DOCTOR OF PHILOSOPHY

Capital adequacy requirements and the risk-return profile of Korean banks.

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CAPITAL ADEQUACY REQUIREMENTS
AND
THE RISK-RETURN PROFILE OF KOREAN BANKS

A THESIS
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LIST OF ACRONYMS

APB	: Accounting Principles Board
APT	: Arbitrage Pricing Theory
ARIMA	: Autoregressive Integrated Moving Average
ARs	: Abnormal Returns
BHCs	: Bank Holding Companies
BIS	: The Bank for International Settlements
BLUE	: Best Linear Unbiased Estimators
BOK	: Bank of Korea
BOKA	: Bank of Korea Act
BOP	: Balance of Payments
BW	: Bonds with Subscription Warrants
CAMEL	: The Banking Rate System in the USA and it stands for Capital, Asset quality, Management, Earnings and Liquidity
CAPM	: Capital Asset Pricing Model
CARs	: Cumulative Abnormal Returns
Cbuk	: Chungbuk Bank
CCB	: Chungcheong Bank
Cheju	: Cheju Bank
CD	: Negotiable Certificates of Deposits
Chohung	: Chohung Bank
CMA	: Cash Management Accounts
CNB	: Citizens National Bank
Commercial	: Commercial Bank of Korea
CP	: Commercial Papers
Daegu	: Daegu Bank
DIDMCA	: Depository Institutions Deregulation and Monetary Control Act
DMB	: Deposit Money Banks
DR	: Depository Receipts
EGLS	: Estimated Generalised Least Squares
ExIm Bank	: Export-Import Bank of Korea
FGLS	: Feasible Generalised Least Squares
FIR	: Financial Interrelation Ratio
First	: Korea First Bank
FRB	: Federal Reserve Board
FRS	: Federal Reserve System
GAAP	: Generally Accepted Accounting Procedures
GBA	: General Banking Act
GLS	: Generalised Least Squares
GNP	: Gross National Products
Hanil	: Hanil Bank
IBK	: Industrial Bank of Korea
JAR	: Journal of Accounting Research
JB	: Jarque-Bera's test of the Normality
JFE	: Journal of Financial Economics
JFQA	: Journal of Financial and Quantitative Analysis
JGLS	: Joint Generalised Least Squares

JMCB : Journal of Money, Credit, and Banking
JOB : Journal of Business
JOBF : Journal of Banking and Finance
Kangwon : Kangwon Bank
KDB : Korea Development Bank
KEB : Korea Exchange Bank
KGB : Kyunggi Bank
KHB : Korea Housing Bank
KNB : Kyungnam Bank
KLTCB : Korea Long Term Credit Bank
KorAm : KorAm Bank
KOSPI : Korea Composite Stock Price Index
KSDA : Korea Securities Dealers Association
KSE : Korea Stock Exchange
KSFC : Korea Securities Finance Corporation
KSSC : Korea Securities Settlement Corporation
KW : Korean Won which is the unit of Korean currency
Kwangju : Kwangju Bank
LM : Lagrange Multiplier
MB : Monetary Board
MSB : Monetary Stabilisation Bonds
MVRM : Multivariate Regression Model
NACF : National Agricultural Cooperative Federation
NBFI : Non-Bank Financial Institutions
NCBs : Nationwide Commercial Banks
NW : Net Worth
NFFC : National Federation of Fisheries Cooperatives
NLCF : National Livestock Cooperatives Federation
OBS : Office of Bank Supervision - the former OBSE
OBSE : Office of Bank Supervision and Examination of the BOK
OLS : Ordinary Least Squares
OPM : Option Pricing Model
Pusan : Pusan Bank
RAP : Regulatory Accounting Procedure
RAR : The Risk Assets Ratio
RBs : Regional Banks
RJE : Rand Journal of Economics
ROA : Return on Assets
ROE : Return on Equity
RP : Repurchase Agreements
Seoul : Bank of Seoul
Shinhan : Shinhan Bank
S & L : Savings and Loans
SEC : Securities and Exchange Commission
SMVAM : Statistical Market Value Accounting Model developed by Kane and Unal (1990)
SSB : Securities Supervisory Board
SURE : Seemingly Unrelated Regression Estimation
TB : Treasury Bills

GENERAL NOTES

1. Totals given in the tables may not equal the sum of individual items due to rounding.

ABSTRACT

Bank supervision in general, and capital adequacy requirements in particular, are concerned fundamentally with bank safety, the stability of the financial system and depositor protection. Bank safety and the stability of the banking and financial system are crucially influenced by the public confidence that depositors and other creditors have in the banks and banking system. Bank capital adequacy is a critical element in generating public confidence in a bank's ability to handle uncertainty and as the ultimate defence against such losses. In this context, capital adequacy regulations by the supervisory authorities have become an increasingly important policy tool to help curb the amount of risk exposure that a bank can assume, thereby helping to preserve public confidence in a bank and the banking system as a whole. Capital adequacy regulations essentially operate on a bank's risk and return profile. This role of capital adequacy requirements is particularly important in Korea.

To examine the impact of the new capital adequacy requirements on bank's risk-return profile, an event study methodology was developed. The empirical results using the OLS and SURE estimation indicated strongly that the new capital standards in Korea did not have an impact on bank shareholders' wealth, whereas they had an apparent partial effect on banks' risk, at least perceived by investors in Korea. In addition, no intra-industry effects were found.

Our conclusions reveal some policy implications. Firstly, supervisory authorities should reexamine and reassess the present supervisory monitoring system and reestablish it to be appropriate for the new, more vulnerable and competitive (deregulating) financial environment. Secondly, to improve the supervisory monitoring process, the supervisory authorities should enhance the role of the market. Finally, under a environment where the free market is being emphasised in resource allocation, bank supervisors should always consider the simultaneous impact of structural deregulation and supervisory re-regulation within their policy-making process.

CHAPTER 1

AIMS AND METHODOLOGY

1.1 INTRODUCTION

The banking industry has been more heavily regulated than any other industry in Korea. Regulations pertaining to banks range from limitations on branching to restrictions on portfolios that strongly influence the business activities of banks. The extensive supervision of banks reflects generally the pivotal role that the banking sector has played in the economic development process within Korea. A stable and solvent banking system is necessary to facilitate an efficient allocation of resources that is crucial to the health of the national economy. For these reasons, banks have been heavily regulated.

In the late 1970s, however, it was widely perceived that the heavy regulations on banks were retarding the growth of the banking and financial sector and preventing the efficient allocation of resources, and that the Korean economy could not progress much further without an adequate, concomitant development of its financial sector. Therefore, since the early 1980s, various deregulation measures were carried out in the financial services industries in order to vitalise the sector by ensuring the autonomy of institutions through a reduction of government involvement in their internal management and other operational matters, and by providing a generally more competitive, responsive environment in the financial sector.

However, as Pecchioli (1987) points out, this financial deregulation carries with it the risk of instability in the short run and requires a reassessment of the existing balances between market forces and supervisory policies. The Korean banking market is not fully-fledged yet, especially compared with the developed countries like Japan, the UK and the USA. As a result, Korean banks may face more uncertainty and higher riskiness in the process of deregulation. Thus, bank supervision, especially capital adequacy requirements which may play a critical role in the 'risk containment' of banks, become vital in maintaining the soundness of the banking and financial system and in stabilising the national economy. Therefore, it is necessary to investigate and analyse the impact of capital adequacy requirements on the banking industry.

1.2 AIMS OF THE STUDY

Bank supervision is fundamentally concerned with ensuring bank safety and depositor protection through reducing the 'excessive' riskiness of banks' portfolios and securing the stability of the banking and financial system as a whole. In practice, the safety and stability of the banking and financial system depend ultimately on the public confidence which depositors and other creditors have in the banks and banking system. Public confidence can be improved through regulating and monitoring the risk of insolvency and curbing banks from taking excessive risks. In this context, bank capital adequacy regulation may play (and is perceived to play) a critical role in the "risk containment" of banks. Capital adequacy requirements have become a central supervisory instrument for instilling greater discipline on bank management in risk assessment and control.

It is a generally accepted view that bank capital acts as a kind of internal buffer or cushion within a bank in order to absorb unexpected losses arising from all the risks which banks assume in their business activities. Typically, the mere addition of capital to the bank's balance sheet is assumed to reduce a bank's risk. The capital base of a bank protects the bank from the risk of insolvency by absorbing losses in times of poor performance. Therefore, *ceteris paribus*, the greater the capital and the larger the respective cushion against losses, the less the probability of insolvency. This risk-absorbing function of capital enhances the safety of depositor's funds, helps to maintain public confidence in the bank and provides funding to support the bank's balance sheet expansion. Following this approach, any regulation that increases the minimum capital adequacy requirement should be considered not only acceptable, but also desirable (Di Cagno, 1990).

However, as Furlong and Keeley (1987) point out, the move to more stringent capital adequacy requirements in banking has met with considerable controversy as well as some scepticism. Some argue that higher capital requirements will simply cause banks to invest in more risky assets, and thereby offset, or even more than offset, the desired effect of higher capital. Koehn & Santomero (1980) and Lam & Chen (1985), for example, conclude that the impact of capital regulation is uncertain, while Furlong & Keeley (1987) show that more stringent capital requirements would not give banks a greater incentive to invest in riskier assets. However, the direction of reshuffling depends upon the risk aversion of the bank's preference function (Koehn & Santomero, 1980).

The essence of modern finance theory is to analyse expected outcomes ('decisions') on a risk and return basis. This is the basis of modern portfolio theory. In a micro-theoretic context, capital adequacy regulation should operate on the risk and return profile of the banking firm. The primary aim of this study is to analyse the impact of the new capital adequacy requirements on commercial banks in terms of risk (condition) and return (performance) in Korea. In particular, it will endeavour to answer the following broad questions.

(1) What is the operational trade-off between risk and return in Korean banking?

(2) What is the impact of capital adequacy requirements on the banking industry in Korea?

(3) How do capital markets perceive the impact of capital regulation and how can we measure this impact?

(4) Are the effects of capital adequacy requirements consistent with supervisor's intention or can they be perverse?

These theoretical and empirical questions will be addressed in the context of a deregulatory financial sector in Korea. The simultaneity of structural deregulation and supervisory re-regulation (both to be defined) policies in Korea complicate the research of the above questions, as will be shown.

1.3 METHODOLOGY OF THE STUDY AND DATA SOURCES

1.3.1 Literature Survey

Bank supervision is basically concerned with bank safety and depositor protection. However, micro-economic theory implies that regulations and supervision tend to reduce competition and may lead to inefficiency. Bank capital regulation has become a central supervisory instrument for the "risk containment" of banks, but the effects of capital adequacy requirements are open to question. The literature survey on the relevant theoretical and empirical literature is very important since it may provide a basic framework to evaluate and analyse the impact of capital adequacy requirements on commercial banks in Korea. It also is the essential starting point in forming relevant and empirically testable hypothesis related to our broad research questions.

1.3.2 Statistical Analysis

Statistical analysis will be carried out in order to analyse and evaluate the effects of capital adequacy requirements on bank shareholders' risk and return. Regression analysis including the ordinary least squares (OLS) and SURE, and other statistical techniques will be utilised in order to test various hypotheses concerned with the impact of capital adequacy requirements. For this purpose, relevant data (i.e., stock prices), are analysed before and after the imposition of the new capital adequacy requirements. The findings based on this analysis may help to develop the future direction of bank supervision policy in Korea.

1.3.3 Application of an Event Study Methodology and Finance Models

To examine the effects of the new capital adequacy requirements on the Korean banking industry, relevant data are analysed before and after the implementation of the new capital standards (in 1990 and 1992). For this purpose, two approaches can be utilised: the accounting approach which is based on *ex post* accounting ratios and the market approach which is based on capital market data. However, *ex post* accounting data are too insensitive to monitor changes in the risk and efficiency of banks. On the other hand, so long as the market has full information, capital market data effectively incorporate investors' current expectation of bank performance. By using the market approach, the sensitivity of the monitoring process should be significantly increased and important conclusions can be drawn regarding the impact of changes in supervisory policy on banks.

To this end, an event study methodology will be utilised in order to evaluate the impact of the new capital adequacy regulations on the banking industry. The underlying models used are those that append a vector of (0,1) dummy variables to the right-hand side of the traditional market model. This dummy variable approach is numerically identical to the standard event study methodology, but provides accurate standard errors with one-step procedures. Furthermore, when combining the dummy variable approach with Zellner's (1962) seemingly unrelated regression estimation (SURE) procedure, a wide variety of hypotheses may be tested. Therefore, a combined model with dummy variables and SURE will be utilised in order to estimate the event parameters.

1.3.4 Data Sources

Data for the study are obtained from the Korea Stock Exchange (KSE), the Office of Bank Supervision of the Bank of Korea (OBS), and individual banks. These data are published statistics, but in some cases, unpublished internal data have been collected.

1.4 THE STRUCTURE OF THE STUDY

The outline of this study is as follows:

CHAPTER 1 : *Aims and Methodology*

CHAPTER 2 : *Banking and Financial System in Korea*

This chapter analyses the main, distinguishing characteristics of the banking and financial system in Korea. The flow of funds in the financial market is analysed. Next, the structure of the banking and financial system are analysed, comprising the Bank of Korea(BOK), banking institutions, non-bank financial institutions, securities market, and money market. This analysis of financial structure seeks to establish the role, nature and relative importance of banks within the Korean financial and economic system.

CHAPTER 3 : *Bank Regulation and Supervision in Korea*

This chapter analyses all the different kinds of regulations pertaining to the banking and financial system including regulations on banking institutions, non-bank financial institutions, securities firms and foreign exchange regulations. The regulatory regimes for banks in Korea are analysed. This chapter also explores the rationale, instruments and targets, the forms and the style of bank supervision and the institutional framework of Korea. The aim is to provide a bird's eye view in order to emphasise capital adequacy rules. The primary emphasis is on analysing the reasons why bank supervision is desirable and the forms and style it may take. The current supervisory system in Korea is analysed within this context.

CHAPTER 4 : *Performance and Condition Analysis of the Korean Banks*

Bank supervision, especially capital adequacy requirements, operates on the performance (return) and condition (risk) of banks. Thus, this chapter examines the performance and condition of the Korean banks: it provides a kind of 'bridge' between Chapters 3 and 5. Although the efficient market model appears to be the best measure of the performance and condition of banks, accounting models are also useful tools for analysing financial performance. This analysis is a necessary prelude to a more refined, market-based analysis. It is also based on these kinds of data widely used by bankers and supervisors in contemporary decision-making and analysis. Ratio analysis, trend and cross-sectional analyses will be utilised. The analysis of the performance and condition of banks will focus on return on equity (ROE), return on assets (ROA), equity multiplier (EM), variability of ROE and capital adequacy risk. Other performance and condition measures will be also analysed. To examine sources of ROE as an overall performance of a bank, ROE decomposition analysis will be employed. Through risk-return analysis and ROE decomposition analysis, an attempt to identify some characteristics of high performance banks will be made.

CHAPTER 5 : *Capital Adequacy and Risk Containment: the Role of the Market*

This chapter examines the issues of capital adequacy which lies at the heart of bank supervision. The aim of this chapter is to provide a theoretical framework in order to evaluate the impact of capital constraints. The primary emphasis is on analysing how bank capital adequacy requirements affect the portfolio composition of banks. Therefore, the nature of capital adequacy regulation - the important role of capital, the definition and the measurement of capital adequacy - is analysed. The micro-finance foundations are also discussed. Finally, the market role is discussed in order to provide a framework in order to evaluate the impact of capital regulations, which is the main task of Chapters 6 and 7.

CHAPTER 6: *Capital Adequacy Requirements and Bank Profitability: Wealth Effects*

This chapter presents the empirical findings of the impact of the new capital adequacy requirements on bank stockholders' wealth. For this purpose, an event study methodology is developed in order to identify the wealth gains and losses of shareholders in the vicinity of the announcements of the new capital adequacy requirements. Various econometric models and hypotheses are specified and tested using stock market data. First, to measure the likely impact of capital regulations on shareholders' wealth, the abnormal returns and cumulative abnormal returns will be estimated using the OLS. Second, to generate more efficient estimates, the SURE will be employed. Then we will test various hypotheses and the results are reported.

CHAPTER 7: *Capital Adequacy Requirements and Bank Risk: Risk Effects*

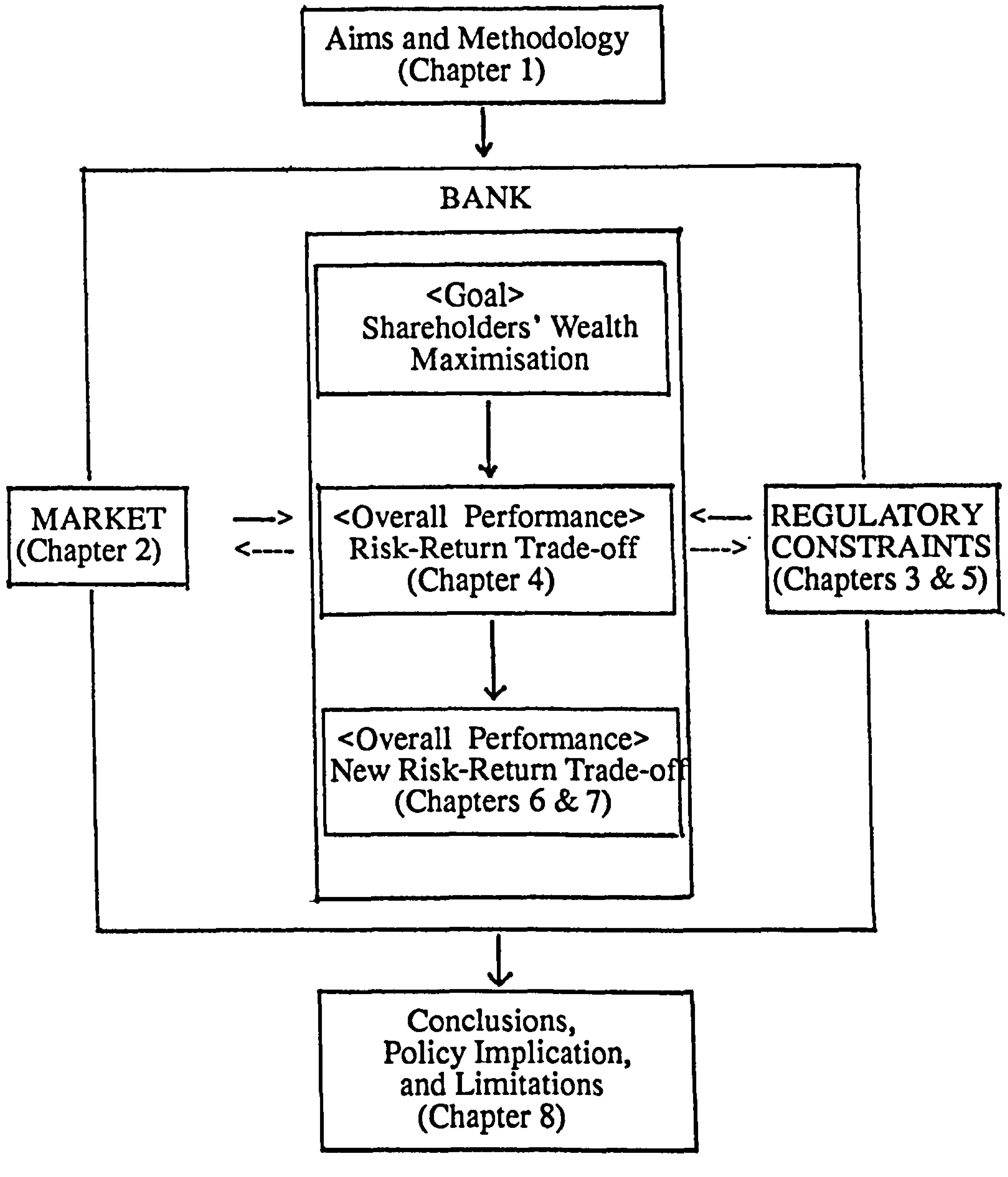
This chapter examines the impact of the new capital adequacy requirements on the risk of commercial banks, which is the main concern of bank supervisors. To test for the likely changes in risk, the variance of rates of return on each portfolio is estimated and compared before and after the imposition of the new capital adequacy requirements. In cases where a change does occur, it is important to examine causes of change. Therefore, the behaviour of the components of total risk is analysed. Whether or not systematic risk shifts occur over time will be tested. Finally, the results are interpreted.

CHAPTER 8 : *Conclusions, Policy Implications, and Limitations*

The main findings and conclusions will be summarised and the overall assessment will be made. Some policy alternatives based on our empirical findings will be developed for the future direction of bank supervision. Finally, the limitations of this study will be made.

Figure 1.1 schematically summarises the structure of this study.

<Figure 1.1> The Structure of the Study



CHAPTER 2

THE BANKING AND FINANCIAL SYSTEM IN KOREA

2.1 INTRODUCTION

This chapter analyses the banking and financial system in Korea in order to identify its main, distinguishing characteristics. In section 2, the flow of funds in the economy is analysed in order to set the scene on the Korean financial market structure. Following this, the modern evolution of the financial system is traced in Section 3, and section 4 goes on to analyse the institutional structure of the banking and financial system. This analysis of the financial sector seeks to establish *inter alia* the relative importance of banks and banking within the Korean financial and economic system.

The objectives of bank supervision include maintaining the soundness and safety of banks, protecting depositors, and stabilising the national economy from possible adverse consequences of broader changes (particularly structural deregulation) within the financial sector. In a structurally deregulating (or financially liberalising) environment, the stability objective of supervision is likely to be especially important; recent Asian and Latin American experiences have emphasised this key role of supervision (Fry, 1988). In Asian countries like Korea and Taiwan, adequate bank supervision has been a key factor in maintaining the soundness of banks and in stabilising the national economy in the process of financial liberalisation. On the other hand, the failure to provide adequate bank supervision has contributed to financial insolvency problems in the Southern Cone countries (Chile, Argentina, and Uruguay), the Philippines, and Turkey (Fry, 1988; World Bank, 1989).

To achieve stability, bank supervision should be appropriate to the underlying banking system. 'Appropriate' here refers both to the kind of supervision and its intensity, or scale. Excessive supervision, for example, might contribute towards making the performance of banks worse and ultimately deter the development of the financial system; while under-regulation or loose supervision may not preserve or enhance the soundness and safety of banks, and this may ultimately lead to disruption of the whole economy. Policy "balance" between liberalisation (or structural de-regulation) and supervision (or, more specifically, supervisory re-regulation) is clearly an important practical problem in this context. Explicit knowledge of the banking and financial system and how it changes, therefore, are necessary when designing the most appropriate bank supervisory framework. Any supervisory system recommended from this research has to be applicable to the banking system in Korea. Furthermore, the banking and financial system of Korea are the 'laboratory' (environment and data source) for the research of this thesis. Therefore, an appropriate starting point for this study must be an analysis of the banking and financial system in Korea.

2.2 FLOW OF FUNDS IN THE ECONOMY (in 1990)

2.2.2 Introduction

In 1990, the Korean economy, driven by an expansion of domestic demand, recorded higher real growth (9.0%) than in the previous year (6.8%). But internal and external disequilibria became more intense with mounting inflationary pressures and the balance of payments sliding back into deficit (see Table 2.1).

Against this background of real economic developments, the volume of financial transactions continued to increase, with expansion of the financial surplus in the Individual sector fed by improvements in wage incomes and the growing demand for funds for investment in the Business sector. In this expansion of financial transactions as a whole, the Individual sector invested its surplus funds in claims on banks such as preferential savings deposits and certificates of deposits (CD), rather than in holdings of stocks, because of the protracted stagnation of the stock market. On the other hand, the Business sector sought to meet its funding needs mainly through borrowing from financial institutions and issues of corporate bonds.

<Table 2.1> Main Economic Indicators

(Unit: %, US$ millions)

Year	Real GNP	CPI[1)]	Wages[2)]	BOP[3)]
1975	6.4	25.4	26.8	- 1,886.9
1976	13.1	15.3	33.2	- 313.6
1977	9.8	10.0	33.2	12.3
1978	9.8	14.5	33.9	- 1,085.2
1979	7.2	18.2	28.5	- 4,151.1
1980	- 3.7	28.7	22.9	- 5,320.7
1981	5.9	21.6	20.2	- 4,646.0
1982	7.2	7.1	14.6	- 2,649.6
1983	12.6	3.4	11.9	- 1,606.0
1984	9.3	2.3	7.7	- 1,372.6
1985	7.0	2.5	10.2	- 887.4
1986	12.9	2.8	9.2	4,617.0
1987	13.0	3.0	11.3	9,853.9
1988	12.4	7.1	19.1	14,160.7
1989	6.8	5.7	24.6	5,054.6
1990	9.0	8.6	20.0	- 2,179.4

Notes: 1) CPI represents Consumer Price Index
2) Wages represent percent changes of Nominal Wages over the previous year
3) BOP represents Balance of Payments in Current Account

Source: The BOK, Monthly Bulletin, December 1991, pp.11-15.

2.2.2 Financial Surpluses and Deficits by Sector

The following Table 2.2 and Chart 2.1 show clearly the transmission mechanism of the flow of funds from surplus sectors (Individual, Government, Financial Institutions and Foreign sectors) to deficit sectors (specifically, the Business sector).

Examining the financial surpluses and deficits of non-financial sectors during 1990, only the Business sector, the principal investor in the economy, showed a financial deficit, and the Foreign sector recorded a financial surplus as the current account shifted into deficit for the first time after being in surplus for four consecutive years from 1986 (see Table 2.2).

<Table 2.2> Financial Surpluses & Deficits by Sector

(Unit: billion won, %)

	1987	1988	1989	1990
Business(A)	-7,705.8	-8,847.5	-16,919.9	-28,751.3
	(13.0)	(14.8)	(91.2)	(69.9)
Individual(B)	12,760.3	11,865.7	14,938.6	19,663.1
	(46.0)	(-7.0)	(25.9)	(31.6)
Government(C)	3,281.7	5,801.0	5,188.8	5,730.5
	(153.8)	(76.8)	(-10.6)	(10.4)
Foreign	-9,036.6	-9,888.3	-3,868.7	3,040.7
	(152.9)	(9.4)	(-60.9)	(-)
Ratios: B/A (%)	165.6	134.1	88.3	68.4
C/A (%)	42.6	65.6	30.7	19.9

Note: Numbers in parentheses represent the rate of change over the previous year
Source: The BOK, Monthly Bulletin, March 1991

<Chart 2.1> Flow of Funds in the Economy (1990)

(Unit:billion won)

Surpluses Sector		Types of Fund Raising		Deficit Sector
Individual Savings / Investments Surpluses 19,663.1	==>	Borrowings from Financial Institution Banks: 3,480.6(12.1) NBFIs:6,388.5(22.2) Total: 9,869.1(34.3)	==>	Business Savings / Invest-ments Deficits: 28,751.3
Government: 5,730.5		Issues of Securities 17,228.1(59.9)		
Financial Institutions: 316.9		Borrowings from Abroad 2,907.9(10.1)		
Foreign: 3,040.7		Others: -1,253.9(-4.3)		

Note: Numbers in parentheses represent the percentage over the total deficit.
Source: The BOK, Monthly Bulletin, March 1991, p.55

The 1990 financial deficit of the Business sector showed an increase of 69.9% over the previous year to a total of 28.8 trillion won, due to the deterioration of corporate profits and increasing investment in construction and facilities. The financial surplus of the Individual sector reached a total of 19.7 trillion won in 1990, showing a rise of 31.6% over the previous year. This was attributable to higher wage incomes and the slower growth of consumption expenditure in the latter part of the year. But the ratio of the Individual sector's surplus to the Business sector's financial deficits, which measures the extent to which companies' shortage of funds is met by the savings of Individuals, reached 68.4%, the lowest level since 1986. The Government sector's surplus also increased in 1990 to a total of 5.7 trillion won, reflecting the fiscal surplus resulting from favourable tax receipts. The balance of the Foreign sector shifted from deficit to surplus, the first surplus since 1986, due to the deficit of the current account of the BOP.

The following Table 2.3 and Figure 2.1 show the ratios of the financial balances to nominal GNP by sector from 1984 to 1990. The ratio of the Business sector's financial deficit to nominal GNP rose sharply to 17.1% in 1990 from 11.9% in 1989 and the ratio of the Individual sector's surplus to nominal GNP slightly increased from 10.5% in 1989 to 11.7% in 1990. The Foreign sector's surplus to nominal GNP was 1.8% in 1990, whereas the sector's deficit in 1989 had been equivalent to 2.6% of GNP.

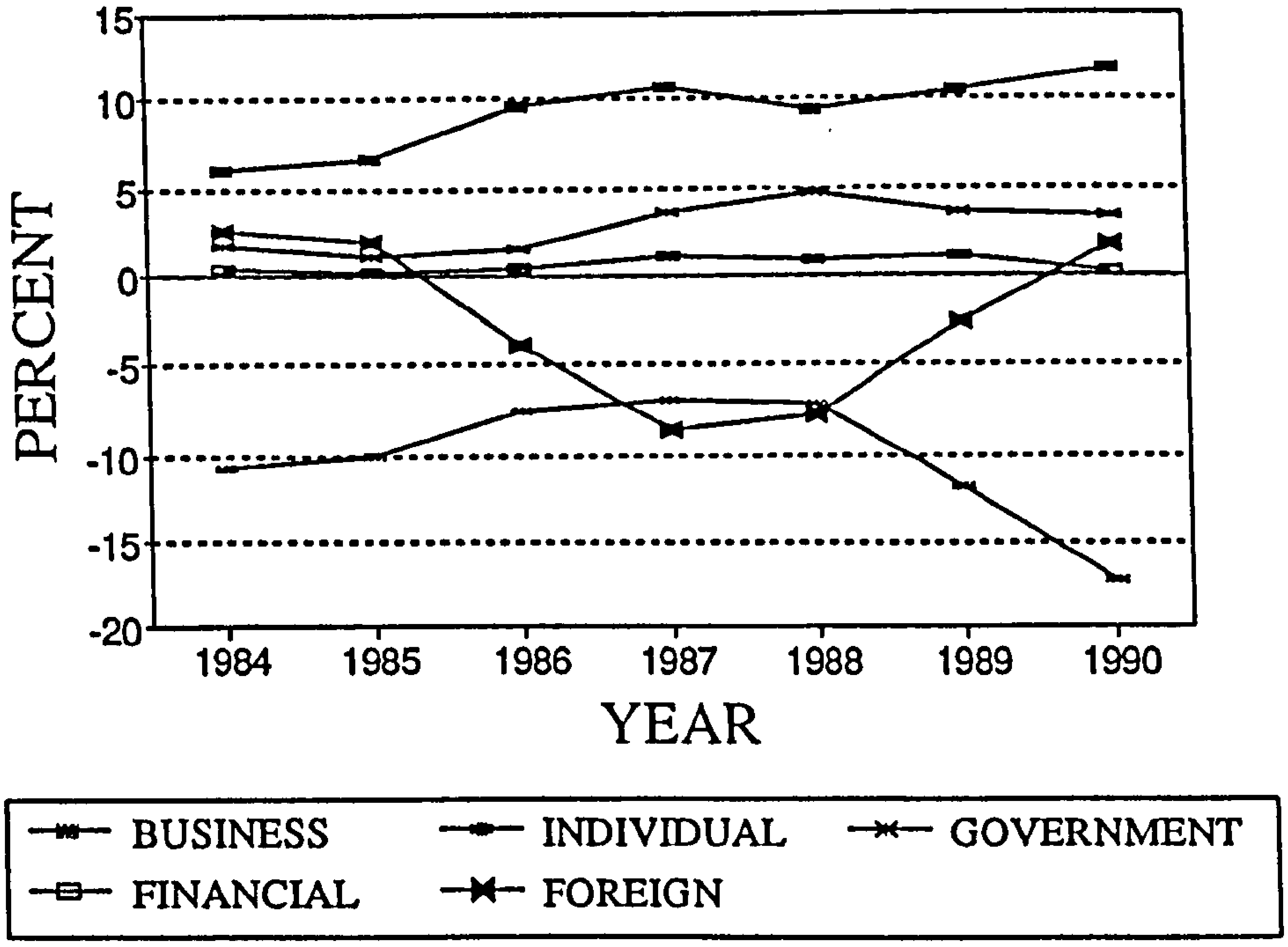
<Table 2.3> Ratios of Financial Surpluses and Deficits to Nominal GNP by Sector

(Unit: %)

Year	Business	Individual	Government	Financial	Foreign
1984	-10.7	6.1	1.6	0.4	2.6
1985	-10.1	6.7	1.2	0.2	1.9
1986	- 7.5	9.7	1.4	0.4	- 3.9
1987	- 6.8	10.8	3.6	1.0	- 8.6
1988	- 7.0	9.4	4.6	0.9	- 7.8
1989	-11.9	10.5	3.6	1.0	- 2.6
1990	-17.1	11.7	3.4	0.2	1.8

Source: The BOK, Monthly Bulletin, March 1991, p.55

<Figure 2.1> Ratios of Financial Surpluses and Deficits to Nominal GNP by Sector



2.2.3 Sources and Uses of Funds by Domestic Sectors

During 1990, the volume of funds raised by the financial sector increased slightly to 65.7 trillion won and the volume of funds utilised to 66.7 trillion won (see Table 2.4). As for sources of funds, the share of deposits sharply increased from 48.1% in 1989 to 64.5% in 1990. Among deposits, those raised by banks showed a great increase, induced by preferential savings deposits and by CDs, and those deposits whose interest rates and issuance ceilings were raised during the year. Claims against non-bank financial institutions (NBFIs) also rose due to an increase in deposits at mutual savings institutions and insurance companies. Thus, the share of deposits raised by banks and NBFIs rose from 14.3% and 33.8% in 1989 to 21.0% and 43.5% in 1990, respectively. Despite an increase in funds raised through the issue of long-term financial obligations, the overall amount of funds raised by the issue of securities notably decreased, due mainly to the bearish stock market. Accordingly, the share of securities issued in total funds raised decreased from 25.7% in 1989 to 13.9% in 1990.

As for uses of funds, the share of loans slightly increased from 52.9% in 1989 to 53.8% in 1990. Within this figure, the share of loans utilised by banks declined from the previous year (1989) owing to the reduction of general loans, whereas loans' share utilised by NBFIs slightly increased from 30.2% in 1989 to 34.1% in 1990: this was attributable mainly to an expansion of lending by development institutions and insurance companies. On the other hand, the share of funds utilised for the purchase of securities fell to 27.1% in 1990 from 32.8% in 1989 due to the decrease in holdings of stocks. The share of foreign claims utilised rose slightly because of the growth of foreign exchange held by domestic banks.

<Table 2.4> Financial Sector's Sources and Uses of Funds [1]

(Unit: billion won, %)

	1989	1990
	Amount (%)	Amount (%)
<Sources of Funds>		
Deposits	29,250.1 (48.1)	42,403.1 (64.5)
0 Banks	8,717.4 (14.3)	13,795.8 (21.0)
0 NBFIs [2]	20,532.7 (33.8)	28,607.3 (43.5)
Issue of Securities	15,618.3 (25.7)	9,120.5 (13.9)
Borrowing from Abroad	443.0 (0.7)	898.9 (1.4)
Others [3]	15,516.8 (25.5)	13,276.6 (20.2)
Fund Raised	60,282.2 (100.0)	65,699.2 (100.0)
<Uses of Funds>		
Loans	32,636.2 (52.9)	35,891.2 (53.8)
0 Banks	14,022.7 (22.7)	13,119.5 (19.7)
0 NBFIs	18,613.4 (30.2)	22,771.8 (34.1)
Securities	20,220.4 (32.8)	18,046.4 (27.1)
Foreign Claims	345.6 (0.6)	1,045.7 (1.6)
Others [4]	8,511.8 (13.8)	11,731.2 (17.6)
Fund Utilised	61,714.0 (100.0)	66,714.6 (100.0)

Notes: 1)includes deposit money banks, insurance companies & pension funds and NBFIs.
2)includes life insurance & pension fund reserves.
3)borrowings from government and the BOK, bills payable, etc.
4)currency, deposits in the monetary stabilisation accounts, and bills receivable, etc.
Source: The BOK, Monthly Bulletin, March 1991, p.57

In 1990 the amount of funds raised by non-financial sectors (Business, Individual and Government sectors) increased 16.7% over the previous year, and funds utilised edged up by 4.6% (see Table 2.5). As for the composition of funds raised by types, the share of borrowings from financial institutions rose from 48.3% in 1989 to 54.2% in 1990. This increase was mainly due to the increased borrowing from banks brought about largely through greater extension of export financing and of funds for facilities investment. Borrowings from NBFIs also increased through borrowings from mutual credits and from mutual savings and finance companies. On the other hand, fund raising by the issue of securities decreased, affected by the subdued stock market and the contraction in the issue of commercial paper (CP) due to the restriction concerning compensating balances[1].

Accordingly, the share of securities issued by domestic non-financial sectors decreased from 39.9% in 1989 to 29.3% in 1990. As for the pattern of funds utilisation, the share of deposits at financial institutions in total funds utilised rose sharply from 49.6% in 1989 to 66.9% in 1990. This figure was boosted by the increase in deposits at banks, such as CDs issued and preferential savings deposits, and in deposits at NBFIs, particularly insurance companies, mutual credits and mutual savings and finance companies. Meanwhile, the share of securities held dropped sharply from 31.6% in 1989 to 15.2% in 1990, reflecting reduced holdings of stocks and CP.

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1. In the USA, compensating balances are an accepted and legal business custom relating to loan pricing, whilst in Korea and Japan, these balances are not considered as legal business custom. Under credit rationing, due mainly to the existence of financial repression, banks as lenders have a dominating position to borrowers and they request implicitly borrowers to make compensating balances in order to circumvent maximum ceilings of interest rates decided by the MB. Borrowers are inevitably forced to make deposits as compensating balances. These compensating balances tend to violate maximum ceilings of interest rates and to increase borrowing costs. Therefore, the BOK regulates compensating balances. However, it is practically difficult to detect these facts. When the government and the BOK regulate compensating balances, banks and NBFIs are reluctant to purchase and discount CP issued by business enterprises. Therefore, funds raised by issuing CP are likely to decrease in the short run.

<Table 2.5> Sources and Uses of Funds by Domestic Non-Financial Sectors

(Unit: billion won, %)

	1989 Amount (%)	1990 Amount (%)
[SOURCES OF FUNDS]		
<By Sector>		
Business	38,484.0 (69.2)	46,081.4 (71.1)
Individual	16,510.0 (29.7)	17,589.0 (27.1)
Government	594.4 (1.1)	1,185.1 (1.8)
Total Funds Raised	55,588.4(100.0)	64,855.5(100.0)
<By Type>		
Borrowings	26,835.9 (48.3)	35,133.4 (54.2)
Banks	8,686.2 (15.6)	12,523.7 (19.3)
NBFIs	18,149.7 (32.7)	22,609.7 (34.9)
Securities	22,154.2 (39.9)	18,980.4 (29.3)
Borrowings from Abroad	- 837.6 (-1.5)	2,878.9 (4.4)
Others	7,435.9 (13.4)	7,862.8 (12.1)
[USES OF FUNDS]		
<By Sector>		
Business	21,564.1 (36.7)	17,330.1 (28.2)
Individual	31,448.6 (53.5)	37,252.1 (60.6)
Government	5,783.2 (9.8)	6,915.6 (11.2)
Total Funds Utilised	58,795.0(100.0)	61,497.8(100.0)
<By Type>		
Currency	608.2 (1.0)	702.9 (1.1)
Deposits	29,190.8 (49.6)	41,144.2 (66.9)
Banks	9,066.3 (15.4)	13,175.0 (21.4)
NBFIs	20,124.5 (34.2)	27,969.2 (45.4)
Securities	18,570.3 (31.6)	9,345.6 (15.2)
Foreign Claims	922.3 (1.6)	481.0 (0.8)
Others	9,504.3 (16.2)	9,824.0 (16.0)

Source: The BOK, Monthly Bulletin, March 1991, p.58

2.3 THE EVOLUTION OF THE FINANCIAL SYSTEM IN KOREA

The modern development of the financial system in Korea can be broadly divided into three stages: the introduction of a modern banking system (1950s), the reorganisation of the banking and financial system in order to support the economic development (1960s-1970s), and the liberalisation of financial market (1980s-).

2.3.1 Introduction of a Modern Banking System (1950s)

The introduction of a modern banking system into Korea dates back to the late nineteenth century (BOK, 1990). The present banking system, however, was not established until the promulgation of the Bank of Korea Act (BOKA) and the General Banking Act (GBA) in 1950. The drafting of these two acts was carried out by Arthur I. Bloomfield and John P. Jensen, both of whom held positions in the Federal Reserve Bank of New York. The drafts were passed by the National Assembly in April and promulgated on May 5, 1950. A new central bank, the Bank of Korea (BOK), came into being on June 12, 1950. Upon its establishment, the BOK initiated a number of policy measures to combat inflation, and an institutional basis was provided for commercial banks to be reorganised under the GBA, whose enforcement was, in fact, delayed until August,1954.

The Korean War (1950-53), which broke out less than two weeks after the establishment of the BOK, created a whole new set of problems. After the armistice, the primary problem facing the financial system was how to finance the necessary industrial and agricultural projects for economic rehabilitation. For this purpose, the Korea Development Bank (KDB) was established in 1954 with capital wholly subscribed by the government, and in 1956 the Federation of Financial Associations was reorganised into the Korea Agriculture Bank.

During the same period, commercial banks were also realigned to strengthen the short-term financing needed for effective economic reconstruction. In addition to the existing commercial banks - Cho Hung Bank, the Commercial Bank of Korea, and Korea Savings Bank, later renamed Korea First Bank - a new bank named Korea Hungop Bank, later renamed Hanil Bank, was added through the merger of the old Trust Bank and Bank of Commerce and Industry in 1954; Seoul Bank was also established in 1959 as a regional bank whose business area was limited to Seoul and its vicinity. In 1962 Seoul Bank was authorised to open a nationwide branch network, and later renamed Bank of Seoul and Trust Company in 1976 after merging with Korea Trust Bank, which had been set up in 1968.

2.3.2 Reorganisation of the Banking and Financial System (1960s-1970s)

Following the military revolution of 1961, a series of measures were implemented throughout the national economy to promote its development. For the purpose of supporting the economic development plan through more efficient allocation of banking funds, a major portion of the equity capital of commercial banks was nationalised in 1961. The BOKA was amended in 1962 to strengthen government influence over the monetary policy of the BOK.

During the 1960s, the government also established a wide range of specialised banks to facilitate financial support for underdeveloped or strategically important sectors: the National Agricultural Cooperative Federation and its member cooperatives (NACF), the National Federation of Fisheries Cooperatives and its member cooperatives (NFFC), the Small and Medium Industry Bank, later renamed the Industrial Bank of Korea (IBK) in 1987, and the Citizens National Bank (CNB). Later in the 1960s, the Korea Exchange Bank (KEB) and the Korea Housing Bank (KHB) were established. In 1983, the National Livestock Cooperatives Federation (NLCF) was added to complete a comprehensive set of specialised banking institutions.

Meanwhile, the commercial banking system was also restructured to meet the changing needs of the national economy: regional banks were introduced and foreign banks were allowed to open branch offices in Korea. Two additional development institutions were also established to meet the surging needs of the continuing economic development plans and to diversify the sources of investment funds. Korea Development Finance Corporation, a private development financial institution later renamed the Korea Long Term Credit Bank (KLTCB), was incorporated as a long-term financial institution, and the Export-Import Bank of Korea (ExIm Bank) was founded to facilitate financial support for exports and overseas investment.

The unorganised curb market is the informal financial sector which is common in the developing countries. It functions outside the purview of regulations imposed on the formal sector in respect of capital, reserve and liquidity requirements, ceilings on lending and deposits rates, mandatory credit targets, and audit and reporting requirements. It comprises pawnshops, landlords, moneylenders, credit unions, 'kye' which is the same as the rotating savings and credit associations (ROSCA), the informal CP market and large-scale informal credit-brokers' market. These have played a important role in channelling credit to small and poor borrowers that were found it difficult to access formal organisations like banks due to the existence of credit rationing. However, since they were frequently bankrupt and produced serious social problems, the government tried to organise this market (Cole and Park, 1983). With the promulgation of the Presidential Emergency Decree in 1972, designed to induce unorganised curb market funds into the organised financial market, three kinds of non-financial institutions - the investment and finance companies, mutual savings and finance companies and merchant banking corporations - were introduced in 1972, 1972 and 1976, respectively. Investment and finance companies were established to engage in short-term dealings in paper issued by business firms. Mutual savings and finance companies were specialised in receiving instalment savings and extending small loans repayable in instalments. Merchant banking corporations were introduced to induce foreign capital and supply medium and long-term funds for business enterprises. NBFIs have grown rapidly since their establishment thanks to the relatively higher interest rates they were allowed to apply and the greater degree of autonomy they enjoyed in management compared with banking institutions, thereby encroaching on the share of banking institutions in the financial market (see Table 2.6).

<Table 2.6> Non-Financial Sectors' Financing

(Unit: %)

	1975	1980	1985	1990
Banks	30.9	27.8	32.6	19.3
NBFIs	17.1	16.9	28.8	34.9
Securities	20.1	19.1	19.8	29.3
Foreign Borrowing	15.7	16.0	1.1	4.4
Total	100.0	100.0	100.0	100.0

Source: The EPB, Economic Bulletin, October 1991, p.9

The securities market has also grown rapidly since 1972, supported by a series of measures designed to promote investment in securities and to encourage enterprises to offer shares for public subscription, including the establishment of the Securities and Exchange Commission (SEC) and its executive body, the Securities Supervisory Board (SSB).

2.3.3 Liberalisation of the Financial Market (1980s-)

As can be seen from Table 2.7, the successful implementation of a series of economic development plans contributed greatly to Korea's achievement of remarkable economic development during the 1960s and 1970s. However, as the economy grew larger and more complex, the side effects of the development policy became more conspicuous in the late 1970s. During the 1960s and 1970s, Korea's heavily regulated financial system was a key instrument in the government's industrial policy. Interest rates were controlled and kept low and a substantial proportion of bank credit - well above one-third - was directed by the

<Table 2.7> Economic Growth Rates

(Unit: %)

	'60-'69	'70-'79	'80-'84	'85-'89	'90
USA	4.1	3.1	1.8	3.3	1.0
UK	3.0	2.3	0.7	3.7	0.7
Japan	11.0	6.1	3.9	2.1	NA
Korea	8.0	11.0	5.9	9.8	9.0

Note: Annual average growth rates during the periods
Source: IMF, International Financial Statistics, various issues.

government to designated sectors. In the late 1970s, however, it was widely perceived that this approach was retarding the growth of the financial sector and preventing the efficient allocation of resources. The Korean economy could not progress much further without an adequate, concomitant development of its financial sector. So, confronted with a significant macroeconomic imbalance and slower economic growth, the government changed direction. The aim of the shift was to enhance economic efficiency by assigning a greater degree of reliance to the market mechanism and promoting competition in every sector of the economy. As a result, wide-ranging structural adjustment policies were implemented from the early 1980s. The five nationwide commercial banks were privatised and seven, new nationwide commercial banks were opened. In addition, entry barriers were substantially lowered for such non-bank financial institutions (NBFIs) as investment and finance companies and mutual savings and finance companies. Foreign bank branches were also considerably expanded, and internationalisation of the capital market was promoted (see Section 2.4.4). Along with the relaxation of entry barriers and control over banks' asset management, the government has continued to move towards universal banking by broadening and diversifying financial services supplied by financial institutions.

As a result, the financial sector grew rapidly in the 1980s, largely owing to the explosive expansion of NBFIs and securities markets (see Table 2.6). Over the last two decades, Korea has experienced rapid growth and significant structural changes of its financial sector as shown in Table 2.8. Measured by the ratio of M_3 to GNP, the size of Korea's financial sector almost tripled between 1980 and 1990. The financial interrelation ratio (FIR), which measures the degree of financial asset accumulation in the economy as a whole (and is the ratio of total financial assets to nominal GNP), rose to 4.2 in 1990 from less than 2.4 in 1980. In particular, the individual or household sector has recorded the highest rate of financial asset accumulation. The ratio is now lower than that of Japan or the USA, but bears comparison with the ratios of Germany or Taiwan.

<Table 2.8> Financial Development in Korea

	1975	1980	1988	1989	1990
M_2/GNP 1)	0.31	0.34	0.39	0.41	0.41
M_3/GNP 2)	0.38	0.48	0.93	1.06	1.15
FIR 3)					
0 Korea	2.17	2.39	3.69	4.10	4.22
0 Germany	2.85	3.07	3.83	3.87	NA
0 Japan	4.41	4.94	7.33	7.55	NA
0 Taiwan	2.82	3.40	4.60	NA	NA
0 U.S.A.	4.16	4.43	5.20	5.62	NA

Notes : 1) M_2 is year-end figures and defined as M_1 + Quasi-money (Time & savings deposits and resident's foreign currency deposits at banking institutions).

2) M_3 is year-end figures and defined as M_2 + NBFI deposits + Debentures issued + commercial bill sold + CD + RP.

3) FIR represents the financial interrelation ratio and defined as the ratio of total financial assets to nominal GNP.

Sources :1)The BOK, Monthly Bulletin, March 1991, p.53

2)The EPB, Economic White Paper, November 1990, p.139

3)The National Data Book, Statistical Abstract of the United States, 111th edition, 1991.

Korea's financial sector now includes well organised and fast growing money and capital markets through which corporations have obtained more than 50% of their financing needs since 1985 (see Table 2.6). Financial services provided by various financial intermediaries range from fixed deposits to cash management, investment banking and asset management for individual savers and institutional investors.

2.4 BANKING AND FINANCIAL STRUCTURE IN KOREA

The financial system in Korea can be classified into four types of institution: the Bank of Korea (BOK) as a central bank; banking institutions including commercial and specialised banks; non-bank financial institutions (NBFIs); and securities market and money market institutions. The following Chart 2.2 shows the present financial institutions in Korea.

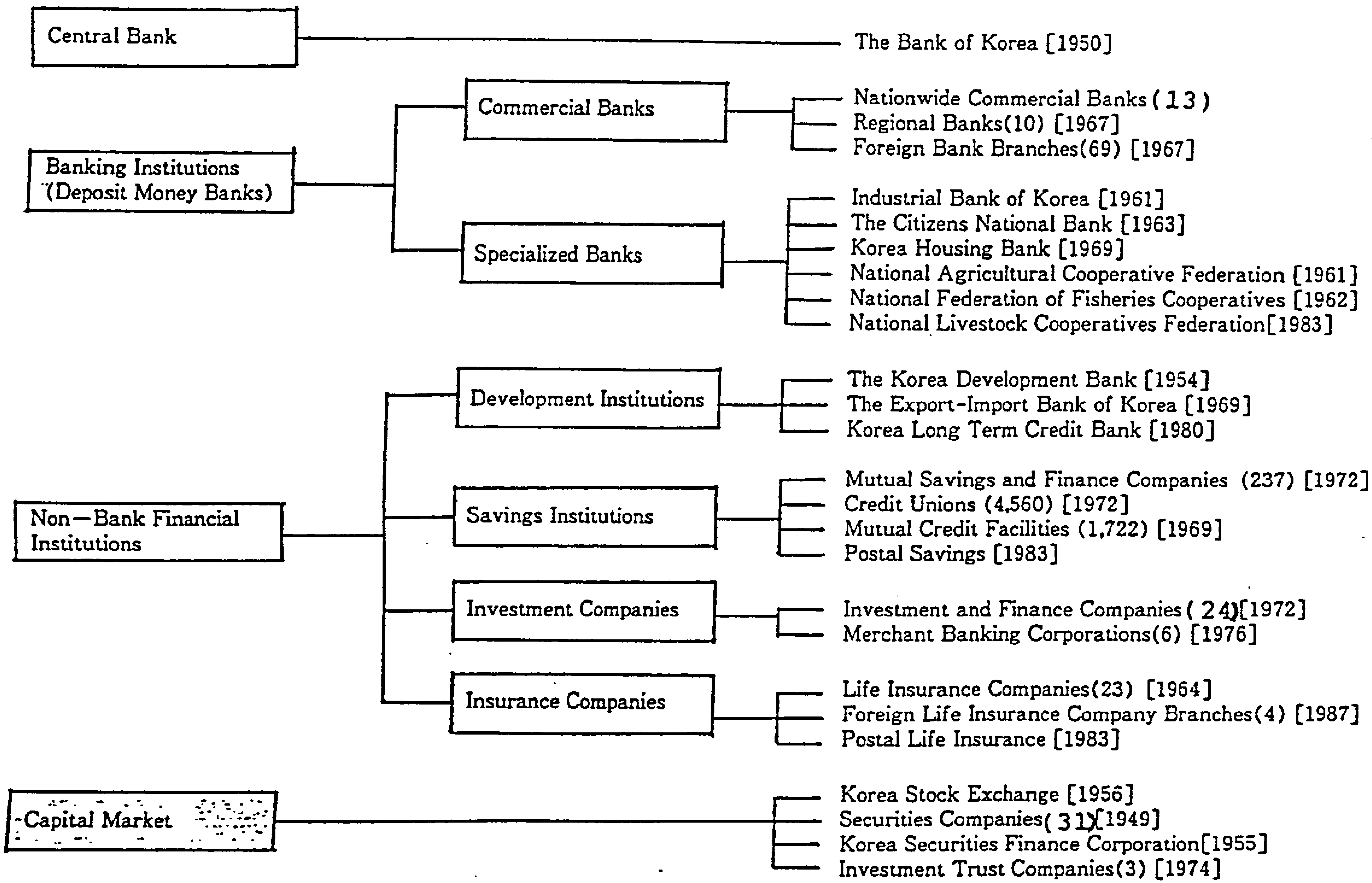
2.4.1 The Bank of Korea (BOK)

The BOK was established on June 12, 1950 under the Bank of Korea Act (BOKA) with its primary purpose being defined as "maintaining the stability of the value of money in the interests of national economic progress and furthering the efficient utilisation of national resources through the sound operation and functional improvement of the nation's banking and credit system" (Article 3). To this end, the BOK like many other central banks conducts a broad array of banking, regulatory and supervisory functions such as issuing currency, acting as banker to the banks as well as to the government, controlling the money supply and supervising banking operations under the instructions of the Monetary Board (MB), its policy-making organ.

2.4.1.1 The Organisation of the BOK

The BOK's capital was originally 1.5 billion won, all of which was subscribed by the government. However, the amendment of the BOKA in 1962 made the Bank a special juridical person with no capital. The BOKA stipulates that the annual net profits of the Bank must be paid into the general revenue account of the government after sufficient allowances have been made for depreciation in assets and authorised reserve funds have been credited. The following Chart 2.3 shows the present organisation of the BOK. As the

<Chart 2.2> Financial Institutions in Korea

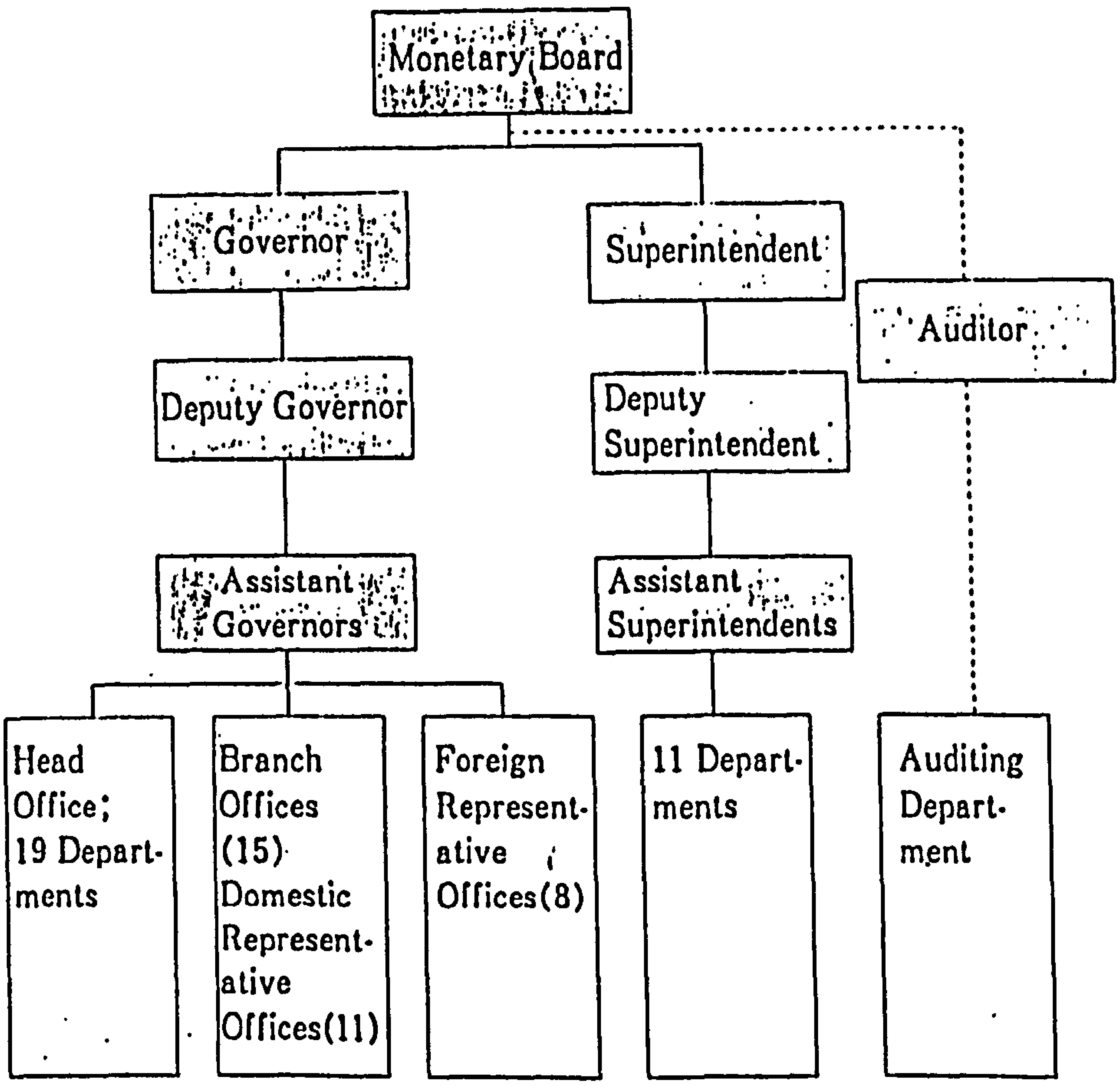


Note : 1) Figures in parentheses represent the number of institutions as of the end of 1990.
2) Figures in brackets represent the year in which the institution was established.
Where there is more than one such institution, the year is that of the first to be established.

Source: The OBSE of the BOK, Bank Supervision in Korea, March 1991, p.5

<Chart 2.3> Organisation of the Bank of Korea

(at the end of 1990)



Source: The OBSE of the BOK, Bank Supervision in Korea, March 1991, p.30

supreme policy-making organ of the Bank, the MB formulates monetary and credit policies and is responsible for the general direction and supervision of the Bank. It also has regulatory and supervisory authority over the activities of banking institutions.

The MB is composed of the following nine members representing various groups in the national economy:

(1) the Minister of Finance, ex-officio;

(2) the Governor of the BOK, ex-officio;

(3) one member recommended by the Minister of the Economic Planning Board;

(4) two members recommended by banking institutions;

(5) two members recommended by the Minister of Agriculture, Forestry and Fisheries; and

(6) two members recommended by the Minister of Trade and Industry.

The Minister of Finance presides over the Board's meeting and, in case of his absence, the Governor of the BOK acts as a chairman. The seven members, excluding the two ex-officio members, are appointed by the President for three-year terms. When conflicts exist on decisions about monetary policy between the MB and the Minister of Finance, the Minister of Finance may request reconsideration of resolutions adopted by the MB and , if the request for reconsideration is rejected by the MB, the final decision is made by the President.

The officers of the BOK include the Governor, the Deputy Governor, five or fewer Assistant Governors, the Superintendent of Banks, the Deputy Superintendent of Banks, three or fewer Assistant Superintendents of Banks and the Auditor. The terms of office are four years for the Governor and the Superintendent of Banks and three years for other officers.

The BOK's head office is located in Seoul, and consists of 30 departments at the end of 1990. In addition, it has fifteen branches and eleven representative offices in major cities throughout the country, and eight overseas representative offices (one each in New York, Frankfurt, Tokyo, London, Singapore, Paris, Hong Kong and Riyadh).

2.4.1.2 The Role of the BOK

Generally speaking, the BOK occupies a central or pivotal position in the financial sector of the economy (see Chart 2.2). Because it is endowed with a broad array of executive powers and responsibilities, it is capable of engaging in a corresponding wide range of activities for accelerating economic progress. These activities can be grouped into five general functions: currency issue and management of foreign reserves; banker and adviser to the government; banker to the banks; money and credit control; regulation and supervision of banking institutions.

The BOK has the exclusive right to issue notes and coins in any dimension, design or denomination determined by the MB. The BOK is not required to maintain any prescribed minimum ratio of gold or foreign exchange against its currency issue, nor is any maximum limit imposed on the issue. This indicates that Korea has adopted a completely managed currency system in which the currency issue relies ultimately on decisions made by the BOK in line with its monetary policy. The BOK holds and manages the nation's foreign exchange reserves, receives foreign currency deposits from commercial banks, and invests funds in international financial institutions in accordance with the government's decisions. The BOK makes loans to and receives deposits from banking institutions. It maintains current deposit accounts for banking institutions. Reserve deposits kept in these current accounts are used to clear checks and settle interbank balances. The Bank engages in loan and deposit transactions with the government as one of its primary functions and carries on various kinds of business for the government in accordance with the BOKA and other relevant laws. The monetary policy and bank supervision of the BOK will be discussed in greater detail in Chapter 3.

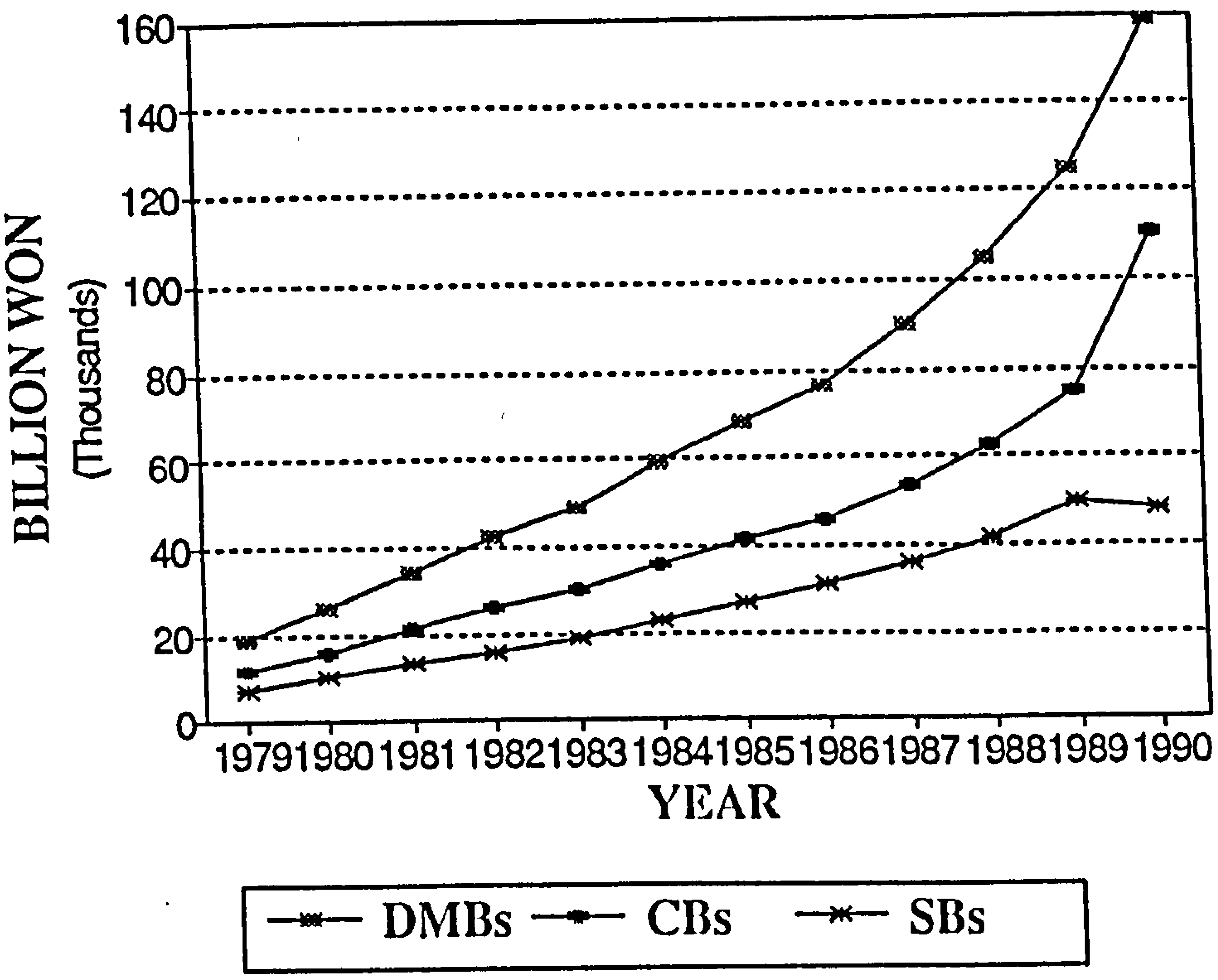
2.4.2 Banking Institutions: Deposit Money Banks (DMBs)

2.4.2.1 Introduction

Banking institutions are defined by the GBA (Article 3) as "all juridical persons which regularly and systematically engage in the business of lending funds acquired through the assumption of obligations in the form of deposits, securities or other evidences of debt". The scope of banking institutions by this definition encompasses deposit money banks (DMBs), including both commercial banks and specialised banks, although the latter were established under a series of separate acts.

Tables 2.9, 2.10 and 2.11 show the growth rates of assets, deposits, and loans and discounts, respectively, of DMBs during the period 1979-1990. Figures 2.2, 2.3 and 2.4 summarise these data graphically. One common feature of these tables and figures is that assets, deposits, and loans and discounts have sharply increased. Another feature is that they grew rapidly until 1982, which is the period in which the Korean economy experienced high inflation due mainly to the second oil shock (see Table 2.1). Since 1983, they have increased more slowly. As for assets, they have increased 1,004.5% for DMBs, 1,117.4% for commercial banks, and 810.9% for specialised banks during the period 1979-1990. They have, on average per year, grown 22.2% for DMBs, 23.2% for commercial banks and 20.2% for specialised banks. As for deposits, the corresponding growth rates from 1979-1990 are 971.7% for DMBs, 944.0% for commercial banks, and 1,018.2% for specialised banks. The average growth rates per year are 21.9% for DMBs, 21.6% for commercial banks, and 22.3% for specialised banks. As for loans and discounts, the growth rates are 1,020.1% for DMBs, 956.9% for commercial banks, and 1,133.4% for specialised banks. The average growth rates per year are 22.3% for DMBs, 21.7% for commercial banks, and 23.3% for specialised banks.

<Figure 2.2> Assets Growth of Deposit Money Banks



<Table 2.9> Assets Growth of Deposit Money Banks

(Unit: billion won, %)

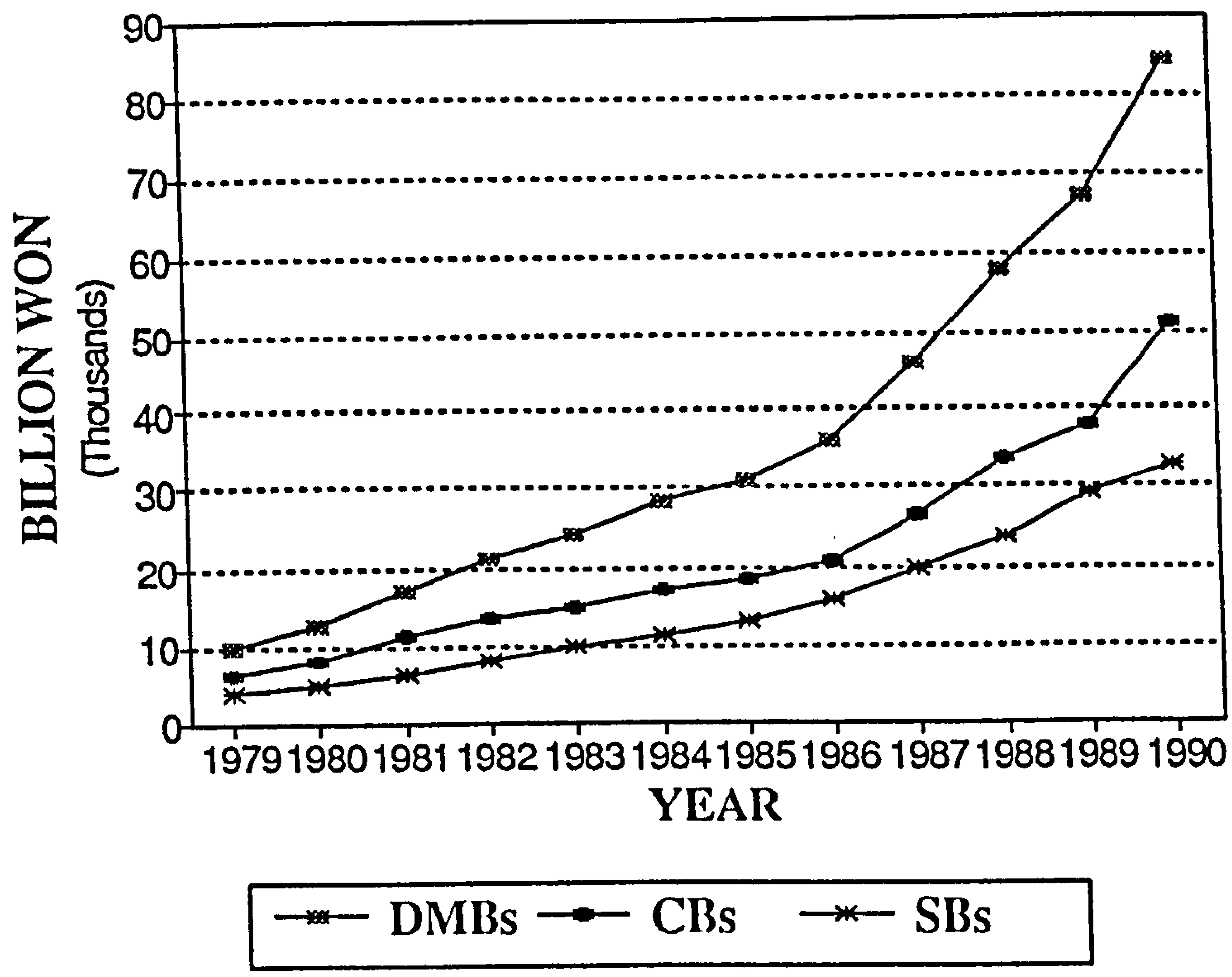
Year	Deposit Money Banks (%)	Commercial Banks (%)	Specialised Banks (%)
1979	18,932.8(32.0)	11,954.5(31.9)	6,978.3(32.1)
1980	26,316.2(39.0)	16,238.1(35.8)	10,078.1(44.4)
1981	34,179.0(29.9)	21,088.5(29.9)	13,090.5(29.9)
1982	42,163.6(23.4)	26,062.3(23.6)	16,101.3(23.0)
1983	49,393.3(17.1)	30,015.5(15.2)	19,377.8(20.3)
1984	59,489.7(20.4)	36,293.0(20.9)	23,196.7(19.7)
1985	68,493.4(15.1)	41,370.6(14.0)	27,122.8(16.9)
1986	76,204.3(11.3)	45,487.2(10.0)	30,717.1(13.3)
1987	90,203.5(18.4)	54,061.4(18.8)	36,142.2(17.7)
1988	104,663.7(16.0)	62,646.0(15.9)	42,017.7(16.3)
1989	124,722.8(19.2)	75,075.1(19.8)	49,647.9(18.2)
1990	158,444.4(27.0)	110,305.5(46.9)	48,139.0(- 3.0)
1979-1990 (%)	1,004.5	1,117.4	810.9
Average growth (%)	22.2	23.2	20.2

Notes: 1) In assets, excludes acceptances and guarantees.

2) Figures in parentheses represent the percentage changes over the previous year.

Sources: The BOK, Monthly Bulletin, various issues.

<Figure 2.3> Deposits Growth of Deposit Money Banks



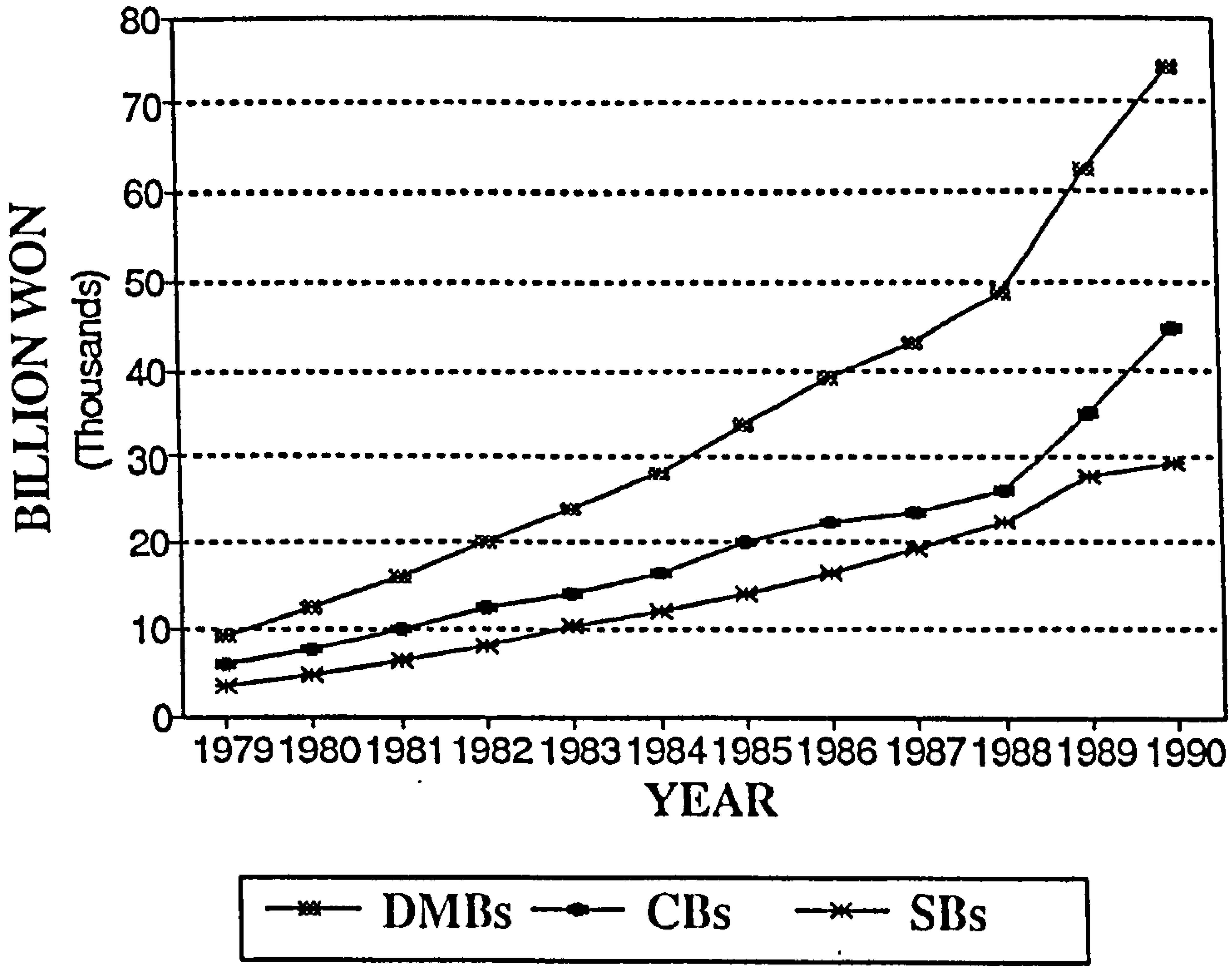
<Table 2.10> Deposits Growth of Deposit Money Banks

(Unit: billion won, %)

Year	Deposit Money Banks (%)	Commercial Banks (%)	Specialised Banks (%)
1979	9,919.8(26.2)	6,158.0(25.1)	3,761.8(27.9)
1980	12,575.7(26.8)	7,883.3(28.0)	4,692.4(24.7)
1981	17,192.6(36.7)	11,022.8(39.8)	6,169.8(31.5)
1982	21,320.0(24.0)	13,190.0(19.7)	8,130.0(31.8)
1983	24,147.3(13.3)	14,534.8(10.2)	9,612.5(18.2)
1984	28,244.9(17.0)	17,072.1(17.5)	11,172.8(16.2)
1985	31,261.7(10.7)	18,389.1(7.7)	12,872.5(15.2)
1986	36,279.6(16.1)	20,738.5(12.8)	15,541.0(20.7)
1987	46,072.0(27.0)	26,380.7(27.2)	19,691.3(26.7)
1988	57,893.8(25.7)	34,042.0(29.0)	23,851.8(21.1)
1989	67,105.9(15.9)	38,034.9(11.7)	29,071.0(21.9)
1990	84,265.5(25.6)	51,373.9(35.1)	32,891.7(13.1)
1979-1990 (%)	971.7	944.0	1,018.2
Average growth (%)	21.9	21.6	22.3

Notes: 1) In deposits, includes interbank deposits but excludes deposits in foreign currencies.
2) Figures in parentheses represent the percentage changes over the previous year.
Sources: The BOK, Monthly Bulletin, various issues.

<Figure 2.4> Loans & Discounts Growth of Deposit Money Banks



<Table 2.11> Loans & Discounts Growth of Deposit Money Banks

(Unit: billion won, %)

Year	Deposit Money Banks (%)	Commercial Banks (%)	Specialised Banks (%)
1979	8,977.8(35.8)	5,635.0(32.8)	3,342.8(41.3)
1980	12,204.5(35.9)	7,476.4(32.7)	4,728.1(41.4)
1981	15,955.6(30.7)	9,862.7(31.9)	6,092.9(28.9)
1982	20,225.7(26.8)	12,172.1(23.4)	8,053.6(32.2)
1983	24,150.3(19.4)	14,018.4(15.2)	10,131.9(25.8)
1984	27,978.9(15.9)	16,199.7(15.6)	11,779.2(16.3)
1985	33,810.7(20.8)	19,800.4(22.2)	14,010.3(18.9)
1986	39,098.6(15.6)	22,618.4(14.2)	16,480.2(17.6)
1987	43,095.8(10.2)	23,781.2(5.1)	19,314.5(17.2)
1988	48,805.4(13.2)	26,265.7(10.4)	22,539.8(16.7)
1989	62,547.8(28.2)	35,055.2(33.5)	27,492.7(22.0)
1990	74,028.7(18.4)	44,844.3(27.9)	29,184.4(6.2)
1979-1990 (%)	1,020.1	956.9	1,133.4
Average growth (%)	22.3	21.7	23.3

Note: 1) Figures in parentheses represent the percentage changes over the previous year.
Sources: The BOK, Monthly Bulletin, various issues.

<Table 2.12> Assets, Deposits and Loans & Discounts of DMBs
(At the end of 1990)
(Unit: billion won, %)

	Assets	Deposits	Loans & Discounts
Commercial Banks	110,305.4(69.6)	51,373.8(61.0)	44,844.3(60.6)
NCBs[1)]	83,836.8(52.9)	39,256.7(46.6)	33,352.4(45.1)
RBs[2)]	18,273.3(11.5)	11,289.6(13.4)	8,377.5(11.3)
FBs[3)]	8,195.3 (5.2)	827.5 (1.0)	3,114.3 (4.2)
Specialised Banks	48,139.0(30.4)	32,891.7(39.0)	29,184.4(39.4)
Total	158,444.4(100.0)	84,265.5(100.0)	74,028.7(100.0)

Notes: 1)NCBs represents nationwide commercial banks.
2)RBs represents regional banks.
3)FBs represents foreign banks
4)In assets, excludes acceptances & guarantees.
5)In deposits, includes interbank deposits but excludes deposits in foreign currencies.
6)Figures in parentheses represent the percentage of total.
Source: The BOK, Monthly Bulletin, December 1991, pp.29-37.

The assets growth of commercial banks is higher than that of specialised banks, whereas the growth rates of deposits and loans and discounts of specialised banks are higher than those of commercial banks.

Table 2.12 shows the composition of the banking market in 1990. At the end of December 1990, commercial banks accounted for 69.6% of assets, 61.0% of deposits and 60.6% of loans and discounts of all deposit money banks.

2.4.2.2 Commercial Banks

There were 11 nationwide commercial banks[2], 10 regional banks, and 69 branches and 24 representative offices of foreign banks at the end of 1990. Commercial banks play an important role in the nation's financial markets, although their relative importance in the

2.Two nationwide commercial banks were opened in 1991: Hana Bank on July 15, and Boram Bank on September 2.

financial market has gradually decreased as specialised banks and other NBFIs (established and operated under a number of special acts) have expanded their business. Commercial banks in Korea have the following distinctive characteristics (BOK, 1990):

(1) they have adopted the branch banking system with nationwide or provincewide networks;

(2) they have been engaged to a certain extent in long-term financing[3] in addition to the short-term banking operations traditionally associated with commercial banking. Long-term financing has, however, not been favoured by commercial banks and the growing demand for long-term funds on the part of business enterprises has customarily been met, in part, by way of frequent roll-overs or renewals of short-term loans;

(3) they still tend to depend heavily on borrowing from the BOK to cover persistent shortages in their own loanable funds;

(4) foreign bank branches have tended to specialise in the wholesale banking business.

The 11 nationwide commercial banks are : Cho Hung Bank, the Commercial Bank of Korea, Korea First Bank, Hanil Bank, Bank of Seoul, Shinhan Bank, KorAm Bank, Donghwa Bank, Daedong Bank, Dongnam Bank and Korea Exchange Bank. They all operate throughout the country with a nationwide branch network and all, apart from Dongnam Bank and Daedong Bank, have their head offices in Seoul. Five[4] of these banks have fairly long histories. Cho Hung Bank and the Commercial Bank of Korea were both established at the close of the nineteenth century (in 1897 and 1899), and the Korea First Bank and Hanil Bank in 1929 and 1932, respectively. Bank of Seoul was established in 1959. Although their share in the banking market has gradually decreased, they still occupy a

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3.Long-term financing operations are defined as those operations involving the lending of funds acquired predominantly from capital subscription, the acceptance of deposits with maturities of at least one year or the sales of debentures or other obligations, for periods not exceeding ten years, or for periods of more than ten years and not exceeding fifteen years within a maximum amount which the MB may fix in relation to the total liabilities of the bank concerned.

4.They are Cho Hung Bank, Commercial Bank of Korea, Korea First Bank, Hanil Bank and Bank of Seoul.

commanding position in the financial markets.

Table 2.13 shows the market share of the five leading banks in the banking market. At the end of 1990, these banks accounted for 43% of the total assets, 49% of total deposits, and 46% of total loans and discounts. Table 2.14 and Figure 2.5 illustrate the growth of nationwide commercial banks during the period 1979-1990 in terms of assets, deposits, and loans and discounts. During the same period, assets increased 1,086.7% and, on average per year, by 22.9%. Deposits and loans and discounts have grown by 865.0% and 20.8%, and 884.9% and 21.0%, respectively.

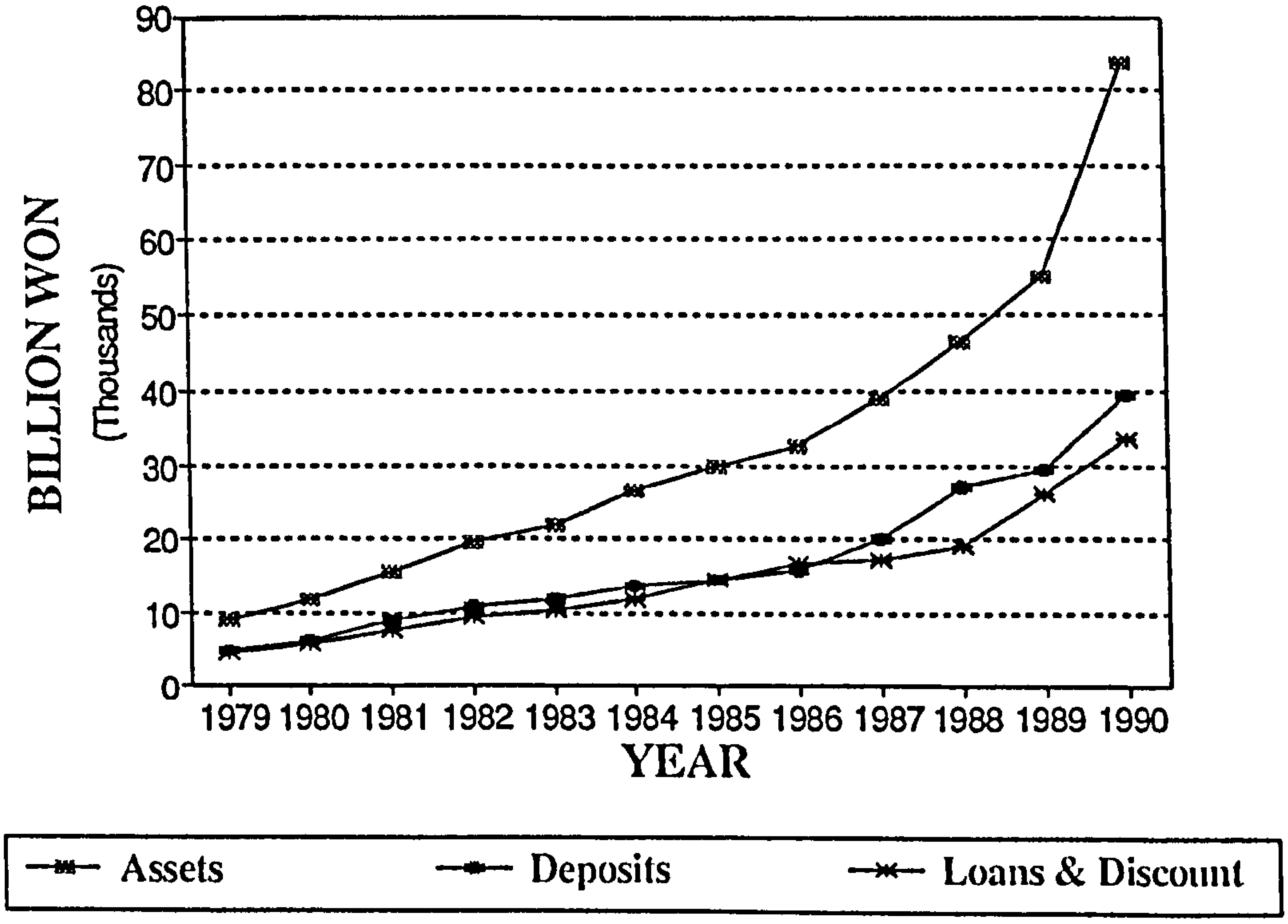
<Table 2.13> Market Share of the Five Leading Banks

Year	Assets	Deposits	Loans & Discounts
1980	0.50	0.54	0.62
1985	0.47	0.46	0.53
1986	0.44	0.43	0.52
1987	0.44	0.42	0.49
1988	0.45	0.44	0.46
1989	0.43	0.39	0.47
1990	0.43	0.49	0.46

Note: Calculated by the researcher.
Sources: 1)The BOK, Monthly Bulletin, December 1991.
2)The OBSE of the BOK, Bank Management Statistics, April 1991.

Table 2.15 summarises the principal accounts of nationwide commercial banks at the end of 1990. It shows that 47% of their total assets was in the form of loans and discounts, most of which represented short-term operational funds loaned to business enterprises. The main source of their funds is deposits from the public (56.3% of total funding). Borrowings from the BOK were also an important funding source (9.8%). Nationwide commercial banks maintained 1,695 domestic branches and offices, 57 overseas branches, 20 overseas representative offices and 26 overseas subsidiaries at the end of 1990.

<Figure 2.5> Growth of Assets, Deposits and Loans & Discounts of NCBs



<Table 2.14> Assets, Deposits and Loans & Discounts of Nationwide Commercial Banks
(Unit: billion won, %)

Year	Assets (%)	Deposits (%)	Loans & Discounts
1979	9,297.9(31.6)	5,086.7(25.0)	4,596.1(35.7)
1980	11,938.1(28.4)	6,528.4(28.3)	5,907.9(28.5)
1981	15,753.1(32.0)	9,208.4(41.1)	7,720.9(30.7)
1982	19,468.1(23.6)	10,900.3(18.4)	9,442.4(22.3)
1983	21,943.8(12.7)	11,769.7(8.0)	10,750.4(13.9)
1984	26,378.8(20.2)	13,701.6(16.4)	12,070.8(12.3)
1985	29,772.1(12.9)	14,622.4(6.7)	14,896.0(23.4)
1986	32,294.5(8.5)	16,060.2(9.8)	17,110.0(14.9)
1987	38,647.7(19.7)	20,373.3(26.9)	17,608.1(2.9)
1988	46,191.5(19.5)	26,904.3(32.1)	19,241.1(9.3)
1989	54,797.2(18.6)	29,163.4(8.4)	26,209.7(36.2)
1990	83,836.8(53.0)	39,256.7(34.6)	33,352.4(27.3)
1979-1990	1,086.7	865.0%	884.9
Average per year	22.9	20.8	21.0

Notes: 1) In assets, excludes acceptances and guarantees.
2) In deposits, includes interbank deposits but excludes deposits in foreign currencies.
3) Figures in parentheses represent the percentage changes over the previous year.
Sources: The BOK, Monthly Bulletin, various issues.

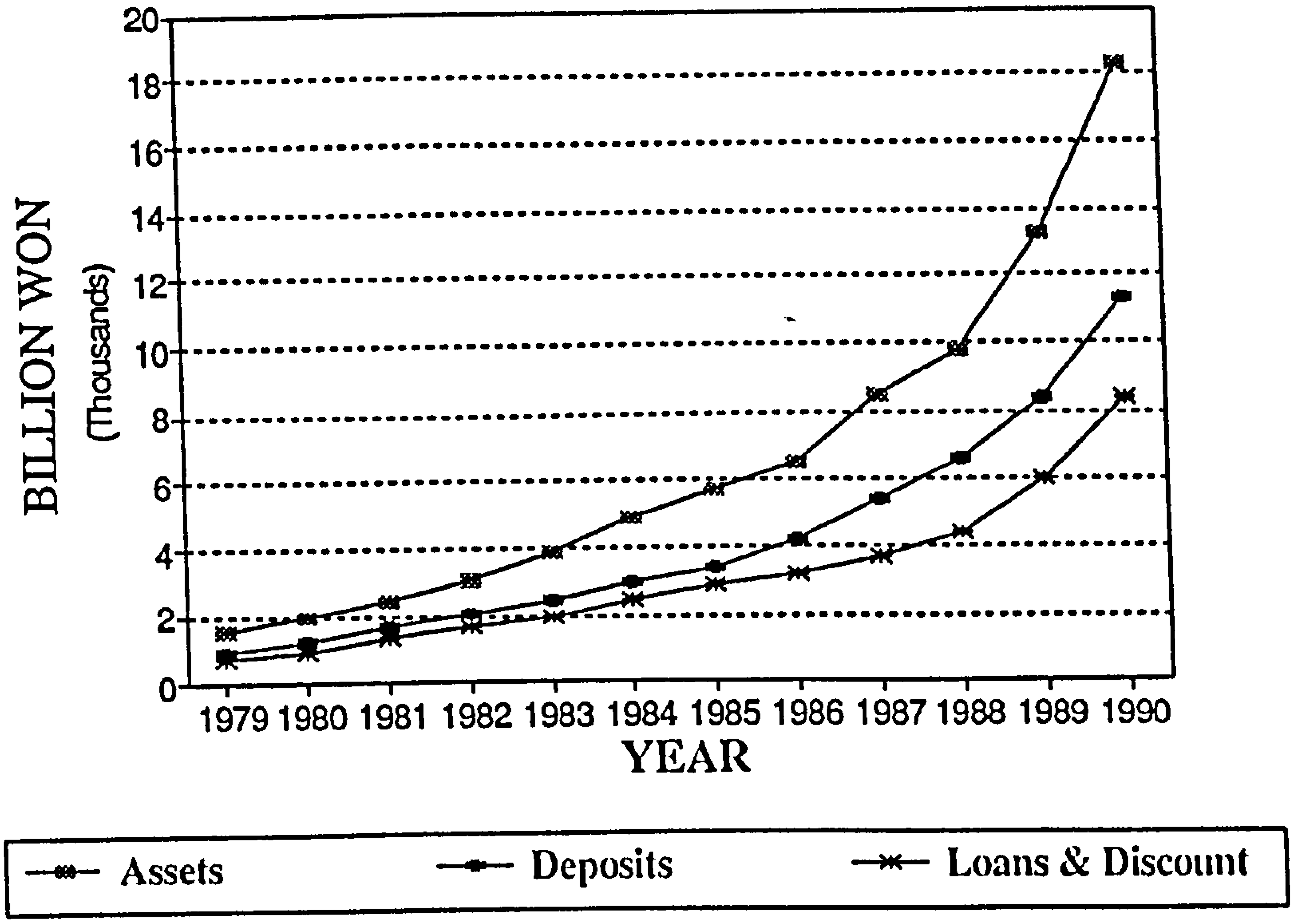
<Table 2.15> Principal Accounts of Nationwide Commercial Banks
(At the end of 1990)
(Unit: billion won, %)

Assets	Amounts	Liabilities & Net worth	Amounts
Currency & Checks	17,060.0(20.3)	Deposits	39,256.7(46.8)
Due from		Deposits in foreign	
the BOK	3,502.9 (4.2)	currency	7,993.3 (9.5)
other banks in		CD	3,812.7 (4.5)
foreign currency	754.4 (0.9)	Borrowings	
Securities	8,202.5 (9.8)	from the BOK	8,189.9 (9.8)
Loans & Discounts	33,352.4(39.8)	in foreign currency	2,410.4 (2.9)
Loans in foreign		Guarantees received	492.8 (0.6)
currency	5,924.8 (7.1)	Other liabilities	12,910.8(15.4)
Foreign assets	5,436.3 (6.5)	Paid-in capital	5,101.0 (6.1)
Fixed assets	2,791.2 (3.3)	Capital surplus	2,232.7 (2.7)
Others	6,812.2 (8.1)	Earned surplus	1,436.5 (1.7)
Total 1)	83,836.8(100.0)	Total	83,836.8(100.0)

Note: Excludes customers' liabilities on acceptances & guarantees
Source: The BOK, Monthly Bulletin, December 1991, pp.30-31

Regional banking effectively commenced in 1967 when a regional banking system was established. During the period from 1967 to 1971, 10 regional banks were set up with a view to the development of inter-regionally balanced economic development and access to financial services. At the end of 1990, the average size of regional banks was about one fifth of that of the nationwide commercial banks on the basis of total assets. Table 2.16 and Figure 2.6 show the growth of regional banks during the period 1979-1990 in terms of assets, deposits, and loans and discounts. During this period, assets increased 1,452.7% and, on average per year, by 25.7%. For deposits and loans and discounts, corresponding growth rates were 1,383.1% and 25.2%, and 1,311.8% and 24.7%, respectively. Regional banks have grown faster than nationwide commercial banks. Table 2.17 shows the financial structure of regional banks at the end of 1990, and it illustrates that their share of loans in foreign currencies and of foreign assets is relatively much smaller than that of nationwide commercial banks. Regional banks had 638 domestic branches and offices and 6 overseas representative offices at the end of 1990.

<Figure 2.6> Growth of Assets, Deposits and Loans & Discounts of Regional Banks



<Table 2.16> Assets, Deposit and Loans & Discounts of Regional Banks

(Unit: billion won, %)

Year	Assets (%)	Deposits (%)	Loans & Discounts(%)
1979	1,491.7(26.7)	978.8(28.6)	744.0(25.4)
1980	1,883.0(26.2)	1,199.2(22.5)	953.0(28.1)
1981	2,456.0(30.4)	1,606.9(34.0)	1,295.1(35.9)
1982	3,087.6(25.7)	2,067.1(28.6)	1,634.5(26.2)
1983	3,862.2(25.1)	2,453.9(18.7)	1,927.0(17.9)
1984	4,830.5(25.1)	2,981.0(21.5)	2,419.7(25.6)
1985	5,648.4(16.9)	3,372.1(13.1)	2,891.9(19.5)
1986	6,499.9(15.1)	4,144.6(22.9)	3,190.8(10.3)
1987	8,483.3(30.5)	5,425.8(30.9)	3,678.5(15.3)
1988	9,790.2(15.4)	6,596.1(21.6)	4,314.0(17.3)
1989	13,187.8(34.7)	8,379.7(27.0)	6,003.1(39.2)
1990	18,273.3(38.6)	11,289.6(34.7)	8,377.5(39.6)
1979-1990	1,452.7	1,383.1	1,311.8
Average per year	25.7	25.2	24.7

Notes: 1) In assets, excludes acceptances and guarantees.

2) In deposits, includes interbank deposits but excludes deposits in foreign currencies.

3) Figures in parentheses represent the percentage changes over the previous year.

Sources: The BOK, Monthly Bulletin, various issues.

<Table 2.17> Principal Accounts of Regional Banks
(At the end of 1990)

(Unit: billion won, %)

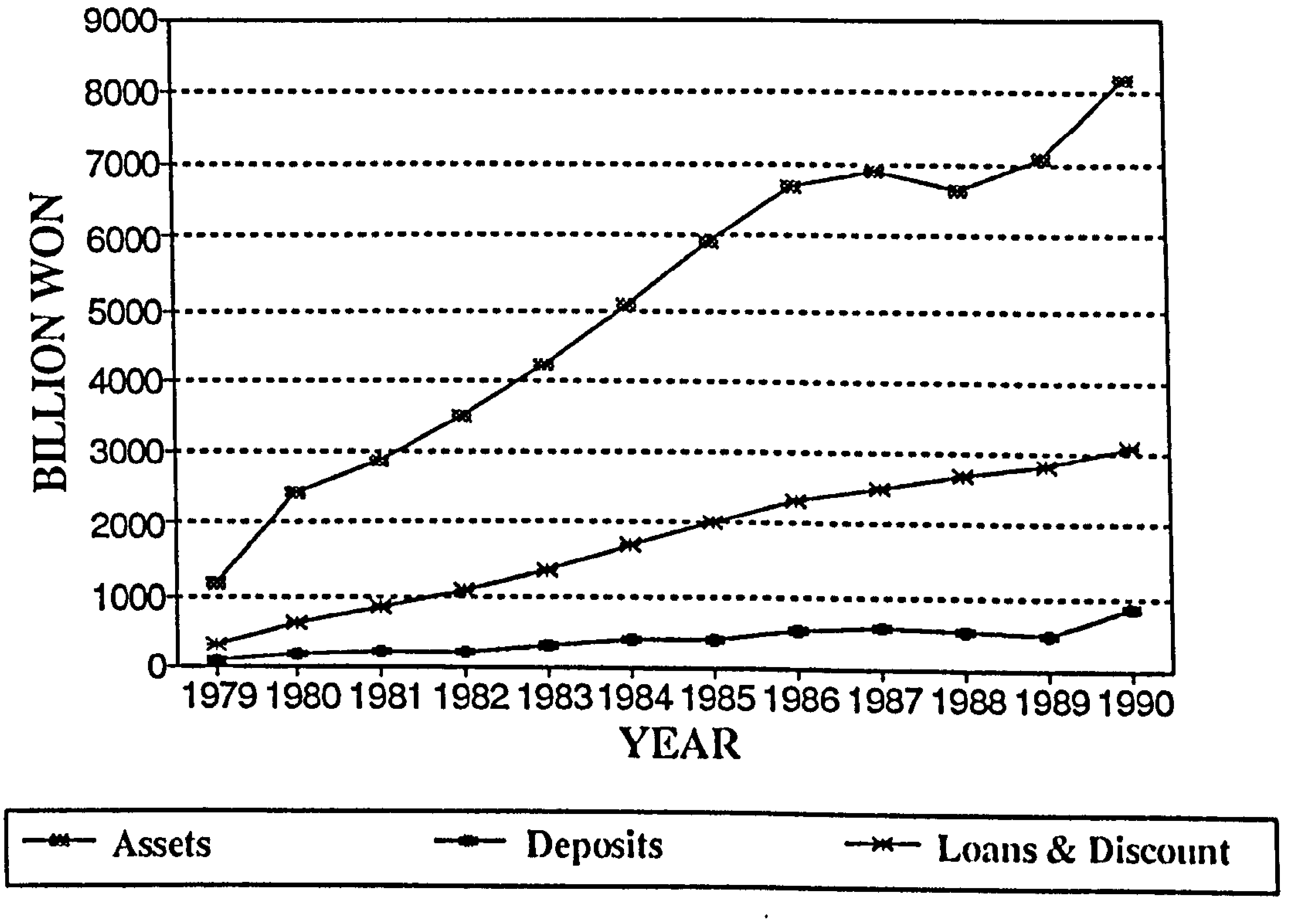
Assets	Amounts	Liabilities & Net worth	Amounts
Currency & Checks	3,001.3(16.4)	Deposits	11,289.6(61.8)
Due from the BOK & other banks	1,163.1 (6.4)	Deposits in foreign currency	274.6 (1.5)
Securities	2,913.6(15.9)	CD	1,290.5 (7.1)
Loans & Discounts	8,377.5(45.8)	Borrowings from the BOK	954.0 (5.2)
Loans in foreign currency	137.5 (0.8)		
Foreign assets	261.0 (1.4)	Guarantees received	39.0 (0.2)
Fixed assets	617.9 (3.4)	Other liabilities	1,966.3(10.8)
Others	1,801.4 (9.9)	Paid-in capital	1,056.6 (5.8)
		Capital surplus	1,078.0 (5.9)
		Earned surplus	324.7 (1.8)
Total[1)]	18,273.3(100.0)	Total	18,273.3(100.0)

Note: Excludes customers' liabilities on acceptances & guarantees
Source: The BOK, Monthly Bulletin, December 1991, pp.32

Foreign banks may open branches in Korea with the approval of the MB as recommended by the Superintendent of Banks under the provisions of the GBA. Foreign banks were allowed to open branches in Korea as early as 1967 when Chase Manhattan Bank opened its Seoul branch, but it was only in the latter half of the 1970s that the number of branches and volume of business expanded rapidly. In the early stages of Korean economic development, foreign bank branches in Korea helped facilitate foreign capital investment in Korea through their close relationships with international financial markets. It is hoped nowadays by the supervisory authorities and Korean banks that they will play a leading role in motivating domestic banks to improve their banking practices and managerial skills.

Table 2.18 and Figure 2.7 depict the growth of assets, deposits, and loans and discounts of foreign banks in Korea during the period 1979-1990: foreign bank assets have increased 900.0% and, on average per year, by 21.2%. Deposits and loans and discounts have increased 802.4% and 20.1%, and 1,083.7% and 22.9%, respectively. Foreign banks have grown slowly compared with domestic commercial banks in Korea. Table 2.19 summarises the principal accounts of foreign banks in Korea. It shows that the main source of funds is from the head office, which accounts for 45.7% of sources of funds. Foreign banks utilise their funds in the form of loans and discounts (60.2%). At the end of 1990, there were 69 foreign bank branches including those of 25 American, 14 Japanese, 5 British and 7 French banks. There were also 24 foreign bank representative offices serving as liaison offices.

<Figure 2.7> Growth of Assets, Deposits and Loans & Discounts of Foreign Banks



<Table 2.18> Assets, Deposits and Loans & Discounts of Foreign Banks

(Unit: billion won, %)

Year	Assets (%)	Deposits (%)	Loans & Discounts(%)
1979	1,164.9(42.1)	92.6(1.0)	294.9(12.1)
1980	2,416.9(107.5)	155.9(68.4)	615.5(108.7)
1981	2,879.3(19.1)	207.5(33.1)	846.7(37.6)
1982	3,506.6(21.8)	222.6(7.3)	1,095.2(29.3)
1983	4,209.6(20.0)	311.2(39.8)	1,341.0(22.4)
1984	5,083.7(20.8)	389.5(25.2)	1,709.2(27.5)
1985	5,950.2(17.0)	394.7(1.3)	2,012.5(17.7)
1986	6,692.9(12.5)	533.7(35.2)	2,317.6(15.2)
1987	6,930.3(3.5)	581.6(9.0)	2,494.6(7.6)
1988	6,664.1(- 3.8)	541.7(- 6.9)	2,710.5(8.7)
1989	7,090.1(6.4)	491.8(- 9.2)	2,842.4(4.9)
1990	8,195.3(15.6)	827.5(68.3)	3,114.3(9.6)
1979-1990	900.0	802.4	1,083.7
Average per year	21.2	20.1	22.9

Notes: 1) In assets, excludes acceptances and guarantees.
2) In deposits, includes interbank deposits but excludes deposits in foreign currencies.
3) Figures in parentheses represent the percentage changes over the previous year.
Sources: The BOK, Monthly Bulletin, various issues.

<Table 2.19> Principal Accounts of Foreign Banks in Korea

(Unit: billion won)

Assets	Amounts (%)	Liabilities & Net	Amounts (%)
Currency & Checks	39.0 (0.5)	Deposits	827.5(10.1)
Due from the BOK & other banks	565.3 (6.9)	Deposits in foreign currency	201.8 (2.5)
Securities	238.0 (2.9)	CD	608.0 (7.4)
Loans & Discounts	3,114.3(38.0)	Borrowings from the BOK	11.6 (0.1)
Loans in foreign currency	1,816.1(22.2)	Guarantees received	449.5 (5.5)
Loans for Korean banks	427.0 (5.2)	Inter-office	3,749.0(45.7)
Foreign assets	862.9(10.5)	Other liabilities	1,238.6(15.1)
Fixed assets	101.0 (1.2)	Paid-in capital	363.3 (4.4)
Others	1,031.7(12.6)	Capital surplus	18.1 (0.2)
		Earned surplus	727.9 (8.9)
Total	8,195.3(100.0)	Total	8,195.3(100.0)

Note: Excludes customers' liabilities on acceptances and guarantees.
Source: The BOK, Monthly Bulletin, December 1991. pp.34-35.

2.4.2.3 Specialised Banks

The specialised banks were established mostly during the 1960s according to a series of separate acts which set out their purposes. There are six specialised banks:

(1) the Industrial Bank of Korea (IBK) for the financing of small and medium enterprises;

(2) the Citizens National Bank (CNB) for small loans to households and small-scale business firms;

(3) the Korea Housing Bank (KHB) for housing loans;

(4) the credit and banking sector of the National Agricultural Cooperative Federation (NACF) for agricultural and forestry loans;

(5) the credit and banking sector of the National Federation of Fisheries Cooperatives (NFFC) for fishery loans;

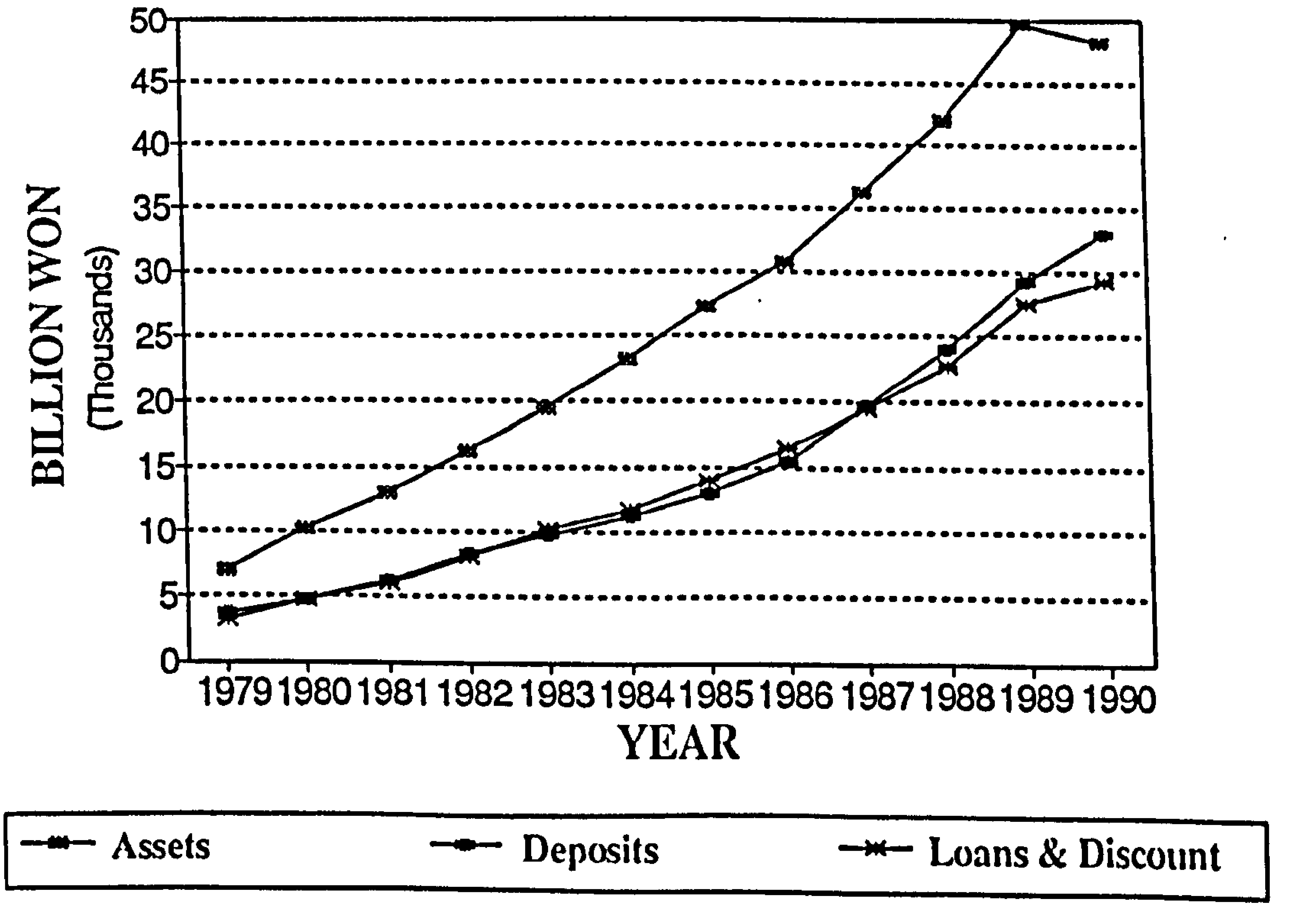
(6) the credit and banking sector of the National Livestock Cooperatives Federation (NLCF) for livestock loans.

The specialised banks play a significant role in the Korean banking system as a whole. They were established to provide funds to particular sectors where funds supplied through the commercial banks was insufficient due to a limited availability of funds or low profitability. With subsequent changes in the financial environment, however, they have expanded their business into the commercial banking area, although their share of funds allocation to their relevant sectors is still relatively high. Nowadays, some specialised banks have by and large the same pattern of business as the commercial banks. The specialised banks rely heavily for their sources of funds on deposits from the public as well as the issue of debentures and borrowing from the government. Therefore, they compete with commercial banks in acquiring deposits.

These banks are, in principle, directed and supervised by the government, as designated in the special acts under which they were established. Some areas of their business operations are, however, subject to the control of the MB. Minimum reserve requirements and maximum interest rates (as decided by the MB and Governor of BOK) apply to the specialised banks as well as to commercial banks. The specialised banks are also subject to examination by the OBSE of the BOK under the authority delegated to it by the Minister of Finance.

Table 2.20 and Figure 2.8 depict the growth of specialised banks during the period 1979-1990: assets have increased 810.9% and, on average per year, by 20.2%. For deposits and loans and discounts, the corresponding growth rates are 1,018.2% and 22.3%, and 1,133.4% and 23.3%, respectively. Table 2.21 also shows the financial structure of the specialised banks and supports the above-mentioned characteristics of the specialised banks, which have a similar pattern of principal accounts to the commercial banks. Like commercial banks, their main source of funds is deposits from the public. As a result, they compete with commercial banks in deposit and loan markets. By the end of 1990, there were 1,507 domestic branches and offices and seven overseas representative offices.

<Figure 2.8> Growth of Assets, Deposits and Loans & Discounts of Specialised Banks



<Table 2.20> Assets, Deposits and Loans & Discounts of Specialised Banks
(Unit: billion won, %)

Year	Assets (%)	Deposits (%)	Loans & Discounts(%)
1979	6,978.3(32.1)	3,761.8(27.9)	3,342.8(41.3)
1980	10,078.1(44.4)	4,692.4(24.7)	4,728.1(41.4)
1981	13,090.5(29.9)	6,169.8(31.5)	6,092.9(28.9)
1982	16,101.3(23.0)	8,130.0(31.8)	8,053.6(32.2)
1983	19,377.8(20.3)	9,612.5(18.2)	10,131.9(25.8)
1984	23,196.7(19.7)	11,172.8(16.2)	11,779.2(16.3)
1985	27,122.8(16.9)	12,872.5(15.2)	14,010.3(18.9)
1986	30,717.1(13.3)	15,541.0(20.7)	16,480.2(17.6)
1987	36,142.2(17.7)	19,691.3(26.7)	19,314.5(17.2)
1988	42,017.7(16.3)	23,851.8(21.1)	22,539.8(16.7)
1989	49,647.9(18.2)	29,071.0(21.9)	27,492.7(22.0)
1990	48,139.0(- 3.0)	32,891.7(13.1)	29,184.4(6.2)
1979-1990	810.9	1,018.2	1,133.4
Average per year	20.2	22.3	23.3

Notes: 1) In assets, excludes acceptances and guarantees.
2) In deposits, includes interbank deposits but excludes deposits in foreign currencies.
3) Figures in parentheses represent the percentage changes over the previous year.
Sources: The BOK, Monthly Bulletin, various issues.

<Table 2.21> Principal Accounts of Specialised Banks
(At the end of 1990)
(Unit: billion won,%)

Assets	Amounts (%)	Liabilities & Net Worth	Amounts (%)
Cash	3,435.3(7.1)	Deposits	32,891.7(68.3)
Due from the BOK and other banks	3,557.8(7.4)	Deposits in foreign currency	494.7(1.0)
Securities	3,031.3(6.3)	CD	1,092.3(2.3)
Loans & Discounts	29,184.4(60.6)	Borrowing from	
Loans in foreign currency	399.1(0.8)	the BOK	1,954.5(4.1)
		government	4,842.2(10.1)
Foreign assets	268.7(0.6)	Debenture issued	1,011.0(2.1)
Fixed assets	1,141.9(2.4)	Other liabilities	5,082.4(10.6)
Others	7,120.5(14.8)	Paid-in capital	382.1(0.8)
		Capital surplus	65.8(0.1)
		Earned surplus	322.3(0.7)
Total[1)]	48,139.0(100.0)	Total	48,139.0(100.0)

Note: 1) Excludes customers' liabilities on acceptances & guarantees.
Source: The BOK, Monthly Bulletin, December 1991, pp.36-37

2.4.3 Non-Bank Financial Institution (NBFIs)

There are many NBFIs, most of which were founded in the 1970s. They have significantly increased in number and in the volume of funds they have handled during the course of rapid economic growth. A further reason for their rapid expansion has been the relatively higher interest rates permitted to them and the greater degree of autonomy in management compared with the banking institutions. Since the mid-1980s, however, the interest rate advantage has declined, and this together with the financial reform toward universal banking has enabled the DMBs to regain their competitiveness. Therefore, since 1991, the government has restructured the NBFIs, especially investment and finance companies. Investment and finance companies were recommended to transform into commercial banks, merchant banking corporations or securities firms.

NBFIs can be broadly classified into five categories according to their business activities: Development institutions, Savings institutions, Investment institutions, Life insurance companies, and others.

Development institutions consist of the Korea Development Bank (KDB), the Export-Import Bank of Korea (ExIm Bank), and the Korea Long Term Credit Bank (KLTCB). They provide medium- and long-term loans or credit for the development of strategic sectors such as heavy industries, exporting industry , and electronic and high-tech industries. Their main sources of funds are borrowings from and capital subscription by the government as well as funds provided by foreign capital or the issuance of debentures (Tables A.1-A.3 in Appendix A show the principal accounts of Development institutions).

Savings institutions include the Trust Account of banking institutions, Mutual Savings and Finance Companies, Credit Unions, Mutual Credit Facilities, New Community Finance Associations, and the Postal Savings system. They grant various small loans with funds obtained from time deposits (Tables A.4-A.8 in Appendix A contain the principal accounts of Savings institutions).

Investment Companies consist of 24 Investment and finance companies for short-term financing, and six Merchant banking corporations for medium and long-term financing. Their main sources of funds are the issuance of their own paper or debentures and handling Cash Management Accounts (CMA) (see Tables A.9-A.10 in Appendix A for the principal accounts of Investment companies).

The insurance system in Korea is divided into life and non-life insurance, and no insurance company may handle both at the same time. There are 23 life insurance companies, including five joint-venture life insurance companies, four branch offices of foreign companies, and the Post Office life insurance. Owing to the successful economic growth in Korea during recent years, life insurance contracts outstanding have grown at an annual rate of 37 percent during the 1985-1989 period (Table A.11 in Appendix A shows the principal accounts of Life insurance companies).

In addition, there are a few quasi-financial intermediaries which do not fall into the category of financial institutions, but which engage in business similar or closely related to those of the above-mentioned financial institutions. These include:

(1) the National Investment Fund to support investment in major industry with particular emphasis on the heavy and chemical sectors;

(2) the National Housing Fund to finance effectively the overall housing construction plan of the government;

(3) leasing companies to provide business enterprises, especially small and medium firms, with lease financing for industrial and business equipment, machinery and plant;

(4) venture capital companies to provide financial support for technology development projects by underwriting stocks and convertible bonds issued by new or established business firms;

(5) non-life insurance companies;

(6) the Korea Credit Guarantee Fund to extend credit guarantees for the liabilities of business enterprises that generally suffer from a lack of adequate collateral;

(7) the Korea Technology Credit Guarantee Fund to extend credit guarantees mainly for the liabilities arising from the adaption and application of newly developed technology to commercial production;

(8) the Housing Finance Credit Guarantee Fund to provide credit guarantees for the liabilities arising from housing finance; and

(9) the Korea Non-Bank Deposit Insurance Corporation to protect depositors and to stimulate the sound management of NBFIs covering investment and finance companies, merchant banking corporations, and mutual savings and finance companies.

Table 2.22 shows the uses and sources of funds of NBFIs. Funds were mainly raised by deposits (76.3%) and utilised through loans and discounts (52.2%) and securities investment (35.7%). Table 2.23 depicts the comparative sizes of NBFIs at the end of 1990. It shows that savings institutions were placed on the top (assets: 37.2%, deposits: 44.0%, and loans and discounts: 43.7%).

<Table 2.22> Uses and Sources of Funds of NBFIs
(At the end of 1990)

(Unit: billion won, %)

	1989	1990
	Amounts (%)	Amounts (%)
<Uses of Funds>		
Cash & Dues	4,534.8 (3.7)	4,982.4 (3.1)
Securities	45,927.4(37.1)	57,042.3(35.7)
Loans & Discounts	63,987.4(51.7)	83,316.6(52.2)
Fixed Assets	2,633.6 (2.1)	3,649.1 (2.3)
Others	6,675.8 (5.4)	10,760.9 (6.7)
Total[1)]	123,759.0(100.0)	159,796.3(100.0)
<Sources of Funds>		
Deposits	92,732.2(74.9)	121,928.4(76.3)
RP	1,331.6 (1.1)	1,496.1 (0.9)
Debentures issued	3,830.0 (3.1)	5,014.8 (3.1)
Borrowings	11,639.1 (9.4)	12,323.8 (7.7)
Others	7,338.9 (7.2)	11,446.1 (5.9)

Note: 1)Includes inter-institution transactions.
Source: The BOK, 41th Annual Report, March 1991, p.93

<Table 2.23> Assets, Deposits and Loans & Discounts of NBFIs (At the end of 1990)

(Unit: billion won, %)

	Assets	Deposits	Loans & Discounts
Development Institutions	26,093.4 (15.4)	6,942.8 (5.7)	18,082.7 (21.7)
Savings Institutions	62,883.9 (37.2)	53,589.9 (44.0)	36,429.9 (43.7)
Investment Companies	50,493.0 (29.9)	33,161.3 (27.2)	13,476.4 (16.2)
Life Insurance Companies	29,675.3 (17.5)	28,234.4 (23.1)	15,372.5 (18.4)
Total	169,145.6 (100.0)	121,928.4 (100.0)	83,361.5 (100.0)

Source: The BOK, 41th Annual Report, March 1991, reconstruct the table from pp.93-97.

2.4.4 Securities Market

The operations of the Korean securities market commenced on February 11, 1956 with the establishment of the Daehan Stock Exchange, later reorganised and renamed the Korea Stock Exchange (KSE) on May 3, 1963. The KSE deals in primary equity and bond issues and in the secondary market for equities and bonds including public bonds.

The growth of the securities market in Korea has been quite impressive (see Table 2.24). Encouraged by government efforts and the improved environment for securities investment resulting from strong economic growth, the securities market experienced very rapid development, and its role in mobilising national savings was greatly strengthened, particularly since 1986. The number of companies listed on the stock market increased from 66 at the end of 1972 to 669 at the end of December 1990. During the same period, the market value of listed stocks increased from KW246 billion to KW79,020 billion, while the amount of listed bonds increased from KW69 billion to KW51,117 billion (KSE, 1991). Since around mid-1989, however, the market has become much less active and bearish owing to an over-supply of shares.

<Table 2.24> Securities Market Trends

(Unit: million shares, billion won, %)

	1985	1988	1989	1990
<Stock Market: End of Year>				
No. of companies	342	502	626	669
No. of issues	414	970	1,284	1,115
No. of shares[1)]	7,955	2,511	4,242	4,796
Value of listed stock				
0 Face value	4,665	12,560	21,212	23,982
0 Market value	6,570	64,544	95,477	79,020
Value of trading stock	3,621	58,121	81,200	53,455
Turn-over ratio	72.3	154.1	111.9	68.6
KOSPI[2)]	138.9	693.1	918.6	747.0
<Bond Market: During the Year>				
Market value of listed bonds				
0 Total	12,001	33,680	43,490	51,117
0 Corporate	7,263	11,521	15,395	22,068
0 Public	4,738	22,159	28,095	29,049
Value of trading bonds				
0 Corporate	2,918	1,545	771	795
0 Public	660	7,001	4,378	2,455

Notes: 1)The number of shares since 1987 is in accordance with raised par value.
2)KOSPI is Korea Stock Price Index (January 4, 1980 = 100).
Source: The KSE, Fact Book, 1991

Meanwhile, the internationalisation of the Korean securities market has been steadily increasing since the government announced the long-term blueprint for capital market opening in 1981. The plan for the capital market internationalisation envisages four phases. A step-by-step approach was taken in opening the stock market. During the first stage of capital market internationalisation from 1981 to 1984, the authorities promoted indirect investment in the Korean securities by foreigners. For this purpose, two international trusts - Korea International Trust and Korea Trust - were established in 1981 to serve European customers. Encouraged by the popularity of these trusts, three more trusts were sold to foreign investors in 1985. A more significant development was marked by the launching of a closed-end mutual fund, the Korea Fund, in New York in 1984. Three years later, another similar fund, the Korea-Euro Fund, of US $30 million was created in 1987 to serve the European market as part of the second phase of internationalisation from 1985 to 1987. Since 1985, Korean firms have been allowed to issue convertible bonds (CB), bonds with subscription warrants (BWs), and depository receipts (DRs) in international financial markets. During the third phase of internationalisation from 1987 to 1990, Korea's large securities companies were allowed to participate in the syndications underwriting foreign securities. At the same time, securities, insurance, and investment trust companies were permitted to invest in foreign securities up to US $30 million.

The most significant measures for opening capital markets were implemented in the fourth phase during 1991 and additional measures will be implemented during the 1992 period. The government announced the guidelines for the opening of the stock market in September 1991. According to these guidelines, foreigners will be allowed to purchase Korean securities from January 1992, but their combined foreign ownership will be limited to 10% of the total outstanding shares in a company listed in the KSE, with a single individual or institution limited to 3% of one counter. In addition, the government authorised the operation of foreign securities companies in Korea.

Institutions which are related to the securities market include (the SEC & SSB, 1991):

(1) the Securities and Exchange Commission(SEC) and its executive body, the Securities Supervisory Board(SSB);

(2) the KSE;

(3) 31 securities companies;

(4) the Korea Securities Finance Corporation (KSFC);

(5) 8 securities investment trust companies;

(6) the Korea Securities Settlement Corporation (KSSC);

(7) the Korea Securities Dealers Association (KSDA); and

(8) 29 investment advisory companies.

(9) 27 representative offices of foreign securities firms.

The SEC and the SSB were established in 1977 by the Securities and Exchange Act in order to review and decide on matters involving the issuance of securities and to supervise securities companies and other securities institutions. Consistent with the overall policies set up by the Minister of Finance, the SEC, as an independent regulatory body, makes decisions on the major issues related to the securities market. The SSB is the executive body of the Commission and supervises the securities industry under the direction of the Commission. The SEC comprises 9 members; 6 commissioners are appointed by the President of the Republic on the recommendation of the Minister of Finance and 3 ex-officio commissioners (the Governor of the BOK, the President of the KSE, and the Vice Minister of Finance).

The KSE consists of all securities firms in Korea. The KSE has 31 member firms, and two subsidiary firms - the KSSC and the Korea Securities Computer Corporation (KOSCOM). The major functions of the KSE are to provide a market for securities (including futures), to maintain a fair and orderly market, to regulate and supervise the 31 member firms, and to list and administer securities. The KSFC, which was established in 1955 in order to facilitate financing in the securities market, is the only institution specialising in securities financing in Korea. Sources of the KSFC's financing mostly consist of borrowings from commercial banks and deposits from securities-related institutions. The KSSC was established in 1974 in order to ensure fast and efficient settlement of securities transactions through the book-entry. Now, it is the sole central depository for securities certificates and the clearing agent of the KSE. It also acts as a transfer agent, safe depository of securities, and paying agent for issuers of securities. The KOSCOM was established in 1977 in order to foster the computerisation of securities trading on the Exchange.

The KSDA, of which all regular members are securities companies, was established in 1953 as a self-regulatory body to represent the interests of member firms, to maintain fair trade in securities, to protect investors, and to foster the securities market. The securities investment trust business was introduced in 1970. The existing investment trusts in Korea are exclusively of the contractual type based on the trust contracts between the investment trust companies and trustees. Thus, the securities investment trust companies services both a manager and distributor of the fund. At present, there are three nationwide companies and five provincial companies specialising in this business. In addition, all six merchant banking corporations are authorised to handle this business. Investment advisory companies were brought into existence to provide consultancy regarding securities investment, under an amendment of the Securities and Exchange Act in November 1987. Investment advisory companies cannot engage in services other than investment advisory business and are banned from dealing with discretionary accounts[5]. At the end of December 1990, there were 29 investment advisory companies, mostly subsidiaries of securities companies and other financial institutions.

2.4.5 Money Market

The money market refers to the market which provides economic entities, such as financial institutions, business firms, governmental units, and individual participants, with various kinds of instruments to intermediate their short-term demand for and supply of funds. In general, the behaviour of the money market provides the most immediate indication of the current relationship between the supply of and demand for funds through changes in yields on instrument in response to changes in market conditions. This helps the monetary authorities to control liquidity.

The introduction of the organised money market in Korea dates back to the 1960s when Monetary Stabilisation Bonds (MSBs) and Treasury Bills (TBs) were first issued in 1961

5.There are normally three areas of investment advisory business: investment advice, subscription advice, and investment counsel. At present, investment advice is the only area permitted in Korea. Therefore, investment advisory companies cannot open discretionary accounts which sell or buy stocks for investors.

and 1967, respectively, but it was not activated until the early 1970s when the government took a series of measures[6.] designed to channel curb-market money into financial institutions and to organise the short-term financial market more systematically. The money market in Korea embraces a wide range of other financial markets including those for the Call market, CP, RP, CD, TB, and MSB markets.

The Call market , which is basically similar to the federal funds market in the USA and the sterling inter-bank market in the UK, was established in 1975 in order to adjust temporary shortages or surpluses of funds among financial institutions. At present, call transactions are standardised on the differing maturity periods from 1 day through 15 days. Call transactions are made in multiples of KW100 million. The numbers of participants in the call market exceed 600 and include 88 banking institutions (the Fund Management Department of the BOK, 13 nationwide commercial banks, 10 regional banks, 11 specialised banks, 53 foreign bank branches in Korea), 48 insurance companies, 30 investment and finance companies and merchant banking corporations, 31 securities firms, and other NBFIs.

CP refers to short-term promissory notes issued on a discount basis by non-financial companies, investment and finance companies, and merchant banking corporations. At present, the CP market consists of three types of paper:

(1) "own paper" issued by the investment and finance companies and merchant banking corporations themselves. However, after the end of 1992, investment and finance companies cannot issue this paper;

(2) resold notes with recourse issued by business firms and whose payments are guaranteed by the dealing companies; and

(3) resold notes without recourse, that is, paper issued by business firms whose payments

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6.They include: the promulgation of the Short-term Financing Business Act and the establishment of investment and finance companies in 1972; the introduction of CDs in 1974; the establishment of the Call Transaction Office in 1975; since the early 1980, the introduction of Commercial Paper (CP), Guaranteed Commercial Paper (GCP), new types of RPs and CDs, etc..

are not guaranteed by the dealing companies.

Maturity ranges from 1 to 180 days and discount rates are deregulated, while on the selling rates only the paper with maturity of 91-180 days and a minimum par value KW30 million or more is deregulated. Since most CP is unsecured, the quality rating is of particular importance. The borrowers, whose creditworthiness is evaluated by the individual investment and finance companies and by professional credit rating companies are usually graded into three ranks: A, B, and C.

Repurchase agreements (RPs) were first introduced in February 1977 when the KSFC undertook such transactions with securities firms. Securities firms were allowed to engage in this business from February 1980, banks from September 1982 and post offices from March 1983. The nature and scope of the business, however, is somewhat different at those three kinds of institutions[7]. RP rates are freely determined by the handling institutions subject to a ceiling set by the Chairman of the SEC. The main borrowers of funds in the RP market are securities firms, banks, post offices, and business corporations, while the main investors are individuals and non-profit corporations.

Negotiable CDs are large time deposits at banks with a fixed maturity date and a specified interest rate. The CD market was designed to promote banking institutions' competitiveness against non-bank financial intermediaries for short-term deposits and to encourage the mobilisation of short-term funds.

The short-term government securities market in Korea can be defined as the market where government securities with maturities of less than one year are issued and traded. The most important types of short-term government securities are as follows:

(1) Treasury Bills issued by the government to cover short-term deficits in the fiscal balance or to control the monetary aggregates;

(2) Foreign Exchange Equalisation Fund Bonds issued by the Foreign Exchange Equali-

7.The maturities differ by institutions: for the KSFC and securities firms 1-364 days; for banks 91-364 days; for post offices 1-90 days. Also, the minimum denominations are different: for post offices KW0.05 million and for other participants KW0.1 million.

sation Fund to enhance the efficiency of liquidity control and to stabilise the nation's foreign exchange markets; and

(3) Grain Management Fund Bonds issued by the Grain Management Fund to stabilise the price of grain.

Monetary Stabilisation Bonds (MSBs), which are special negotiable obligations of the BOK issued to control monetary growth and which serve as one of the most important instruments in the open market operations of the BOK(see Chapter 3).

<Table 2.25> Money Market Trends

(Unit: billion won)

End of Year	1985	1988	1989	1990
CPs	5,281	8,851	12,237	11,622
RPs	2,563	2,449	2,138	2,607
Government bonds (short-term)	750	4,149	6,600	9,242
MSBs	504	15,374	17,305	15,241

Note: Numbers of outstanding amounts of CP and RP in 1990 are the end of June 1990.
Sources: 1) The BOK, Financial System in Korea, December 1990
2) The BOK, Monthly Bulletin, April 1991, p.74

Table 2.25 shows the recent development of money market at the end of December 1990. The rapid growth of the money market was due mainly to an expansion in the number of financial institutions resulting from financial deregulation. The quick growth in volume of short-term government bonds and MSBs reflects that, in order to absorb excess liquidity supply resulting from the large surpluses in the balance of payments (BOP) in the 1986-1989 period, monetary policy was implemented mainly by the open market operations.

2.5 CONCLUSION

This chapter has analysed the flow of funds in the financial sector and traced the evolution of the financial system in Korea. The structure of the banking and financial system was also analysed, including the BOK, banking institutions, NBFIs, the securities market and the money market.

Financial deepening and modernisation have brought about a number of significant changes in the structure of the financial sector. Perhaps the most significant developments in Korea's financial system have been the rapid growth of credit extended by the NBFIs and direct financing through capital markets. The NBFIs' share of total financing of the non-financial sector soared from 17.1% in 1975 to 34.9% in 1990 as shown in Table 2.6. DMBs have maintained their share at around 20% in recent years after a period of relative decline in the early 1980s. The large gain of the NBFIs and direct financing has been balanced out by the decline of foreign financing and informal borrowing from the informal credit markets. The rapid growth of the NBFIs can be attributed to the relatively free regulatory environment in which they have been allowed to operate. Unlike the DMBs, these institutions have enjoyed considerable discretion in managing their asset portfolios and setting their lending and borrowing rates at competitive money market levels because they were initially intended to replace the informal money markets. Their competitive edge and managerial autonomy allowed these institutions to grow rapidly by cutting into the market share of the DMBs. Since the mid-1980s, however, the interest rate advantage has declined, and this, together with the financial reform toward universal banking, has enabled the DMBs to regain their competitiveness.

Since 1991, wide-ranging structural adjustments in financial market have been implemented. The government has directed its efforts towards developing capital markets since the late 1960s in order to diversify the sources of financing and reduce the high degree of leverage of corporations. Such efforts had been initiated from the early 1980s in order to achieve a greater diffusion of corporate ownership through increased capital participation as a means of promoting distributive equity and preparing for the opening the capital market in the early 1990s.

CHAPTER 3

BANK REGULATION AND SUPERVISION IN KOREA

3.1 INTRODUCTION

Bank regulation and supervision are concerned primarily with bank safety and depositor protection through regulating and monitoring the financial health of banking firms. Sometimes, prudential regulation and supervision are formally distinguished by regulators, bankers and/or academics. Prudential regulation then indicates more specifically the mandating of prudential rules for banks, while supervision is the monitoring process implemented in order to ensure that these rules are met. However, the most widespread and generally accepted meaning of 'banking supervision' covers specifically the rules and associated monitoring that are directed towards the prudential soundness of individual banks (Gardener, 1991). We will follow this generalised definition of bank supervision for the purposes of this study.

This chapter examines the supervisory system in Korea. The aim is to provide a bird's eye view and a basic framework to evaluate the impact of supervision policy on banks. Therefore, the primary emphasis is placed on examining the reasons why bank supervision is desirable and the forms and style it may take. In this context, the present supervisory system in Korea is analysed. Section 2 traces the evolution of bank supervision in Korea. Section 3 analyses all the different kinds of regulations pertaining to the banks, including the BOKA, the GBA, acts for specialised banks and foreign exchange regulations. Section 4 examines the regulatory regimes in Korea, including monetary policy and credit controls. Section 5 explores the theories of regulation and rationale for regulation, and in Section 6, the objectives of bank supervision are analysed. Section 7 examines forms and style of banking supervision in Korea. Section 8 analyses the instruments, while section 9 examines the monitoring apparatus of supervision. Section 10 provides a broad picture of supervisory authorities. Section 11 discusses relationship between the BIS and the BOK. Finally, section 12 is a summary and conclusion.

3.2 THE EVOLUTION OF REGULATION AND SUPERVISION

The evolution of modern bank supervision in Korea may be broadly divided into three stages corresponding to the development stages of the banking and financial system discussed in Chapter 2: the period of establishing modern bank supervision (1950s); the period of enhancing supervision for economic development (1960s - 1970s); and the period of deregulation (1980s -).

3.2.1 Establishment of Modern Bank Supervision (1950s)

The introduction of modern banking regulation and supervision in Korea dates back to 1950 when the BOKA was promulgated. On May 5, 1950, the bank supervision department of the BOK was established. This Department, subject to instructions of the MB, is in charge of the supervision and examination of banking institutions. Unfortunately, shortly after this establishment the Korean war broke out and supervision of banking institutions was not carried out effectively, due mainly to the lack of manpower and " Emergency Measures on Money and Banking". However, as the GBA (which was approved in 1950) was implemented on August 15,1954, the authority of supervision and examination of banking institutions was given to the OBSE of the BOK. At the same time, four nationwide commercial banks - Cho Hung Bank, the Commercial Bank of Korea, Korea Savings Bank (renamed Korea First Bank) and Korea Hungop Bank (renamed Hanil Bank) were privatised. Meanwhile, bank supervision was focused on maintaining the soundness of banks through regulating risky assets (defined as total assets minus cash and due from the BOK and others) which was mandated not to exceed ten times a bank's paid-in capital and reserves; since 1955, the BOK strongly enforced banks to write off assets which had no effective value as well as expediting the settlement of bad loans.

3.2.2 Enhancement of Supervision for Economic Development (1960s - 1970s)

Since the government launched its first Five-Year Economic Development Plan in the early 1960s, financial institutions have been reorganised to support economic development plans. In June 1961, the government repossessed the shares of the commercial banks held by large stockholders on the grounds that they were illegally hoarded properties. At the same time, the bank supervision institution of the BOK was also restructured and became an office rather than a department in order to enhance the control on personnel management and business activities of commercial banks. If a bank examiner learned that any officer or employee had been involved in certain specified irregularities, the Superintendent of Banks requested the presidents of the bank concerned to take disciplinary action commensurate with the gravity of the irregularity. Regulations on portfolios of commercial banks, which were regulations on the amount of risky assets, were also eased and finally abolished in 1969 in order to enhance financial support for economic development.

Meanwhile, since the early 1960s, the government also introduced various specialised banks to facilitate financial support for economic development plans, and the authority of supervision of specialised banks was given to the Ministry of Finance. As a result, the authority of supervision of banking institutions was dichotomised between the Ministry of Finance and the OBSE of the BOK.

As the side effects of the development policy became conspicuous in the 1970s, bank regulation and supervision focused on expediting the settlement of bad loans, and enhancing the bank management function of the OBSE through the introduction of the Prime

Bank System[1] and comprehensive directives and orders regarding bank management were issued by the Superintendent of Banks.

3.2.3 Deregulation and Reregulation (1980s -)

Since the early 1980s, various deregulation measures were carried out in the financial services industries in order to vitalise the sector by ensuring the autonomy of institutions through the reduction of government involvement in their internal management and other operational matters, and by providing a generally more competitive market environment. Since 1985, the focus of bank regulation and supervision by the OBSE has been on consolidating the managerial autonomy of banking institutions and enhancing the soundness of bank operations. Therefore, the forms and style of bank supervision have changed from direct and excessive to more indirect ones, like enhancing capital adequacy requirements.

3.3 REGULATIONS PERTAINING TO BANKS

There are many laws and regulations relating to financial institutions. However, the most comprehensive regulations are the BOKA and the GBA. Although they are, in principle, applied to all financial institutions, some clauses of the two acts, however, are not applied to specialised banks and NBFIs. The functions and business activities of the commercial banks are regulated in terms of the BOKA and the GBA. As for the specialised banks, the respective special acts regulate the functions and business activities of the specialised banks. Foreign exchange business of financial institutions is subjected to the provision of the Foreign Exchange Control Act (FECA).

1.The Prime Bank System is a system which the prime bank, designated from among lender banks, can exercise overall credit control over major clients who have been granted more than a specified amount of credit by the bank.

3.3.1 The Bank of Korea Act

There are complementary relationships between the BOKA and the GBA and, at the same time, the BOKA has the characteristics of a fundamental law on the business activities of banking institutions. Thus, the GBA comprises some clauses of the BOKA related to the functions and authorities of the MB and the OBSE. One of the main functions of the BOK, like many other central banks, is to control the money supply and to supervise banking operations under the instructions of the MB. These functions are clearly stated in the BOKA. Article 3 stipulates the primary purposes of the BOK are " to maintain the stability of the value of money in the interest of national economic progress, and to further economic progress and efficient utilisation of national resources by the sound operation and functional improvement of the nation's banking and credit system". The regulations on banking institutions under the BOKA are derived from these functions.

As for the traditional monetary and credit policies, the BOKA stipulates a number of instruments. They include reserve requirements taking into account marginal reserve requirements; selective regulations of banking business such as the maximum rates of interest on deposits and loans, ceilings on the aggregate volume of loans and investments, the maximum maturities of the loans, and prior approval of applications for loans in excess of specified amounts in periods of pronounced expansion; and open market operations. In addition to these, the BOKA stipulates a comprehensive clause for monetary policy: that is, the MB must, when it deems particular movements in the money supply and prices to be detrimental to a balanced growth of the national economy, initiate appropriate measures[2] provided in the BOKA and exert all possible efforts to achieve the objectives of such measures. As for bank supervision and examination, the OBSE must examine the business condition of each banking institution at least once a year without prior notice, and the

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2. These measures are stipulated in greater detail in Article 97.

Superintendent of Banks may demand documents, subpoena witnesses, and receive testimony or opinion from banking institutions. The Superintendent of Banks may also request the president of the pertinent banking institutions to take disciplinary action when any officers or employees of the banking institution have been involved in certain specified irregularities.

3.3.2 The General Banking Act

The GBA was enacted in 1950 and revised 5 times by 1982. As discussed earlier, since the early 1980s, the Korean financial markets changed rapidly. Financial deregulation and internationalisation have actively proceeded. However, this rapid (structural) deregulation carries with it, and increases, the risk of instability in the short run. Meanwhile, pressures to open the Korean financial markets from developed countries, especially the USA, have continuously increased. The GBA was, however, not enough to meet efficiently these internal and external changes of the financial environment. Therefore, it was urgent to revise the GBA in response to these changes. Under these circumstances, the GBA was revised and promulgated on December 31, 1991 in order to enhance competitiveness through ensuring the autonomy of domestic banks and to make clear the position of foreign banks in relation to bank supervision.

The GBA regulates several areas of banks' business activities. These regulations may be classified by authorisation, capital adequacy requirements, credit restrictions, business activities restrictions and pricing restrictions, statements restrictions, and disciplinary measures.

First, the GBA stipulates any juridical person who undertakes banking business must obtain the advance authorisation of the MB, upon recommendation by the Superintendent of Banks of the BOK. According to the GBA, banking business is defined as regularly and in an orderly manner engaging in the business of lending funds acquired through the assumption of obligations to the public in the form of deposits received, and securities or other evidences of debt issued. This banking business may be further divided into "commercial banking business" and "long-term financing business"[3]. Furthermore, the GBA specifies the cases which need the authorisation of the MB. They include:

(1) any merger with other banking institutions;

(2) liquidation of a bank or closing of banking business;

(3) a change in a bank's capital or articles of association; and

(4) opening or closing of a branch, agency or a change in the domicile of the head office, branch, or agency of a banking institution.

Second, the GBA stipulates the obligatory minimum capital requirements which were increased from KW25 and 3 billion to KW100 and 25 billion for nationwide commercial banks and regional banks, respectively, in 1991. Each bank must always maintain an amount of net worth equivalent to at least one twentieth of its outstanding liabilities arising from guarantees or assumptions of obligations. Whenever the amount of net worth is less than the required minimum, the banking institution concerned must submit to the Superintendent of Banks a schedule for eliminating this deficiency within a reasonable period of time. The most conspicuous part of the GBA revised in 1991 is to provide the explicit clause (Article 18) for "Guidelines for Bank Management" which encompasses capital adequacy requirements. Until this revision in 1991, capital adequacy regulations were imposed by administrative guidelines without explicit legal foundation. The main purpose of Article 18 is to prepare the introduction of Bank for International Settlements' (BIS) proposal as a mandatory guidance.

Third, the GBA restricts lending to prevent banks from taking excessive risk on a single customer or business. No bank may, in principle, grant loans in excess of 20% of its net worth, or payment guarantees and assumptions of obligations in excess of 40% of its net worth, to a single individual or juridical person. The GBA also prohibits following loans:

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3. The definitions of these businesses are stipulated in Articles 20 and 21.

(1) loans to be used for speculation in commodities or securities;

(2) loans, directly or indirectly, on the pledge of its own stocks, or on the pledge of stocks in excess of 20% of the issued stocks of any other corporations;

(3) loans, directly or indirectly, to enable a natural or juridical person to buy the banking institution's own stocks;

(4) loans, directly or indirectly, to finance political activities;

(5) loans to any of its officers or employees, but this does not apply to small loans as determined by the Superintendent of Banks of the BOK.

Fourth, the GBA, subject to the control of the MB, restricts the banks' business activities in order to ensure the sound operation of banking institutions. The GBA prohibits the possession of and investment in real properties except those premises necessary for the conduct of a bank's business, and also prohibits the purchasing or retaining ownership of stocks issued by banking institutions, or stocks in excess of 10% of the shares issued by any other corporation. In addition to the above restrictions, the MB may also fix ceilings of interest rates and on the aggregate volume of outstanding loans, guarantees or assumed obligations of banking institutions.

Fifth, the GBA regulates statements of banks. A banking firm must, within three months after the end of its accounting period which ends the end of December for NCBs and the end of September for RBs, publish a balance sheet, an income statement and a consolidated balance sheet as of the closing date in a form specified by the Superintendent of Banks of the BOK and, within thirty days after the end of each month, submit to the Superintendent of Banks of the BOK a report outlining, in a form specified by him, its operations during that month.

Finally, the GBA provides bank examination and supplementary provisions for disciplinary measures. If any bank violates the GBA, or any regulation, order or instruction issued by the MB in accordance with the provisions of the above Act, the Board may not only instruct the Superintendent of Banks to make such bank desist from its unlawful conduct or malpractice or suspend its business operations for a specified period, but also, if necessary, cancel its business authorisation. The Superintendent of Banks may also request presidents of banking institutions to take disciplinary action when their officers or employees have been involved in certain specified irregularities.

3.3.3 Acts for Specialised Banks

The specialised banks, which like commercial banks function as DMBs, were established during the 1960s according to a series of separate acts which set out their purposes. One feature of the specialised banks is that they are directed and supervised by the government under these special acts. Their business operations are also restricted by the respective special acts except in some areas such as the minimum reserve requirement and maximum interest rates which are decided by the MB and the Governor of the BOK, and are universally applied to the specialised banks as well as to commercial banks. The specialised banks are also subject to examination by the OBSE under the authority delegated to it by the Minister of Finance. Another feature is that they can borrow government funds as their financial sources. There are two main types of restrictions on specialised banks: first concerning their main business activities (see details in Chapter 2), and, second, concerning the issuance of debentures. Table 3.1 summarises the main business and kinds and limits of issuing debentures of the specialised banks. The issuance of debentures with government guarantees are restricted within 10 to 20 times of their paid-in capital and reserves. However, no debentures by the CNB, NFFC and NLCF have so far been issued.

3.3.4 Foreign Exchange Regulation

The foreign exchange business of DMBs is subject to the provisions of the Foreign Exchange Control Act (FECA) which was promulgated on December 31, 1961 and recently revised on December 27,1991. The main features of the revised FECA in 1991 are to change the FECA from the 'Positive' to 'Negative System'[4] and to provide the explicit clauses for financial futures. The FECA states that a bank wishing to engage in the foreign exchange business must be authorised as a foreign exchange bank by the Minister of Finance.

<Table 3.1> Main Business and Issuing Debentures of the Specialised Banks

Bank	Main Business	Issuance of Debentures
IBK	- Financing small and medium enterprises	- Small and Medium Industry Finance Debentures 0 10 times (the amount of its paid-in capital and reserves)
CNB	- Banking services to households and small-scale business firms exclusively 0 Mutual remuneration loans	- National Savings Debentures 0 10 times * No debentures have been issued so far.
KHB	- Housing finance for low income households 0 Loans for the construction and purchase of houses or housing sites 0 Loans for local governments and small and medium-sized firms producing basic housing materials	- Housing Debentures 0 20 times
NACF	- Funding to its member cooperatives and non-financial business sectors	- Agricultural Finance Debentures 0 20 times
NFFC	- Funding to its member cooperatives and the NFFC's other sectors	- Fisheries Finance Debentures 0 20 times * No debentures have been issued so far.
NLCF	- Funding to its member cooperatives and other sectors of the NLCF	- Livestock Finance Debentures 0 20 times * No debentures have been issued so far.

4. Under the Positive System, people are allowed to do items enumerated in the FECA, while under the Negative System, people are allowed to do everything except items enumerated in the FECA. Therefore, the Negative System allows more freedom to people.

Foreign exchange banks are classified into two groups, Class A and Class B, according to the scope of their foreign exchange business. Class A foreign exchange banks are allowed to conduct almost all kinds of normal foreign exchange business, including the purchase and sale of foreign exchange, the opening of letters of credit, the holding of foreign currency funds in foreign countries, the issue of guarantees in foreign currencies to non-residents and the setting up of correspondent agreements with foreign banks. Class B foreign exchange banks are not permitted to engage directly with foreign banking institutions in some aspects of international banking business such as the establishment of correspondent arrangements and so on. However, the Minister of Finance may, if it is necessary to stabilise the domestic foreign exchange market and to maintain the international credibility of foreign exchange banks, fix the ceilings of purchase and sale of foreign exchange, and also restrict the uses and sources of funds related to foreign exchange business and other business of foreign exchange banks. The head offices of all domestic banks and foreign bank branches are authorised as Class A foreign exchange banks. A domestic bank wishing its branches to engage in the foreign exchange business as Class A or Class B foreign exchange banks must file a report with the Governor of the BOK.

Meanwhile, the BOK is responsible only for those aspects of foreign exchange control business entrusted to it by the Minister of Finance under the FECA. These comprise intervention in the foreign exchange market, approval and *ex post facto* control of some foreign exchange transactions, decisions as to residential status, and so forth. The BOK also examines foreign exchange banks under the authority delegated by the Minister of Finance.

3.4 REGULATORY REGIMES

3.4.1. Introduction

The regulatory framework under which banks operate is one of the most important factors influencing the banking structure (Gardener *et al*, 1990). Regulatory authorities may influence the banking market through regulations affecting structure and competition, bank supervision, monetary policy, and credit controls. Regulatory bodies can influence the size and structure of the banking sector through their control over access to the banking system via authorisation or licensing. A licensing system implies that the licensed operators may be able to extract a regulatory rent in the form of growing and protected profit margins. This may happen through restrictions on competition (both existing and potential) brought about by regulations limiting the numbers of institutions that can perform banking business. On the other hand, economic controls may correspondingly impede the competitive abilities of regulated institutions. Bank regulations, therefore, usually have significant implications for competition. Too much competition has its dangers for prudential safety, while excessive regulations may stifle innovations and the ability to meet legitimate demands on the system(Gardener, 1986).

Regulations affecting structure and competition of banks in Korea can be placed in two categories: entry barriers and bank business restrictions. Bank supervision and examination are carried out by the BOK in accordance with the provisions of the BOKA and the GBA. According to these acts, the OBSE of the BOK, subject to the MB, is in charge of the supervision and regular examination of banking institutions. Monetary policy has broad and diverse ultimate goals. While the direct goals of bank supervision and monetary policy are different, some are often closely related, and monetary policy inevitably affects the portfolio strategies of banks. Therefore, we need to explore monetary policy in order to enhance our general understanding of banking behaviour in the Korean banking market. The above two regimes will be discussed in greater detail in the following sections, and in the next section, we will concentrate on monetary policy and credit controls.

3.4.2. Monetary Policy

3.4.2.1 The Objectives and Targets of Monetary Policy

Monetary policy is a macro-economic policy which is designed to moderate the fluctuations of the economy through the changes in the stock of money, changes in the interest rate - the discount rate - at which the Central Bank lends money to banks, and via some controls over the banking system. Therefore, monetary policy encompasses actions which affect the availability and cost of banking institutions' reserves and thereby influences overall monetary and credit conditions. Monetary policy has broad and diverse ultimate goals such as stabilising the price level, fostering steady economic growth, keeping unemployment low, and balancing international trade.

Like many other developed and developing countries, the goals of monetary policy in Korea also include the four main objectives mentioned above. Although the main emphasis has shifted from time to time according to the prevailing economic trends, the focus of Korean monetary policy has centred on the stabilisation of the overall price level and the promotion of steady economic growth. The prevailing objective is to foster steady economic growth with stable prices.

To achieve this ultimate goal, the monetary authority may set the intermediate targets like M_1, M_2, M_3 and interest rates. Since the 1970s, many countries have used a monetary aggregate as the monetary policy target instead of the interest rate (Goodhart,1989). Monetary aggregates in Korea include M_1, M_2, M_2A and M_3. M_1 is defined as currency in circulation plus demand deposits at monetary institutions. M_2 is defined as M_1 plus time and savings deposits and resident's foreign currency deposits at monetary institutions. M_2A is defined as M_2 minus long-term time and savings deposits. M_3 is defined as M_2 plus NBFI deposits, Debentures issued, commercial bills sold, CDs, and RPs.

Since 1979, M_2 has served as the principal target of monetary control and other aggregates have also been used as supplementary indicators. At present, the target rate of money growth is determined according to the following equation (BOK, 1989):

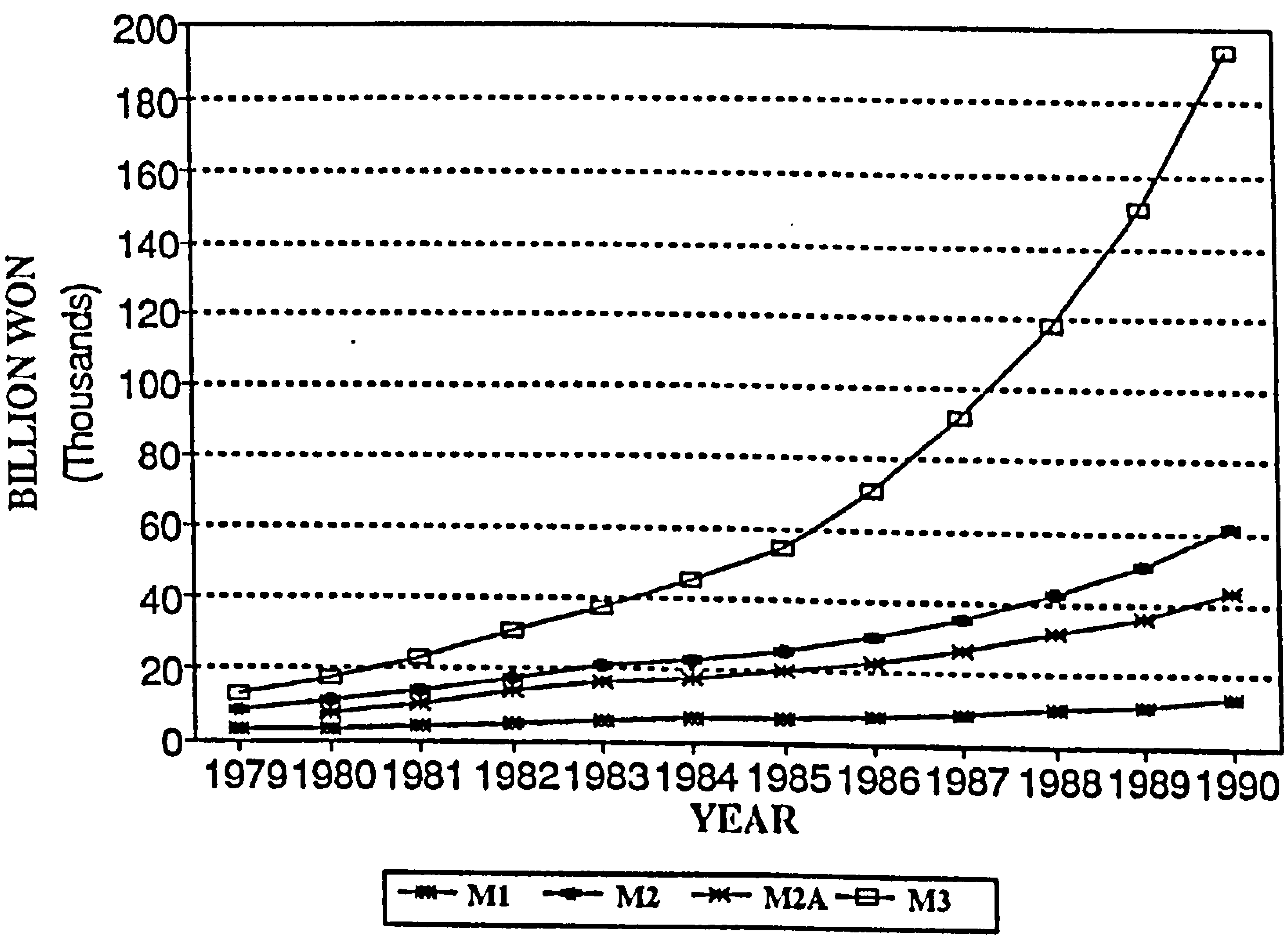
Target rate of money growth(M_2) = the expected growth of real GNP

+ the expected rate of inflation

- the predicted rate of increase of the velocity of money.

The recent growth rates of money supply are shown in Figure 3.1 and Table 3.2.

<Figure 3.1> Recent Money Supply Trends



<Table 3.2> Recent Growth of Money Supply

(Unit: billion won, %)

Year	M_1(%)	M_2(%)	M_2A(%)	M_3(%)
1979	2,775.8(18.0)	8,555.5(26.8)	NA	13,379.3(31.0)
1980	3,253.6(17.2)	10,764.1(25.8)	7,772.4(NA)	17,810.8(33.1)
1981	3,689.9(13.4)	13,714.8(27.4)	10,212.8(31.4)	23,243.2(30.5)
1982	4,581.4(24.2)	17,575.2(28.1)	13,530.3(32.5)	30,964.6(33.2)
1983	5,767.8(25.9)	21,005.0(19.5)	16,189.2(19.7)	37,647.7(21.6)
1984	6,340.3(9.9)	23,261.2(10.7)	17,583.8(8.6)	45,204.1(20.1)
1985	6,545.0(3.2)	26,015.3(11.8)	19,791.0(12.6)	54,763.9(21.1)
1986	7,236.7(10.6)	30,396.2(16.8)	22,691.9(14.7)	70,709.8(29.1)
1987	8,644.4(19.5)	36,119.6(18.8)	26,586.8(17.2)	92,040.3(30.2)
1988	9,984.3(15.5)	42,893.0(18.8)	32,055.6(20.6)	118,134.7(28.4)
1989	11,393.3(14.1)	50,793.1(18.4)	37,039.9(15.5)	150,774.3(27.6)
1990	13,450.8(18.1)	61,576.1(21.2)	44,163.3(19.2)	193,409.8(28.3)

Note: 1) M_1, M_2, M_2A are average balances, while M_3 is end of period.
2) Figures in parentheses represent percentage change to previous year.
Source: The BOK, Monthly Bulletin, December 1991, pp.6-7

3.4.2.2 Instruments of Monetary Policy

Monetary policy is, in practice, exercised principally through three orthodox instruments: changes in the terms and conditions of rediscounts, open market operations, and changes in reserve requirement ratios. In addition to these policy instruments, the BOK has authority to set maximum interest rates on deposits and loans of banking institutions and to control the volume of bank credit directly in periods of pronounced monetary expansion.

The following Chart 3.1 depicts the structure of monetary policy in Korea. As discussed earlier, the ultimate goal of monetary policy is fostering economic growth with stable prices. To pursue this goal, the BOK sets the target rate of M_2 as an intermediate target. In order to control the growth rate of M_2, the BOK uses policy instruments such as reserve requirements and open market operations as major tools, and the rediscount rate as a minor tool.

<Chart 3.1> The Structure of Monetary Policy in Korea

Ultimate goal

Fostering Economic Growth
With Stable Prices

↓

Intermediate Target

Monetary Growth(M2)

↓

Policy Instruments

↓

Rediscount Rate	Reserve Requirements	Open market Operations
<Minor tools>	< Major tools>	

3.4.2.2.1 Rediscount Policy

The BOK, like other central banks, uses rediscount policy to control the credit operations of banking institutions. According to economic theory, a change by the central bank in rediscount rates brings about a change in the lending rates of banking institutions and ultimately affects firms' demand for bank credit. In Korea, however, the rediscount instrument has had only a limited role in controlling the overall volume of bank credit because, with a chronic excess demand for bank credit[5], banking institutions until recent years tended to depend extensively on borrowings from the BOK. Since this instrument did not function effectively, the MB used to change directly bank lending rates as well as the

5. This excess demand for bank credits is mainly derived from the so-called financial repression.

rediscount rates so as to affect the interest costs of business firms. The emphasis of rediscount policy has, therefore, been placed on determining rediscount ratios and changing the eligibility requirements of bills presented to the BOK for loans and rediscounts.

Table 3.3 shows the recent trends in loans and discounts of the BOK. It depicts that rediscounts on commercial bills have continuously increased and reached 32.9% in 1990 from 13.7% in 1985, while loans for foreign trade have dropped from 21.2% in 1985 to 7.7% in 1990. However, general loans have maintained more than 50% of total loans and discounts. Table 3.3 also shows that at the end of 1990, general loans accounted for 51.4% of the BOK's total loans and rediscount, compared with 7.7% for loans for foreign trade and 32.9% for rediscounts on commercial bills. Meanwhile, Table 3.4 shows the principal interest rates on loans and discounts of the BOK. The BOK sets the preferential loan rates for agriculture, fisheries and livestock bills in order to boost and modernise these industries.

<Table 3.3> Loans and Discounts of The BOK

(Unit: billion won, %)

Year	Total	RCB[1)]	LFT[2)]	LAFL[3)]	GL[4)]	Others
1985	9,641.3	1,320.8	2,039.2	173.6	5,463.2	644.5
	(100.0)	(13.7)	(21.2)	(1.8)	(56.7)	(6.7)
1986	10,157.2	1,291.9	1,927.2	199.0	6,115.7	623.4
	(100.0)	(12.7)	(19.0)	(2.0)	(60.2)	(6.1)
1987	10,783.3	1,620.1	1,132.8	260.8	7,144.0	625.6
	(100.0)	(15.0)	(10.5)	(2.4)	(66.3)	(5.8)
1988	9,725.2	1,862.1	526.7	314.4	6,416.7	605.3
	(100.0)	(19.1)	(5.4)	(3.2)	(66.0)	(6.2)
1989	10,290.5	2,588.0	639.2	567.0	5,920.6	575.7
	(100.0)	(25.1)	(6.2)	(5.5)	(57.5)	(5.6)
1990	11,604.8	3,819.6	891.9	348.2	5,968.4	576.7
	(100.0)	(32.9)	(7.7)	(3.0)	(51.4)	(5.0)

Notes: 1) RCB represents rediscounts on commercial bills.
2) LFT represents loans for foreign trade.
3) LAFL represents loans for agriculture, fisheries and livestock.
4) GL represents general loans.
5) Figures in parentheses represent percentage of total.
Source: The BOK, Monthly Bulletin, December 1991, p.24.

<Table 3.4> Principal Interest Rates on Loans & Discounts of the BOK

(Unit: % per annum)

Effective date	Loans to government	Rediscounts commercial bills [2]	Foreign trade bills [1]	Agriculture, Fisheries, and Livestock bills[1]	Other bills and securities
1980. 6. 5	5.0	20.0-19.5	10.0(7.0)	10.0(7.0)	20.0-26.0
9.16	5.0	18.0-17.5	10.0(7.0)	10.0(7.0)	18.0-24.0
11. 8	5.0	16.0-15.5	10.0(7.0)	10.0(7.0)	16.0-22.0
1981. 11. 9	5.0	15.0-14.5	10.0(7.0)	10.0(7.0)	12.0-21.0
11.30	5.0	13.0-12.5	10.0(6.0)	10.0(6.0)	12.0-20.0
12.29	5.0	11.0-10.5	10.0(5.0)	10.0(5.0)	11.0-19.0
1982. 1. 4	5.0	7.0-6.5	5.0	5.0	5.0-18.0
3.29	5.0	5.5-5.0	5.0	5.0	5.0-18.0
5. 7	5.0	5.0	5.0	5.0	5.0-18.0
6.28	5.0	5.0	5.0	5.0	5.0-12.5
1983. 2.24	5.0	5.0	5.0	5.0	5.0- *
1985. 7. 1	5.0	5.0	5.0	3.0	3.0- *
1986. 5. 1	5.0	5.0	5.0	3.0	3.0-15.0
7.10	5.0	7.0	7.0	3.0-5.0	3.0-15.0
1988. 9. 2	5.0	8.0	8.0	3.0-5.0	3.0-15.0
1989.11.14	5.0	7.0	7.0	3.0-5.0	3.0-15.0

Notes: 1) Figures in Parentheses are the preliminary interest rates.
2) Bills related with loans for general export and import, for export of construction and services and for export preparation of agricultural and main products.
3) "*" indicates the average call rate for last reserve maintenance period plus 1% point.

Source: The BOK, Monthly Bulletin, December 1991, p.25.

3.4.2.2.2 Open Market Operation

Open market operations have, in recent years, been more actively employed as a tool for achieving policy objectives. The BOK participates directly in the open market, buying or selling government securities, which are fully guaranteed by the government, and MSBs. Before the mid-1980s, open market operations had not been regarded as an important policy instrument for the control of financial market conditions. This under-development of open market operations was due to a shortage of marketable instruments which, in turn, reflected a notable gap between issuing rates and market interest rates. Thus, the BOK had no option but to carry out the majority of its open market operations in the MSBs market, even though this was something of a captive market.

The MSBs were first introduced in 1961. They have played an important role since that time in controlling the reserve positions of banking institutions. The BOK may issue the MSBs in the open market under terms and conditions decided by the MB, and may repurchase them before maturity, depending upon monetary and credit conditions. The BOK has, in practice, issued and repurchased the MSBs in the captive market on a discount basis at a rate similar to the interest rates on time deposits of a comparable maturity. Recently, the BOK and the government have attempted to create an environment conducive to open market operations and, although very limited in size and frequency, the BOK has attempted to sell the MSBs by auction to the general public including NBFIs.

Table 3.5 illustrates that from the mid-1980s, TBs, MSBs and Foreign Exchange Stabilisation Fund Bonds (FESFBs) have been issued in high volumes in order to absorb the excess liquidity supply resulting from the large surplus in the BOP during the 1986-1989 period.

<Table 3.5> Issues and Outstanding Amounts of TBs, MSBs & FESFBs

(Unit: billion won)

Year	TBs		MSBs[1]		FESFBs	
	Issued	Balance	Issued	Balance	Issued	Balance
1979	410.0	100.0	-	-	-	-
1980	470.0	150.0	3.2	3.2	-	-
1981	510.4	68.0	146.4	30.0	-	-
1982	189.8	19.8	365.0	5.0	-	-
1983	-	-	240.6	155.5	-	-
1984	-	-	1,514.0	563.6	-	-
1985	-	-	2,099.8	504.1	-	-
1986	200.0	200.0	4,435.3	3,258.6	-	-
1987	1,000.0	1,000.0	9,383.1	8,174.5	1,500.0	1,500.0
1988	1,500.0	1,500.0	16,966.4	15,373.5	988.8	988.8
1989	2,500.0	2,500.0	19,828.4	17,305.4	1,400.0	1,400.0
1990	2,500.0	2,500.0	20,262.1	15,240.5	3,000.0	3,000.0

Note: 1) Amounts of public offerings.
Sources: The BOK, Monthly Bulletin, various issues.

3.4.2.2.3 Reserve Requirement Policy

The BOK may impose reserve requirements on the deposit liabilities of banking institutions. These requirements are applied uniformly to all similar deposits at all banking institutions, with reserve ratios not exceeding 50 percent (The BOKA, Art.57). In periods of pronounced inflation, the BOK is authorised to impose a marginal reserve requirement, directing banking institutions to hold minimum reserves of up to 100% of any increase in deposits (The BOKA, Art. 58).

Until June 1981, reserve requirement ratios distinguished between demand deposits and time and saving deposits. However, in July 1981, the BOK unified the ratios with the aim of countering the phenomenon whereby a shift of funds between financial assets with different reserve requirements resulted in added instability of the monetary multiplier.

Table 3.6 shows that at the end of 1990, the uniform ratios are 11.5% in won currency and 1% in foreign currency, except for lower ratios applied only to a few long-term time and savings deposits and non-residents' deposits.

<Table 3.6> Minimum Reserve Requirement Ratios of DMBs[1)]

(Unit: %)

Effective from	In Won Currency	In Foreign Currency[3)]
1981 July 1	5.5	1
Nov.23	3.5	1
1982 May 23	5.5	1
1984 Sep. 8	4.5	1
1985 July 23	4.5	1(20.0)
1987 Feb. 20	4.5	1(4.5)
Nov.23	7.0	1(4.5)
1988 Dec.23	10.0	1(4.5)
1989 May 8	10.0(30.0)[2)]	1(4.5)
1990 Feb. 8	11.5	1(4.5)
1990 Mar. 8	11.5	1(11.5)

Notes: 1) Applies to the KDB and KLTCB.
2) Figures in parentheses is marginal ratio applied to the increment of each half-monthly average deposits compared with the first half-monthly average deposits of April 1989.
3) Figures in parentheses apply to the resident accounts.

Source: The BOK, Monthly Bulletin, December 1991, p.25.

3.4.2.2.4 Maximum Interest Rates

Under the BOKA, the MB is authorised to set and adjust the maximum interest rates on each type of deposit and loan of banking institutions as well as the rediscount rates of the BOK. Before the interest rates liberalisation in 1988, the maximum interest rates on deposits were set by the MB and those on loans were determined by the individual banks subject to guidelines set by the Governor of the BOK.

In December 1988, the MB and the government undertook an extensive liberalisation of the interest rates of banks and NBFIs, deregulating most of their lending rates and, in the case of interest rates on deposits, those on deposits with long maturities. Accordingly, the MB now regulates only the ceiling rates on deposits - except of time deposits with maturities of more than two years (see Tables 3.7 and 3.8).

<Table 3.7> Principal Interest Rates on Deposits of DMBs

(Unit: % per annum)

Effective	Time and Savings		Instalment	Demand deposits	
date	Time[1)]	Savings	savings[2)]	Passbook	Household checking
1981.7. 1	19.5(21.6)	14.4	19.5(22.5)	1.8	14.4
11. 9	18.6(20.4)	14.4	18.5(21.5)	1.8	14.4
11.30	17.4(19.2)	14.4	17.3(20.3)	1.8	14.4
12.29	16.2	14.4	16.2	1.8	14.4
1982.1.14	15.0	14.4	15.0	1.8	14.4
3.29	12.6	12.0	12.6	1.8	12.0
6.28	8.0	8.0	8.0	1.8	8.0
1984.1.23	9.0	6.0	9.0	1.0	6.0
11.4	10.0	6.0	10.0	1.0	6.0
1988.12.5	10.0	5.0	10.0(13.0)	1.0	4.0

Note: 1) For 1-2 year time deposits
2) For 3 year instalment savings
3) Figures in parentheses are preferential rates on household deposits
Source: The BOK, Monthly Bulletin, March 1991, p.61

<Table 3.8> Principal Interest Rates on Loans & Discounts of DMBs[1)2)]

(Unit: % per annum)

Effective date	Discounts on comm. bills	Loans on foreign trade bills[3)]	Loans on other bills (up to 1 year)	Call loan	CD loan
1981.12.29	A 16.5	15.0	A 16.5(17.5)	17.0	-
	B 17.0		B 17.0(18.0)		
1982. 1.14	A 15.5	12.0	A 15.5(16.5)	16.0	-
	B 16.0		B 16.0(17.0)		
3.29	A 13.5	11.0	A 13.5(15.0)	16.0	-
	B 14.0		B 14.0(15.4)		
6.28	10.0	10.0	10.0(11.0)	*	-
1984. 1.23	10.0-10.5	10.0	10.0-10.5 (11.0-11.5)	*	-
11. 5	10.0-10.5	10.0	10.0-11.5 (11.0-12.5)	*	12.0
1985. 4.19	10.0-11.5	10.0	10.0-11.5 (11.0-12.5)	*	13.0
10.11	10.0-11.5	10.0	10.0-11.5 (11.0-12.5)	*	12.75
1986. 3.24	10.0-11.5	10.0	10.0-11.5	*	*
1988.12. 5	*	*	*	*	*

Note: 1) "A" represents the prime rate, "B" non-prime rate, and "*" market interest rates.
2) Applies also to specialised banks and figures in parentheses are for regional banks.
3) Bills related with loans for general export and import, for export of construction and services and for export preparation of agriculture and marine products.

Source: The BOK, Monthly Bulletin, March 1991, p.62

3.4.2.2.5 Monetary Stabilisation Account(MSA)

The Monetary Stabilisation Account (MSA) system was introduced in 1967 in an effort to reinforce the reserve requirement policy and also to develop a new instrument having certain characteristics of open market operations. Under this system, the BOK may require banking institutions to deposit a certain amount in the Account at the BOK. As far as the mechanism is concerned, the system is identical to a required-reserve system, but it can exert effects similar to those of open market operations. Funds deposited in the MSA are not regarded as reserve requirements and interest is paid on them. Because the operation of the Account could be conducted selectively and flexibly with attention being paid to the reserve position of each bank, manipulation of this instrument was frequently resorted to until the mid-1980s.

In particular, during the first half of the 1980s, the MSA system was frequently used as a useful means of controlling the money supply which was liable to expand as banking institutions borrowed the foreign capital needed to compensate for the current account deficit. However, following the shift of the current account into surplus in 1986, the BOK has made little use of this instrument in seeking to control liquidity. Instead, the BOK has pursued a course of seeking to control the short-term liquidity of banking institutions through sales of government and public bonds under repurchase agreements in the open market (see Table 3.5). And, in May 1989, the BOK allowed banks to withdraw their balances with the MSA which had been deposited for liquidity control. Table 3.9 describes that the balance of MSA has decreased sharply from 1988 to 1989.

<Table 3.9> Balances of MSAs

(Unit: billion won)

	1980	1981	1982	1983	1984	1985
Balance	50.0	273.7	1,610.9	376.9	1,192.3	6,518.0
	1986	1987	1988	1989	1990	1991
Balance	5,392.1	3,146.4	3,184.2	127.7	11.0	9.8

Source:The BOK, Monthly Bulletin, various issues.

3.4.3. CREDIT CONTROLS

3.4.3.1 Direct Control of Bank Credit

Direct control of bank credit was widely used in the early stages of development. During and after the Korean War, credit ceilings were fixed for each banking institution, while prior approval was needed for the extension of credit. There was frequent resort to this instrument, even after the interest rate reform in 1965 when the indirect credit control system came to play a major part in attaining the monetary target. During the period from 1977 to 1981, for example, a ceiling was set on the domestic credit expansion of each bank in order to put a curb on excessive monetary expansion.

However, since an indirect system of monetary control was adopted in 1982, there has been no formally-based limitation of bank credit. Nowadays, this instrument has evolved into a form of moral suasion.

3.4.3.2. Guidelines on the Efficient Allocation of Banking Funds

Government controls over credit allocation in Korea were initially exercised through guidelines which set a ranking of loan priorities for different sectors and within each sector. Credit guidelines were formally introduced in 1958 under "Regulations Pertaining to the Uses of Funds in the Financial Sector". As stated in the Regulations, the credit guidelines were too comprehensive and general to be translated into operational terms. As a result, the guidelines gave the BOK considerable discretion for the actual credit allocation.

Beginning in the early 1960s, the government took a more active role in guiding resource allocation through the formulation of both multi-year development plans and annual overall-resource-allocation programmes. The government increasingly interfered with the allocation of credit and gradually took over the rationing of credit from the BOK and financial institutions. Accordingly, guidelines became more specific, ranging from general guidelines to the earmarking of funds or prescription of bank loans for specific sectors, industries, and individual firms and projects. In formulating the annual financial stabilisation plan, the government allocates anywhere from 50% to 70% of domestic credit, depending upon the classification of "directed" or "policy" loans, to pre-designated sectors, industries and uses. The remainder is then, in theory, allocated at the discretion of the DMBs, but, in reality, these banks exercise little control over even the residual banking funds.

The main objectives of credit-allocation guidelines were facilitating the inflow of foreign aid, promoting new import-substituting industries, and maintaining sufficient support for the agriculture sector. However, as the economy grew larger and more complex (see Section 2.3.3), it was widely perceived that this approach was preventing the efficient allocation of resources. Therefore, guidelines were revised in 1982 and adopted in an indirect way. The current "Regulations of Loan Management in Banking Institutions" encourage banking institutions to operate their funds in a manner conducive to development of the national economy and entrust the Governor of the BOK with the authority to make, if necessary, rules governing the use of banking funds. Under this authority, the BOK has sought to restrain banking institutions from making loans to non-essential sectors such as luxury-oriented and speculative-inducing ventures. The BOK requires that each commercial bank extend at least 35 percent of its loans to small and medium firms. But for regional banks this requirement is 80 percent and for regionally-based nationwide commercial banks 90 percent. Branches of foreign banks are normally required to extend at least 25 percent of their lending, while this is raised to a requirement of at least 35 percent for branches of foreign banks which use the rediscount facilities of the BOK.

Table 3.10 shows the loans and discounts of DMBs by industrial sectors during the 1983-1990 period. It illustrates that most of the loans and discounts of DMBs are allocated to manufacturing, construction and agriculture and fisheries. Manufacturing accounts for 42% to 46% of total loans and discounts of DMBs. As for construction, agricultures and fisheries, corresponding ratios are 9% to 17% and 8% to 11%, respectively.

3.5 THEORIES AND RATIONALE OF BANK SUPERVISION

3.5.1 Introduction

Financial services in general, and banking in particular, have been more heavily regulated than any other industry in most countries. The Korean banks are no exception from this

<Table 3.10> Loans & Discounts of DMBs by Industry

(Unit: billion won, %)

	1983	1984	1985	1986
Agriculture[1]	1,956.9(8.1)	2,469.3(8.8)	2,870.4(8.5)	3,351.9(8.6)
Mining	155.9(0.6)	154.6(0.6)	184.1(0.5)	156.2(0.4)
Manufacturing	10,999.7(45.5)	12,295.6(43.9)	14,643.5(43.5)	17,972.6(46.0)
Electricity[2]	86.4(0.4)	101.9(0.4)	123.3(0.4)	108.7(0.3)
Construction	2,910.7(12.1)	4,065.3(14.5)	5,437.6(16.1)	6,530.2(16.7)
Wholesale[3]	2,316.6(9.6)	2,705.2(9.7)	3,306.4(9.8)	3,274.2(8.4)
Transportation[4]	662.3(2.7)	707.7(2.5)	968.7(2.9)	1,272.7(3.3)
Financing[5]	646.5(2.7)	787.5(2.8)	857.0(2.5)	716.7(1.8)
Community[6]	1,116.6(4.6)	1,326.4(4.7)	1,377.8(4.1)	1,229.7(3.1)
Others	3,298.7(13.6)	3,365.8(12.0)	4,042.0(12.0)	4,485.9(11.5)
Total	24,150.3 (100.0)	27,978.9 (100.0)	33,810.7 (100.0)	39,098.6 (100.0)

	1987	1988	1989	1990
Agriculture[1]	4,371.9(10.1)	5,182.9(10.6)	6,109.1(9.8)	7,373.5(10.0)
Mining	145.2(0.3)	234.2(0.5)	238.9(0.4)	267.3(0.4)
Manufacturing	19,547.5(45.4)	21,586.5(44.2)	25,918.4(41.4)	31,072.9(42.0)
Electricity[2]	82.1(0.2)	82.6(0.2)	118.2(0.2)	143.0(0.2)
Construction	7,332.8(17.0)	8,244.2(16.9)	10,368.6(16.6)	6,464.2(8.7)
Wholesale[3]	3,128.1(7.3)	3,630.1(7.4)	4,380.7(7.0)	5,319.0(7.2)
Transportation[4]	1,452.3(3.4)	1,571.6(3.2)	2,018.1(3.2)	2,145.9(2.9)
Financing[5]	750.0(1.7)	950.3(1.9)	4,057.6(6.5)	4,154.1(5.6)
Community[6]	1,298.5(3.0)	1,324.9(2.7)	1,714.7(2.7)	2,289.0(3.1)
Others	4,987.4(11.6)	5,998.1(12.3)	7,626.1(12.2)	14,799.8(20.0)
Total	43,095.8 (100.0)	48,805.4 (100.0)	62,547.8 (100.0)	74,028.6 (100.0)

Notes: 1) Includes fisheries, forestry and hunting.
2) Includes gas and water.
3) Includes retail, restaurants & hotels.
4) Includes storage & communication.
5) Includes insurance, real estate and business services.
6) Represents community, social and personal services.
Sources: The BOK, Monthly Bulletin, various issues.

general phenomenon. Regulations are pervasive around the world and surprisingly elusive to define clearly. For this study, however, we may define regulations generally as the intervention of the government or regulatory authorities in order to influence a bank's policies. This definition, however, is a general one: it also illustrates the potential difficulties in developing a crisp, clear definition of any banking regulation. A basic problem relates to the time scale of targeted regulatory effects and the simultaneity of effects within the plethora of regulations to which banks are subject. To compound the problem, some banking regulations appear to have multiple objectives, and a collection of regulations may sometimes be targeting for the some general policy objective (see also the following Section 3.8). In short, and at this stage, general definitions are easier to handle.

Regulation takes many different forms and style across countries and over different periods. The form of regulation often implies use of the legal framework such as the BOKA and the GBA. It also includes moral suasion often employed by the BOK like the Bank of England. The scope of regulations on banking ranges from opening and branching of banks to restrictions of banking business activities in Korea. Although regulations have continuously eased, the justification for these heavy regulations is still open to debate, especially under the current deregulatory and competitive environment. Why are banks more heavily regulated than any other industry? Are banks considered to be 'special' and, therefore, heavily regulated? Some argue that banks must be regulated because they play various special roles in the economy through providing liquidity, financial intermediation and a national payments system. Others argue that banks are not unique (see details in Sinkey, 1989): first, non-banks provide essentially the same financial services as banks; second, fewer (not more) regulations on pricing, services lines, and location may lead to improved financial services. However, there is no unanimous answer and much strenuous debate as to the question whether or not banks are special. In the following section, we are concerned with theories and the rationale of bank regulation and supervision.

3.5.2 Theories of Regulation

There are broadly three 'theories' of regulation. They are the public interest theory (consumer protection theory), the capture theory (producer protection theory) and the new economic theory.

According to economic theory, the ideal market is perfectly competitive. In the perfect market, resources are allocated in the most efficient way and social welfare is maximised. However, market failures occur when, for some reasons, the market does not function at all or is unable to operate in a competitive manner. The public interest theory views regulation as a device to offset the detrimental effects resulting from market failure. The market failure identified relates to the existence of natural monopolies, externalities, and information asymmetries (see Campbell, 1982; Gardener, 1986; and Goodhart, 1989).

The public interest theory suggests that regulation, as a remedial measure for defects resulting from market failure, is to protect consumers. However, empirical studies on the effect of regulation, especially evidence from the USA, tend to show that regulation does not achieve its desired effects in protecting consumers, while regulation distorts and restricts competition. Recent research in the USA has also shown that regulation is not positively correlated with causes of market failures. Another criticism is that theory seems to assume that regulation is costless. However, regulation involves significant direct and indirect costs (Goodhart, 1988 and 1989). Even where government regulation may prevent market failures, if the costs of regulation exceeds the benefits, then regulation may not be justifiable or necessary. There is also no clear mechanism in order to translate the public interest into legislation (Gardener, 1986). A number of early USA studies of the apparent failure of regulation to protect consumers led to the emergence of the capture theory of regulation and the new economic theory.

The capture theory - though there are several different versions of the capture explanation - suggests that the regulatory process has been subject to a process of 'capture' by the industry or interest group which it was initially designed to control (Goodhart, 1989). Posner (1974) argues that initially the regulated may object to regulations, but after becoming familiar with the legislative and administrative process, they will try to influence the regulators to pass legislation or to use administrative machinery in such a way as to bring them (the regulatees) higher returns. The capture (or producer protection) theories generally emphasise that producers gain through regulation. It ignores, however, the fact that customer groups also benefit from regulations. The capture theory, like the public interest theory, also fails to explain the mechanism that transforms the demand for regulation into regulatory schemes.

The new economic theory of regulation applies demand and supply reasoning to the problem, and it acknowledges the possibility that regulation can benefit both producers and consumers. Stigler (1971) and Peltzman (1976) view regulation as a commodity being transacted in the political market with constituents on the demand side and their political representatives on the supply side. The "commodity" transacted is the right to tax the wealth of others in society. In other words, this theory views regulation as the result of the interaction among various social and political forces, and suggests that regulation should be seen as a kind of wealth transfer brought about through a political process of supporting the measures leading to this transfer. As Stigler (1971) points out, the transfer will rarely be in cash, but rather in the form of indirect benefits such as a regulated price, entry restrictions, and so on. Stigler also argues that the market will distribute more of the goods to the highest bidders, and successful bidders tend to be a small group with a large per capita stake over the large group (consumers) with more diffused interests. According to Peltzman (1976), regulation will tend to be weighted more heavily toward "producer protection" in depression and toward "consumer protection" in expansions. Although the new economic theory of regulation is a pathbreaking step forward from earlier explanations of regulation and is aware of the importance of political lobbying in supervision, this "new theory" approach has not been developed in the supervision literature (Gardener, 1991).

3.5.3 Justification for Bank Regulation

According to the public interest theory, bank regulation aims at improving the allocative efficiency of the banking system by ensuring its stability and maintaining public confidence through a remedial measure against market failure. The capture theory and the new economic theory of regulation suggest that regulation is an ineffective way to achieve the objective of financial stability because regulation is subject to capture by those regulated. Although the new economic theory acknowledges the capture by other interest groups rather than the producers, regulators are in much closer touch with the regulated than with the consumers. The exercise of regulation, whether statutory or practitioner-based, is hardly possible without willing acceptance of the regulated. Therefore, regulation is frequently formulated as acceptable to regulatees. Moreover, regulators have their own interests and these may not necessarily be in the public interest.

Whichever 'theory' of regulation is 'correct', the supervisory authorities deliver a lot of regulation. The theories of regulation and supervision attempt to explain why the supervisory authorities intervene in the banking markets. They also seek to explain who benefits ✓ or looses from regulation. These theories generally suggest, although there is no general theory, that the needs of bank regulation and supervision can be justified in terms of financial stability and depositor protection. In practice, these tend to be the strongest economic rationales for supervision

With regard to the financial stability rationale, it is often argued that individual banks are inherently unstable because they hold fractional reserves, engage in maturity transformation by borrowing short and lending long, have high gearing ratios, depend upon external ✓ sources of funds, and undertake various kinds of risks. The risks faced by banks include credit risk, liquidity risk, interest rate risk, foreign exchange risk, regulatory risk, and many more (Benston *et al*, 1986; Sinkey, 1989). Unlike other industrial companies, however, banks have high gearing ratios and depend heavily on external source of funds, especially deposits which are withdrawable at par value on demand and at short notice. If depositors perceive that their bank's risk exposure is too great and that they may not be able to be repaid fully, they will try to withdraw their funds immediately.

To see this, assume a bank which produces liquidity and which, if depositor confidence in a bank exists, is a viable enterprise. A bank highly geared may face a problem in which the value obtained at any time from liquidating assets by calling in loans and realising assets at distress prices is likely to be less than total deposit liabilities (Lewis and Davis, 1987). Loans of a bank are not readily marketable assets (i.e. illiquid assets) and can be disposed of only at a significant discount on their book value (Dale, 1986). Therefore, a bank incurs fire-sale losses. If such assets are sold at 'fire prices', then a solvent bank may become insolvent: what Benston and Kaufman (1986) call a 'fire-sale insolvency'. Any worry about a bank's solvency makes it sensible for individual depositors to attempt to withdraw their deposits immediately (Lewis & Davis *ibid*). However, Diamond and Dybvig (1983) demonstrate that insolvency is not a necessary condition for bank runs. They argue that a bank run is caused by a shift in expectations, which could depend on almost anything that is consistent with the apparently irrational observed behaviour of people running on banks. This could be a bad earnings report, or a negative government forecast. It need not be anything fundamental about the bank's condition.

According to Benston *et al* (1986), when depositors withdraw funds from a bank, they have three alternatives. They can redeposit at other perceived safer banks, purchase safer securities, or hold currency outside the banking system. Which alternative they choose has important implications for the importance of bank runs on other banks and on levels of economic activity. The first two types of run generally result in direct or indirect deposit shifts to other banks and indicate faith in the solvency of the banking system as a whole. Even with direct or indirect redeposits, runs are, however, likely to do some economic and social damage by breaking banking connections and producing uncertainty. Hence, Goodhart (1989) argues strongly that even such large scale fund flows between banks would have undesirable effects on the banking system and economy, therefore, they should be prevented. The third type of run indicates a distrust of all banks. A run on one bank without redeposits at other banks will ignite runs on banks systemwide, and cause banks to increase their excess reserves. The combined effects of a reduction in reserves and in the multiplier will precipitate a multiple contraction in total bank deposits (money) and assets (credit), requiring hasty asset sales at fire sale prices with potentially large losses. This will both upset the stability of the national financial system and reinforce the adverse impact on economic activity of the shock that set in motion the initial run.

The characteristics of the banking firm - high financial gearing, liquid liabilities and illiquid assets, and lack of transparency - indicate that all banks are only solvent under the conditions that depositors do not withdraw their deposits at the same time (Dale *ibid*). In other words, banks are safe only when public confidence is maintained in the banking system. Once this confidence is lost, a single bank failure can cause runs on other banks through the negative contagion effect, and threaten the stability of the banking system and the whole national economy. Of course, regulation does not aim at preventing the individual bank failure, nor the number of actual failures, but at the stability of the whole system which can be threatened by the negative contagion effect of an individual bank failure. Social cost may exceed the private cost borne by depositors and shareholders of the failed banks mainly on three counts (Masera, 1990):

(1) the destruction of deposits may affect negatively overall savings behaviour, because of the perception of risk on assets usually regarded as safe;

(2) the corresponding reduction in the real money stock leads to excess demand for monetary balances, which works towards depressing economic activities;

(3) the evaporation of a fraction of the transactions network affects the overall cost of monetary transactions, since the cost of making connections in any transactions network is exponentially related to the proportion of the network destroyed.

All of these factors indicate that social costs of bank failure will appreciably exceed private costs if a significant share of bank deposits is affected. This, in turn, can happen either in the case of default by a large bank, compared to market size, or when the failure of one bank extends to others, through a domino effect. In this latter case, panics may develop in the absence of an adequate lender-of-last resort function towards illiquid, but solvent banks. These external and/or potential contagion effects of bank failures are a cause of concern for the regulatory authorities. A safe and sound banking system is a necessary condition for the stability of the real sector of the economy.

The depositor protection rationale for bank regulation is closely related with the stability rationale. This rationale is based on the assumption that information asymmetry exists in the banking system, and that ordinary depositors cannot assess the conditions of their banks. Furthermore, even if the relevant information were obtainable, it would be very quickly outdated, since banks can adjust their risk profile within a very short space of time. In fact, banks and other financial intermediaries are specialists in collecting and processing information. They possess information which is not available to all parties. An important part of the rationale for financial intermediation is the existence of information asymmetries. The evaluation of bank risk is a costly activity which has the nature of a public good. Once it is produced, it is available to consumers at very low transfer cost. Since the monitoring and evaluation of banks are too difficult and costly to be undertaken by the small, ordinary depositors, these may be delegated to a regulatory or public authority.

The main form of regulation concerned with information asymmetries involves two fields of intervention on:

(1) minimum standards for quality of financial products; and

(2) transparency requirements, regarding both the quantity and the quality of information.

The whole approach to regulation in any of its above-mentioned forms can be based on cost-benefit analysis of information with reference to depositors, professional operators, and banks. Information is of crucial importance because it allows and stimulates the independent assessment of opportunities among which economic agents can choose in a transparent market.

Information improvement and transparency are two related concepts and if transparency is necessary to stability, then it follows that improvement of information within the banking system will be one of the most important contributions one can make to enhance stability. In the extreme case of perfect information, risk would be avoided, thereby ensuring financial stability (Masera, 1990).

Public confidence in the banking system is fragile because of the existence of information asymmetries and the comparative lack of transparency. Banks are inherently subject to runs whenever depositors fear that their deposits will not safe. However, if deposits are protected, the motives for bank runs are alleviated or even eliminated.

3.5.4 Alternatives to Bank Supervision

Among the afore-discussed theories of regulation, the capture theory that regulation can be ineffective as well as inefficient implies that there exist better alternatives to regulation. One alternative is the deposit insurance scheme. Another alternative to supervision is to allow the market, or market discipline, to play a larger role in supervision. Therefore, we will discuss whether or not these alternative considerations can replace (or complement) regulation and supervision.

3.5.4.1 Deposit Insurance

In order to preserve public confidence, the deposit insurance scheme has been advocated as an alternative because it reduces or eliminates the reason for bank runs through the provision of protection to depositors in case of liquidation. Thus, deposit insurance strengthens the stability of the banking system by reducing the potential contagion effect. But it is widely perceived that an over-extensive degree of deposit insurance scheme may reduce the role of market discipline in preventing banks from undertaking excessive risk-taking policies. It raises a greater problem known as "moral hazard". The existence of a safety net may induce depositors to become indifferent to risk exposure of individual banks. Banks themselves may tend to factor deposit insurance into their management policy, particularly with regard to the availability of deposits. Thus, under this situation, depositors are encouraged to transfer their deposits to banks paying the highest interest rates, irrespective of their financial condition. In turn, this may encourage banks to take excessive risks in order to cover the higher costs of deposits. If this situation continues over time, then the risk borne by the banking and financial system will increase, and the system may become vulnerable in the future. The current flat-rate deposit insurance may actually encourage banks to undertake unsound risk-taking policies since they do not need to pay more either to the insurance companies or to the depositors. The attempts to minimise and reduce the problem of moral hazard have been made in a number of ways (Lewis and Davis, 1987; Pecchioli, 1987; Benston and Kaufman, 1988).

One remedial measure is to limit maximum coverage or to introduce partial coverage. Deposit insurance is provided only for small depositors by insuring up to a certain amount as a way of instilling a market discipline upon depositors. The maximum coverage per account significantly affects the degree of aggregate market discipline applied by depositors. The lower the maximum, the higher the number of depositors and amount of deposits that are at risk, and the more depositors have incentives to monitor the activities of banks. Arguments against this scheme are that it is not clear whether or not this limit on coverage is politically feasible. The scheme also ignores higher individual and social costs of depositors' credit evaluations of banks. Furthermore, to the extent that demand depositors are not insured, they have both the incentive and the ability to run.

Another solution is the coinsurance scheme described by Benston and Kaufman (1988). Coinsurance is a risk-sharing device, so that the insured and the insurer share in some proportion of the covered loss, and the shared proportions may differ. Therefore, this scheme leaves some incentives for depositors to monitor and scrutinise the soundness of their banks. This scheme can provide some protection to depositors in case of liquidation, but it cannot eliminate the motive for bank runs.

The ideal way to solve the moral hazard problem is to introduce risk-sensitive insurance premia scheme. Risk-related premia are charged for almost all kinds of insurance offered by private insurers, such as life, accident, fire, and automobile insurance. Private companies attempted to match their premia to the actuarially computed fair value of the potential loss. Because the probability of loss is related to the risk assumed by the insured, the greater the risk, the higher the premia. Risk-related premia serve not only to protect the insurance company but also to affect the behaviour of the insured. The higher the premium, the more costly the activity, and the less likely the insured is to engage in it. In this way, the insurance company can control its risk exposure.

Although conceptually appealing, this scheme involves several practical problems (Pecchioli, 1987). Firstly, it is difficult to assess the relative degree of riskiness of the various banks involved. Secondly, it is also difficult to form a view on how risks will develop in future in order to set a realistic fee schedule. Moreover, to act as an effective restraining element, fee levels should be differentiated sharply according to perceived riskiness, but the application is particularly difficult due mainly to insufficient historical experience, lack of homogeneity in the variables to be considered, and the potential impact of the premia themselves upon some of the parameters used for determining the fee schedule. At the same time, in the absence of effective monitoring and co-insurance, the required premia would have to be so high that only a banker who expected to get very high gross returns from risk taking would be willing to pay. Thus, the insurance agency would suffer from adverse selection. And if monitoring were efficient, there would be no need for risk-related premia scheme (Benston & Kaufman, 1988) . Finally, the resulting "grading" of banks carries attendant risk on confidence if it was publicly known or aroused suspicions.

In its present form (flat-rate), the system of deposit insurance creates the wrong kinds of incentives. A subsidy for risk-bearing encourages the kind of behaviour that regulators are trying to control. To monitor such unsound behaviour, regulators must monitor risk-taking and enforce administrative penalties (which include cease-and-desist orders, removal of bank officers, etc.) on high-risk banks. Since deposit insurance subsidies and guarantees are not free, they come at the expense of the general taxpayer and banks that maintain low-risk profiles (Sinkey, 1989). Therefore, the introduction of deposit insurance is not a substitute but a supplement for bank supervision.

It may be argued that risk-related capital adequacy requirements (RAR) can be replaced or substituted by a risk-related insurance scheme. In the world of which deposit insurers can collect perfect information on banks and assess banks' risk profiles, RAR and risk-related insurance schemes may be mutually exclusive. However, the real world is far from this hypothetical world. It is difficult for regulatory authorities or deposit insurers to gather perfect information and to assess risks assumed by banks. This implies that risk-related insurance premiums cannot reflect accurately a bank's risk profile and suggests that RAR cannot be substituted by risk-related insurance scheme. Furthermore, as discussed above, levels of insurance fees should be high enough to dissuade risk-prone bankers from taking excessive risks. However, it is also difficult to introduce prohibitively high insurance premiums; that is infeasible. If a prohibitively high fee scheme is introduced, then most banks may, if they are allowed to do, get out of deposit insurance scheme. Thus, the insurance agency would suffer from adverse selection. In addition, the fee structure of risk-related insurance scheme should reflect the capital ratios of individual banks because it is assumed that the higher the capital, the lower the probability of failure, *ceteris paribus*. Therefore, in reality, risk-related capital adequacy rules and risk-related insurance scheme are not necessarily substitute but they are supplements. This relationship between RAR and risk-related insurance scheme may be clear through optimal closure policy of failed or failing banks discussed below.

There is agreement that optimal closure policy is a crucial element in the supervisory system in order to protect the deposit insurance fund. But optimal closure policy depends on a good monitoring system; the problem is that monitoring cannot be perfect, and hence closure policy cannot be perfect. Therefore, some buffer or cushion must exist to protect the deposit insurance system (Horvitz, 1988). In this context, capital adequacy requirements are essential (and extremely important) because bank capital plays a key role in curbing excessive risk-taking incurred by banks in order to limit the calls on the resources of the government and insurance funds. It is very important that capital adequacy requirements (whether they are 6%, 10%, or whatever) be rigorously enforced to curb those inclined to gamble using fully insured deposits (Silverberg, 1988). In brief, so long as the regulatory authorities provide the deposit insurance and lender-of-last-resort functions, there is a widespread agreement in the literature that there will be a need for bank regulation. Furthermore, bank regulatory interference in general and capital regulation in particular can be considered as implicit deposit insurance premia under the current fixed-rate deposit insurance scheme (see further discussions in Chapter 5; Buser *et al*, 1981; and Sinkey, 1992).

3.5.4.2 Free Banking and Market Discipline

Another alternative to supervision is to let the market regulate banks. The most radical proposal is simply to abandon supervision completely in favour of free market forces. Proponents of free banking have denied the need for any government or regulatory authority to regulate banks. They argue that the only reason for banking panics is legal restrictions or supervision on the banking system. In the absence of such regulations and supervision on banks, the free market would produce a panic-proof banking system. According to Kareken and Wallace (1978), banking failures in the past were not so much the result of free banking as of inappropriate regulations blunting the market mechanisms which would place limits upon the prudence of banks. They argue that an unregulated banking industry would be 'risk-free' in that profit-maximising bankers would voluntarily choose an asset portfolio and deposit/equity ratio which would involve no risk of insolvency and depositor loss.

In history, Scotland had a free banking system from 1727 to 1844. The key features of this system were free entry into banking and free issue of bank notes; bank notes that were fully convertible into full-bodied coin; and unlimited liability of bank shareholders. Scotland experienced very few bank failures and financial crises. One reason, as White (1984) pointed out, was the unlimited liability of bank shareholders and strict bankruptcy laws that instilled a sense of confidence in noteholders. Another reason, according to Goodhart (1985), was that Scottish banks were always able to turn to the Bank of England. Switzerland also had a successful experience with free banks during periods spanned by 1826-1850 (Weber, 1988) but, like Scotland's dependence on the Bank of England, Swiss banks depended on the Bank of France as lender of last resort (Goodhart, 1985). Although Canada had a competitive fractional reserve banking system throughout the nineteenth century, no central bank evolved (Bordo and Reddish, 1987). Because Canadian banks kept most of their reserves on 'call' in the New York money market, they were able to satisfy the public's demand for liquidity. On two occasions, 1907 and 1914, however, these reserves proved inadequate to prevent a liquidity crisis and the Government of Canada had to step in to supplement the reserves (Bordo, 1990). In sum, the low failure rate during the free banking era in several countries did not result from market forces but governmental authorities which could provide high-powered money in the event of such a crisis.

One part of the rationale for bank intermediation lies in the existence of imperfect information. In other words, there appears to exist certain market failures like information asymmetries and externalities, and the strongest economic justification for supervision stems primarily from these market failures. Bank failures may give rise to significant and far-reaching negative externalities because the loss of wealth through a bank failure is not the same as the loss of an equal amount of other kinds of wealth. This involves social costs such as the instability of the whole banking system and economy through the contagion effect precipitated by an actual or threatened banking problem. Regulation is designed not to prevent individual bank failures but to curb the contagion effect of a banking problem, and to ensure the stability of the whole banking and economic system. Therefore, it is generally agreed that at least some prudential supervision is necessary. What is not agreed, however, is the extent, kind, and desirable form of supervision (Gardener, 1991). It is not a case of the market replacing supervisors, or *vice versa*. Both have a clear role. Essentially the supervisor's role might be argued (in practice) to let the market and bank managements operate with as much freedom as supervisors deem safe (Gardener, 1986).

As Pecchioli(1987) points out, the impact of market discipline on banks depends on three factors: the capacity of market participants to perceive and respond timely to the exposure and changes of financial condition of individual banks; the awareness and degree of responsiveness of the management of individual banks to market signals; and the market perception of the authorities' response to the prospects of failure or liquidation of a bank.

The capacity of market participants to affect bank behaviour relies crucially on detailed information with regard to the financial condition of banks. Otherwise, the participants cannot assess the various risks run by banks and evaluate their current and prospective performance conditions. However, as Pecchioli (1987) argues, banks cannot be subject to the same disclosure standards as other industrial companies. First, because banks act as custodians of public's savings and provide the central elements of country's payment system, so that safety and soundness must be incorporated when formulating disclosure policies for banks. Second, the specific features of banking business imply a major element of customer and competitive confidentiality. Third, banking business is inherently volatile in terms of pricing and risks. If disclosure is not instantaneous and extremely detailed, its usefulness is limited and may mislead in certain conditions. Finally and more importantly, banks are particularly vulnerable to market shifts, reflecting their high leverage and dependence on external sources of funds and shifts of public confidence in a bank. Taken these arguments into consideration, disclosure policies for banks require an adequate balance between the potential benefits of disclosure in order to facilitate efficiency and the implications for stability of exposing banks.

The impact of market discipline also depends upon the responsiveness of bank management to market signals. This means that the primary responsibility for the safety and soundness of individual banks lies with the directors and management of each banks, not with the supervisors (Corrigan, 1986), and the director and management of each bank must be able to take corrective actions in response to market signals. This implies that it needs to establish an adequate internal and external monitoring system, and policies and procedures ensuring the integrity of appropriate controls. In this context, the role of supervisors is to ensure that adequate systems for detecting signs of weakness are in place in the banks subject to their jurisdiction and to stand ready to promote and require early corrective actions.

The influence of market discipline is reduced in the presence of bank supervision because market participants anticipate that the regulatory intervention is inevitable in case of difficulty. Therefore, market behaviour is influenced by this factor.

3.5.5 Synthesis

Banks are regulated from two directions: monetary policy and supervision. The purposes of monetary policy are different from supervision. However, monetary policy affects the financial environment in which banks operate, and which in turn influences the solvency of banks and the stability of the banking system. Therefore, the unique or specific effect(s) of monetary policy from a prudential standpoint are difficult to isolate from supervision. Supervision alone is not sufficient to achieve the stability objective. Other factors, like the quality of bank management and market forces, are also important. On the other hand, the purposes of supervision are to ensure the safety and soundness of banks and to protect depositors, and ultimately to maintain the stability of the banking and economic system as a whole.

Dale (1986) argues that the prudential rationale for bank regulation is closely related to the monetary rationale. Concern of regulatory authorities for the stability of banks reflects the threat that multiple bank failures might lead to a sudden monetary contraction and severely disrupt the real sector of the economy.

On the other hand, Baltensperger and Dermine (1987) contend that macroeconomic concerns, related to the impact of monetary policy, provide no clear-cut foundation for or against bank regulation. They conclude that bank regulation should be based on microeconomic efficiency grounds; the main threat is that information asymmetry and risk of contagion can trigger a run on other, solvent banks. Therefore, some kinds of bank regulation may be justified to the extent that these events are socially inefficient.

Kareken and Wallace (1978), and Dothan and Williams (1980) argue that unregulated banking would be 'risk free' because profit maximising bankers would choose an optimum portfolio and deposit/equity ratio that would involve no depositor loss or risk of bank failures. As discussed earlier, however, this would be an unlikely result in competitive markets (see Baltensperger & Dermine, 1987; Lewis & Davis, 1987).

Pecchioli (1987) suggests there is good evidence that market forces do not ultimately impose discipline on banks through the pricing mechanism or through the rationing of funds (also see Goodhart, 1989). As Gardener (1986) points out, the market has no incentive to take into account the wider social costs inherent in actual and potential bank failure, and does not have sufficient information to make efficient risk-return trade-offs.

The rationale for bank supervision derives broadly from two sources relating to the nature and functions of banks. First, banking business has many characteristics of a 'public nature' because banks act as custodians of the public's savings and provide the central elements of a country's payments system. These characteristics are inherently different from those of other industries and justify the specific regulatory framework (Corrigan, 1982; Pecchioli, 1987). This public nature of banking business (which implies that banks are 'special' compared with other firms) has been strongly emphasised in Korea (The BOK, 1986). Second, the existence of specific market failures - such as negative externalities and information asymmetries - justify bank supervision because the maintenance of public confidence in the stability of the banking system through curbing the possible contagion effects is a vital element to ensure the stability of the banking and financial system as a whole. In other words, protecting the public against financial disruption and curbing the contagion effect and systemic instability provide a strong rationale for bank supervision. In this context, a number of countries, including many OECD countries and Korea, provide legal provisions entrusting the authorities to operate cease-and-desist powers against banks engaging in irregularities. A practical problem for the authorities is how to intervene speedily in a form which limits the scope for counterproductive reactions by the market. However, there is no question that the authorities must stand ready to intervene if a particular contingency emerges which could undermine the safety of the banking system. This implies that market discipline cannot totally substitute for supervision, and it suggests that more prudential regulation is needed in a rapidly changing financial deregulation environment.

As discussed in Chapter 2, since the early 1980s, wide-ranging structural deregulation was carried out in the financial services industry in Korea. The aim of deregulation was to enhance efficiency by assigning a greater degree of reliance on the market mechanism and to vitalise the financial sector by ensuring the autonomy of institutions and provide for a more competitive environment in the market. However, as Pecchioli (1987) points out, this financial deregulation carries and increases the risk of instability in the short run and requires a reassessment of the existing balance between market forces and supervisory policies. The Korean financial market, especially the banking market, is not fully-fledged yet compared with the developed countries like Japan, the UK, and the USA. Hence, Korean banks may face more uncertainty and higher risk in the process of deregulation[6]. In this context, therefore, the rationale of supervision in Korea is to reduce the systemic instability of the banking system and the national economy, and the role of supervision is to achieve a proper equilibrium between supervisory policy and market discipline for the stability of the banking system and the national economy. In short, increased risks are associated with intense competition and the move towards a more deregulated environment has made it imperative to strengthen and adapt prudential supervision within the overall public policy schemes.

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6. This point has been recently appeared in the BOK and the government papers.

3.6 OBJECTIVES OF SUPERVISION

As can be seen in the rationale of supervision, the general objectives of supervision seem clear enough. The most important objectives of banking supervision are to help ensure the safety and soundness of banks and depositor protection, and to maintain the stability of the banking system and the national economy as a whole. Although vigorous debate often arises on how much and what form of supervision can best attain these goals, these general objectives are widely accepted.

The objectives of supervision in Korea are stated in the GBA. The GBA states that " the purpose of this Act shall be to contribute to the national economic progress by directing the sound operation of banking institutions and protecting depositors and maintaining the credit system". However, one noteworthy thing is that there exists a hierarchy between these objectives. In other words, these objectives of bank supervision are not placed on the same level (see Chart 3.2).

<Chart 3.2> Objectives of Bank Supervision in Korea

Lower Objectives		Upper Objective
0 Ensuring soundness of banks 0 Protecting depositors 0 Maintaining the credit system	=======>	Development of the National Economy

Source: Jeong, U.C. (1991), P.38, Figure 2.1

It has been perceived that the main objective of supervision is promoting economic development through mobilising funds in order to facilitate the growth of the real sector (see Section 3.4.3.2), while other goals such as ensuring safety and soundness of banks, protecting depositors, and maintaining the credit system are secondary in order to achieve the national economic development. As discussed in Chapter 2 and the earlier part of this chapter, the banking industry in Korea has been heavily regulated. The existence of this hierarchy between objectives of supervision is a rationale to justify a heavy regulation of the banking and financial industry in order to mobilise funds to support economic development.

3.7 FORMS AND STYLE OF REGULATION AND SUPERVISION

The forms and style of regulation and supervision characterise the supervisory "policy mix", together with the amount of supervision and respective supervisory instruments, but the effectiveness and efficiency of supervision are determined by how objectives and instruments are implemented.

3.7.1 Forms of Regulation and Supervision

There is much variety in the form of regulation and supervision between different countries. Supervision implies that the business operations, balance sheet structures and pricing policies of financial institutions are different than they would be in a fully competitive, unconstrained market environment.

According to Llewellyn(1986), there are six forms of regulation which may be established: environmental, legal, self-imposed, moral suasion, self-regulation, and external agency. However, the basic forms of prudential regulation and supervision may be broadly categorised into two forms: a non-statutory system and a statutory-based system. In the past, there used to be a clear distinction between two systems. Although it is difficult to classify countries regarding all the various aspects of supervision, it seems fair to say that Australia, New Zealand and the UK were probably the typical examples of countries with a non-statutory system, while statutory-based systems have been popular in Continental Europe, Japan, Korea and the USA.

However, recent years have witnessed a convergence between two systems. In countries with a non-statutory system, the trend is towards greater formality in supervision, reflecting the rapid diversification of banks' activities and the entry of new banks. In contrast, those countries which have adopted a statutory-based system, like the USA, have tended to complement their formal and complex legal frameworks with more informal and flexible systems. This movement has coincided with an attempt to deregulate certain aspects of banking business activities and with an increased emphasis on flexibility in the application of supervision as a major element for ensuring the adequate monitoring of banks' operations in a rapidly changing financial environment. As a result, differences between countries have become more a matter of degree than a clear-cut differentiation.

The forms of supervision in Korea comprise detailed laws and rules such as the BOKA, the GBA, acts for specialised banks, circulars and directives, instruments and guidelines, moral suasion, etc. These regulations draw up the scope and characteristics of banking business activities.

3.7.2 Supervisory Style

Supervisory style is concerned with how the regulatory authorities employ the supervisory techniques and instruments, and is reflected in both the philosophy employed by the authorities and the way that supervision is implemented operationally. The style of supervision is probably the single most important factor bearing on both the efficiency and effectiveness of supervision (Gardener, 1986).

In practice, although supervisors have intended to adopt various styles of supervision, it is possible to identify, or postulate, two extreme styles by way of explanation : a tight style of control and a flexible one. In a tight system of control, regulations and rules outline the conditions of entry into the banking market, conditions for mergers and the type and scope of business activities. Where controls are tight, certain criteria such as minimum capital and liquidity ratios are applied to all banks irrespective of size and type of institution. Most EC countries administer such rules. This style of supervision may reduce uncertainty considerably.

However, tight supervision involves several drawbacks. First, tight or excessive supervision might restrict entrepreneurial activities. As a result, the performance of banks might be aggravated and, in the long run, the development of the banking and financial system will be retarded. Second, this system may not be able to respond quickly to changes and innovations, especially in periods of rapidly changing economic conditions and highly volatile interest rates. Under this system, another problem occurs. The high risk-taking banks may be subsidised by the more prudent and low risk-taking banks. Therefore, prudentially safe banks and progressive managements are penalised because of a kind of 'Gresham's law' in which bad banking drives out good banking (Revell, 1979).

In a flexible style of supervision, individual banks are not severely restricted under the common, mandatory ratio levels. This has the advantage that it is more responsive to change and innovations but with the co-existence of flat-rate deposit insurance and an effective lender of last resort function, moral hazard becomes a danger(Gardener, 1986). Furthermore, too lax or loose supervision may not maintain the soundness and safety of banks and may ultimately lead to disruption of the whole economy. In other words, as Onado (1982) points out, banks are trying to compete and could be willing to accept higher risks and to weaken their screening of credit demands. Aggressive or non-regulated competition in the financial market could lead to financial crises, not to higher efficiency (Revell, 1981; Onado, 1982) . Therefore, the critical point in designing the supervisory system and implementing supervisory techniques and instruments is how to achieve a proper equilibrium between two systems.

The supervisory style in Korea is of the first category, tight control. Detailed laws and rules set out certain criteria like capital adequacy, provision for liquidity, etc.. Banking supervision is carried out tightly under these laws and rules, and is uniformly applied to all banks irrespective of the type or size. As a result, the development of banking and the financial sector has been retarded compared with the real sector, and has become an obstacle to further economic growth. Therefore, the task of the OBSE of the BOK is how to achieve a proper balance between a tight style and a flexible one under a deregulating and rapidly changing financial environment.

3.8 Instruments of Supervision

Given the acceptance of the needs and objectives for supervision, the supervisory authorities' task is to design the most appropriate instruments which satisfy the supervisory objectives. To meet successfully the objectives which regulation and supervision are intended to achieve depends on the instruments and the powers by which the regulators activate the instruments. However, one difficulty in developing a targets and instruments approach in supervision arises. The problem is that it is not easy to match an objective by a single instrument due mainly to two reasons. One reason is that a single instrument may sometimes have multiple objectives. For example, capital adequacy acts as a kind of buffer or cushion against unexpected loss; it also helps a bank to grow. Other bank regulations may also have similar objectives to those of the supervisors. Another reason is that an objective cannot be achieved by a single instrument and, therefore, requires several instruments; in order to ensure the soundness and safety of banks, regulators implement several regulatory measures such as liquidity controls, capital adequacy requirements, pricing constraints, and entry restriction, etc.(Gardener, 1986).

Supervisors use a number of instruments to regulate and monitor bank prudential soundness (Hall, 1989). These include licensing (or authorisation) of banks, ownership rules, inspection, capital adequacy and liquidity ratios, rules on foreign currency and other risk exposures, and deposit insurance. In Korea, the GBA prescribes the main instruments and "Guidelines for Bank Management" in detail. They include authorisation, capital adequacy, provision of liquidity, credit restrictions, asset classification and provisioning criteria and restrictions on business activities.

3.8.1 Authorisation

Under the GBA, a commercial bank cannot commence business without a charter of the MB upon recommendation by the Superintendent of Banks. To obtain a licence from the MB, an applicant is required to have the appropriate legal status as a juridical person by the Commercial Code; however, this provision does not apply where the application is for a branch or an agency of a foreign bank. Evidence is required that the applicant possesses the requisite personnel and professional qualifications for the management of a bank. The minimum paid-in capital requirements are 100 billion won in the case of a nationwide bank and 25 billion won in the case of a regional bank or a branch of a foreign bank. The MB then rules whether the application is justified on the grounds of general and local economic need or public interest.

Foreign banks wishing to establish branches in Korea are required to meet certain additional criteria. They should demonstrate the potential to contribute to the Korean economy and exhibit international creditworthiness. Reciprocity for Korean banks in their home jurisdiction, economic and trade relationships between Korea and their home country, and domestic financial market capacity are taken into account in arriving at a decision.

To open or close a domestic branch, agency or office, or to change the domicile of a branch or agency, a bank must obtain approval from the Superintendent of Banks. Under the provision of the FECA, permission from the Minister of Finance is required for a bank to engage in foreign exchange business.

3.8.2 Capital Adequacy

In recent years, capital adequacy has attracted the greatest supervisory policy concern and academic interest. Capital adequacy has also become a central supervisory instrument for the 'risk containment' of banks around the world because of the important role it plays in the banking firm. Bank capital functions as a kind of cushion or buffer against unexpected losses. Therefore, the greater the capital, the less the probability of insolvency *ceteris paribus*. In order to assess whether capital is adequate to absorb unexpected losses, various measures are used. The most widely used measure of capital adequacy is ratio analyses which include the capital-to-deposit ratio, capital-to-total-asset ratio and capital-to-risky-asset ratio (see detail in Chapter 5).

In Korea, aside from the obligatory minimum capital requirements to receive a charter, all banks (including foreign bank branches) are required to maintain a prescribed solvency position under the provisions of the GBA and the Foreign Exchange Control Regulations. The GBA stipulates bank capital as the sum of paid-in capital, reserves and the other surpluses carried over from the previous term. The 'Guidelines for Bank Management (July 16, 1992)' and 'Implement Rules of the Guidelines for Bank Management (July 16, 1992)' define bank capital more specifically than the GBA (see detail in Chapter 5). Following the Basle system, the new definition of bank capital established by the OBS recognises two types of capital: Core capital (Tier 1) and Supplementary capital (Tier 2) (see Table 5.2 in Chapter 5).

Core capital consists of equity stocks plus capital surplus and earned surplus plus minority interests in equity accounts of consolidated subsidiaries, minus goodwill, difference on consolidation, own shares held by banks, non-consolidated participation in financial firms and a bank's equity participations in other banks. Supplementary capital consists of asset revaluation reserves plus 45% of the differences between the book value and the market value of securities held in banking account plus general loan-loss reserves. The total of supplementary capital is limited to 100% of core capital (see details in Chapter 5). Another requirement relating to bank capital is that, in its allocation of the net profit earned in fiscal terms, a bank should credit at least 10 percent of its net profit to the legal reserve fund until such time as the fund equals the amount of its total paid-in capital.

In the case of a foreign bank branch, its specially defined operating funds are assumed as its capital. The operating funds comprise 'Kap-Funds' and 'Eul-Funds'. 'Kap-Funds' means the general working capital of a foreign bank branch which is supplied to the branch by its head office in the form of foreign currency, and then sold outright to the BOK for domestic currency. 'Eul-Funds' is held as supplementary funds for the operation of the foreign bank branches and is obtained by selling foreign currency funds to the BOK for won currency funds under the condition of repurchase. The limit on the amount of 'Eul-Funds' granted by the OBSE may not exceed six times the sum of 'Kap-Funds' and reserves. If a foreign bank branch incurs a loss or its total assets in Korea fall short of its operating funds, it should make up for any such deficiency within 60 days after the closing date of the fiscal year by either drawing on its reserves or receiving foreign currency funds from its head office.

Core capital plus Supplementary capital make up a bank's total capital, which by year end 1995 and onwards must be a minimum of 8% of risk-adjusted assets. However, a transition period is established for the new capital standards. By year-end 1993 and onwards, all commercial banks in Korea have to meet an interim standard of 7.25% for total capital.

A domestic bank wishing to change the amount of its paid-in capital must obtain the authorisation of the MB upon recommendation by the Superintendent of the Banks. A foreign bank branch seeking to change the amount of its operating funds has to obtain the authorisation of the Superintendent of Banks.

3.8.3 Liquidity Control

In order to secure liquidity of banks, the OBSE requires banks to match the maturities of their assets and liabilities in accordance with the GBA. Long-term loans with a maturity of over one year but less than ten years must be financed by capital subscriptions, the acceptance of deposits with maturities of at least one year, or the issue of bonds and other securities. Banks may not invest more than 100 percent of their equity capitals in stocks, bonds and other securities with maturities of over three years. This does not apply, however, to government bonds and MSBs of the BOK.

Through the banks' statistical reports, the OBSE monitors banks' long-term and short-term lending operations on a monthly basis. Though not formally regulated, the loan-deposit ratio is also considered a useful index in gauging banks' liquidity, and the OBSE encourages banks to extend loans only within the amount of deposits received. Table 3.11 illustrates the recent loan-deposit ratios. This table indicates that nationwide commercial banks had granted more loans as uses of funds than deposits as sources of funds during the period 1989-1990. Banks are not allowed to acquire non-business real estate except by way of bad-loan settlement, in which case it should be disposed of at an early stage.

<Table 3.11> Loan-Deposit Ratios

(Unit: %)

	1987	1988	1989	1990	1991
Five NCBs	89.1	90.8	107.1	115.7	101.2
Total NCBs	87.9	89.8	106.0	115.5	85.4
Regional Banks	60.7	62.3	81.5	85.1	77.0
Total Banks	81.3	82.2	99.9	107.2	83.3

Source: The OBSE, Bank Management Statistics, April 1991, p.231

Like other central banks, the BOK is empowered to fix and alter the minimum reserve requirements that banks should maintain against their deposit liabilities. This serves the liquidity position of banks and the current minimum reserve ratio is 11.5 percent for outstanding domestic currency deposits with a maturity term of less than two years. However, the reserve ratio is set at 8 percent for outstanding time deposits with a maturity term of more than two years. For foreign currency deposit liabilities, an 11.5 percent reserve ratio is applied to resident accounts, while a 1 percent reserve ratio is set on non-resident accounts.

3.8.4 Credit Restrictions

Under the GBA, no bank may grant loans to a single individual or juridical persons in excess of 20 percent of its equity capital, nor may it grant guarantees or assume obligations to a single individual or juridical person in excess of 40 percent of its equity capital. These two limitations shall not, however, apply to loans, guarantees or assumptions of obligations approved by the Superintendent of Banks in case of urgent need for the stability of the economy.

In addition, the banks exercise overall credit control through what is termed "the Prime Bank System" over major corporate groups who have been granted more than a specified amount of credit by the bank. This system is now operated subject to the regulation of the MB and is monitored by the Superintendent of Banks. The purpose of this measure is to evaluate the financial structure and solvency of major corporate groups, thus lowering the risk of default, to enhance the effectiveness of the supply of business funds and to encourage sound business management. The prime banks, designated from among lender banks, therefore perform an important role in checking the health of business and the financial structure of enterprises; in guiding enterprises to improve their management and financial structure; and in establishing overall ceilings on loans for operational funds and on guarantees for enterprises.

Additionally, banks are obliged to expand their loans to small and medium enterprises in proportion to their increase in domestic currency financing resources. Specifically, the nationwide commercial banks must extend loans exceeding 35%[7] of their increase in domestic currency funds, while regional banks should extend loans exceeding 80% of such funds. Foreign bank branches which make use of the BOK's rediscount facility must also required to extend loans exceeding 35 percent of their increase in domestic currency funds,

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7. This ratio will increase to 45% in 1992 in order to enhance the support for small and medium enterprises.

but for those which do not use it the minimum is only 25 percent.

3.8.5 Asset Classification and Provisioning Criteria

A bank should analyse and classify its assets in order to manage them efficiently and to promote the soundness of its operations. With due consideration to the financial position, funding status, profitability, transaction records and other relevant matters to ensure an overall assessment of the customers' liabilities, a bank's assets should be classified by quality into five different categories: "normal, precautionary, substandard, doubtful and estimated loss". The standards for carrying out credit classification are set out below.

(1) Normal: total credit extended to customers maintaining a certain level of collateral or credit standing and having sound business and administration standards, or to customers who though having overdue loans for less than three months have sufficient debt-serving capability.

(2) Precautionary: total credit extended to customers who from the viewpoint of banking transactions and credit status call for particular attention in *ex post facto* control.

(3) Substandard: the value covered by collateral among total credit extended to customers who have an unfavourable pattern of banking transactions or credit status, and which requires some concrete methods of collecting or controlling the credit.

(4) Doubtful: that portion of credit extended with insufficient collateral among total credit to customers classified as substandard, which is expected to be a loss but has not yet been realised as such.

(5) Estimated Loss: that portion of credit extended with insufficient collateral among total credit to customers classified as substandard, which must be accounted as a loss because collection will not be possible.

The OBSE monitors the appropriateness of asset classification through on-site examinations and may require a bank, when necessary, to adjust the book value of its assets, in order to set up provisions for loan losses of at least 1% of the total loans outstanding as of the end of each fiscal year. Table 3.12 shows the soundness of asset quality and provision ratios for loan losses. The ratios of bad loans to the total loans has sharply decreased. It reflects the rapid growth of total loans and decreased bad loans due to the close scrutiny for bank loans and efforts to write off bad loans.

However, Korean banks have not yet introduced any sophisticated country risk evaluation system in dealing with overseas transactions, since their credits to overseas customers are relatively small at present. Differential provisioning against country risk, therefore, has not yet been put into practice. As the overseas fund operations of domestic banks are expected to increase considerably in the future in line with financial internationalisation, the evaluation of country risk and differential provisioning against it is expected to be introduced in accordance with the internationalisation of financial activities.

<Table 3.12> Bad Loans and Provision Ratios

(Unit: billion won, %)

	1987	1988	1989	1990	1991
Total Loans (A)	56,474	59,474	71,265	90,556	118,475
Bad Loans (B)	3,049	2,979	2,205	1,910	2,090
% (B/A)	5.4	5.0	3.1	2.1	1.8
Provision Ratios for Loan Losses	1.36	1.44	1.59	1.57	1.64

Note: Provision ratios for loan losses are the ratios of the balance of provision for loan losses to the total loan
Source: The OBSE, Bank Management Statistics, April 1991, p.9 and unpublished internal material for data in 1991.

3.8.6 Restrictions on Business Activities

In Korea, commercial banks may operate in any kind of banking business which includes both commercial banking and long-term financing business within the purview of the GBA and other pertinent legislation. Although Korea operates a universal banking system, however, a bank which wishes to enter into any non-banking business such as trust or credit card business must, in advance, obtain the authorisation of the MB by filing an application with the Superintendent of Banks. Korean banks have been authorised by the MB to operate both trust and credit card business since 1982. What constitutes banking operations is determined by the Superintendent of Banks.

There are some restrictions on bank investment in property or equity holdings of non-bank companies. A bank may not possess real properties except those necessary for the conduct of business. Real properties acquired through the foreclosure of mortgages should be promptly disposed of. Investment in business property must not exceed a bank's equity capital. The term "invest" includes all such capital expenditures involved in the purchase, building and renovation of business property. A bank is not allowed to purchase or retain permanent ownership of stocks issued by banks, or stocks in excess of 10% of the shares issued by any non-banking company. The Superintendent of Banks may, however, defer these restrictions on stock purchase under certain moderating circumstances. In addition, to ensure sound credit operations of banks, loans for certain purposes are prohibited.

3.9 MONITORING APPARATUS OF SUPERVISION

3.9.1 Bank Examination

The OBSE has the authority to examine all commercial banks in Korea and some of the specialised banks, i.e. NACF, NFFC and NLCF. In addition, upon the delegation of examining power by the Minister of Finance or the Board of Audit and Inspection, the OBSE examines other specialised banks and some NBFIs which are not regulated under the GBA.

During the 1960s and 1970s, the OBSE placed its principal emphasis on compliance with rules and regulations and identifications of insider abuse. Since the early 1980s, however, it has placed more emphasis on provisions, and the evaluation of the institution's internal control system.

3.9.1.1 On-site Examination

On-site examinations are divided into two categories: regular examinations and special examinations. All head offices of individual banks undergo regular annual examination and about 10% of their branches are selected every year to undergo regular examinations. Special examinations are carried out when the Superintendent of Banks determines that they are necessary in view of the analysis of bank's management.

Examiners usually focus their attention on the quality of assets; compliance with the GBA, relevant statutes and decrees, regulations and instructions; adequacy of the internal control system; fraud, embezzlement and other financial irregularities; the accuracy of the statistical returns and reports submitted; and collection of information.

3.9.1.2 Collections of Reports and Analysis

In order to enhance the effectiveness of on-site examinations, the OBSE collects regular business reports such as balance sheets and income statements, as well as other necessary reports and data from individual banks, analyses the current status of bank management, and gathers available information necessary for on-site examination. After the examination, the OBSE evaluates the current status of the bank's management including quality of assets and reserve holdings, adequacy of internal control systems, and recommends appropriate measures to cope with the problems which have been revealed in the process of the examination.

3.9.2 Disciplinary Measures

When a bank examiner learns that any officer or employee has violated the relevant laws and regulations, the Superintendent of Banks is empowered to request the president of the bank concerned to take disciplinary action equivalent to the gravity of the irregularity. When any bank intentionally violates the provisions of the GBA, or regulations, orders or instructions issued in accordance with the GBA or conspicuously hinders the sound operation of banking institutions, the MB may order the concerned officer to suspend the execution of his business upon recommendation by the Superintendent of Banks and may advise the shareholders' meeting that the officer should be dismissed. Also, when any bank conducts unsound business or violates the provisions of the GBA, orders or instructions issued in accordance with the GBA, the MB may instruct the Superintendent of Banks to bring about the ceasing of such unlawful conduct or unsound business conduct or it may suspend the bank's business operations for a specified period, or, if necessary, cancel the business authorisation of the bank concerned.

3.9.3 Issue of Directives, Orders, Guidelines, and Recommendation

The OBSE employs this measure to control the book value of bank's assets; increase of retained earnings, writing-off of bad assets and increase of paid-in capital, etc. The OBSE also circulates provisions and notices in relation to bank supervision and banking operations. Especially in order to encourage a responsible system of bank management, the OBSE has set out guidelines of bank management, evaluates each bank's management results upon completion of the fiscal year, and appraises banks according to the results. Furthermore, the OBSE may recommend certain measures to improve bank profitability, to guard against the deterioration of assets, and to ensure the soundness of banking operations within the purview of the GBA. The OBSE may also employ moral suasion for supervisory activities.

3.10 SUPERVISORY AUTHORITIES

Even though our main concern is the commercial banks established under the GBA and the supervisory system by which they are regulated, it is useful to draw the entire picture of institutional supervision on financial institutions (see Table 3.13).

The legal authority to supervise commercial banks, including domestic branches of foreign banks, is given to the OBSE of the BOK by both the BOKA and the GBA. Subject to the instructions and directives of the MB and within the framework of the two Acts, the OBSE implements supervision and examination of commercial banks. The OBSE also has the authority to examine some of the specialised banks, i.e. NACF, NFFC, and NLCF.

Other specialised banks and NBFIs are subject to the direct control and supervision of the Minister of Finance pursuant to the relevant statutes. However, the on-site examination of specialised banks and some NBFIs is performed by the OBSE upon the delegation of this function by the Minister of Finance or the Board of Audit and Inspection.

To complement the above-mentioned institutional supervision, functional supervision is carried out in compliance with the relevant financial statutes. For example, minimum reserve requirements and maximum interest rates, where applicable, as decided by the MB are universally applied to the specialised banks as well as to the commercial banks. The foreign exchange business of banking institutions is subject to the FECA and Foreign Exchange Control Regulations formulated by the Minister of Finance.

The OBSE now has 11 departments (see Chart 3.3). Its executive officers are the Superintendent of Banks, the Deputy Superintendent of Banks, and three Assistant Superintendents of Banks. The Superintendent of Banks is appointed by the President of the Republic upon the recommendation of the MB for a four-year term, and the Deputy Superintendent and Assistant Superintendents are appointed by the MB upon the request of the Governor of the BOK as recommended by the Superintendent of Banks for three-year terms.

<Table 3.13> Supervisory Jurisdiction In Korea

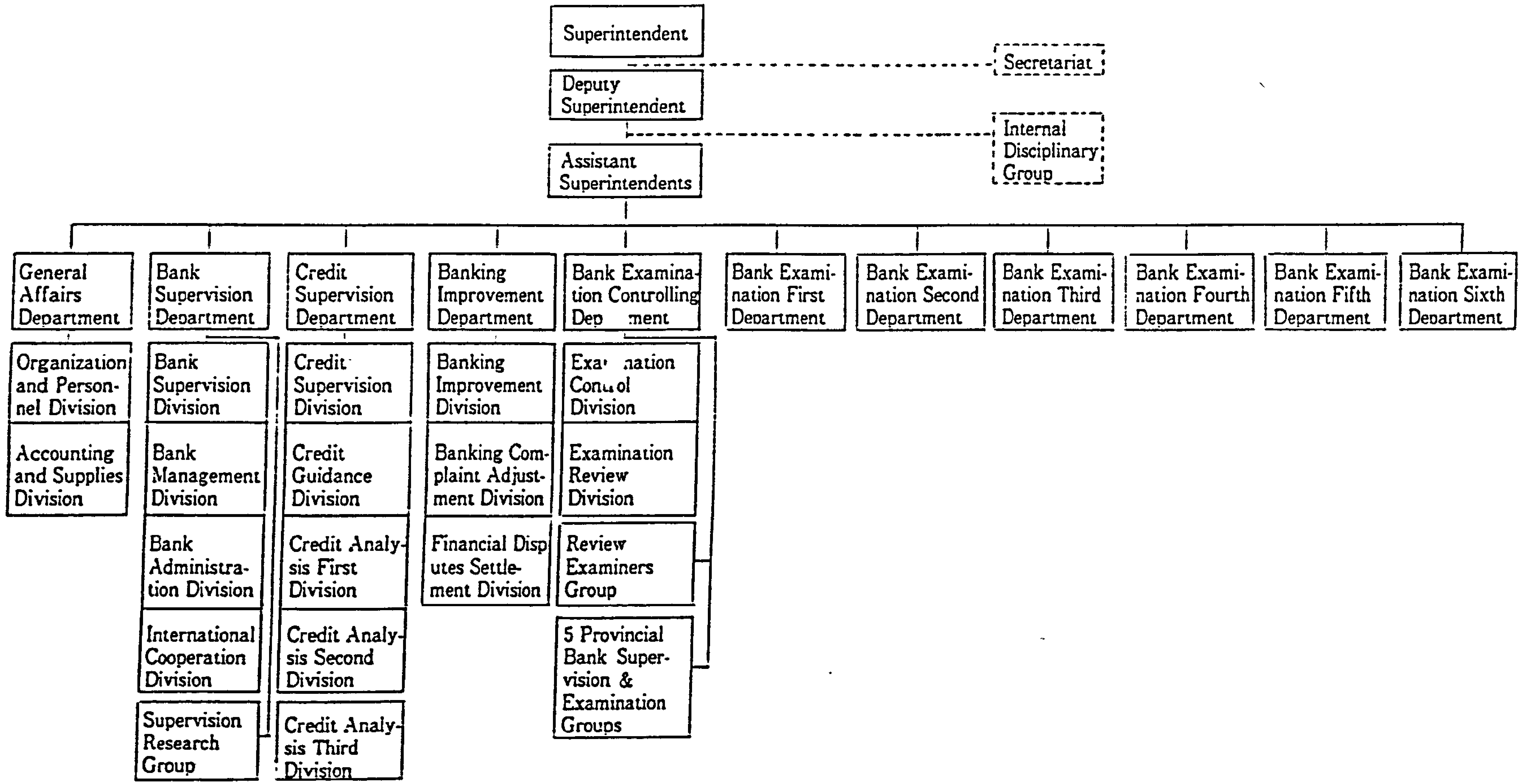
Financial Institutions	Supervised By	Examined By
Commercial Banks 0 Nationwide CBs 0 Regional CBs 0 Foreign CBs	Superintendent of Banks	Superintendent of Banks
Specialised Banks	Minister of Finance	Board of Audit & Inspection Superintendent of Banks[1)]
NBFIs 0 Development Institutions 0 Investment Companies 0 Savings Institutions (except Postal Savings)	Minister of Finance	Board of Audit & Inspection Minister of Finance Superintendent of Banks[1)]
Other NBFIs 0 KCGF, KRC, etc.	Minister of Finance	Superintendent of Banks
Securities Institutions 0 Securities Companies 0 SITC and KSFC	Minister of Finance SSB[2)]	SSB
Insurance Companies 0 Life Insurance 0 Non-Life Insurance	Minister of Finance Insurance Supervisory Board[2)]	Insurance Supervisory Board

Note: 1) The OBSE examines IBK, CNB, KHB and KDB by delegation of Board of Audit and Inspection, and other NBFIs by the delegation of Minister of Finance.
2) The SSB and the Insurance Supervisory Board carry out their supervisory roles within the purview of the relevant statutes and are supervised by Minister of Finance.

Source: The OBSE, Bank Supervision In Korea, March 1991, p.9.

<Chart 3.3> ORGANISATION CHART OF THE OBSE OF THE BOK

(At the end of 1990)



Source: The OBSE of the BOK, Bank Supervision in Korea, March 1991, p.15.

3.11 RELATION TO BANK FOR INTERNATIONAL SETTLEMENTS

As the cross-border business of banks expands continuously and the risks involved become greater, international supervisory cooperation is particularly important and the exchange of various information and frequent consultation with foreign supervisory authorities is becoming crucial. Effective supervision of banks' foreign establishments call for ongoing contacts and collaboration between host and parent countries. Therefore, the OBSE needs to exchange various information and make frequent consultation with foreign supervisory authorities and the international supervisory authorities like the BIS. Efforts to comply with the provisions of international agreements among bank supervisors need to be strengthened. According to the OBSE, it basically supports the "International Convergence of Capital Measurement and Capital Standards" of the BIS, but is of the opinion that developing countries, where banking business is in the early stages of development, should be given greater flexibility as to the timing of its adoption.

In this context, the GBA was revised in 1991 and the OBS (the former OBSE was renamed as Office of Bank Supervision on January 1, 1992) fixed a firm schedule for introducing the Basle standard on July 16, 1992 (see detail in Chapter 5). The OBS recognises that convergence with the BIS standards is necessary both to consolidate the capital adequacy of Korean banks and to ensure that they are placed on a competitive footing with international banks in the major global financial centres. According to the revised 'Guidelines for Bank Management (July 16, 1992)', a minimum risk-adjusted capital ratio of 7.25% will be applied by the end of 1993 and onwards. After a transition period, the minimum ratio will be increased to 8% by the end of 1995 and onwards.

3.12 CONCLUSION

This chapter has been examined the regulatory and supervisory system in Korea. The aim was to draw the broad picture and to provide a basic framework in order to help evaluate the impact of supervisory policy. The primary emphasis of this chapter, therefore, has been placed on analysing the reasons why bank supervision is needed and what forms and style it may take. This survey is essential since capital adequacy rules are a key part of modern supervisory systems.

Bank supervision is concerned fundamentally with bank safety and depositor protection. The most wide spread and generally accepted meaning of the 'bank supervision' covers specifically the rules and associated monitoring that are directed towards the prudential soundness of individual banks. In this context, we traced the evolution of bank supervision and examined all the different kinds of regulations pertaining to banks, including the BOKA, the GBA, acts for specialised banks, and the FECA and regulatory regimes in Korea. We also explored the theories and rationales of supervision. Theories such as the public interest theory, the capture theory, and the new economic theory seek to explain the rationale of bank supervision. However, they explain only some aspects of regulation; there is no generally accepted explanation as yet. The rationale and objectives of bank supervision in Korea are to contribute to the national economic progress through ensuring the soundness of banking operations, protecting depositors and maintaining the credit system. Under this rationale and objectives, the forms, style, and instruments of supervision and the present supervisory system in Korea have been analysed. From this analysis, the task of the OBS is how to achieve a proper balance between a tight and a flexible supervisory style in order not to 'undo' the economic benefits sought by the recent extensive deregulation.

CHAPTER 4

PERFORMANCE AND CONDITION ANALYSIS OF THE KOREAN BANKS

4.1 INTRODUCTION

The aim of this chapter is to provide a preliminary financial picture, an exploratory data analysis, of Korean banks in terms of their performance (return) and condition (risk). Effective bank regulation and supervision, especially capital adequacy requirements as a central supervisory instrument, ultimately impact on the performance (return) and condition (risk) of banks. Indeed, the objective (explicit and/or implicit) of prudential regulation is to operate on the risk and return profile of the banking firm. Banks face various risks, and this chapter will also explore the most important of these risks and their respective determinants. If the performance of banks is not increased or matched with their corresponding risk exposure, banks may face insolvency risk. Therefore, the total effect of all the various risks that banks face may be captured by the bank's overall risk, or probability, of failure. Capital adequacy analysis attempts to capture the overall soundness or risk exposure of an individual bank arising from the various risks that a bank faces (Sinkey, 1992).

This chapter analyses the performance and condition of Korean banks based on accounting data. These data should *ceteris paribus* reflect at least some of the impact of prudential regulation and/or provide a part of the target mix for such regulation. Since accounting data are published, banks must be especially sensitive to significant changes in these data. This analysis is a necessary prelude to a more refined, market-based analysis. It is also based on those kinds of data widely used by bankers and supervisors in contemporary decision-making and analysis.

Financial theorists would argue that, in an efficient market, there is little nee performance and condition analysis based on accounting data because the bank's best measure of performance is its stock price (Sinkey, 1992), and/or *ex post* accounting data are too insensitive to monitor changes in the risk and efficiency of banks (Saunders & Ward, 1976). However, if there exist some doubts on the market efficiency, or most banking firms do not have their shares publicly traded, then accounting approaches are also useful second-best tools for analysing the performance and condition of banks. Furthermore, a detailed analysis of bank performance and condition based on accounting data does not preclude a market approach but is a useful, if not essential, 'first stage' analysis. Since bank financial analysis using accounting data is still widely employed, it seems likely to have a material impact on the respective bank, supervisory and, indeed, market decisions. As a result, one may also need to compare market to accounting data/information at a later stage.

Financial statement analysis of a bank's balance sheet, income statement, and statement of changes in financial position is essential to understanding the bank's prevailing strengths and weaknesses (Graddy & Spencer, 1990). For bank managers, a thorough financial analysis of a bank's financial performance and condition allows an assessment of where they are now relative to where they want the bank to be in the future, and how the bank stands relative to other banks in the industry. For bank regulators and supervisors, this analysis permits a more detailed understanding and evaluation of the potential impact of shifts in supervisory policy on the bank's current and prospective financial condition and performance. This implies further that the performance and condition of banks should be explicitly considered in policy discussions regarding bank regulation and supervision (FRB, 1987).

The remainder of this chapter is organised in the following manner. Section 2 provides a risk-return framework for overall bank performance and analyses the key performance and condition indicators (or measures) of Korean banks. Section 3 examines the causes of banks' performance, using return on equity (ROE) decomposition analysis. Section 4 explores the key characteristics of high performance banks. Section 5 discusses the limitations of accounting approach. Finally, Section 6 is a summary.

4.2 PERFORMANCE AND CONDITION OF THE KOREAN BANKS

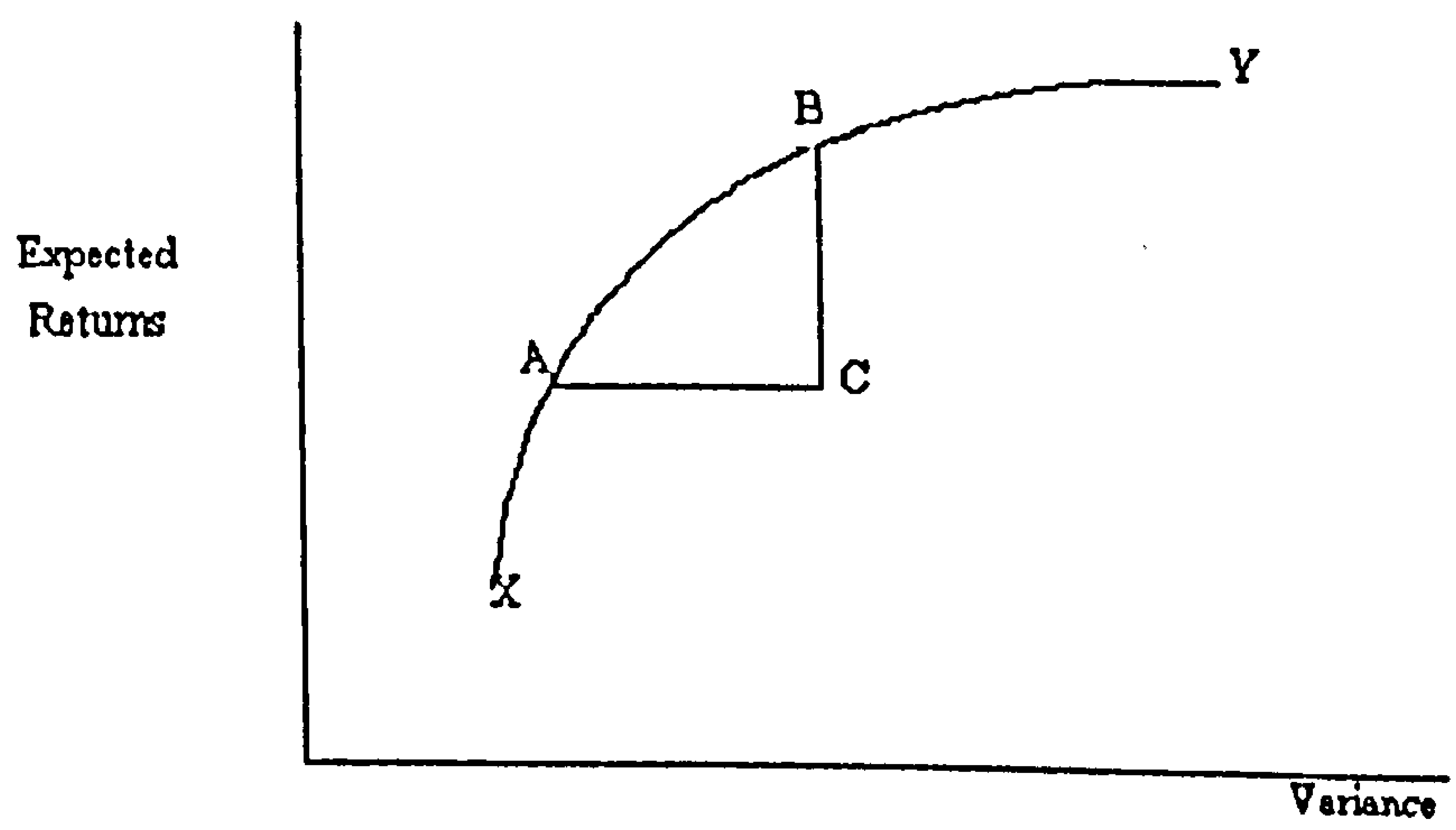
4.2.1 A Risk-Return Framework

Modern finance theory suggests that investors operate through a trade-off between expected risk and the rate of return on their portfolio of 'securities', that is, any financial decision with an expected outcome. From a finance point of view, risk is best understood in the context of a portfolio, and can be defined as the dispersion (typically proxied by variance or standard deviation) of returns around the expected (mean) return. Expected return is the return that an individual investor expects a stock (or project) to earn over the forthcoming period. In general, investors expect a certain amount of return for a given amount of risk.

How can a rational investor select the most efficient portfolio? The dominance principle in portfolio theory states that an investor will prefer the portfolio with the highest expected return for a given risk level and prefer the portfolio with the lowest risk level for a given level of expected return. Figure 4.1 illustrates this principle. Curve X--->Y in Figure 4.1 denotes the efficient frontier. An efficient portfolio is a portfolio that has the highest expected return for a given risk level; all securities with a given marginal contribution to the variance of the portfolio will have the same expected returns. The set of efficient portfolios forms the efficient frontier. From Figure 4.1, it is apparent that portfolio A dominates C and portfolio B also dominates C. No dominance relation exists between A and B as they are on different points of the efficient frontier.

The choice between A and B (and other points on the frontier) will depend on the investor's preferences for risk versus return. The higher the risk, the greater the return they expect from the project, *ceteris paribus*. This indicates that a fundamental trade-off exists between risk and return, and it is fundamental to financial decision making. Taking more risky positions, in general, requires a higher return: this reflects the property of risk aversion that underpins portfolio theory and its dominance principle. Banks are no exception to this general principle.

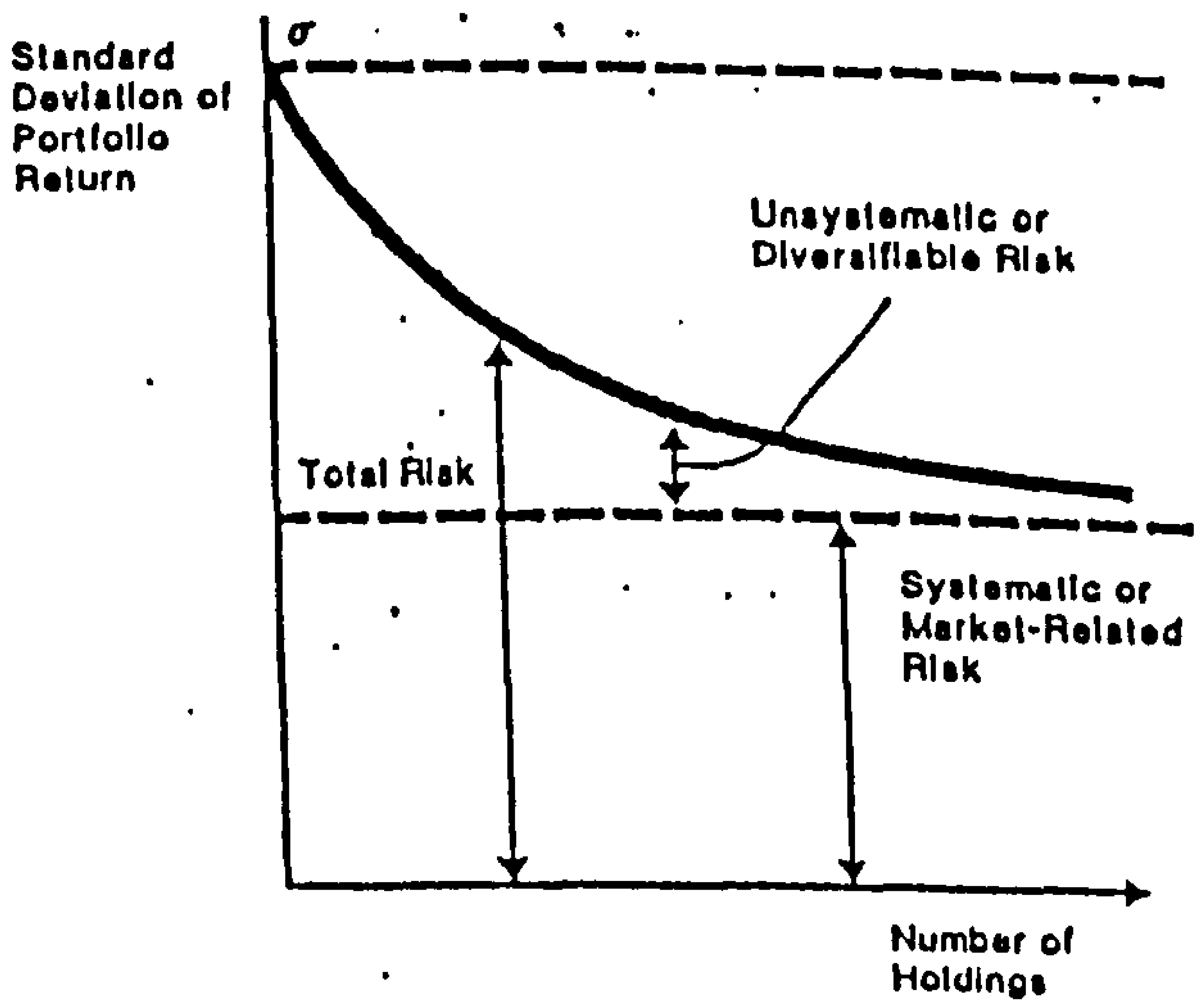
<Figure 4.1> Efficient Frontier and Dominance Principle



Two risk measures are most commonly used in Markowitzian portfolio analysis: the variance and standard deviation of returns. The larger the variance or standard deviation, the greater the possible dispersion of realised return around the expected return, and the larger the investor's uncertainty.

Two types of risk are inherent in the portfolios of individual banks: systematic risk and unsystematic risk. Unsystematic risk can be eliminated through diversification, while systematic risk cannot be eliminated. This proposition is illustrated in Figure 4.2. It shows total portfolio risk declining as the number of securities increases. Increasing diversification gradually tends to eliminate the unsystematic risk, leaving only systematic (i.e., market-related) risk. The remaining variability results from the fact that the return on nearly every security depends to some degree on the overall performance of the market. Consequently, the return on a well-diversified portfolio is highly correlated with the market, and its variability or uncertainty is basically the uncertainty of the market as a whole (Modigliani and Pogue, 1974).

<Figure 4.2> Systematic and Unsystematic Risk



Source: Modigliani & Pogue (1974)

Risks faced by banks include portfolio or balance sheet risk, regulatory risk, technological risk, fraud risk, foreign exchange risk, operating-efficiency risk, and market-strategy risk (Benston *et al*, 1986; Sinkey, 1989; Rose, 1991). These risks are always associated with uncertainty which is reflected in unanticipated changes in events. For example, portfolio uncertainty arises from changes in interest rates, in deposit flows and in the ability of borrowers to repay loans. These unknown factors generate three basic and crucial portfolio risks faced by banks: interest-rate risk, liquidity risk and credit risk. If bank managers properly manage their portfolio risks and operate their banks, they may protect their banks from insolvency or failure. Since rational bank managers incorporate anticipated changes in their decision making, risks arise only from unanticipated changes. Therefore, adequate risk analysis enables bankers to price products and services in such a way that they receive fair compensation for the risks they bear. Since unanticipated changes create an unanticipated claim on bank earnings and capital, however, a bank should have more capital, *ceteris paribus*.

The above discussions, in particular on risk and return trade-offs, are based on portfolio theory which has been more widely applied for non-financial companies compared with banks. All too often bankers and supervisors seem to conclude that banks are so different from non-financial businesses (see Chapter 3) that most of the concepts developed in analysing such businesses are not appropriate for commercial banks. However, such a conclusion is unwarranted. While banks are unique in certain ways, most of the primary concepts developed for profit-oriented, business corporations are generally appropriate for analysing commercial banks. This is very much the 'modern view' of banking in a deregulated financial environment.

A commercial bank is a business corporation charged with responsibility to its owners to attempt to maximise the value of the shareholders' wealth invested in the bank at an acceptable level of risk (see Section 5.3.3 in Chapter 5). Bankers may be most interested in achieving high stock prices and high performance, but none can fail to pay attention to the risks they are accepting as well. Therefore, a detailed analysis of the performance and condition of a bank is a necessary step for bankers in planning for an acceptable future performance and for bank regulators in evaluating the impact of changes of regulatory policy. In this context, we will, first, analyse the performance (return) and, next, condition (risk) of Korean banks. Finally, we will examine the risk-return trade-off relationships. As explained earlier, and unlike the (real or economic) data employed in conventional portfolio analysis, this chapter focuses primarily on accounting data.

4.2.2 Data Sources and Information

The data used for this study have been taken from several sources. Most of the data, comprising balance sheets and income statements of individual banks, are obtained from the KSE, which preserves in microfilms financial statements of all listed banks. Data for the period 1987-1991 are taken from the Korea Credit Rating Company which constructs a data base for credit-rating purpose based on published financial statements of individual banks. Financial statements of the KEB, Shinhan and KorAm banks are directly collected from the banks. Although the sources of data are different, the data in all cases are exactly identical to the financial statements which individual banks produce, i.e, not normalised in any way. Banks' financial statements were produced and reported by 'Corporate Accounting Standards' formulated by the Ministry of Finance and 'Guidelines for Bank Management' issued by the Office of Bank Supervision of the BOK (OBS; the former OBSE was renamed as the OBS on January 1, 1992).

Our sample contains 19 banks; one development bank, 8 nationwide commercial banks, and 10 regional commercial banks. At the end of 1991, there are 23 commercial banks in Korea. However, five newly established nationwide commercial banks are excluded, because they have very short time periods for analysis: they are Donghwa, Dongnam, Daedong banks which all were established in 1989, and Hana and Boram banks which were both established in 1991. Therefore, our sample, in reality, includes most of the commercial banks in Korea.

Table 4.1 shows some selected comparative data of our sample banks and Table 4.2 summarises these data. NCBs are, on average, 6.5 times bigger than RBs in terms of total assets and 4 times bigger in terms of capital. However, NCBs are more widely dispersed than RBs. KorAm Bank is the smallest out of the NCBs and Cheju Bank is the smallest out of the RBs in terms of all criteria (data) presented in Table 4.1. Which bank is the biggest, however, changes as the criteria change shown in Table 4.2.

4.2.3 Key Performance and Condition Measures

To analyse the performance and condition of Korean banks, ratio analysis techniques will be utilised. Therefore, this subsection begins with a definition of ratio analysis and a consideration at its strength and weakness. Ratio analysis is a technique for assessing the financial condition and performance of a bank (Graddy & Spencer, 1990; Sinkey, 1992). The basic component of ratio analysis is a single ratio, calculated by dividing one balance-sheet and/or income-statement item by another. The denominator of such a ratio may be conceived as a 'base' or 'scale' factor. For example, ROE and ROA use equity capital and total assets, respectively, as the scale factors.

<Table 4.1> Present Status of Sample Banks
(At the end of 1991)
(Unit: billion won, person)

Banks	Total Assets	Total Capital	No. of Branches	No. of Staff
<NCBs>				
Hanil	18,425.7	1,286.4	280	9,617
Commercial	19,586.3	1,136.5	275	9,522
First	19,073.1	1,227.0	291	9,276
Cho Hung	17,430.9	1,165.5	299	10,006
Seoul	15,391.0	1,120.4	299	10,279
KEB	24,932.9	1,082.2	255	8,431
Shinhan	10,308.3	1,203.1	115	3,692
KorAm	4,607.0	265.1	60	1,578
KLTCB	10,247.6	611.6	N.A	N.A
NCBs Total	129,755.2	8,486.2	1,874	62,401
<RBs>				
Daegu	4,612.5	410.6	129	3,211
Pusan	4,255.5	273.2	123	3,715
Chungchong	2,146.8	228.7	74	1,815
Chungbuk	1,406.9	173.6	38	948
Kyunggi	3,383.5	366.3	103	2,703
Kangwon	1,378.2	173.4	34	794
Jeonbuk	1,550.1	261.5	45	1,025
Kyungnam	3,269.1	332.1	85	2,458
Kwangju	2,404.4	304.7	89	1,845
Cheju	446.1	74.6	33	611
RBs Total	24,853.1	2,598.7	753	19,125
Total	154,608.3	11,084.9	2,627	81,526

Note: 1) Figures of total assets are banking accounts of individual banks.
Sources: 1) Total assets and total capital are from the balance sheet of each bank.
2) Numbers of branches and staff are from the OBS.

<Table 4.2> Summary Statistics of Sample Banks

(Unit: billion won, person)

	Mean	Max	Min	Std
[Total Assets]				
NCBs	16,219.4	24,932.9	4,607.0	5,833.7
RBs	2,485.3	4,612.5	446.1	1,289.3
[Total Capital]				
NCBs	1,060.8	1,286.4	265.1	306.7
RBs	259.9	410.6	74.6	95.7
[No. of Branches]				
NCBs	234	299	60	86.9
RBs	75	129	33	34.7
[No. of Staff]				
NCBs	7,800	10,279	1,578	3,070.9
RBs	1,922	3,715	611	1,026.4

Ratio analysis is a widely used, practical technique, but it has several limitations. It is carried out mainly using accounting data. Therefore, it only gives information about a bank's past history and its current financial position. In this sense, ratio analysis is a static tool. However, it can be made dynamic through the use of estimated data that permit *pro forma* financial ratios to be constructed. In addition, ratios can be used in conjunction with alternative statistical techniques to attempt the prediction of corporate bankruptcy (see Beaver, 1966; Altman, 1968, 1983 & 1984) or in early-warning systems for distressed financial institutions. As for the general use of accounting data, such statistically derived data are subject to different interpretations and even to manipulation.

Earnings are especially subject to manipulation. According to Sinkey (1992), three techniques are commonly used by banks for managing earnings:

(1) changing accounting methods;

(2) manipulating manager's estimates of costs;

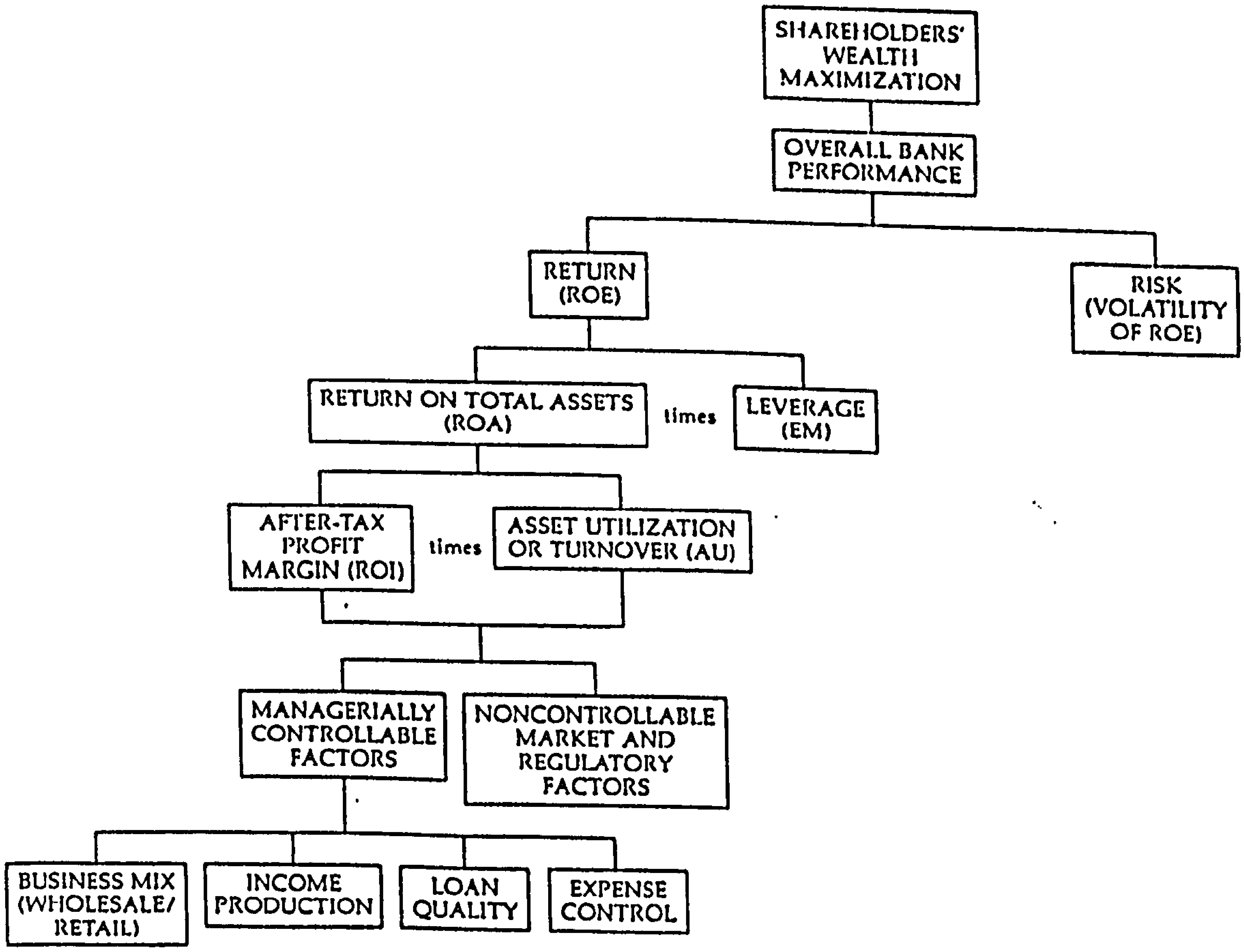
(3) shifting the period when expenses and revenues are included in results.

The third technique is dominated by management judgment. The opportunity for judgment in accounting matters to affect earnings is particularly potent in the banking industry. For example, banks must make a provision for estimated loan losses. However, the amount of the provision for loan losses is heavily dependent upon managers' estimates or judgments.

Therefore, when ratio analysis is used, one must take into account these limitation of ratio analysis. Ratio analysis only shows the symptoms of good or bad performance and not the causes. The decomposition analysis attempts to pinpoint the causes of good or bad performance that are identified through ratio analysis.

With these limitations of ratio analysis in mind, let us begin with a look at the main determinants of overall banking performance. Figure 4.3 shows the determinants of stockholder's wealth maximisation. The purpose of Figure 4.3 is to re-emphasise the risk-return trade-off decision in terms that explicitly relate to the factors determining the ROE, which is a comprehensive measure of bank performance. From this perspective, overall bank performance results from the trade-off between risk, or the volatility of ROE, and the level of

<Figure 4.3> Overall Bank Performance



Source: Adapted Gillis, Lumry and Oswald (1980), p.70

ROE. Overall bank performance is divided into a risk component measured by the variability of ROE, and a return component measured by ROE itself. The return component (ROE) can be divided into the equity multiplier (EM) and return on assets (ROA). Next, the ROA can be further split into factors that are controllable and noncontrollable by the bank. In this context, however, control does not necessarily mean absolute control, but rather some degree of control. Controllable factors include a bank's business mix, the ability to generate income from the chosen business mix, loan quality (the riskiness of the loan portfolio as reflected in loan losses), expense control, and tax management. Noncontrollable factors are environmental factors such as the demand and supply conditions that a bank faces, and regulations (Sinkey, 1992).

As monitors of financial health, the return indicators are extremely important because adequate returns are essential for sustaining the flow of capital resources to a bank. Risk measurements are related to return measurements because a bank must take risks in order to earn adequate returns (the risk-return trade-off relationship). If banks fail to earn an adequate return corresponding to their risk exposure, they may face the risk of insolvency. In fact, capital adequacy captures the overall soundness or risk exposure of an individual bank. Furthermore, since bank capital may act as a short-term buffer or cushion against unexpected losses, maintaining the adequacy of a bank's capital relative to the level of its risk is extremely important. In addition, as shown in Figure 4.3, since the overall objective of banks should be to maximise shareholders' wealth, a market approach can be profitably utilised at a later stage of this study in order to examine the impact of the new capital adequacy requirements on bank shareholders' wealth and risk.

Table 4.3 shows the key risk and return measures for our study, incorporating and modifying the determinants of overall performance shown in Figure 4.3. As return measurements, ROE is firstly analysed as an overall performance measure because it is influenced by how well the bank has performed on all other return categories. Secondly, to explore the causes of ROE outcomes, ROA and equity multiplier (EM) measures are examined.

Regarding risk measurements, variability of ROE and capital adequacy risk are examined. In addition, to analyse further the specific strengths and weaknesses of the Korean banks, supplemental performance and condition measures are analysed in Appendix B.

To provide a meaningful basis for evaluating a bank's financial statements, we need to make comparisons with other banks and/or with a bank's own performance and condition over time. Therefore, all the risk and return measures are analysed respectively in a cross-section and time-series analysis.

<Table 4.3> Performance (Return) and Condition (Risk) Measurements

Category	Equation
[Return Measures]	
1. ROE	Net Income After Tax/Core Capital
2. ROA	Net Income After Tax/Total Assets
3. EM	Total Assets/Core Capital
4. Supplemental Measures	(Appendix B)
[Risk Measures]	
1. Variability of ROE	Variance of ROE
2. Capital Adequacy Risk	(1) Core Capital/Total Assets
	(2) Total Capital/Total Assets
	(3) Core Capital/Total Deposits
	(4) Total Capital/Total Deposits
3.Supplemental Measures	(Appendix B)

4.2.4 Return Measures

4.2.4.1 Return on Equity

Table 4.4 shows the ROEs of sample banks. The ROE compares net income after tax to core capital. This ratio measures the ultimate and/or comprehensive competitiveness of a bank. The higher the ratio, *ceteris paribus* the more profitable a bank. Table 4.4 shows that some fluctuation occurred during the period 1982-1991. Figure 4.4 clearly illustrates the long-term trends of ROEs by banking group: NCBs, RBs and all CBs. The ROEs of RBs

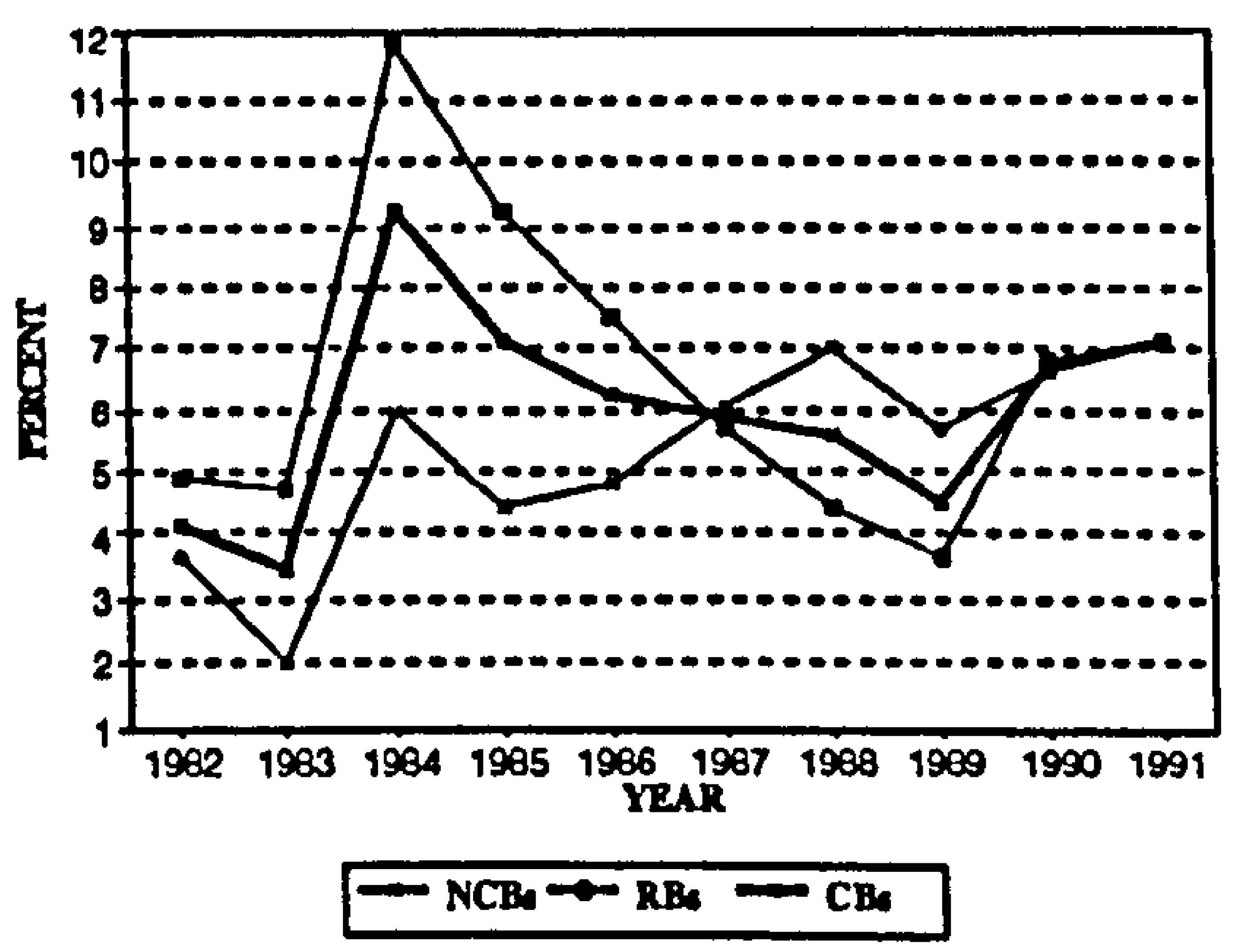
<Table 4.4> Return on Equity

Unit: %

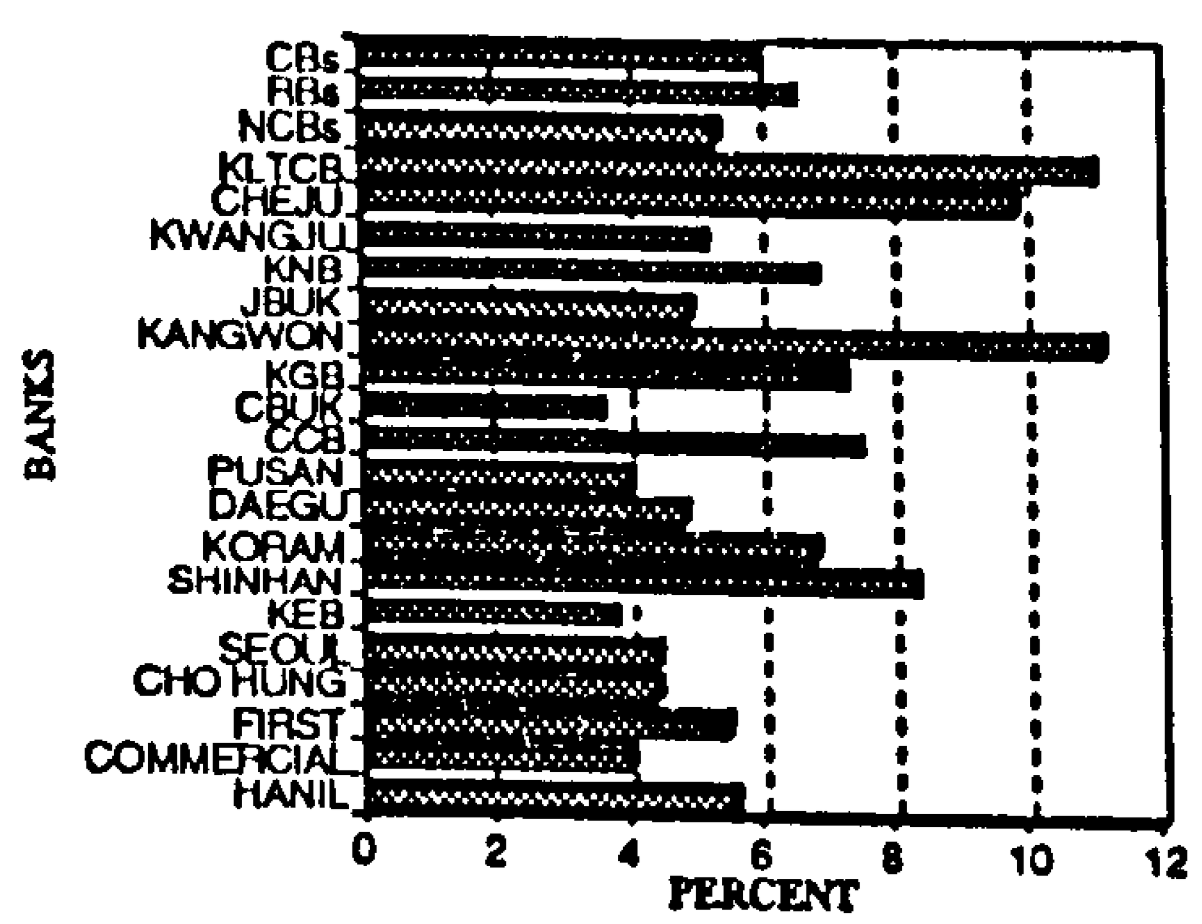
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	7.21	3.14	6.49	3.20	3.27	3.98	7.27	6.58	7.07	7.65	5.59
COMMER	5.40	2.31	6.05	3.08	2.46	1.92	3.18	4.10	5.82	5.67	4.00
FIRST	4.37	2.88	9.57	3.69	3.83	3.74	6.13	6.37	7.09	7.84	5.55
CHO HUN	4.47	2.85	3.62	3.36	3.03	2.55	4.58	6.54	6.57	6.87	4.44
SEOUL	4.20	2.77	5.63	3.54	3.93	3.09	5.75	5.69	4.89	5.25	4.47
KEB	3.64	1.29	2.69	2.61	3.78	4.01	5.72	5.76	5.03	3.85	3.84
SHINHAN	-3.96	4.37	8.35	10.36	9.56	17.07	13.32	5.72	8.74	9.61	8.31
KORAM	**	-3.77	5.46	5.64	8.33	12.25	10.52	4.68	8.14	10.23	6.83
DAEGU	2.15	1.00	7.29	4.57	5.13	4.57	5.30	3.56	7.23	8.05	4.89
PUSAN	6.14	5.21	7.97	3.10	2.72	1.59	1.00	1.65	5.62	6.05	4.10
CCB	5.55	3.31	17.43	7.40	9.25	6.95	4.81	5.99	8.07	6.60	7.54
CBUK	1.76	2.76	2.72	3.01	3.22	3.02	3.32	3.42	6.67	6.18	3.61
KGB	3.16	3.81	14.82	9.41	10.81	5.37	4.74	5.85	7.99	7.59	7.35
KANGWO	13.55	13.54	19.73	19.05	11.99	5.51	6.88	6.96	6.79	7.25	11.13
JBUK	1.28	2.01	6.49	6.23	3.80	5.34	4.73	5.85	7.57	6.75	5.01
KNB	3.18	4.99	16.04	8.17	7.64	5.74	4.49	4.28	7.24	7.46	6.92
KWANGJ	7.90	5.77	12.12	10.50	4.85	3.13	4.16	-7.24	6.06	4.47	5.17
CHEJU	4.10	4.38	13.60	20.46	15.41	15.41	4.48	5.82	5.06	10.77	9.95
KLTCB	13.89	10.66	11.50	11.63	12.00	11.96	11.15	6.45	9 94	12.00	11.12
NCBs	3.62	1.98	5.98	4.44	4.78	6.08	7.06	5.68	6.67	7.12	5.38
RBs	4.88	4.68	11.82	9.19	7.48	5.66	4.39	3.61	6.83	7.12	6.57
CBs	4.12	3.48	9.23	7.08	6.28	5.85	5.58	4.53	6.76	7.12	6.04

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure 4.4> Trends of ROE



<Figure 4.5> ROE by Banks (10 Year Average)



rose sharply from 4.88% in 1982 to 11.82% in 1984. However, since 1984, the ROEs of RBs drastically dropped and dipped below the level of 1982 in 1989. After 1989, ROE shows an upward trend. The ROEs of NCBs increased more steadily than RBs. RBs achieved higher performance than NCBs until 1986. However, since 1987, they had performed lower than NCBs. Since 1990, the ROEs of NCBs and RBs have converged.

Figure 4.5 illustrates the average ROEs of individual banks for 10 years. The ROEs are 6.04% for all commercial banks, 5.38% for NCBs and 6.57% for RBs. Although Kangwon Bank shows the highest ratio (11.13%), its performance dropped drastically from 19.05% in 1985 to 7.25% in 1991. Cheju Bank is ranked second (9.95%) followed by the 8.31% Shinhan Bank. Chungchong Bank (CCB), Kyunggi Bank (KGB), Kyungnam Bank (KNB) and KorAm Bank also performed very well. There are three negative ROEs: Shinhan Bank in 1982, KorAm Bank in 1983 and Kwangju Bank in 1989. As for Shinhan Bank and KorAm Bank, they reflected some difficulty in their first business year. Regarding Kwang-ju Bank, this result reflects a big loss in foreign currency futures in 1989. In 1991, the average ROE of NCBs is the same as the 7.12% recorded for RBs. Cheju Bank achieved the top record (10.77%) followed by the 10.23% of KorAm Bank. Shinhan Bank and Daegu Bank also have high ROEs. It is noteworthy that KLTCB as a development bank outperforms most commercial banks. It recorded 11.12% during the period 1982-1991 and 12.00% in 1991.

In brief, RBs achieved a higher performance than NCBs until 1987, while NCBs outperformed RBs since 1987 and the ROE of NCBs has increased more steadily than RBs.

4.2.4.2 Return on Assets

Table 4.5 and Figure 4.6 illustrate the long-term trend in bank profitability as measured by the ROA. Starting from a level of 0.17% in 1982, the ROA for all commercial banks increased to 0.70% in 1991. Some fluctuation did occur during the period 1982-1987.

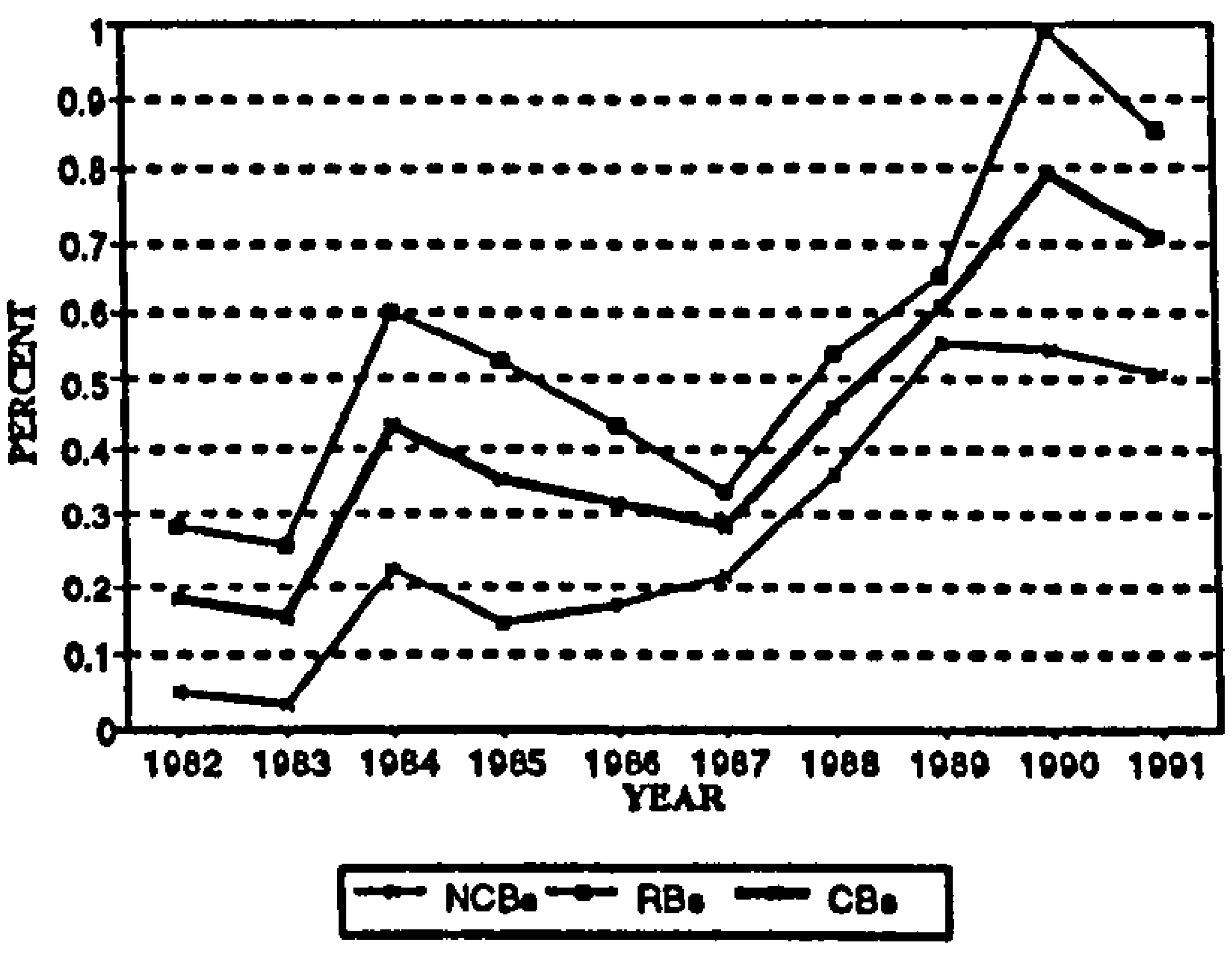
<Table 4.5> Return on Assets

Unit: %

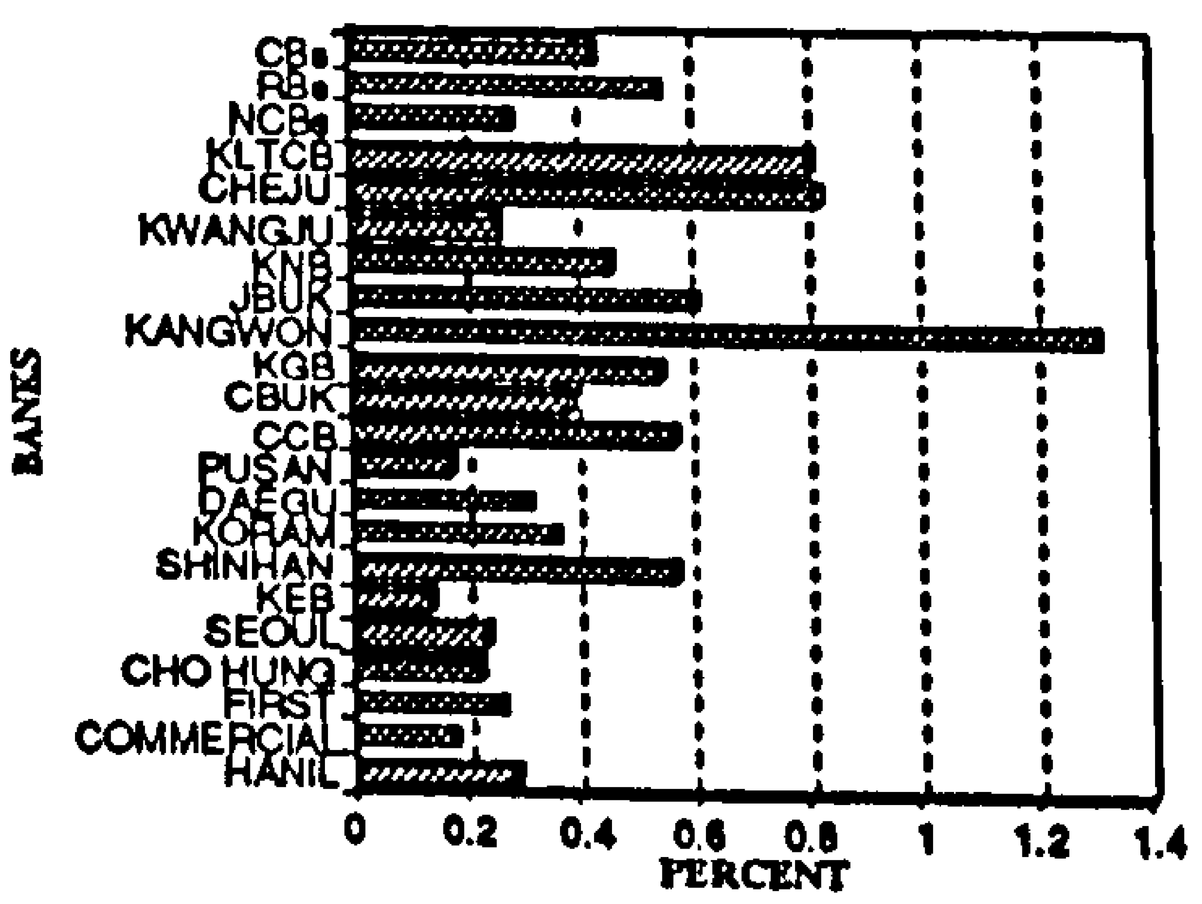
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	0.16	0.10	0.20	0.09	0.10	0.15	0.39	0.62	0.56	0.53	0.29
COMMER	0.13	0.07	0.18	0.08	0.08	0.07	0.15	0.33	0.39	0.33	0.18
FIRST	0.10	0.08	0.26	0.09	0.11	0.13	0.30	0.57	0.50	0.50	0.27
CHO HUN	0.10	0.08	0.10	0.09	0.09	0.09	0.21	0.57	0.47	0.46	0.22
SEOUL	0.11	0.10	0.19	0.11	0.14	0.12	0.33	0.54	0.39	0.38	0.24
KEB	0.14	0.05	0.09	0.09	0.13	0.15	0.22	0.23	0.18	0.17	0.14
SHINHAN	-0.41	0.24	0.39	0.34	0.42	0.65	0.78	0.97	1.21	1.12	0.57
KORAM	**	-0.45	0.38	0.25	0.28	0.35	0.51	0.63	0.68	0.59	0.36
DAEGU	0.08	0.04	0.24	0.15	0.14	0.15	0.38	0.49	0.78	0.72	0.32
PUSAN	0.17	0.13	0.20	0.07	0.08	0.05	0.06	0.15	0.42	0.39	0.17
CCB	0.29	0.15	0.74	0.36	0.50	0.40	0.53	1.02	1.02	0.70	0.57
CBUK	0.05	0.10	0.11	0.15	0.14	0.11	0.54	0.77	1.12	0.76	0.39
KGB	0.13	0.13	0.64	0.37	0.48	0.30	0.52	1.01	1.02	0.82	0.54
KANGWO	1.32	1.22	1.78	1.86	1.22	0.64	1.25	1.70	1.25	0.91	1.32
JBUK	0.06	0.08	0.20	0.21	0.11	0.24	0.90	1.48	1.65	1.14	0.61
KNB	0.16	0.20	0.61	0.34	0.30	0.20	0.44	0.70	0.90	0.76	0.46
KWANGJ	0.36	0.27	0.64	0.56	0.26	0.17	0.42	-1.33	0.79	0.57	0.27
CHEJU	0.20	0.22	0.81	1.20	1.13	1.14	0.32	0.57	0.94	1.80	0.83
KLTCB	1.26	0.86	0.84	0.70	0.66	0.58	0.79	0.83	0.86	0.72	0.81
NCBs	0.05	0.03	0.22	0.14	0.17	0.21	0.36	0.56	0.55	0.51	0.28
RBs	0.28	0.25	0.60	0.53	0.44	0.34	0.54	0.66	0.99	0.86	0.55
CBs	0.17	0.16	0.43	0.36	0.32	0.28	0.46	0.61	0.79	0.70	0.43

NOTE: "**" denotes that KorAm Bank was not established in 1982

<Figure 4.6> Trends of ROAs



<Figure 4.7> ROAs by Banks (10 Year Average)



Since 1987, however, the ROA continued its upward path. During the period 1982-1991, the ROAs for NCBs and RBs increased from 0.05% and 0.28% in 1982 to 0.51% and 0.86% in 1991, respectively. The average ROAs are 0.43% for all sample banks, 0.28% for NCBs and 0.55% for RBs. However, these average numbers are distorted by three banks as we saw when we examined the respective ROEs. Table 4.5 and Figure 4.6 and 4.7 show that RBs, which are small banks, realised substantially higher ROAs than NCBs which are big banks. Kangwon Bank has the highest ROA (1.32%) followed by the 0.83% of Cheju Bank and 0.57% of Shinhan Bank and CCB. The lowest ROA is recorded by KEB at 0.14%, followed by Pusan Bank at 0.17%. ROAs for five NCBs range from 0.18% for the Commercial Bank of Korea to 0.29% for the Hanil Bank. It is noteworthy that KLTCB outperforms most commercial banks. KLTCB has, on average, maintained an ROA of 0.81% during the period as a whole. In 1991, Cheju Bank is ranked at the top (1.80%), then Jeonbuk Bank (JBUK) (1.14%) followed by the 1.12% of Shinhan Bank. KLTCB achieved an ROA of 0.72% which is well above most NCBs.

In sum, during the entire period 1982-1991, although some fluctuation did occur, RBs achieved much higher performance (ROA) than NCBs. Furthermore, the gap of ROAs between NCBs and RBs has not reduced over time.

4.2.4.3 Equity Multiplier

Table 4.6 shows the ratio of total assets to core capital - the equity multiplier (EM). EM's reciprocal is the familiar capital/total asset ratio. If bank managers attempt to increase ROE by using greater leverage (i.e., a larger EM, which implies a lower capital/asset ratio), they may incur the wrath of the bank supervisor. Bank supervisors regard a bank's capital/asset ratio as an important indicator of its risk exposure. Therefore, the lower the ratio, the less the probability of insolvency, *ceteris paribus*.

Table 4.6 and Figures 4.8 and 4.9 illustrate that the EM of NCBs is much higher than that

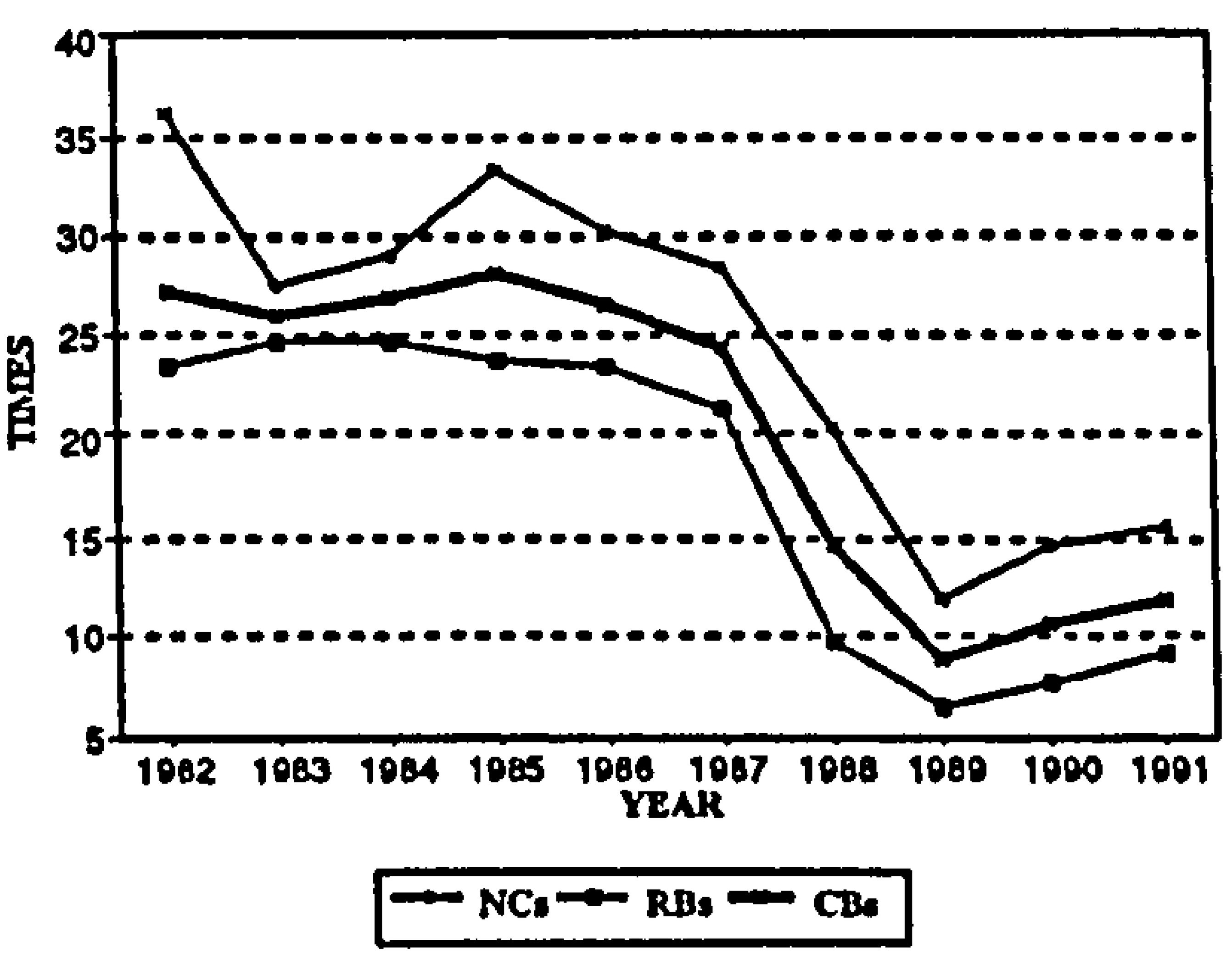
<Table 4.6> Equity Multiplier

Unit: times

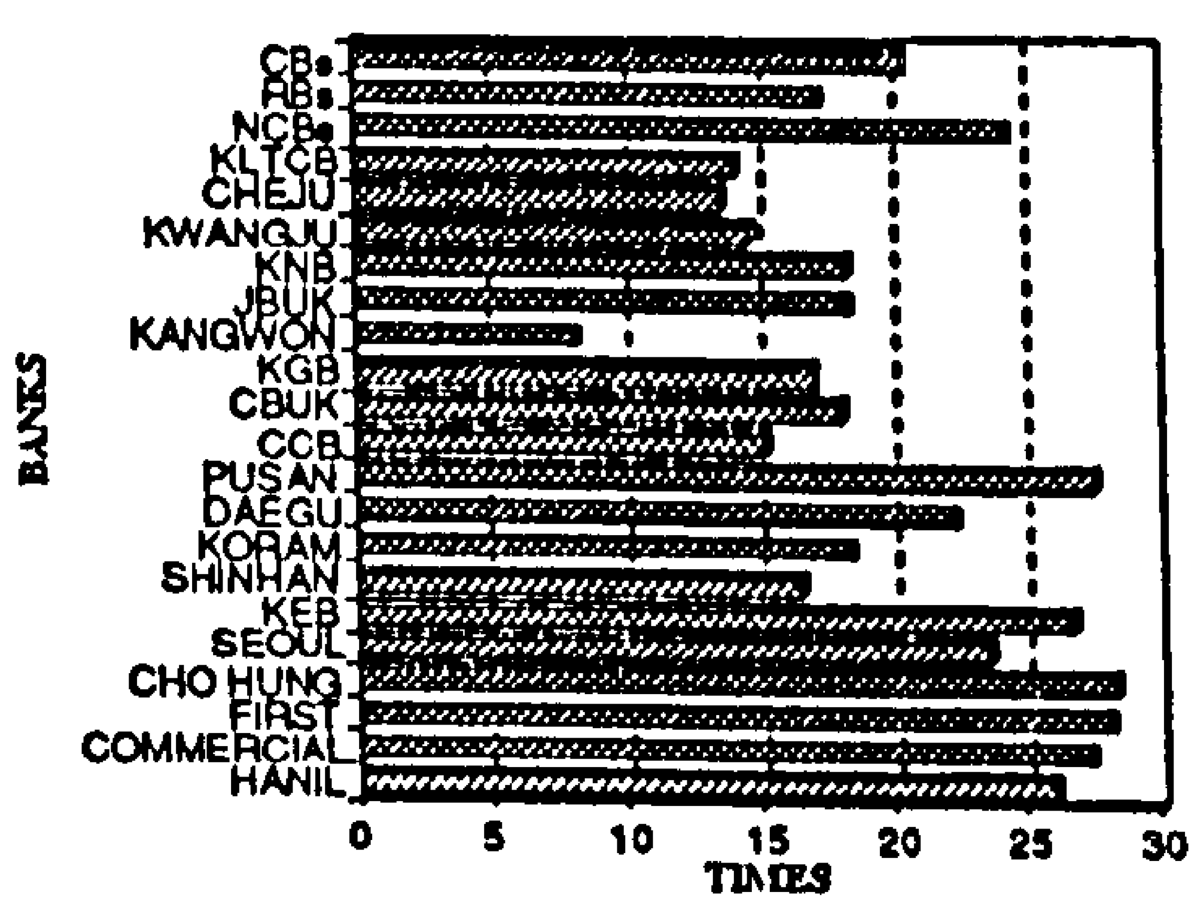
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	45.3	32.1	32.8	35.9	31.4	27.0	18.9	10.6	12.7	14.3	26.1
COMMER	42.2	33.7	33.2	36.5	32.7	28.7	20.8	12.6	15.0	17.2	27.3
FIRST	46.0	35.6	36.7	40.6	34.1	28.2	20.5	11.1	14.0	15.5	28.2
CHO HUN	46.9	36.3	37.6	38.8	34.2	29.4	21.4	11.5	13.9	15.0	28.5
SEOUL	36.7	29.0	29.0	32.7	28.5	25.8	17.7	10.4	12.7	13.7	23.6
KEB	25.9	26.1	28.3	29.7	28.6	27.3	25.6	25.1	28.5	23.0	26.8
SHINHAN	9.6	18.2	21.2	30.2	23.0	26.3	17.1	5.9	7.2	8.6	16.7
KORAM	**	8.4	14.5	22.6	29.5	35.1	20.7	7.4	12.0	17.4	18.6
DAEGU	27.3	26.7	30.8	30.0	36.2	31.1	14.1	7.2	9.3	11.2	22.4
PUSAN	35.8	38.6	39.6	44.0	34.1	29.1	15.5	10.7	13.5	15.6	27.7
CCB	19.1	22.3	23.4	20.4	18.4	17.3	9.1	5.9	7.9	9.4	15.3
CBUK	35.3	28.3	25.1	19.9	23.1	26.8	6.1	4.4	6.0	8.1	18.3
KGB	23.9	28.3	23.3	25.3	22.6	17.6	9.2	5.8	7.8	9.2	17.3
KANGWO	10.3	11.1	11.1	10.2	9.9	8.6	5.5	4.1	5.4	7.9	8.4
JBUK	21.7	25.0	32.9	29.5	33.3	22.5	5.3	4.0	4.6	5.9	18.5
KNB	20.0	25.0	26.2	24.3	25.7	29.4	10.1	6.1	8.0	9.8	18.5
KWANGJ	21.8	21.7	18.9	18.7	18.5	18.0	10.0	5.4	7.6	7.9	14.9
CHEJU	20.7	19.8	16.9	17.0	13.6	13.6	14.1	10.2	5.4	6.0	13.7
KLTCB	11.1	12.4	13.6	16.5	18.3	20.6	14.1	7.8	11.6	16.8	14.3
NCBs	36.1	27.4	29.2	33.4	30.2	28.5	20.3	11.8	14.5	15.6	24.5
RBs	23.6	24.7	24.8	23.9	23.5	21.4	9.9	6.4	7.6	9.1	17.5
CBs	27.1	25.9	26.8	28.1	26.5	24.5	14.5	8.8	10.6	12.0	20.6

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure 4.8> Trends of Equity Multiplier



<Figure 4.9> Equity Multiplier by Banks (10 Year Average)



of RBs. Corresponding figures during the period 1982-1991, are 20.6X for all commercial banks, 24.5X for NCBs and 17.5X for RBs. EMs of NCBs and RBs have drastically decreased from 36.1X and 23.6X in 1982 to 15.6X and 9.1X in 1991, respectively. The drop of EM reflected the OBS's efforts to increase banks' capital. Kangwon Bank has the lowest EM (8.4X) followed by the 13.7X of Cheju Bank and the 14.9X of Kwangju Bank. Most NCBs, with the exception of Shinhan Bank and KorAm Bank have a high EM (i.e., more than 20X). They range from 23.6X for Bank of Seoul to 28.5X for Cho Hung Bank. On the other hand, RBs have a relatively lower EM. With the exception of Daegu Bank and Pusan Bank, they are well below 18.5X. In 1991, EMs are 12.0X for all commercial banks, 15.6X for NCBs and 9.1X for RBs. The EM of NCBs is much higher than that of RBs. JBUK is the lowest EM (5.9X) of all the RBs followed by the 6.0X of Cheju Bank. Shinhan Bank has the lowest EM (8.6X) of all the NCBs. The EMs of NCBs range from the 8.6X for Shinhan Bank to the 23.0X for KEB, whereas those of RBs range from the 5.9X for JBUK to the 15.6X for Pusan Bank. KLTCB has a relatively high EM (16.8X).

In a nutshell, although it has risen a little since 1989, the EM of the Korean banks has decreased drastically during the entire period 1982-1991. The EM of NCBs is still much higher than RBs.

4.2.4.4 Supplemental Return Measures

In addition to the key performance (return) measures, supplemental return measures are examined in Appendix B in order to analyse further the specific strengths and weaknesses of the Korean banks. Supplemental return measures include: profit margin (PM), asset utilisation (AU), net interest margin (NIM), net burden, operating ratio and debt service coverage. Examining these supplemental return measures (see further detail in Appendix B) reveals:

(1)as a whole, RBs achieved higher PM than NCBs during the entire period. PMs of NCBs and RBs had converged until 1989, but they have diverged since 1989.

(2)AU as an indicator to measure productivity indicates that although some fluctuation occurred during the period 1982-1991, the level of AU has been maintained at around 7.00% and suggests that productivities of Korean banks are not so different between them and have not improved significantly over time.

(3)NIMs of the Korean banks fluctuated with interest rate changes. RBs have a significantly higher NIMs than NCBs during the entire period. The main reason is that RBs charged higher loan rates than NCBs and, accordingly, earned more interest income than NCBs. On the other hand, RBs paid similar interest rates on deposits to NCBs. As a result, interest expenses for the RBs are almost the same as those for the NCBs.

(4)the trend of net burden shows similar pattern to that of NIM. However, NCBs are more efficient than RBs in terms of net burden. Net burden of RBs is almost three times higher than that of NCBs.

(5)operating ratios have decreased drastically, implying that the ability of Korean banks to pay dividends and reinvest in the banks has greatly increased. Examining these ratios reveals that NCBs are slightly higher than RBs. This implies that NCBs have a lower ability to pay dividends and reinvest in the bank than RBs.

(6)analysing the debt service coverage ratio reveals the RBs have more ability to cover their interest expenses than NCBs. However, the RB ratios fluctuated more widely over time than that of the NCBs.

4.2.5 Risk Measures

4.2.5.1 Variability of ROE

As discussed in Section 4.2.3 and shown in Figure 4.3, the overall risk of a bank can be measured by the variability of ROE. Various risks a bank faces affect the variability of a bank's returns. From a practical rather than conceptual standpoint, three critical portfolio risks - liquidity risk, interest-rate risk and credit risk - and operating risk directly affect the variability of earnings (Sinkey, 1992). Therefore, it is time to analyse the variability of ROE in order to measure the overall risk exposure of the Korean banks.

Table 4.7 shows the variance of ROE and Figure 4.10 illustrates long-term trends. During the period 1982-1991, ROE has fluctuated widely but trended downwards. Variance of ROE for NCBs went down slowly until 1986, but rose sharply in 1987. This sudden increase of variance of ROE for NCBs derives from the huge increase of ROEs of the Shinhan Bank and the KorAm Bank in 1987 as shown in Table 4.4. ROEs of the Shinhan Bank and the KorAm Bank increased from 9.56% and 8.33% in 1986 to 17.07% and 12.25% in 1987, respectively, while the average ROEs of other NCBs decreased from 3.38% in 1986 to 3.22% in 1987. Therefore, variance of NCBs' ROE in 1987 was heavily influenced by abnormally increased ROEs of these banks. If these two banks maintained a similar level of ROEs to those in 1986, variance of ROEs in 1987 would be low and stable.

Variance of ROE for RBs shows a little different pattern to that of NCBs. Variance of ROEs for RBs rose sharply in 1984 and reached a top point in 1985 and, thereafter, dropped sharply for three years until 1988. The reason why the volatility of ROEs in 1984 increases is that ROE of the Kangwon Bank (which is the highest one) increased from 13.54% in 1983 to 19.73% in 1984, whereas the lowest ROE increased slightly from 2.01% for the Kyungnam Bank in 1983 to 2.72% for the Chungbuk Bank in 1984. Therefore, the range and variance of ROE increased in 1984. Meanwhile, variance of RBs rose sharply in 1989. This stems from the negative ROE (-7.24%) of the Kwangju Bank, resulting from big losses in foreign currency futures in 1989. During the period 1982-1991, the average variances of ROE are 4.386 for all CBs, 2.097 for NCBs and 5.591 for RBs. This implies that ROEs of RBs are distributed more widely than NCBs. However, variances in 1990 and 1991 show a little different picture. ROEs of NCBs in 1990 and 1991 are distributed more widely than RBs.

As an overall risk measure, variability of ROE was analysed. However, where does this volatility of ROE come from? According to Sinkey (1992, p.364), ' variability of ROE

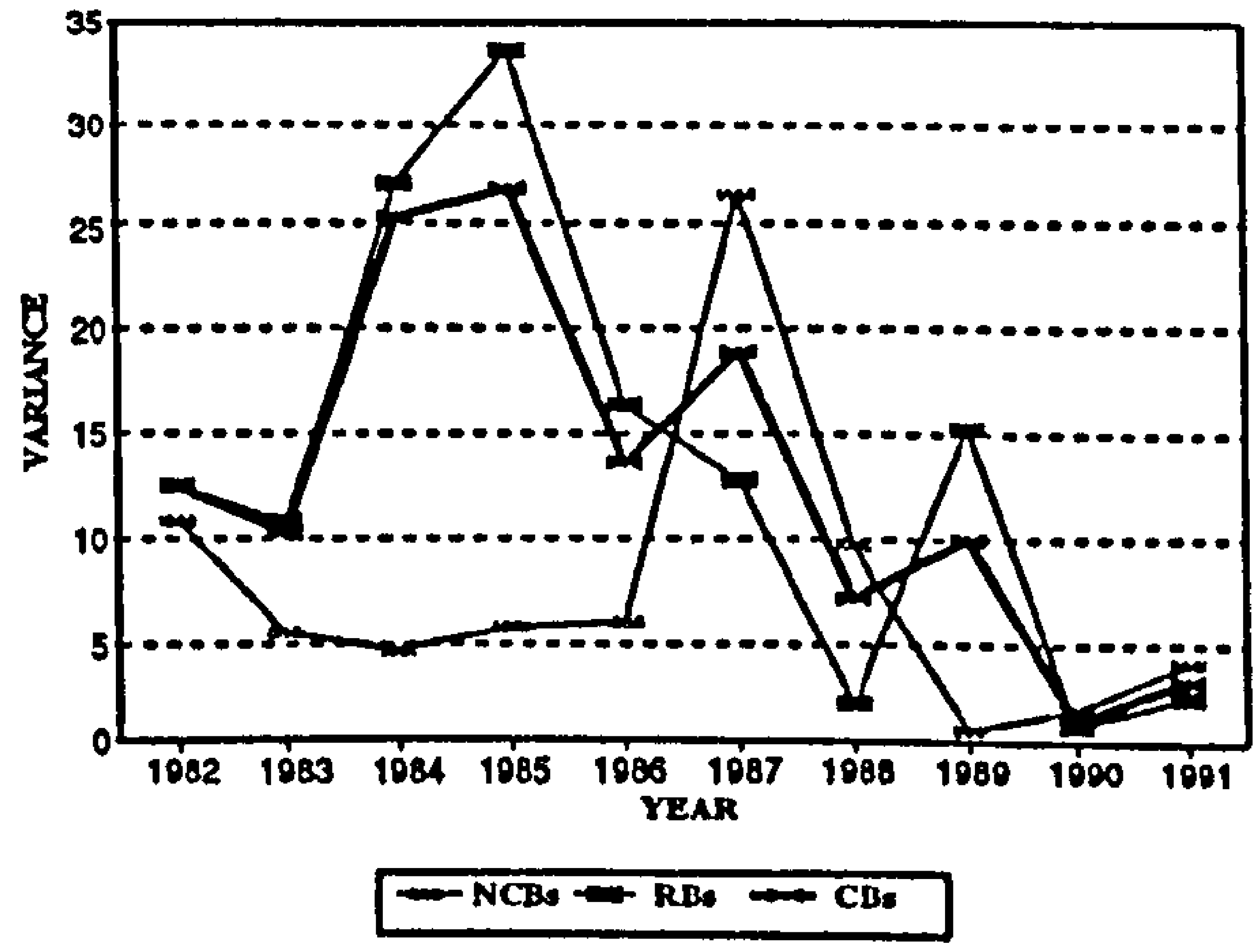
<Table 4.7>

Variance of Return on Equity

BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
NCBs	10.736	5.365	4.449	5.716	6.108	26.481	9.605	0.691	1.665	4.129	2.097
RBs	12.298	10.713	27.062	33.553	16.422	12.806	2.018	15.380	0.901	2.403	5.591
CBs	12.366	10.136	25.423	26.759	13.648	18.926	7.148	9.904	1.247	3.170	4.386

<Figure 4.10>

Trends of Variance of ROE



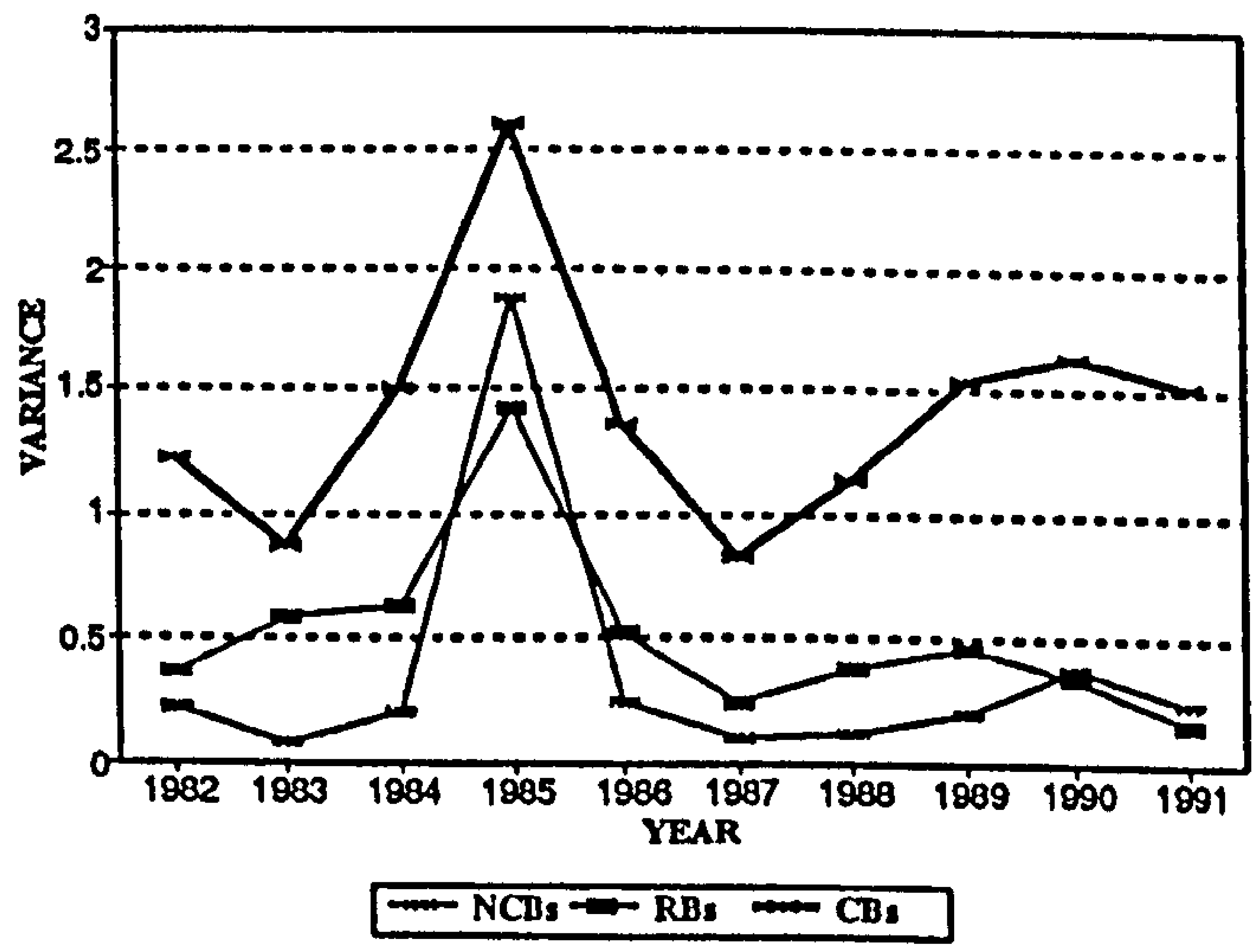
<Table 4.8>

Variance of NIM

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
NCBs	0.230	0.075	0.191	1.885	0.244	0.106	0.123	0.203	0.379	0.239	0.174
RBs	0.353	0.592	0.627	1.426	0.519	0.240	0.393	0.471	0.332	0.154	0.232
CBs	1.212	0.862	1.489	2.613	1.359	0.825	1.123	1.542	1.641	1.516	1.139

<Figure 4.11>

Trends of Variance of NIM



derives from the variability of NIM and net burden. The level and variability of a bank's NIM are the primary determinants of its overall risk-return position. A bank's NIM, in turn, is a function of the interest-rate sensitivity, volume and mix of its earning assets and liabilities'.

Table 4.8 shows variance of NIM and Figure 4.11 illustrates the long-term trends. Table 4.8 shows some strange results. Variance of NIM for CBs is much higher than those of NCBs and RBs. When we look at Table B.3 in Appendix B, however, it becomes clear. As shown in Table B.3 in Appendix B, the average NIM of NCBs is 1.27%, while that of RBs is 3.21%. Therefore, when the pooled (aggregated) variance of NIM is calculated, the variance of NIM for all CBs is greater than that of NCBs and RBs. Variance of NIM is closely related to the movements of NIM (see Figure B.5 in Appendix B) and interest rates (see Figure B.25 in Appendix B). The volatility of NIM sharply increased from 1983 to 1985, dropped in 1987, and thereafter gradually increased. The same factors discussed under interest rate risk (see Section 2.3.2 in Appendix B) explain the volatility of NIM. Liberalisation of interest rate in 1988 increased the volatility of NIM.

Table 4.9 and Figure 4.12 show variance of net burden and its long-term trends. They illustrate almost the same pattern as variance of NIM shown in Figure 4.11. Variance of net burden rose sharply from 0.503 in 1983 to 1.590 in 1985 and fell for two consecutive years until 1987. Since 1987, variance of net burden shows almost the same fluctuation as before.

Table 4.10 and Figure 4.13 are an attempt to show clearly the sources of variability of ROE. Data presented in Table 4.10 and Figure 4.13 are those for CBs. In Figure 4.13, variance of ROE is drawn by a right-hand-side scale and variance of NIM and net burden are drawn by left-hand-side scale. This graph illustrates that volatility of ROE derives from the volatility of NIM and net burden. The reason why variance of ROE in 1987 looks different from our conclusion is that, as examined earlier in this subsection, variance of ROE in 1987 was heavily affected by Shinhan Bank and KorAm Bank. If these outliers are adjusted, variance of ROE in 1987 also shows the same pattern as those of NIM and net

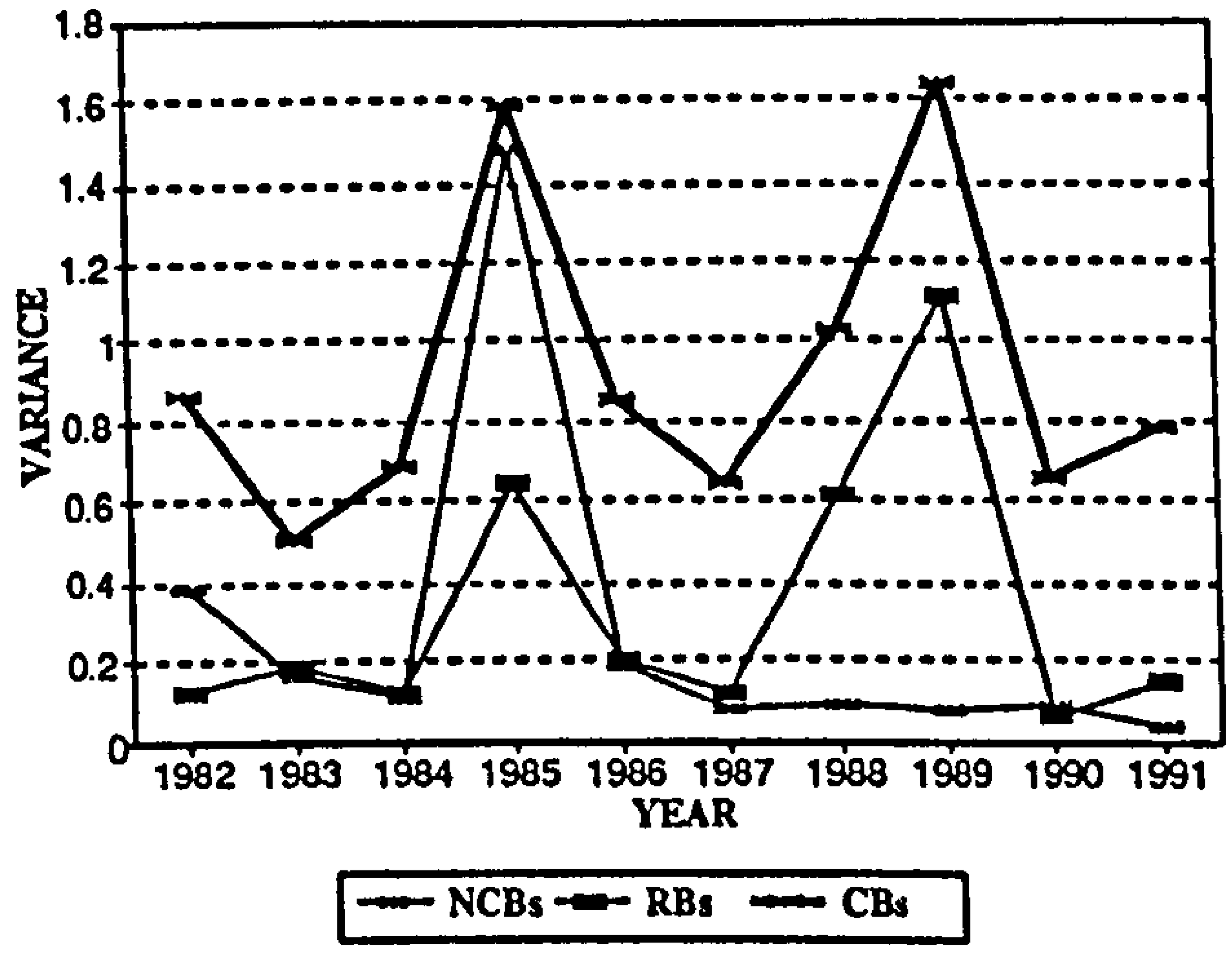
<Table 4.9>

Variance of Net Burden

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
NCBs	0.382	0.166	0.104	1.472	0.196	0.086	0.088	0.081	0.090	0.044	0.059
RBs	0.125	0.189	0.125	0.654	0.199	0.117	0.623	1.112	0.070	0.154	0.071
CBs	0.863	0.503	0.687	1.590	0.859	0.644	1.033	1.641	0.666	0.782	0.664

<Figure 4.12>

Trends of Variance of Net Burden



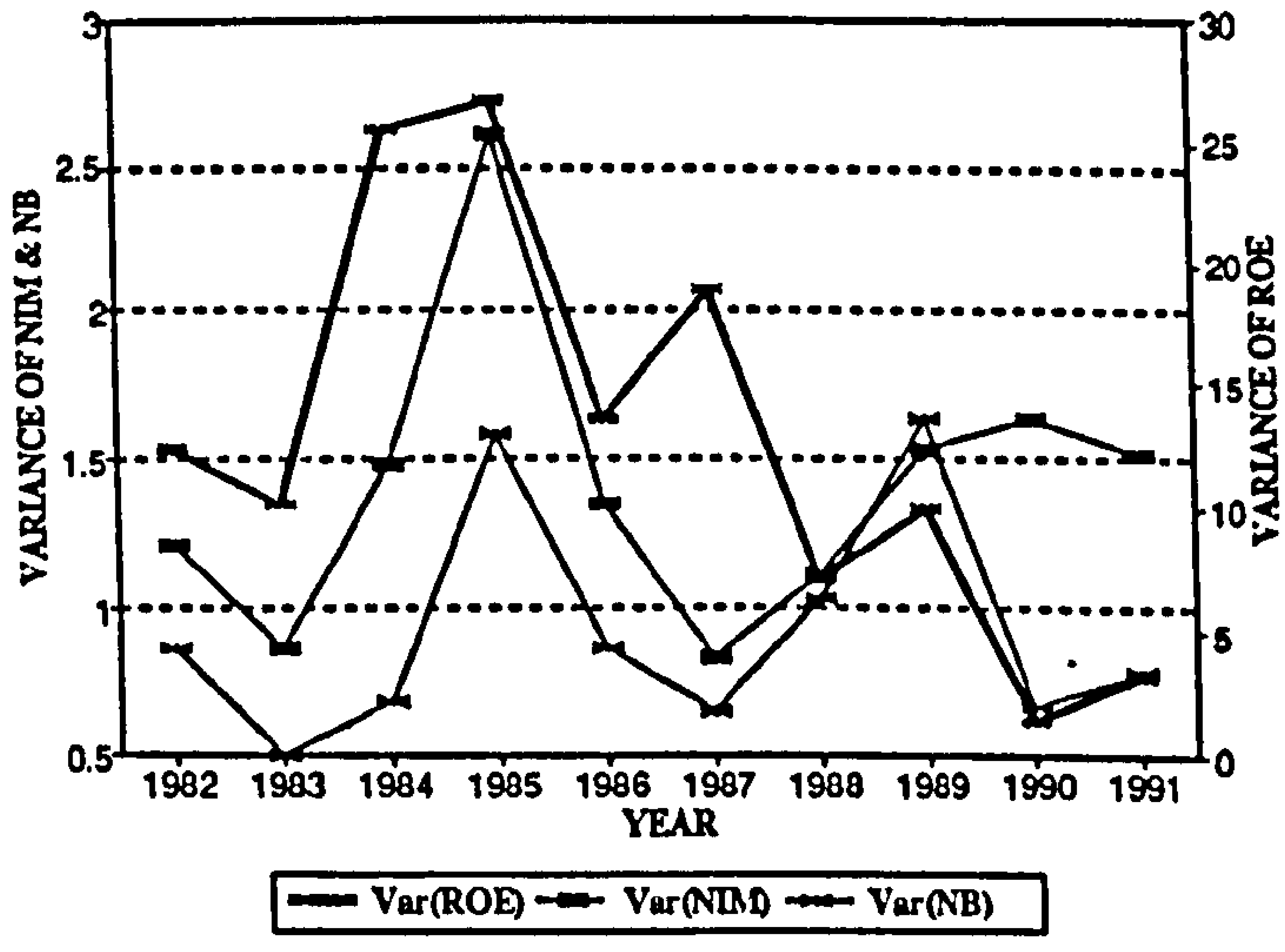
<Table 4.10>

Sources of Variability of ROE

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
Var(ROE)	12.366	10.136	25.423	26.759	13.648	18.926	7.148	9.904	1.247	3.170	4.386
Var(NIM)	1.212	0.862	1.489	2.613	1.359	0.825	1.123	1.542	1.641	1.516	1.139
Var(NB)	0.863	0.503	0.687	1.590	0.859	0.644	1.033	1.641	0.666	0.782	0.664

<Figure 4.13>

Trends of Variability of ROE by Sources



burden. Variance of NIM in 1990 is also affected by KEB which is extremely low as shown in Table B.3 in Appendix B.

As an overall risk measure of the Korean banks, the variability of ROE was analysed. Analysing the variance of ROE reveals that ROE has fluctuated widely, but gradually decreased during the entire period. Average variance of NCBs is lower than RBs. This implies that ROE of NCBs is relatively more stable than RBs over time. Examining the variance of NIM and net burden indicates that, as theory suggests, volatility of ROE originated from the volatility of NIM and net burden.

4.2.5.2 Capital Adequacy Risk

As discussed earlier in this chapter, the critical portfolio risks of banking are liquidity risk, interest-rate risk and credit risk. In addition, banks with foreign operations face the additional problem of foreign exchange risk. Furthermore, banks face other risks such as technological risk, regulatory risk, operating risk, etc.. The total effect of these various risks that a bank faces may be captured by a bank's overall risk of insolvency or failure. Capital adequacy analysis attempts to capture the overall soundness or risk exposure of an individual banks, arising from the aforementioned various risks a bank faces (Sinkey, 1992). A bank's risk profile determines the relative level of capital a bank needs. Therefore, a major banking, market and regulatory concern is the adequacy of the capital cushion against unexpected losses. Especially for bank supervisors and/or regulators, bank capital regulation may play a critical role in the 'risk containment' of banks. As a result, capital adequacy requirements have become a central supervisory instrument.

The capital adequacy risk of a bank indicates how much asset values may decline before the position of its depositors and other creditors is jeopardised (Hempel and Simonson, 1991). Thus, a bank with a 10% capital/assets ratio could withstand greater declines in asset values than a bank with a 5% capital/assets ratio. This means that the greater the capital cushion against unanticipated losses, the less the probability of insolvency, *ceteris* *paribus*. Capital risk is inversely related to the equity multiplier and , therefore, to ROE. When a bank chooses (assuming this is allowed by its regulators) to take more capital risk, its equity multiplier and ROE will be higher, *ceteris paribus*. If the bank chooses (or is forced to choose) to lower capital risk, its equity multiplier and ROE will be lower.

Many ratios are available for evaluating the safety of a bank, and the measurement of capital adequacy risk is complicated by the numerous definitions of capital (even leaving aside the formidable problems of defining and measuring banking risks). The definition of bank capital varies from one country to another because of institutional differences, different accounting practices and different approaches to the handling of non-equity capital instruments (see Chapter 5 in detail). To measure the capital risk of the Korean banks, four indicators are examined:

(1) core capital/total assets ratio;

(2) total capital/total assets ratio;

(3) core capital/total deposits ratio; and

(4) total capital/total deposits.

The ultimate cushion or buffer against the unexpected losses is core capital. However, disclosed reserves such as allowances for loan losses can also absorb the unexpected losses. Therefore, we will examine the ratios of these two kinds of capital to total assets and total deposits. Here, core capital is defined as equity capital plus capital surplus and earned surplus, while total capital is defined as core capital plus reserves disclosed. Related arguments to capital such as definition, measurement, and role of capital will be discussed in Chapter 5.

Table 4.11 shows the ratio of core capital to total assets and Figures 4.14 and 4.15 illustrate the long-term trend and average ratio of each bank for 10 years. The higher the ratio, the less the probability of bankruptcy, *ceteris paribus*. During the period 1982-1991, the average ratios are 6.99% for all sample banks, 5.19% for NCBs and 8.42% for RBs, respectively. The ratio of RBs is much higher than NCBs. Core capital/total assets ratio did

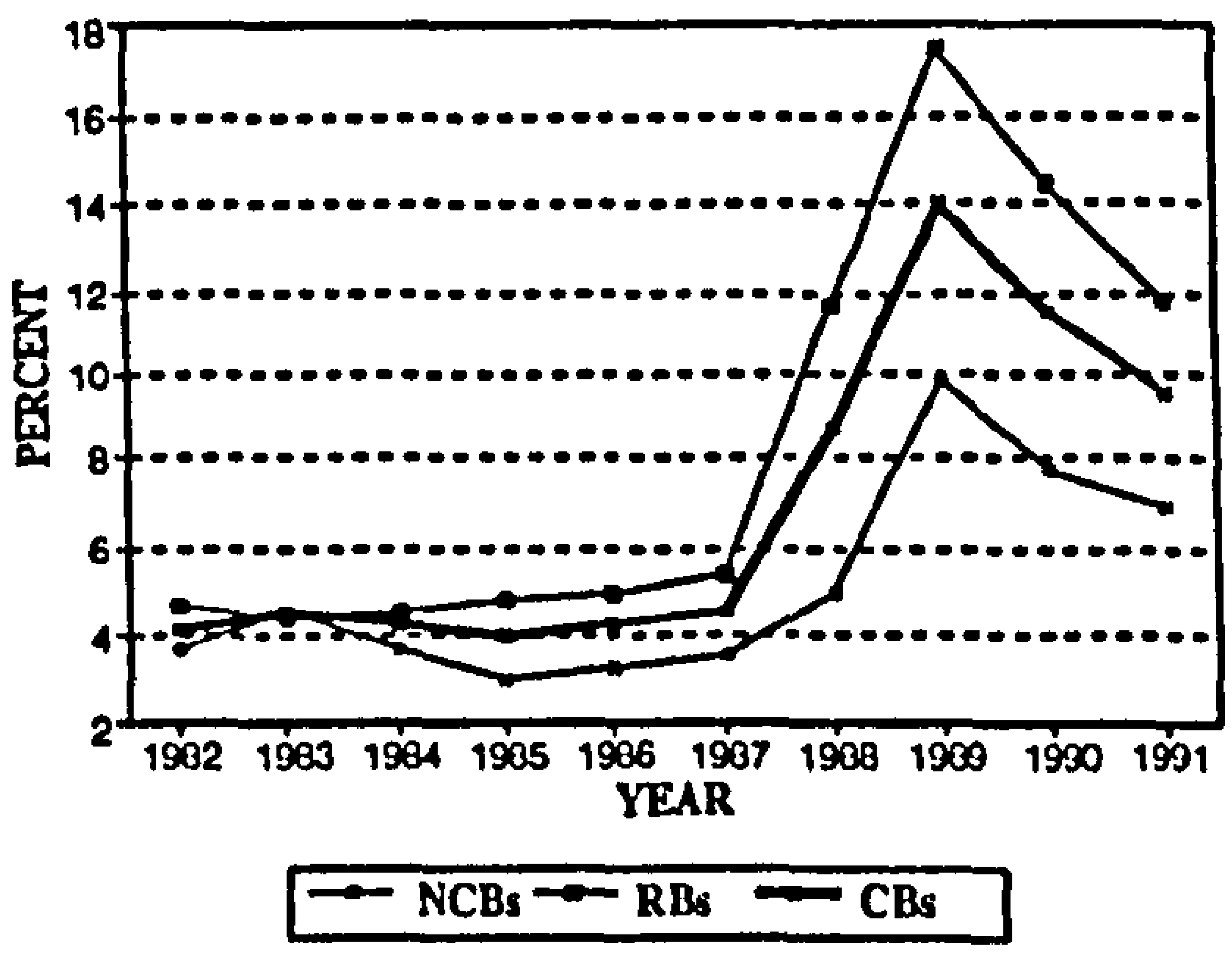
<Table 4.11> Core Capital to Total Assets

Unit: %

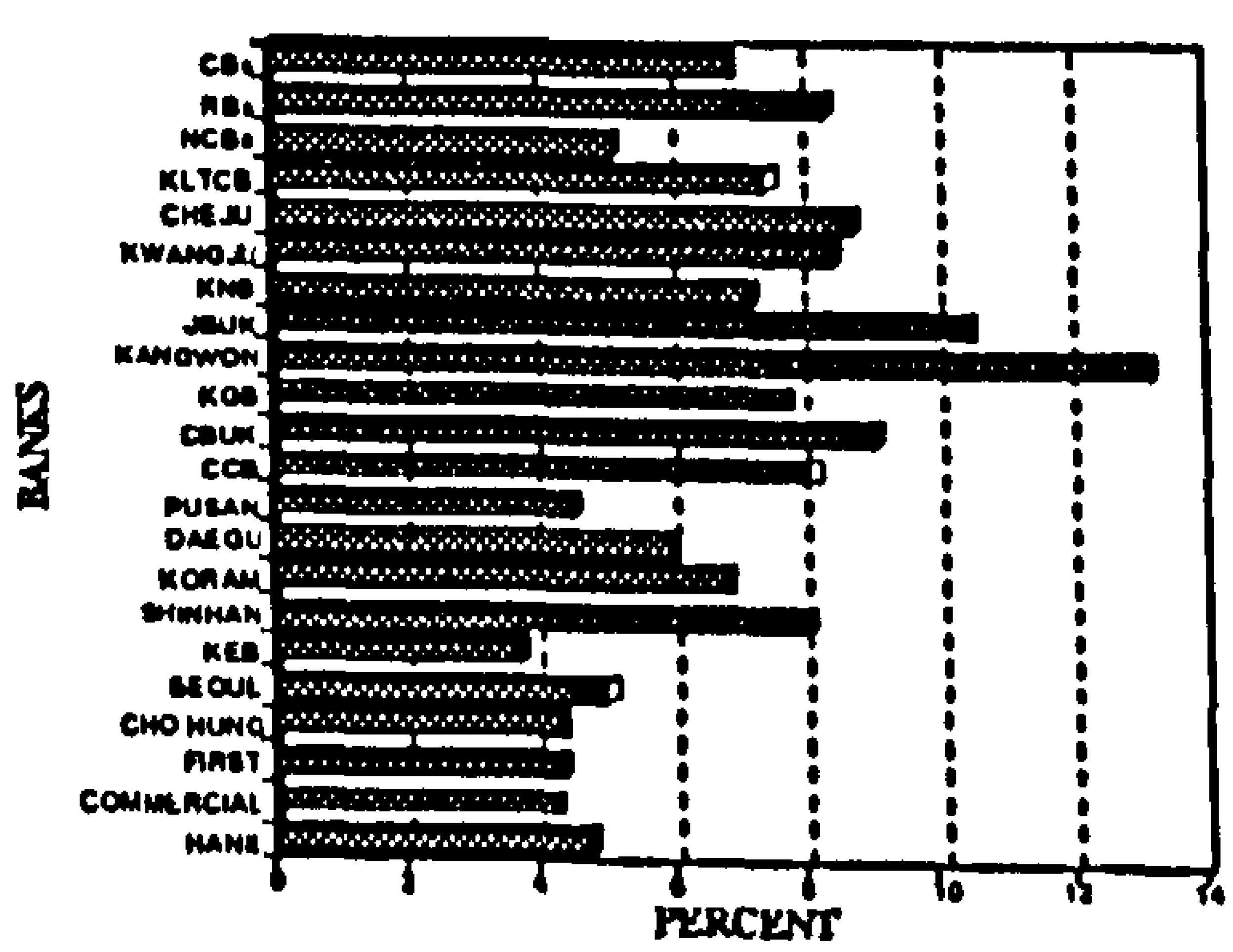
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	2.21	3.12	3.05	2.79	3.18	3.71	5.30	9.39	7.87	6.98	4.76
COMMER	2.37	2.96	3.01	2.74	3.05	3.48	4.80	7.96	6.65	5.80	4.28
FIRST	2.17	2.81	2.72	2.46	2.93	3.55	4.89	9.00	7.12	6.43	4.41
CHO HUN	2.13	2.75	2.66	2.58	2.92	3.40	4.68	8.72	7.20	6.69	4.37
SEOUL	2.73	3.45	3.45	3.06	3.51	3.88	5.66	9.57	7.90	7.28	5.05
KEB	3.87	3.84	3.53	3.37	3.50	3.66	3.91	3.98	3.50	4.34	3.75
SHINHAN	10.44	5.49	4.72	3.31	4.35	3.81	5.85	17.03	13.89	11.67	8.06
KORAM	**	11.90	6.90	4.42	3.40	2.85	4.84	13.45	8.33	5.75	6.87
DAEGU	3.66	3.74	3.25	3.34	2.76	3.22	7.08	13.89	10.73	8.90	6.06
PUSAN	2.79	2.59	2.52	2.27	2.93	3.44	6.44	9.33	7.39	6.42	4.61
CCB	5.23	4.49	4.27	4.91	5.45	5.79	11.03	16.96	12.67	10.65	8.14
CBUK	2.83	3.53	3.99	5.03	4.32	3.73	16.29	22.62	16.77	12.34	9.14
KGB	4.18	3.53	4.29	3.96	4.42	5.68	10.90	17.27	12.78	10.83	7.78
KANGWO	9.73	9.03	9.02	9.78	10.14	11.60	18.20	24.44	18.49	12.58	13.30
JBUK	4.62	4.01	3.04	3.39	3.00	4.45	19.02	25.26	21.81	16.87	10.55
KNB	5.00	3.99	3.81	4.11	3.89	3.41	9.88	16.41	12.43	10.16	7.31
KWANGJ	4.59	4.61	5.30	5.34	5.41	5.56	10.00	18.38	13.10	12.67	8.50
CHEJU	4.84	5.06	5.92	5.88	7.37	7.37	7.08	9.77	18.53	16.71	8.85
KLTCB	9.04	8.05	7.33	6.05	5.46	4.86	7.08	12.89	8.62	5.97	7.54
NCBs	3.70	4.54	3.75	3.09	3.36	3.54	4.99	9.89	7.81	6.87	5.19
RBs	4.75	4.46	4.54	4.80	4.97	5.42	11.59	17.43	14.47	11.81	8.42
CBs	4.08	4.49	4.19	4.04	4.25	4.59	8.66	14.08	11.51	9.62	6.99

NOTE: '**' denotes that KorAm Bank was not established in 1982.

<Figure 4.14> Trends of Core Capital/Total Assets Ratio



<Figure 4.15> Core Capital/Total Assets Ratio by Banks (10 Year Average)



not increase until 1987, but rose sharply in 1988 and reached a peak in 1989. Since 1989, however, this ratio has gradually decreased, reflecting the bearish stock market movements as discussed in Chapter 2. The trends of capital ratios are closely related to stock market movements, and the period 1987-1989 is the 'golden age' in the Korean stock market. Therefore, banks issued new equity without any difficulty. Capital raised through issuing new equity was KW457.8 billion in 1987, KW1,236 billion in 1988 and KW1,708.8 billion in 1989. When the stock market had became bearish from the end of 1989, however, banks raised only KW400 billion in 1990. In addition to favourable stock market movements, the BOK strongly recommended banks to increase their capital. The average ratio of all sample banks has risen from 4.08% in 1982 to 14.08% in 1989 and, thereafter, decreased to 9.62% in 1991. Corresponding figures for NCBs and RBs have increased from 3.70% and 4.75% in 1982 to 9.89% and 17.43% in 1989, and thereafter decreased to 6.87% and 11.81% in 1991, respectively. As shown in Figure 4.15, the Kangwon Bank has the highest ratio at 13.3%, followed by the 10.55% of the JBUK and 9.43% of the Shinhan Bank. In 1991, the JBUK is placed at the top (16.87%) followed by the 16.71% of the Cheju Bank. The Shinhan Bank out of the NCBs has the highest ratio at 11.67%. With the exception of KEB (4.34%), all sample banks range from 5.75% for the KorAm Bank to 16.87% for the Kangwon Bank in 1991.

Table 4.12 shows the ratio of total capital to total assets and Figures 4.16 and 4.17 illustrate its long-term trend and average ratios of individual banks for 10 years. This ratio illustrates the same pattern as the ratio of core capital to total assets shown in Table 4.11 and Figures 4.14-4.15. The capital ratios of RBs are much higher than those of NCBs over time. The average capital ratio of all sample banks has risen from 4.85% in 1982 to 15.58% in 1989 (that is the peak point), and since 1989 this ratio decreased slightly to 11.25% in 1991. The Kangwon Bank as shown in Table 4.12 and Figure 4.17 marks the top position (14.71%), followed by the 11.88% for the JBUK. The Shinhan Bank (out of the NCBs) has the highest ratio at 8.77%; the KEB has the corresponding lowest ratio (4.78%). In 1991, three banks out of the NCBs - the Commercial Bank of Korea, the Cho Hung Bank and the

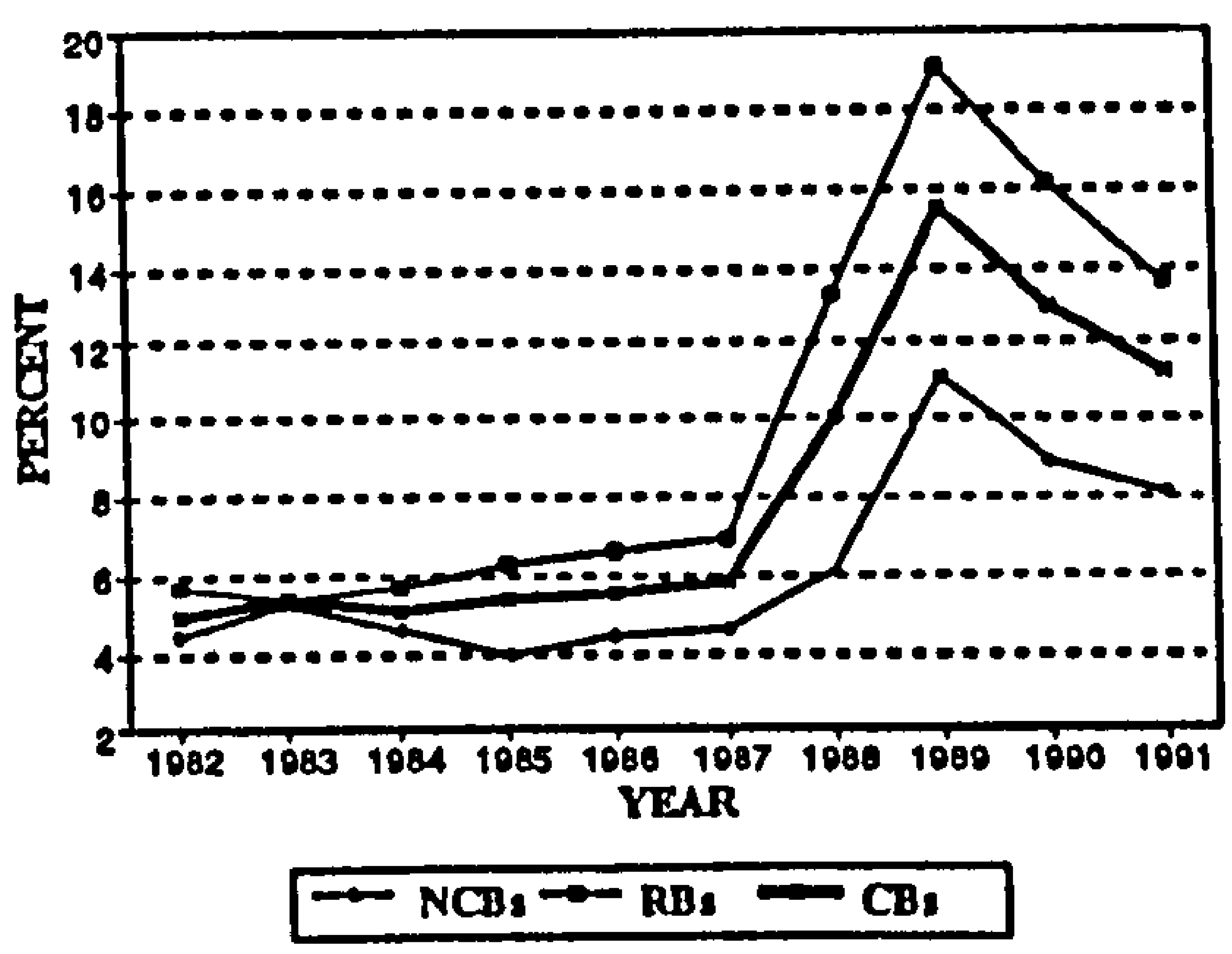
<Table 4.12> **Total Capital to Total Assets**

Unit: %

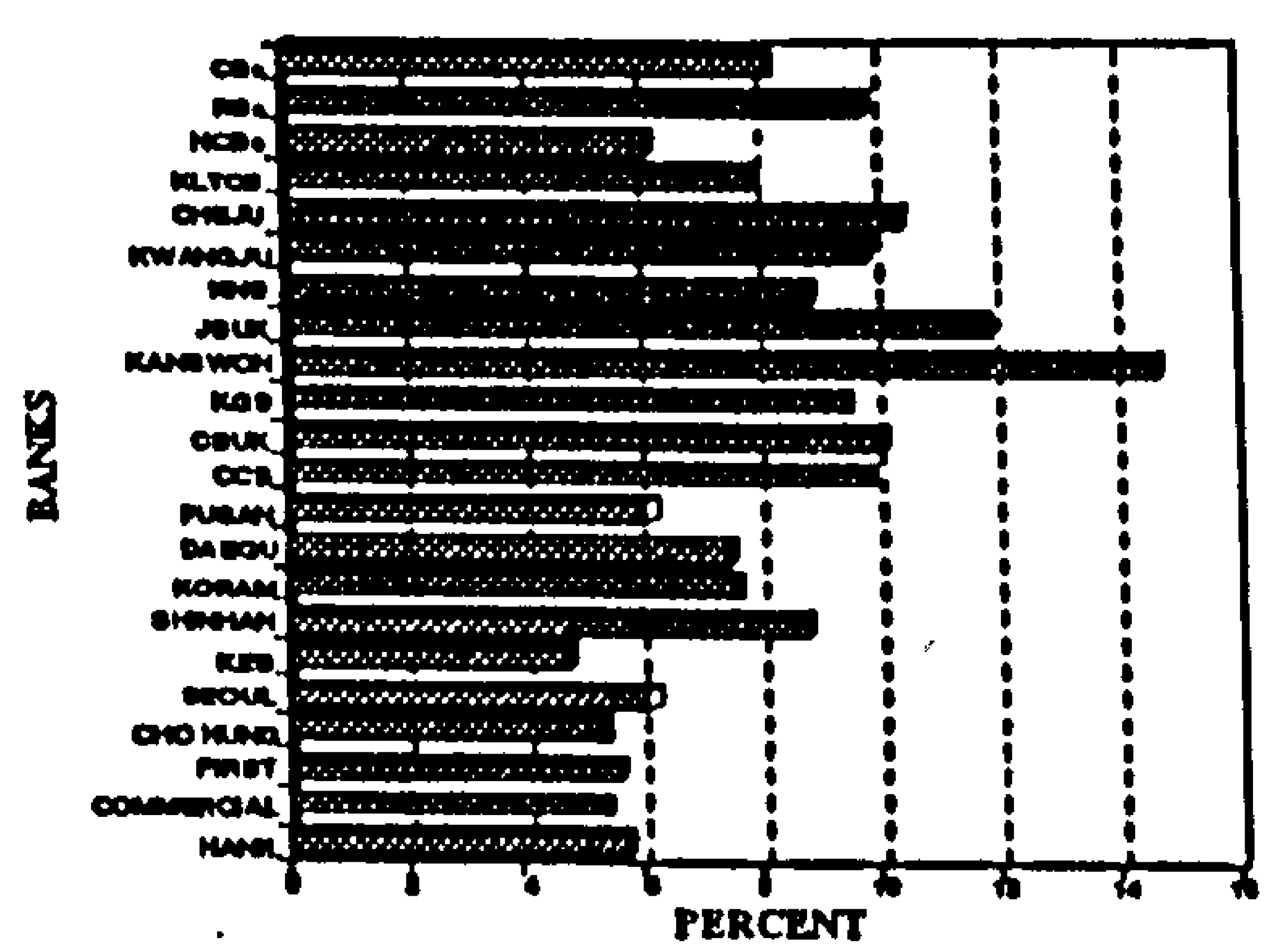
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	2.91	3.86	3.84	3.71	4.18	4.75	6.36	10.54	8.92	8.24	5.73
COMMER	3.22	3.77	3.96	3.86	4.02	4.43	5.84	9.33	8.04	7.39	5.39
FIRST	2.73	3.44	3.47	3.45	4.16	4.78	6.08	10.58	8.61	8.14	5.54
CHO HUN	2.87	3.48	3.42	3.46	3.85	4.38	5.64	9.87	8.33	7.93	5.32
SEOUL	3.62	4.27	4.41	4.13	4.69	4.98	6.73	10.74	8.99	8.72	6.13
KEB	4.44	4.50	4.27	4.19	4.44	4.83	5.42	5.24	4.77	5.71	4.78
SHINHAN	10.44	5.58	5.09	3.95	5.12	4.65	6.79	18.10	15.07	12.89	8.77
KORAM	**	12.08	7.35	5.04	4.10	3.57	5.68	14.43	9.22	6.63	7.57
DAEGU	4.27	4.37	4.12	4.63	3.93	4.48	8.58	15.98	12.89	11.23	7.45
PUSAN	3.76	3.60	3.81	3.97	4.39	4.94	8.10	11.08	9.11	8.64	6.14
CCB	6.59	5.24	5.39	6.87	7.51	7.63	13.01	18.73	14.46	12.61	9.80
CBUK	3.67	4.22	4.69	5.83	5.18	4.74	17.31	23.98	17.99	13.53	10.12
KGB	5.28	4.44	5.54	5.86	6.50	7.62	12.87	19.33	14.82	13.04	9.53
KANGWO	11.07	10.35	10.20	11.30	11.67	13.03	19.70	25.98	19.91	13.95	14.71
JBUK	5.42	4.76	3.80	4.63	4.36	5.96	20.72	26.91	23.51	18.68	11.88
KNB	5.99	4.98	5.02	5.97	5.81	5.01	11.69	18.29	14.22	12.07	8.90
KWANGJ	5.28	5.39	6.28	6.69	6.95	7.05	11.70	19.64	14.60	14.36	9.80
CHEJU	5.72	5.99	7.04	7.43	9.08	9.08	8.83	11.62	20.41	18.75	10.40
KLTCB	9.87	8.79	8.02	6.85	6.68	4.86	7.08	12.89	8.62	5.97	7.96
NCBs	4.32	5.12	4.48	3.97	4.32	4.55	6.07	11.10	8.99	8.20	6.15
RBs	5.70	5.34	5.59	6.32	6.54	6.95	13.25	19.16	16.19	13.69	9.87
CBs	4.85	5.24	5.09	5.28	5.55	5.88	10.06	15.58	12.99	11.25	8.22

NOTE: "**" denotes that KorAm Bank was not established in 1982

<Figure 4.16> **Trends of Total Capital/Total Assets Ratio**



<Figure 4.17> **Total Capital/Total Assets Ratio by Banks (10 Year Average)**



KorAm Bank - are below the capital adequacy guideline of the OBS, and the Pusan Bank did not meet this guideline (8% for NCBs and 9% for RBs, see Chapter 3).

It is also possible to assess the banks' capital adequacy by comparing capital to liabilities, especially deposits. As discussed earlier, one of the critical portfolio risks of banking is liquidity risk. Liquidity risk of banks stems from unanticipated deposit outflows. Therefore, when the greatest risk encountered by banks was deposit withdrawals, the gearing ratio (i.e., capital to deposits ratio) was regarded by many as a reasonable measure of capital adequacy. This gearing ratio scheme was adopted by the OBS of the BOK during the period 1971-1987.

Tables 4.13 and 4.14 show the ratio of core capital and total capital as a percentage of total deposits (defined as deposits plus instalment savings deposits and CDs) and Figures 4.18-4.21 illustrate long-term trends and average ratios of individual banks for 10 years. These gearing ratios show almost the same results as the capital/assets ratios shown in Tables 4.11 and 4.12 in terms of trends, top ranker, etc.. The higher the ratio, the safer the banks are expected to be. The ratios of core capital and total capital to total deposits maintained a low level until 1987. These ratios, however, rose sharply in 1988 and reached a peak point in 1989. Since 1989, these gearing ratios have gradually decreased. The movements of gearing ratios show two different aspects compared to capital/assets ratios. First, the capital/assets ratios of RBs are higher than NCBs during the entire period with the exception of 1982. However, the gearing ratios of NCBs are higher than RBs until 1987 and, thereafter, lower than the RBs. Second, the KEB shows high gearing ratios, while it shows very low capital/assets ratios. This implies that the KEB raises its funds through other sources rather than deposits compared to other banks.

Capital adequacy captures the overall risk exposure of an individual bank. Therefore, the level of capital of a bank should reflect a bank's risk profile. This importance of bank capital as a buffer or cushion to absorb unexpected losses arising from various risks a bank faces makes capital adequacy requirements a central supervisory instrument around the world. Regarding the capital adequacy risk of the Korean banks, four measures were

<Table 4.13>

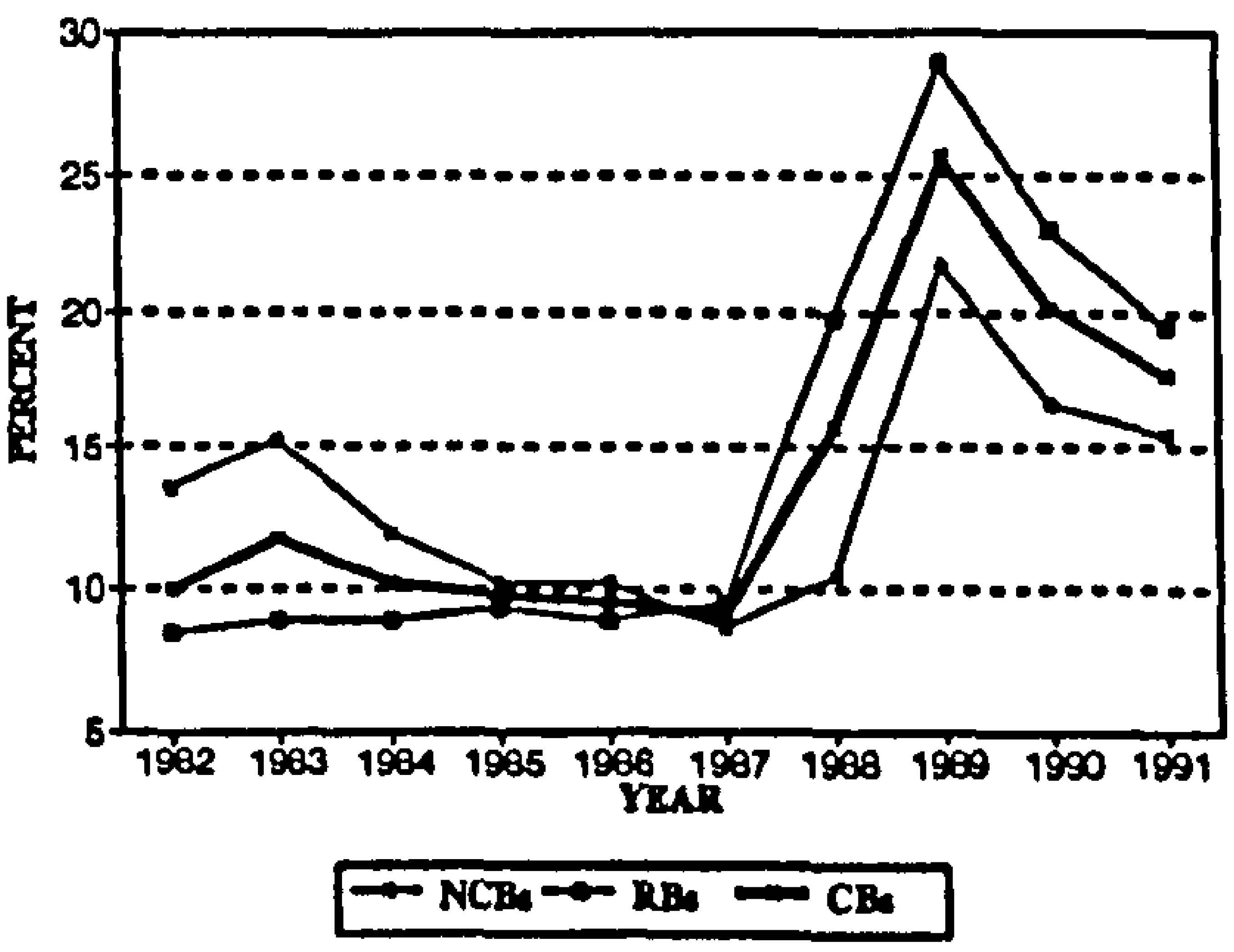
Core Capital to Total Deposits

Unit: %

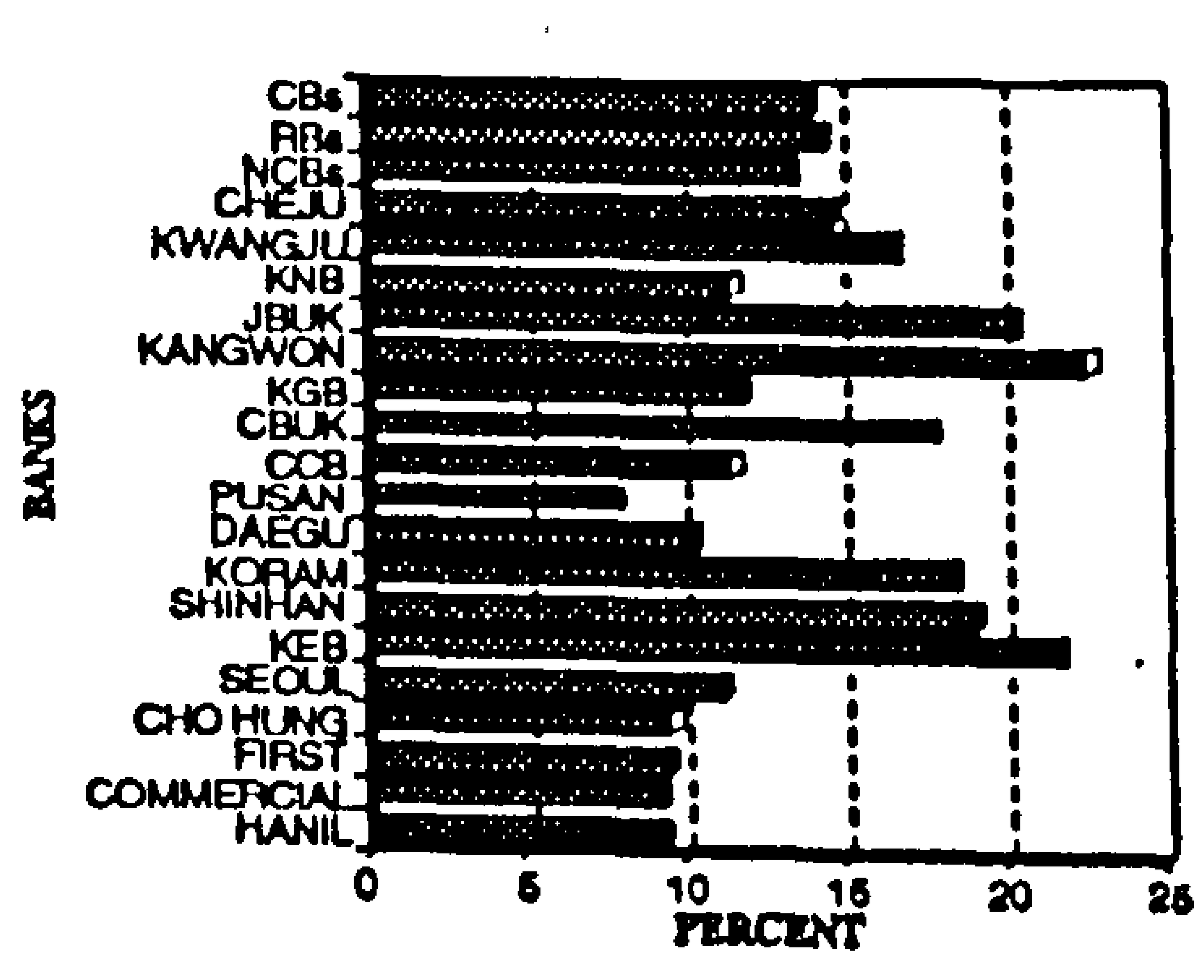
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	5.68	8.00	7.00	6.45	7.02	6.76	8.47	17.30	14.50	12.55	9.37
COMMER	6.65	7.94	7.65	7.18	7.49	7.32	9.07	16.10	12.40	11.37	9.32
FIRST	6.21	7.80	6.75	6.45	6.71	6.98	8.64	17.71	13.43	13.61	9.43
CHO HUN	6.16	8.38	7.00	6.69	7.05	7.31	8.93	17.13	13.93	13.30	9.59
SEOUL	7.82	10.19	9.21	8.48	8.68	8.36	10.65	19.35	15.34	13.63	11.17
KEB	39.86	38.17	29.94	28.25	24.79	14.80	12.02	9.39	8.78	10.98	21.70
SHINHAN	22.08	11.01	9.70	7.93	9.99	8.44	12.96	42.18	34.72	31.34	19.03
KORAM	**	30.96	18.57	10.95	10.05	9.18	13.57	34.16	20.76	17.28	18.39
DAEGU	7.57	7.66	6.73	6.82	4.60	5.25	10.50	22.74	16.54	14.51	10.29
PUSAN	6.08	5.76	5.20	4.44	4.97	5.67	10.45	15.15	11.34	10.62	7.97
CCB	8.41	7.36	6.37	6.89	7.53	7.62	14.73	24.57	17.39	14.71	11.56
CBUK	5.50	8.57	9.82	12.15	9.80	8.17	33.53	38.93	29.30	21.07	17.68
KGB	6.26	5.68	6.83	6.26	6.64	8.62	15.67	25.53	20.11	16.58	11.82
KANGWO	14.05	14.85	14.27	16.11	18.33	21.71	34.55	41.41	29.09	22.69	22.71
JBUK	7.96	8.07	6.46	7.57	6.98	8.26	36.93	51.13	38.88	30.92	20.32
KNB	8.98	7.34	6.63	7.26	6.33	5.71	14.06	25.82	18.07	15.33	11.55
KWANGJ	13.33	13.66	14.76	14.04	11.35	10.06	16.12	30.31	19.82	22.68	16.61
CHEJU	6.95	9.48	11.42	12.29	13.64	13.64	11.59	14.16	29.02	24.76	14.69
KLTCB	427.65	343.30	284.19	308.01	183.75	195.44	171.55	302.63	183.94	132.24	253.27
NCBs	13.49	15.31	11.98	10.30	10.22	8.64	10.54	21.66	16.73	15.51	13.50
RBs	8.51	8.84	8.85	9.38	9.02	9.47	19.81	28.98	22.96	19.39	14.52
CBs	9.97	11.72	10.24	9.79	9.55	9.10	15.69	25.73	20.19	17.66	14.07

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure 4.18> Trends of Core Capital/Total Deposits Ratio



<Figure 4.19> Core Capital/Total Deposits Ratio by Banks (10 Year Average)



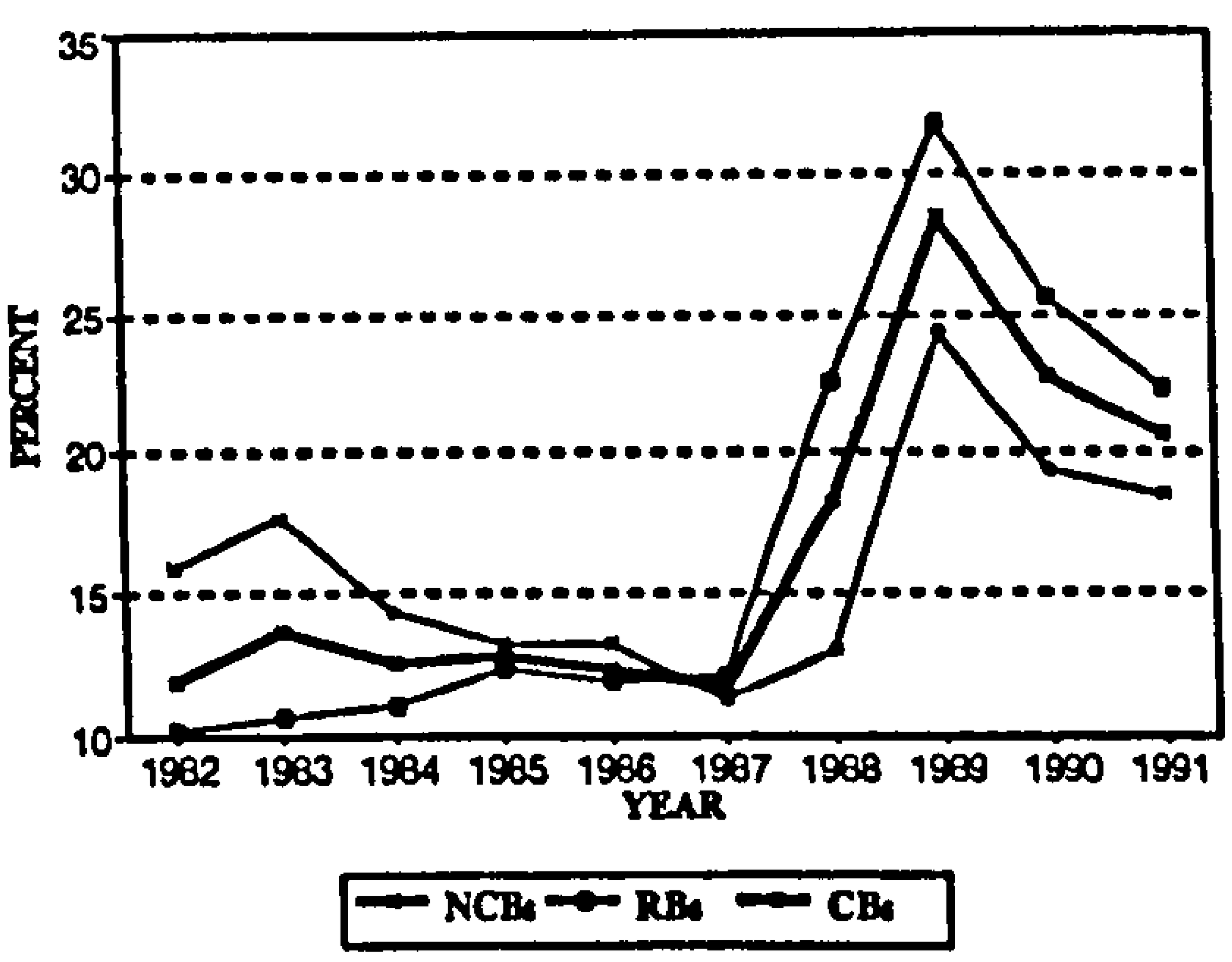
<Table 4.14> Total Capital to Total Deposits

Unit:%

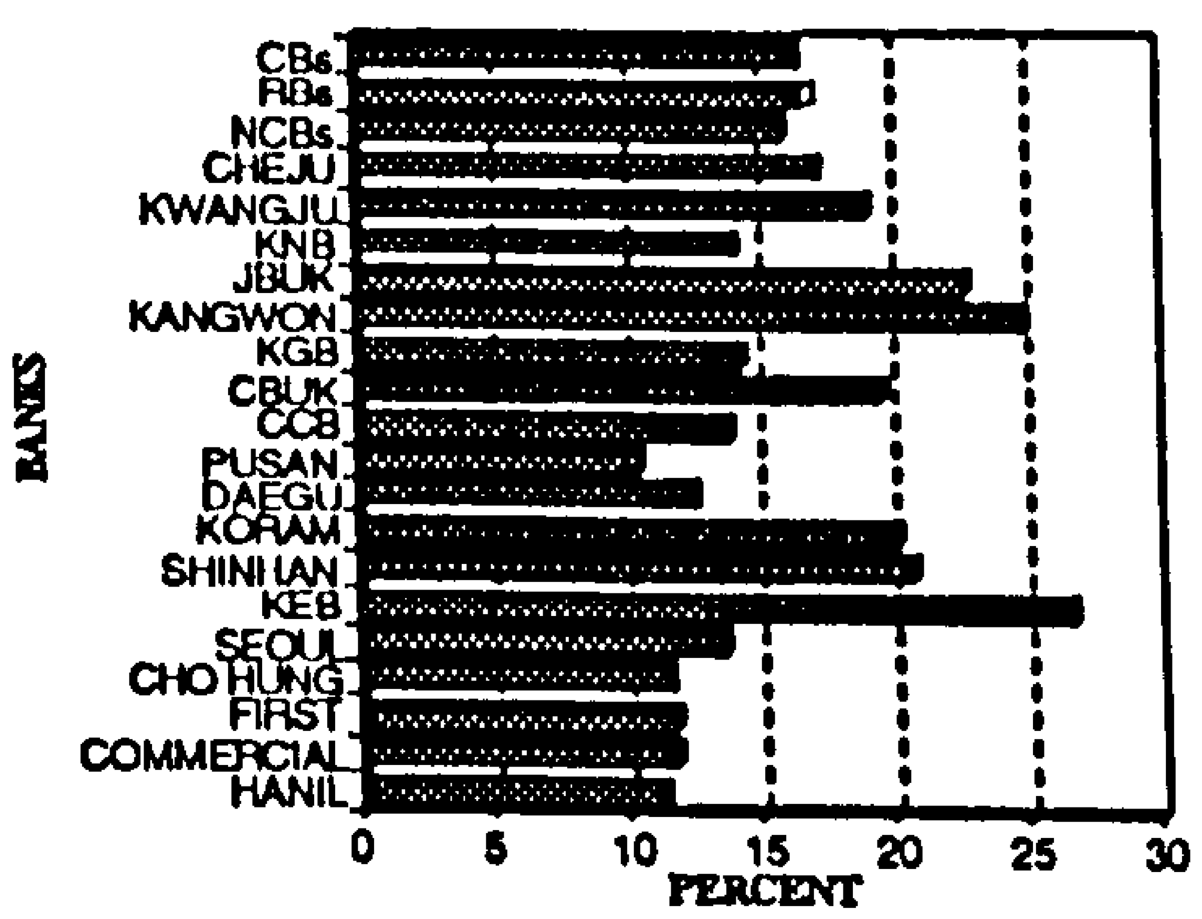
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	7.48	9.90	8.82	8.58	9.21	8.65	10.17	19.41	16.42	14.82	11.35
COMMER	9.04	10.11	10.07	10.11	9.84	9.31	11.05	18.87	14.98	14.49	11.79
FIRST	7.79	9.56	8.60	9.05	9.51	9.41	10.74	20.82	16.24	17.22	11.90
CHO HUN	8.30	10.59	9.01	8.98	9.28	9.42	10.76	19.39	16.12	15.76	11.76
SEOUL	10.38	12.62	11.78	11.47	11.61	10.73	12.66	21.71	17.47	16.32	13.68
KEB	45.77	44.79	36.27	35.08	31.49	19.53	16.68	12.34	11.95	14.43	26.83
SHINHAN	22.08	11.18	10.47	9.46	11.76	10.31	15.05	44.81	37.66	34.60	20.74
KORAM	**	31.43	19.77	12.47	12.13	11.50	15.93	36.66	22.97	19.90	20.31
DAEGU	8.82	8.94	8.53	9.46	6.55	7.30	12.71	26.17	19.88	18.31	12.67
PUSAN	8.18	8.01	7.86	7.77	7.45	8.16	13.15	17.99	13.98	14.30	10.68
CCB	10.60	8.60	8.03	9.65	10.39	10.04	17.37	27.15	19.86	17.42	13.91
CBUK	7.14	10.25	11.53	14.07	11.76	10.37	35.63	41.28	31.44	23.11	19.66
KGB	7.90	7.15	8.82	9.27	9.78	11.58	18.50	28.58	23.32	19.96	14.49
KANGWO	15.98	17.03	16.13	18.61	21.09	24.39	37.41	44.01	31.32	25.15	25.11
JBUK	9.35	9.59	8.08	10.32	10.15	11.08	40.23	54.48	41.92	34.23	22.94
KNB	10.75	9.16	8.74	10.55	9.47	8.39	16.63	28.78	20.67	18.21	14.13
KWANGJ	15.37	15.98	17.49	17.60	14.59	12.75	18.85	32.40	22.09	25.70	19.28
CHEJU	8.22	11.23	13.57	15.52	16.82	16.82	14.47	16.85	31.96	27.77	17.32
KLTCB	466.47	374.55	311.00	348.78	224.56	195.44	171.55	302.63	183.94	132.24	271.12
NCBs	15.84	17.52	14.35	13.15	13.10	11.11	12.88	24.25	19.23	18.44	16.04
RBs	10.23	10.59	10.88	12.28	11.80	12.09	22.49	31.77	25.65	22.42	17.02
CBs	11.84	13.67	12.42	12.67	12.38	11.65	18.22	28.43	22.79	20.65	16.59

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure 4.20> Trends of Total Capital/Total Deposits Ratio



<Figure 4.21> Total Capital/Total Deposits Ratio by Banks (10 Year Average)



analysed and the following were found. First, capital ratios sharply rose since 1987. This rise reflects two factors: a bullish capital market and the effort of the OBS to increase banks' capital. Second, the capital to assets ratios of RBs are much higher than the NCBs during the entire period, but the gearing ratios of RBs are only higher than the NCBs since 1987. Finally, the capital ratios of some NCBs are below the capital adequacy guideline imposed by the OBS. These banks should increase their capital.

4.2.5.3 Supplemental Risk Measures

In addition to the variability of ROE and capital adequacy risk, the three key portfolio risks of banking (i.e., liquidity risk, interest rate risk, and credit risk) are analysed in greater detail within Appendix B. The main findings are as follows:

(1)regarding the liquidity risk of the Korean banks, four liquidity measures were examined. First, analysing the ratio of cash and due from banks to total assets reveals that RBs have the same ability to meet short-term liquidity needs as NCBs. Second, the ratio of loans to deposits ratio for NCBs is much higher than that for the RBs. This indicates that as bank size increases, the relative volume of loans to deposits increases. Third, examining the ratio of core deposits to total assets reveals that RBs raise more funds from the local market than do the NCBs. Finally, the ratio of loans to total assets shows that the ratio for the RBs was much higher than NCBs during the period 1982-1986. However, since 1986, there is no difference between NCBs and RBs. Therefore, it is difficult to conclude that big banks (i.e., NCBs) tend to have higher ratios than small banks (i.e., RBs) in Korea.

(2)based on the 6 month gap analysis, banks in Korea had a positive gap for the period 1983-1990. Therefore, when interest rates rise, net interest income of sample banks will increase, while when the interest rate falls, net interest income will decrease.

(3)as for credit risk of the Korean banks, four credit risk measures were analysed. First, the ratio of provision for loan losses to total loans shows that the Korean banks allocated more funds for loan loss provision in 1985 and in 1989 when they made more profits, and they correspondingly allocated less in 1987 when they earned relatively less. In addition, NCBs allocated more provisions for loan losses than RBs. Second, examining the ratios of allowances for loan losses to total loans and total assets reveals that the average ratios of RBs are slightly higher than those of NCBs. This implies that NCBs wrote off more bad loans than RBs during the entire period. Finally, the loss coverage ratio of RBs is slightly higher than that of NCBs. This indicates that RBs' ability to protect earnings is higher than NCBs.

4.2.6 Synthesis: Risk-Return Trade-off in the Korean Banks

The notion of a risk-return trade-off is a fundamental concept of bank financial management: to obtain a higher rate of return, a bank must take more risk. With this trade-off between risk and return in mind, several return and risk measures were analysed in order to evaluate the performance and condition of Korean banks. Although some discussions on the risk-return trade-off were made in each section, however, these indicators were not jointly analysed within a risk-return trade-off framework. Accordingly, they could not explain clearly whether or not a risk-return trade-off exists in Korean banking. Therefore, further discussion on the risk-return trade-off of Korean banks is needed. To analyse the trade-off between risk and return, four relationships are examined: mean of ROE vs its variance, mean of NIM vs its variance, ROE vs liquidity and ROE vs capital-to-asset ratio.

Table 4.15 shows means and variances of ROE and NIM for all CBs. Figure 4.22 graphically illustrates the relationships between them. The upper graph in Figure 4.22 illustrates that ROE (return) and its variance (risk) are positively and strongly correlated. The correlation coefficient between ROE and its variance is 0.898. Therefore, as theory suggests, to obtain more returns, the Korean banks must take more risks. The lower graph

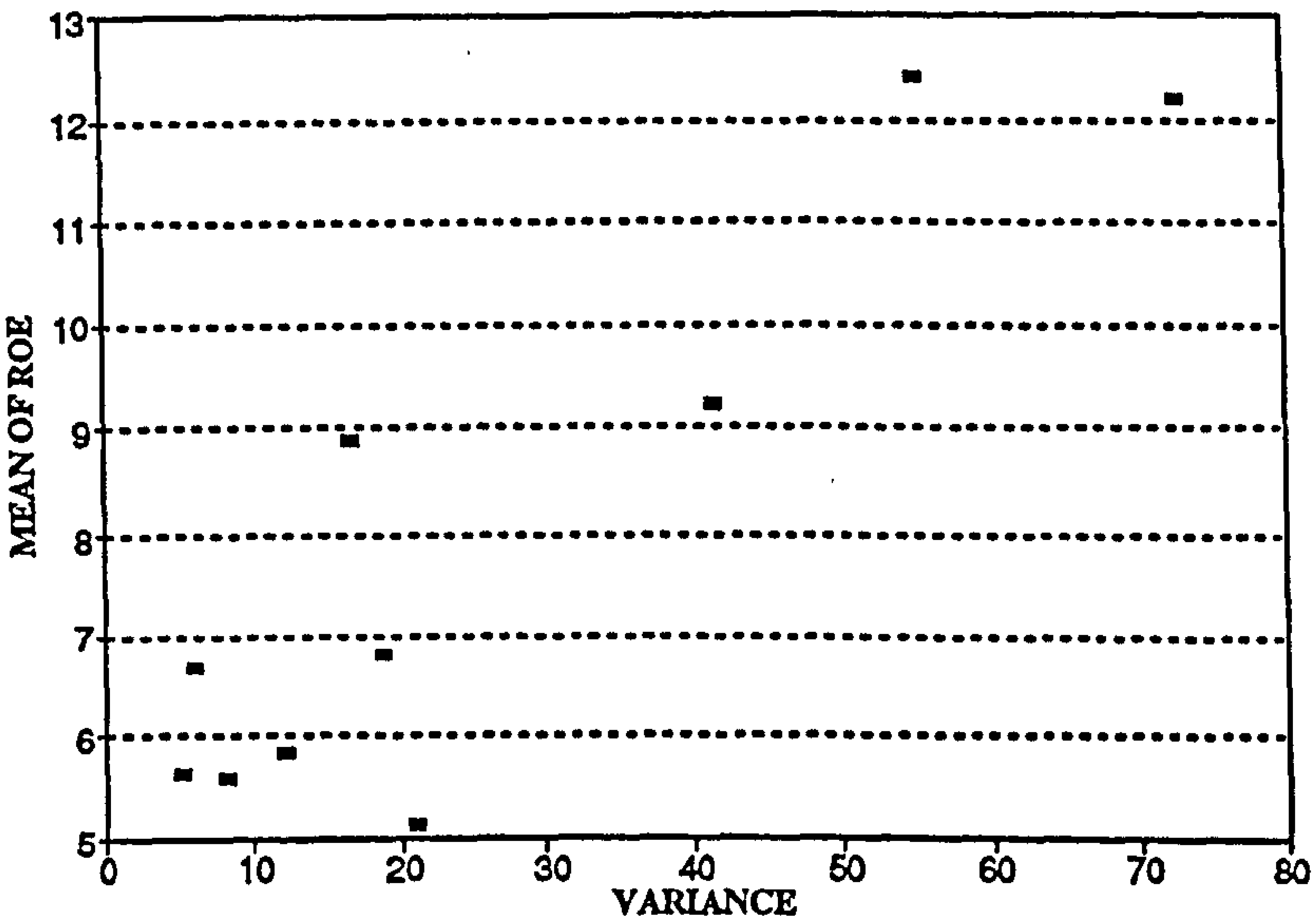
<Table 4.15> Mean & Variance of Return on Equity and NIM

Unit: %

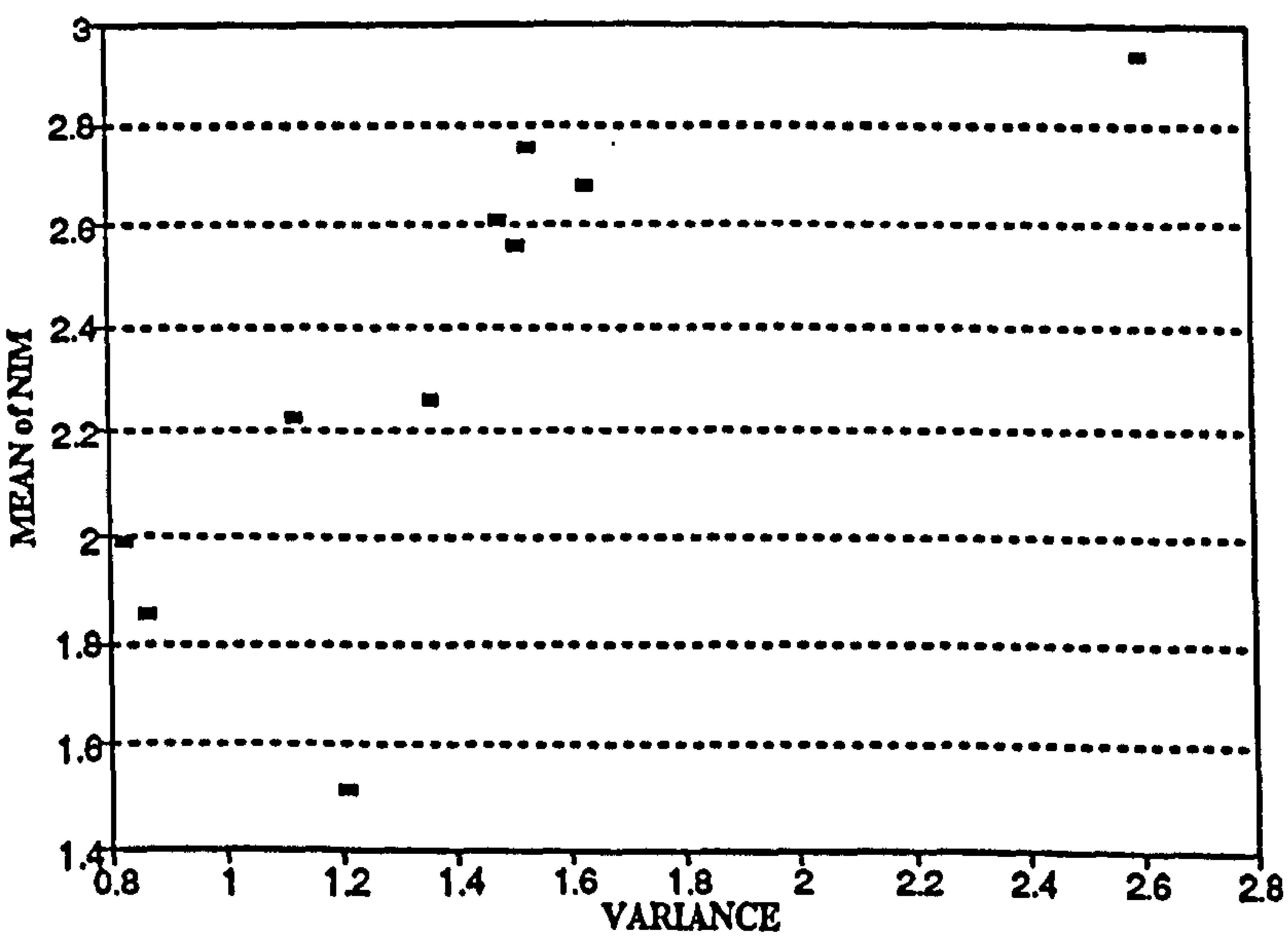
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
[ROE]										
MEAN	6.83	5.84	12.40	12.17	8.91	9.22	5.64	5.15	5.59	6.68
VAR	19.06	12.29	55.13	72.73	16.96	41.41	5.28	20.96	8.26	5.98
[NIM]										
MEAN	1.52	1.85	2.61	2.94	2.26	1.99	2.23	2.76	2.68	2.56
VAR	1.21	0.86	1.49	2.61	1.36	0.82	1.12	1.54	1.64	1.52

<Figure 4.22> Risk-Return Trade-off between Mean and Variance of ROE & NIM (CBs)

[Return on Equity]



[Net Interest Margin]



in Figure 4.22 illustrates almost the same relationships as shown in the upper graph. NIM is also positively correlated to its variability. The correlation coefficient between NIM and its variance is 0.767.

Table 4.16 shows ROE, liquidity ratio and capital-to-asset ratio of all CBs for 10 years (1982-1991). As discussed in Section 2.3.1 in Appendix B, a bank should have adequate cash and other liquid assets to meet demands for deposits withdrawals and by their nature, these liquid assets reduce a bank's profitability. Therefore, a negative relationship is expected between profitability and the liquidity of a bank. The upper graph in Figure 4.23 illustrates this trade-off between ROE and liquidity. Liquidity here is the ratio of cash and due from banks to total assets. At a glance, there appears to be no relationship between ROE and the liquidity ratio. However, the correlation coefficient between them indicates that although the magnitude is small, they are negatively correlated (-0.327). This implies that to make more profits, a bank must reduce its liquidity. In other words, a bank must take more liquidity risk in order to increase its earnings.

As discussed earlier, to increase the ROE of a bank, a bank must increase ROA and/or EM. Since EM is the reciprocal of the capital-to-asset ratio, as EM increases, the capital-to-asset ratio decreases. Accordingly, as the capital-to-asset ratio increases, the ROE of a bank decreases *ceteris paribus*. Therefore, a negative relationship is expected between profitability and the capital-to-asset ratio of a bank. The lower graph in Figure 4.23 illustrates this trade-off between ROE and the capital-to-asset ratio. The capital-to-asset ratio is defined as the ratio of core capital to total assets. The lower graph in Figure 4.23 shows that a strong negative relationship exists between them. The correlation coefficient between ROE and the capital ratio is -0.658. This implies that to obtain a higher ROE, a bank must reduce its capital ratio, which means that a bank must increase its EM in order to increase its ROE.

In brief, the risk-return trade-off in the Korean banks was analysed. Examining the relationships between means of ROE and NIM and their variances reveals that returns and the

<Table 4.16>

ROE, Liquidity and Capital Ratio (CBs)

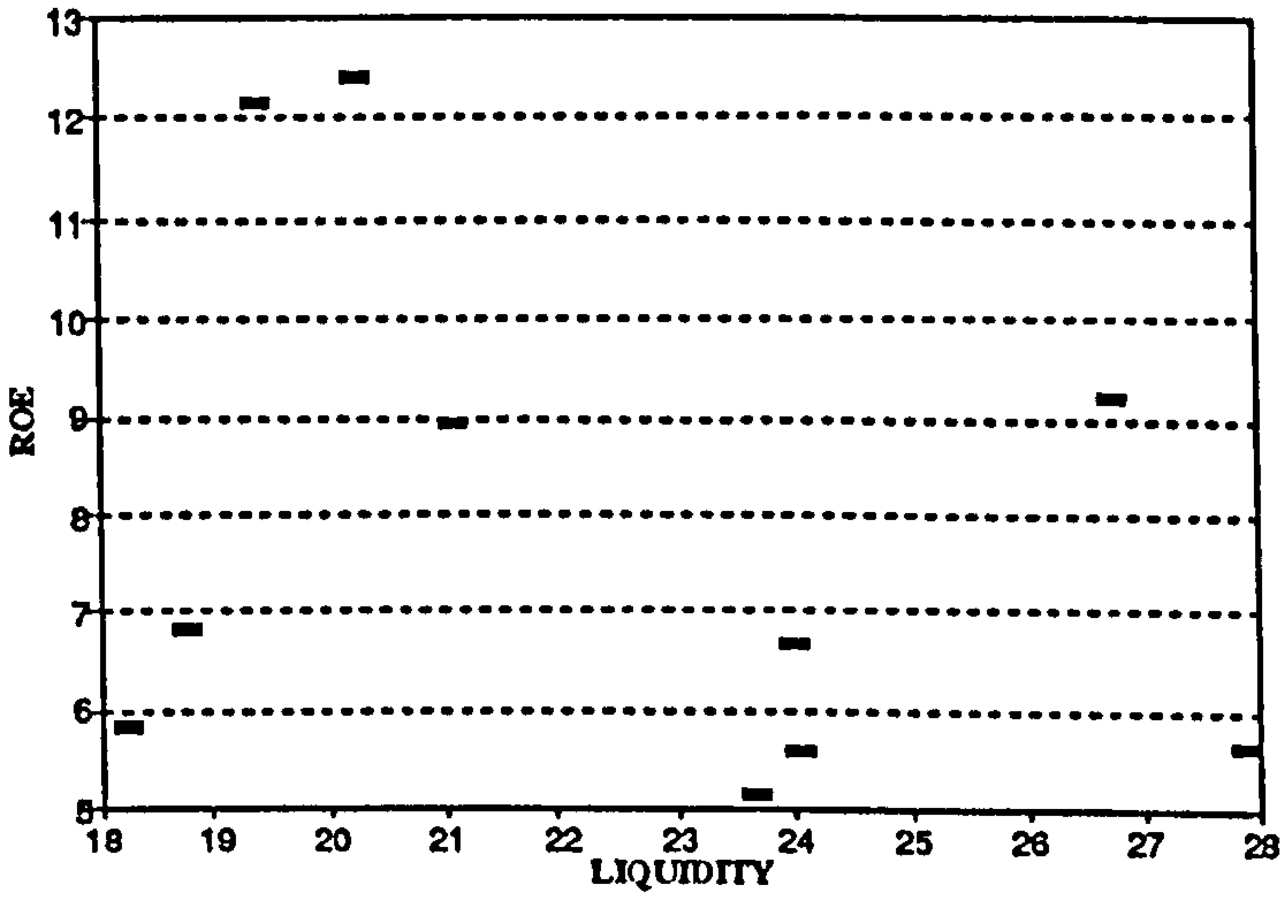
Unit: %

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
ROE	6.83	5.84	12.40	12.17	8.91	9.22	5.64	5.15	5.59	6.68
LQ	18.75	18.23	20.30	19.44	21.09	26.78	27.90	23.69	24.05	24.03
CAP	4.08	4.49	4.19	4.04	4.25	4.59	8.66	14.08	11.51	9.62

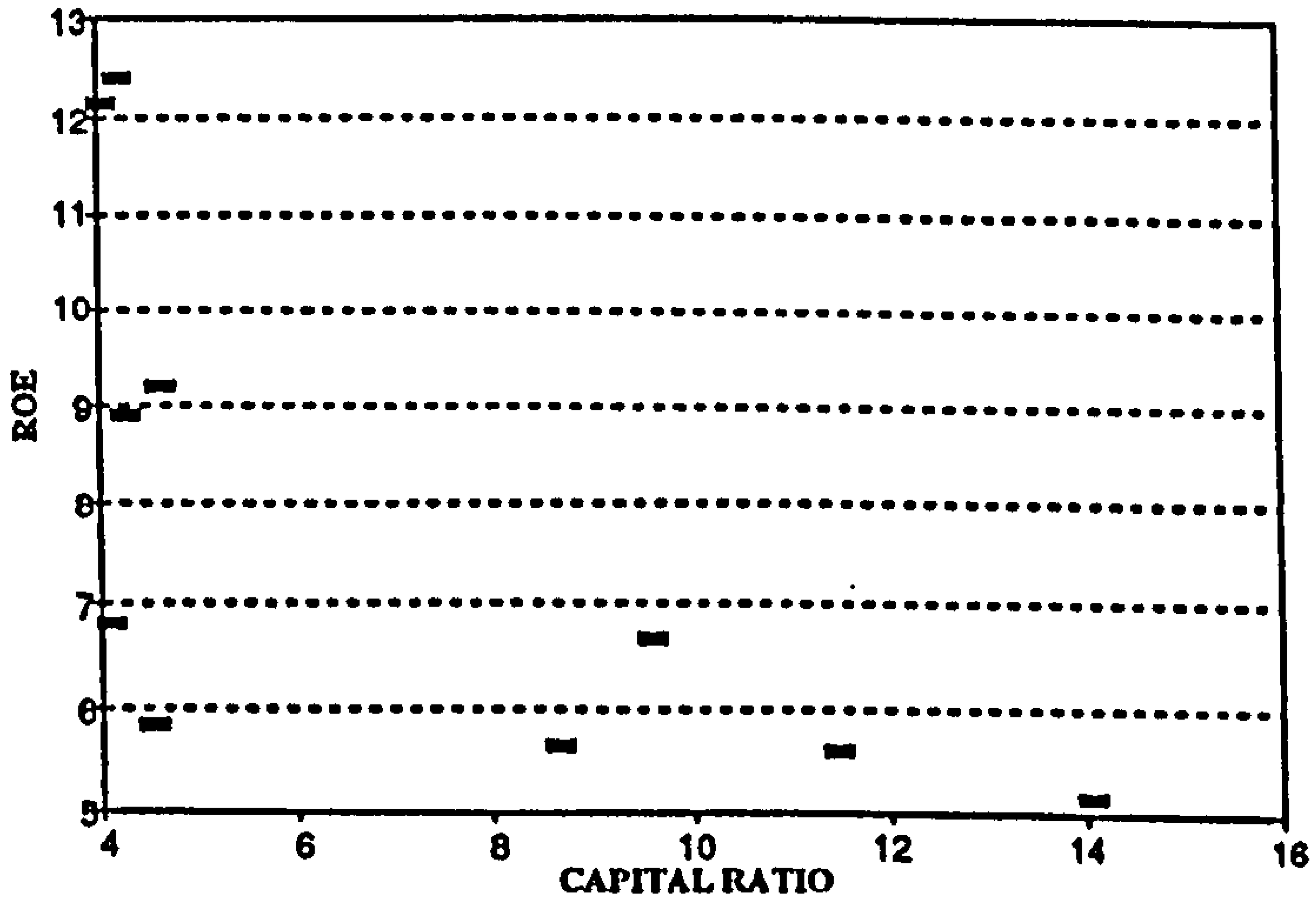
NOTES: <1>LQ represents the ratio of cash and dues from banks to total assets.
<2>CAP represents the ratio of core capital to total assets.

<Figure 4.23>

Trade-off between ROE, Liquidity and Capital
[ROE vs Liquidity]



[ROE vs Capital]



variability of returns are positively and strongly correlated. This implies that to obtain more earnings, a bank must take more risks. Analysing the relationship between ROE and the liquidity ratio and capital-to-asset ratio indicates that, as theory suggests, they are negatively correlated. Therefore, to increase the ROE of a bank, a bank must reduce its liquidity and capital position. This implies that as the liquidity of a bank's portfolio increases, a bank's profitability will correspondingly decrease. Furthermore, as a bank becomes safer in terms of capital cushion, the profitability of a bank will also deteriorate.

4.3 THE ROE DECOMPOSITION ANALYSIS

4.3.1 A Framework: ROE Model

The source(s) of a bank's profitability and its respective variability through time can be explored more rigorously by analysing the determinants of ROE. This technique is referred to as ROE decomposition analysis. ROE can be calculated in a number of ways depending upon how the numerator and denominator of the ratio are specified. In general, ROE measures profits per currency unit (e.g. pound, dollar, or Korean won, etc.) of bank capital. Since there are several definitions of profits and capital, ROE figures may be calculated in a number of ways. The definition of ROE in this study employs net income after tax in the numerator and core capital (consisting of common stock, capital surplus and earned surplus) in the denominator. Net income after tax is utilised because it reflects the 'bottom line' of banks; core capital is employed because of the emphasis on shareholders' return as a short-run proxy for long-run value maximisation. The basic ROE model is presented in Table 4.17.

The first stage of ROE decomposition analysis splits ROE into its ROA and EM components. The second stage of the decomposition analysis splits ROA into profit margin (PM) and asset utilisation (AU) components. Stage three involves a detailed examination of both PM and AU.

To carry out ROE decomposition analysis, four sets of accounting information are required (Sinkey, 1992):

(1) net income;

(2) total operating income;

(3) average assets;

(4) average equity.

<Table 4.17> The Return on Equity Model

$$\text{ROE} = \text{ROA} \times \text{EM}$$

$$= \text{PM} \times \text{AU} \times \text{EM}$$

or

$$\frac{\text{Net Income}}{\text{Core Capital}} = \frac{\text{Net Income}}{\text{Operating Income}} \times \frac{\text{Operating Income}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Core Capital}}$$

$$= \frac{\text{Net Income}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Core Capital}}$$

$$= \frac{\text{Net Income}}{\text{Core Capital}}$$

The first two are *flow* variables that come from a bank's income statement, while the last two are *stock* variables that come from the balance sheet. To make the stock and flow variables more compatible, average balance-sheet figures should be used. As a practical matter, however, we will use year-end balance-sheet data because of convenience of calculation . Furthermore, as long as the comparative or trend data are calculated in the same manner, we will get the same results.

4.3.2 ROE Decomposition Analysis

The purpose of decomposition analysis is to measure and evaluate the impact of the controllable and non-controllable factors on the ROA and coincidentally on the ROE. Decomposition analysis provides the information necessary for management to evaluate the results of discretionary changes in the controllable factors. In addition, ROE decomposition analysis permits management to evaluate the impact of external factors (e.g., a change in regulatory policy) on the bank's profitability goal. This information may allow the bank to position itself more advantageously and monitor more accurately its profit plan.

As discussed earlier in this section and shown in Table 4.17, the first stage of ROE decomposition analysis is to break down the ROE into the ROA and EM:

$$\text{ROE} = \text{ROA} \times \text{EM} \qquad (4.1)$$

$$= \frac{\text{Net Income After Tax}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Core Capital}}$$

The above relationship between ROE and ROA reminds us that a bank's return to its shareholders is highly sensitive to how the bank's assets are financed - whether more debt (including deposits) or more capital is used. Even a bank with a low ROA can achieve a relatively high ROE through heavy use of debt (larger EM) and minimal use of capital. In fact, the above equation shows quite clearly the fundamental trade-off bank managers face between risk and return.

Table 4.18 and Figure 4.24 illustrate the first stage of ROE decomposition analysis during the period 1982-1991 for each bank (Panel A) and for each group (Panel B) of the Korean banks. Focusing on Panel B of Table 4.18, ROE for CBs sharply rose in 1984 and thereafter gradually decreased until 1989. Since 1989, ROE for CBs has been on an upward trend. ROA also rose in 1984 and thereafter gradually decreased for three consecutive years. Since 1987, however, ROA for CBs rose sharply until 1990. On the other hand, although some fluctuation occurred, the EM for CBs dropped dramatically

<Table 4.18>

ROE Decomposition Analysis : Stage 1

<A> By Banks

Unit: %, times

BANKS\YEAR		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
HANIL	ROE	7.21	3.14	6.49	3.20	3.27	3.98	7.27	6.58	7.07	7.65
	ROA	0.16	0.10	0.20	0.09	0.10	0.15	0.39	0.62	0.56	0.53
	EM	45.32	32.09	32.78	35.88	31.40	26.99	18.87	10.64	12.70	14.32
COMMER	ROE	5.40	2.31	6.05	3.08	2.46	1.92	3.18	4.10	5.82	5.67
	ROA	0.13	0.07	0.18	0.08	0.08	0.07	0.15	0.33	0.39	0.33
	EM	42.18	33.74	33.24	36.46	32.73	28.73	20.85	12.57	15.03	17.23
FIRST	ROE	4.37	2.88	9.57	3.69	3.83	3.74	6.13	6.37	7.09	7.84
	ROA	0.10	0.08	0.26	0.09	0.11	0.13	0.30	0.57	0.50	0.50
	EM	46.01	35.61	36.71	40.62	34.12	28.17	20.46	11.12	14.05	15.54
CHOHUN	ROE	4.47	2.85	3.62	3.36	3.03	2.55	4.58	6.54	6.57	6.87
	ROA	0.10	0.08	0.10	0.09	0.09	0.09	0.21	0.57	0.47	0.46
	EM	46.88	36.30	37.63	38.81	34.20	29.39	21.37	11.47	13.89	14.96
SEOUL	ROE	4.20	2.77	5.63	3.54	3.93	3.09	5.75	5.69	4.89	5.25
	ROA	0.11	0.10	0.19	0.11	0.14	0.12	0.33	0.54	0.39	0.38
	EM	36.66	28.97	29.03	32.73	28.49	25.76	17.66	10.45	12.66	13.74
KEB	ROE	3.64	1.29	2.69	2.61	3.78	4.01	5.72	5.76	5.03	3.85
	ROA	0.14	0.05	0.09	0.09	0.13	0.15	0.22	0.23	0.18	0.17
	EM	25.85	26.06	28.34	29.67	28.61	27.29	25.58	25.11	28.55	23.04
SHINHAN	ROE	-3.96	4.37	8.35	10.36	9.56	17.07	13.32	5.72	8.74	9.61
	ROA	-0.41	0.24	0.39	0.34	0.42	0.65	0.78	0.97	1.21	1.12
	EM	9.58	18.20	21.19	30.21	22.98	26.25	17.11	5.87	7.20	8.57
KORAM	ROE	**	-3.77	5.46	5.64	8.33	12.25	10.52	4.68	8.14	10.23
	ROA	**	-0.45	0.38	0.25	0.28	0.35	0.51	0.63	0.68	0.59
	EM	**	8.40	14.49	22.62	29.45	35.08	20.67	7.44	12.01	17.38
DAEGU	ROE	2.15	1.00	7.29	4.57	5.13	4.57	5.30	3.56	7.23	8.05
	ROA	0.08	0.04	0.24	0.15	0.14	0.15	0.38	0.49	0.78	0.72
	EM	27.30	26.70	30.80	30.00	36.20	31.10	14.10	7.20	9.30	11.20
PUSAN	ROE	6.14	5.21	7.97	3.10	2.72	1.59	1.00	1.65	5.62	6.05
	ROA	0.17	0.13	0.20	0.07	0.08	0.05	0.06	0.15	0.42	0.39
	EM	35.80	38.60	39.60	44.00	34.10	29.10	15.50	10.70	13.50	15.60
CCB	ROE	5.55	3.31	17.43	7.40	9.25	6.95	4.81	5.99	8.07	6.60
	ROA	0.29	0.15	0.74	0.36	0.50	0.40	0.53	1.02	1.02	0.70
	EM	19.10	22.30	23.40	20.40	18.40	17.30	9.10	5.90	7.90	9.40
CBUK	ROE	1.76	2.76	2.72	3.01	3.22	3.02	3.32	3.42	6.67	6.18
	ROA	0.05	0.10	0.11	0.15	0.14	0.11	0.54	0.77	1.12	0.76
	EM	35.30	28.30	25.10	19.90	23.10	26.80	6.10	4.40	6.00	8.10
KGB	ROE	3.16	3.81	14.82	9.41	10.81	5.37	4.74	5.85	7.99	7.59
	ROA	0.13	0.13	0.64	0.37	0.48	0.30	0.52	1.01	1.02	0.82
	EM	23.90	28.30	23.30	25.30	22.60	17.60	9.20	5.80	7.80	9.20
KANGWO	ROE	13.55	13.54	19.73	19.05	11.99	5.51	6.88	6.96	6.79	7.25
	ROA	1.32	1.22	1.78	1.86	1.22	0.64	1.25	1.70	1.25	0.91
	EM	10.30	11.10	11.10	10.20	9.90	8.60	5.50	4.10	5.40	7.90
JBUK	ROE	1.28	2.01	6.49	6.23	3.80	5.34	4.73	5.85	7.57	6.75
	ROA	0.06	0.08	0.20	0.21	0.11	0.24	0.90	1.48	1.65	1.14
	EM	21.70	25.00	32.90	29.50	33.30	22.50	5.30	4.00	4.60	5.90
KNB	ROE	3.18	4.99	16.04	8.17	7.64	5.74	4.49	4.28	7.24	7.46
	ROA	0.16	0.20	0.61	0.34	0.30	0.20	0.44	0.70	0.90	0.76
	EM	20.00	25.00	26.20	24.30	25.70	29.40	10.10	6.10	8.00	9.80
KWANGJ	ROE	7.90	5.77	12.12	10.50	4.85	3.13	4.16	-7.24	6.06	4.47
	ROA	0.36	0.27	0.64	0.56	0.26	0.17	0.42	-1.33	0.79	0.57
	EM	21.80	21.70	18.90	18.70	18.50	18.00	10.00	5.40	7.60	7.90
CHEJU	ROE	4.10	4.38	13.60	20.46	15.41	15.41	4.48	5.82	5.06	10.77
	ROA	0.20	0.22	0.81	1.20	1.13	1.14	0.32	0.57	0.94	1.80
	EM	20.70	19.80	16.90	17.00	13.60	13.60	14.10	10.20	5.40	6.00
KLTCB	ROE	13.89	10.66	11.50	11.63	12.00	11.96	11.15	6.45	9.94	12.00
	ROA	1.26	0.86	0.84	0.70	0.66	0.58	0.79	0.83	0.86	0.72
	EM	11.06	12.42	13.64	16.53	18.31	20.56	14.13	7.76	11.60	16.76

NOTE: "**" denotes that KorAm Bank was not established in 1982.

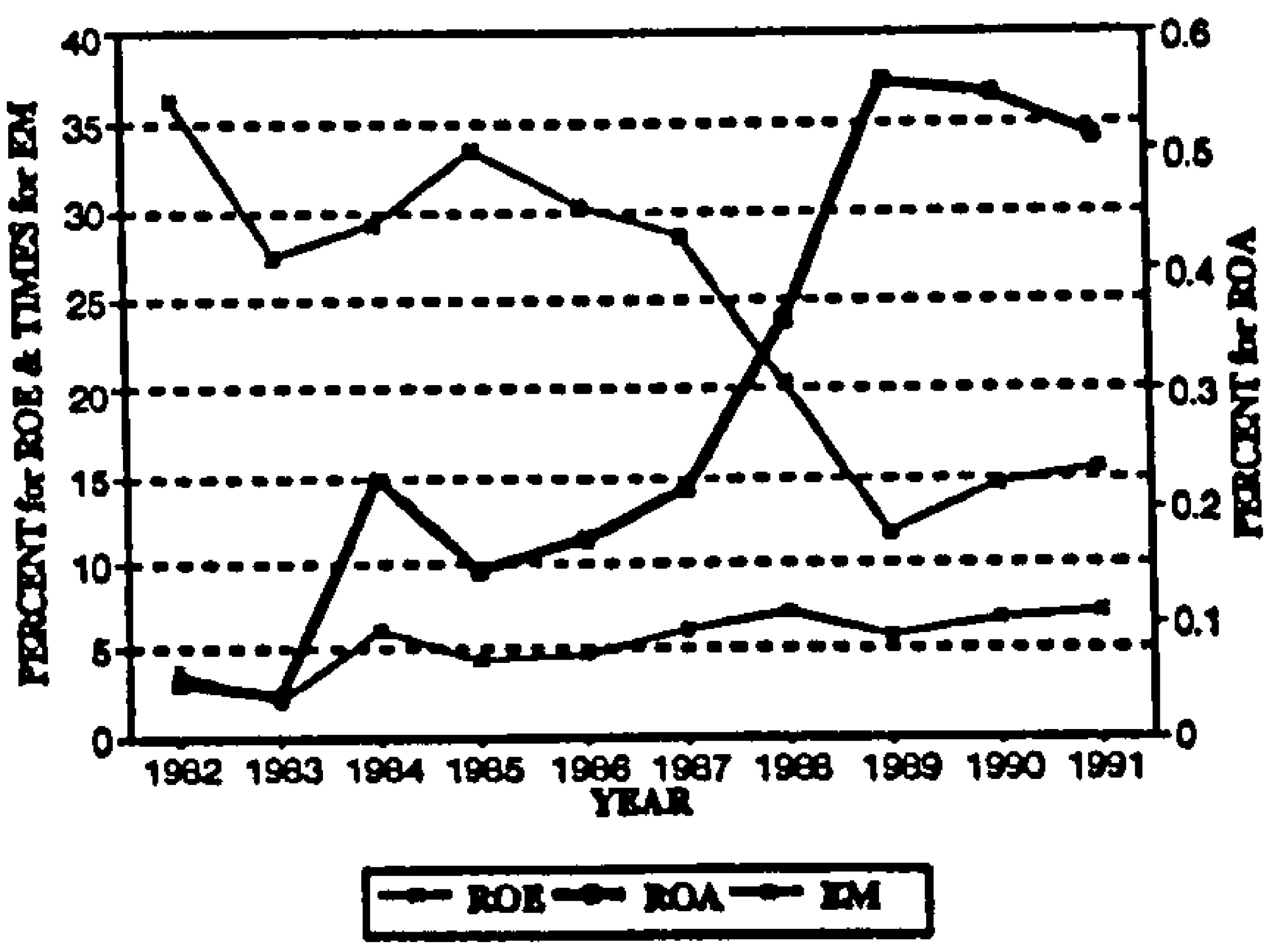
<Table 4.18 continued>
<B> By Groups

Unit: %, times

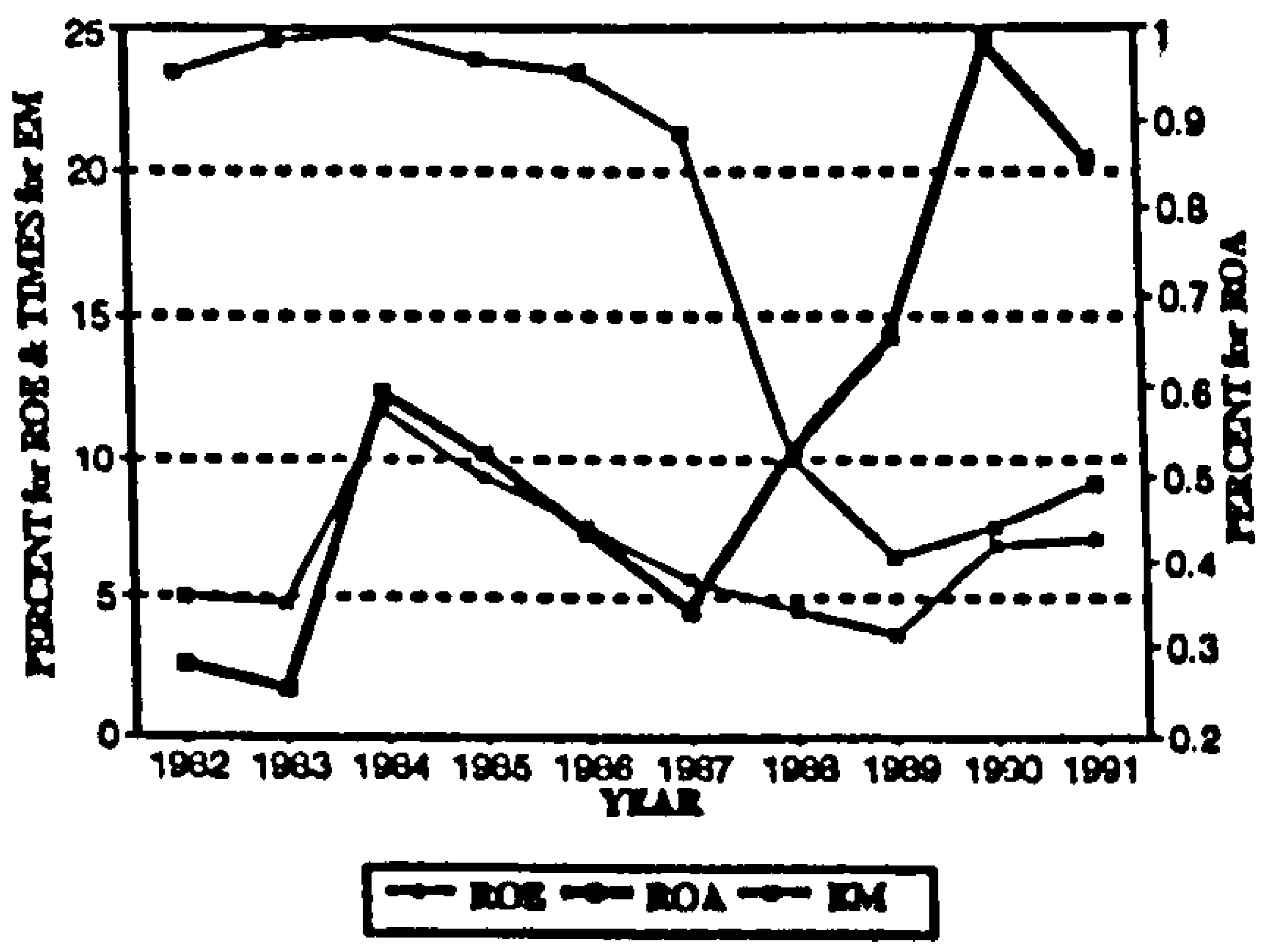
BANKS\YEAR		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
NCBs	ROE	3.62	1.98	5.98	4.44	4.78	6.08	7.06	5.68	6.67	7.12
	ROA	0.05	0.03	0.22	0.14	0.17	0.21	0.36	0.56	0.55	0.51
	EM	36.07	27.42	29.17	33.37	30.25	28.46	20.32	11.83	14.51	15.60
RBs	ROE	4.88	4.68	11.82	9.19	7.48	5.66	4.39	3.61	6.83	7.12
	ROA	0.28	0.25	0.60	0.53	0.44	0.34	0.54	0.66	0.99	0.86
	EM	23.60	24.70	24.80	23.90	23.50	21.40	9.90	6.40	7.60	9.10
CBs	ROE	4.12	3.48	9.23	7.08	6.28	5.85	5.58	4.53	6.76	7.12
	ROA	0.17	0.16	0.43	0.36	0.32	0.28	0.46	0.61	0.79	0.70
	EM	27.13	25.90	26.76	28.13	26.52	24.54	14.53	8.80	10.64	11.99

<Figure 4.24> ROE Decomposition Analysis: Stage 1

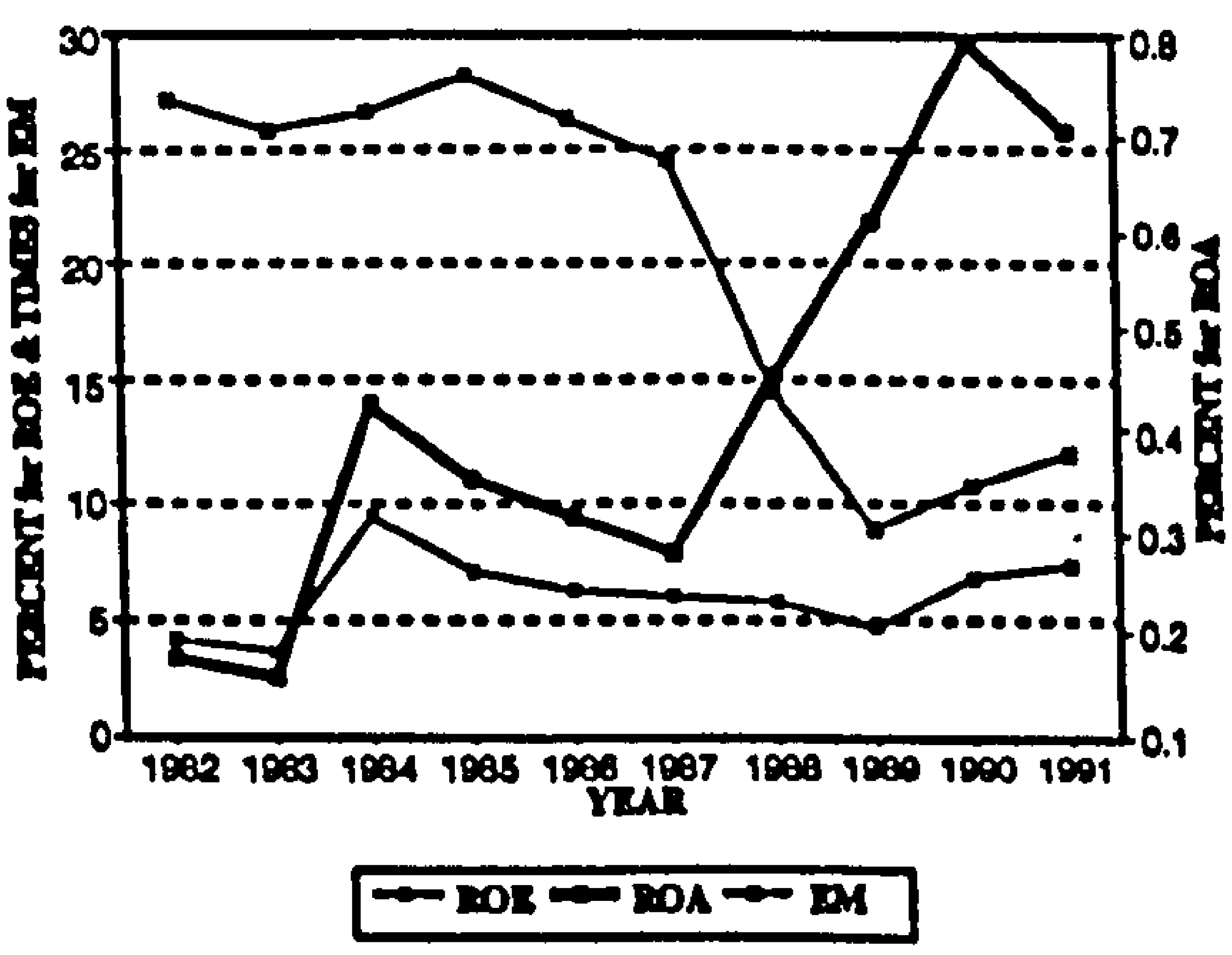
[NCBs]



[RBs]



[All Commercial Banks]



until 1989 and, thereafter, began to rise slightly again. Analysing the trends in ROE, ROA and EM for CBs reveals that although the impact of the decline in EM was offset by the increase in ROA, the downward trend in ROE derives mainly from the decline in EM. The risk-return trade-off is fairly obvious: lower profitability (greater risk) but a stronger capital position (greater safety).

Regarding NCBs, Panel B of Table 4.18 and Figure 4.24 show almost the same movement in EM as in CBs but slightly different movements in ROE and ROA. ROE for NCBs gradually increased since 1983 and was relatively stable over time. ROA for NCBs rose in 1984 and dropped in 1985, as in the case of CBs. However, the ROA for NCBs increased continuously until 1989 and thereafter, dropped slightly. Despite the adverse impact of the decline in EM, NCBs gradually increased their ROE through improving their ROA. However, as shown in Table 4.5, the magnitude of ROA for NCBs is still lower than that for the RBs. As for RBs, ROE, ROA and EM fluctuated more widely than for the NCBs. Furthermore, although RBs improved their ROA since 1987, it seems that the adverse impact of the decreased EM on ROE was relatively more severe than NCBs.

To examine closely the trade-off between risk and return, let us compare NCBs to RBs. During the period 1982-1991, the average ROE of NCBs (5.38%) is similar to RBs (6.57%) as shown in Table 4.18, whereas ROA of NCBs is always lower than RBs. To maintain the similar level of ROE, NCBs boost their comparative lower ROA through higher leverage (EM). In other words, they took more risk. As shown in Table 4.18, the EMs of NCBs are always higher than those of RBs. The fundamental risk-return trade-off is shown once again to exist in Korea.

To examine closely how the risk-return trade-off does work in the Korean banks, let us focus on 1991. Panel B of Table 4.18 shows that the average ROE of NCBs is the same as the RBs (7.12%). However, Table 4.18 also illustrates that the ROA of NCBs (0.51%) is lower than RBs (0.86%). How can NCBs have the same ROE as RBs? The answer is quite straightforward. The only way to achieve the same ROE as the RBs is for the NCBs to take on more risk. Table 4.18 shows that the average EM of NCBs (15.6X) is much higher than

RBs (9.1X). Panel A of Table 4.18 also shows this fact at a glance of individual banks. To maintain or increase the ROE, the banks must increase the ROA or take more risk or increase both. Looking at the performance of the most recent four years in Table 4.18, the Shinhan Bank and the KorAm Bank show the high performance. Although their EMs are relatively smaller than other banks, they have achieved high performance through increasing their ROA. Most RBs show high ROA, but take less risk. Accordingly, their overall performance (ROE) is not so favourable, compared with NCBs, especially since 1987.

The second stage of ROE decomposition analysis is to further break down ROA into PM and AU, that is

$$ROA = PM \times AU \qquad (4.2)$$

Each component of this equation is a telltale indicator of a different aspect of the bank's operations. For example, PM reflects the effectiveness of expense management and service pricing policies, while AU reflects the portfolio management policies, especially the mix and yield on the bank's assets (Rose, 1991). If any of these ratios begin to decline, management needs to pay close attention to this development and assess the reasons behind the change. Table 4.19 (like Table 4.18) is the unified table of Tables 4.5, B.1 and B.2 (in Appendix B). Although Table 4.19 does not explain more than its constituent tables (i.e., Tables 4.5, B.1 and B.2), it shows directly at a glance the sources of ROA. Table 4.19 and Figure 4.25 illustrate that although some fluctuations occurred, PM has increased remarkably, especially since 1987, whereas AU is relatively stable over time. This implies that (as clearly shown in Figure 4.25) the changes in ROA derive mainly from the changes in PM. Furthermore, the higher ROA of the RBs stems from relatively higher PM and AU than NCBs. During the entire period, RBs produced higher PM and AU than NCBs. Although the PM and AU of Kangwon Bank have decreased in recent years, it has the highest ROA with high PM and AU during the entire period. When the unfavourable performance is excluded for Shinhan Bank in 1982, the Shinhan Bank is ranked second

<Table 4.19>

ROE Decomposition Analysis: Stage 2

<A> By Banks

Unit: %

BANKS\YEAR		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
HANIL	ROA	0.16	0.10	0.20	0.09	0.10	0.15	0.39	0.62	0.56	0.53
	PM	2.54	1.54	3.10	1.37	1.56	2.34	6.01	8.91	8.50	8.18
	AU	6.28	6.34	6.39	6.48	6.67	6.31	6.41	6.94	6.55	6.53
COMMER	ROA	0.13	0.07	0.18	0.08	0.08	0.07	0.15	0.33	0.39	0.33
	PM	2.12	1.24	2.94	1.34	1.17	1.07	2.54	4.93	6.07	4.85
	AU	6.03	5.50	6.19	6.30	6.44	6.24	6.01	6.62	6.38	6.78
FIRST	ROA	0.10	0.08	0.26	0.09	0.11	0.13	0.30	0.57	0.50	0.50
	PM	1.42	1.35	4.00	1.37	1.61	2.05	4.72	8.05	8.05	7.56
	AU	6.69	6.01	6.53	6.65	6.96	6.47	6.34	7.12	6.27	6.67
CHOHUN	ROA	0.10	0.08	0.10	0.09	0.09	0.09	0.21	0.57	0.47	0.46
	PM	1.54	1.35	1.67	1.49	1.48	1.48	3.74	8.74	7.60	6.81
	AU	6.18	5.81	5.76	5.82	5.99	5.85	5.74	6.53	6.22	6.75
SEOUL	ROA	0.11	0.10	0.19	0.11	0.14	0.12	0.33	0.54	0.39	0.38
	PM	1.72	1.63	3.02	1.74	2.03	2.00	5.49	8.28	6.28	5.74
	AU	6.64	5.87	6.42	6.23	6.78	5.99	5.94	6.57	6.15	6.65
KEB	ROA	0.14	0.05	0.09	0.09	0.13	0.15	0.22	0.23	0.18	0.17
	PM	2.14	0.86	1.44	1.40	2.16	2.45	3.34	2.95	2.65	2.65
	AU	6.58	5.77	6.57	6.30	6.12	6.00	6.69	7.77	6.66	6.30
SHINHAN	ROA	-0.41	0.24	0.39	0.34	0.42	0.65	0.78	0.97	1.21	1.12
	PM	-21.11	6.01	7.50	6.36	7.90	10.42	12.26	15.27	17.42	16.39
	AU	1.96	3.99	5.26	5.39	5.27	6.24	6.35	6.38	6.97	6.85
KORAM	ROA	**	-0.45	0.38	0.25	0.28	0.35	0.51	0.63	0.68	0.59
	PM	**	-14.79	6.20	4.32	4.82	5.96	8.26	10.23	14.82	13.71
	AU	**	3.04	6.09	5.78	5.87	5.86	6.16	6.15	4.57	4.29
DAEGU	ROA	0.08	0.04	0.24	0.15	0.14	0.15	0.38	0.49	0.78	0.72
	PM	0.99	0.57	3.43	2.12	2.07	2.04	4.92	6.71	10.84	9.61
	AU	7.91	6.64	6.89	7.17	6.84	7.21	7.63	7.37	7.15	7.46
PUSAN	ROA	0.17	0.13	0.20	0.07	0.08	0.05	0.06	0.15	0.42	0.39
	PM	1.98	1.86	2.62	0.88	0.94	0.68	0.74	1.94	5.38	4.43
	AU	8.67	7.27	7.67	8.04	8.49	8.06	8.63	7.92	7.72	8.77
CCB	ROA	0.29	0.15	0.74	0.36	0.50	0.40	0.53	1.02	1.02	0.70
	PM	3.02	2.26	10.20	4.20	5.83	5.15	6.29	13.98	15.12	9.82
	AU	9.59	6.58	7.29	8.64	8.65	7.81	8.44	7.26	6.77	7.16
CBUK	ROA	0.05	0.10	0.11	0.15	0.14	0.11	0.54	0.77	1.12	0.76
	PM	0.50	1.68	1.60	2.09	1.78	1.50	6.62	8.54	15.98	11.18
	AU	9.91	5.79	6.77	7.26	7.82	7.50	8.17	9.07	7.00	6.82
KGB	ROA	0.13	0.13	0.64	0.37	0.48	0.30	0.52	1.01	1.02	0.82
	PM	1.29	1.88	7.48	4.27	5.41	3.68	6.03	12.79	13.50	10.18
	AU	10.25	7.14	8.50	8.72	8.82	8.29	8.57	7.89	7.57	8.07
KANGWO	ROA	1.32	1.22	1.78	1.86	1.22	0.64	1.25	1.70	1.25	0.91
	PM	12.11	13.81	19.01	17.20	13.71	8.60	15.34	22.33	19.32	14.40
	AU	10.88	8.85	9.36	10.82	8.87	7.43	8.17	7.62	6.50	6.33
JBUK	ROA	0.06	0.08	0.20	0.21	0.11	0.24	0.90	1.48	1.65	1.14
	PM	0.82	1.29	3.57	3.22	1.72	3.36	12.41	21.45	23.02	16.53
	AU	7.19	6.24	5.54	6.56	6.64	7.07	7.25	6.89	7.18	6.89
KNB	ROA	0.16	0.20	0.61	0.34	0.30	0.20	0.44	0.70	0.90	0.76
	PM	1.82	2.74	7.73	3.70	3.62	2.69	5.21	9.59	13.30	10.46
	AU	8.76	7.27	7.90	9.08	8.20	7.26	8.51	7.32	6.77	7.24
KWANGJ	ROA	0.36	0.27	0.64	0.56	0.26	0.17	0.42	-1.33	0.79	0.57
	PM	6.55	5.35	10.30	8.71	3.68	2.73	5.09	-19.81	11.91	7.75
	AU	5.53	4.98	6.24	6.44	7.13	6.37	8.17	6.71	6.67	7.31
CHEJU	ROA	0.20	0.22	0.81	1.20	1.13	1.14	0.32	0.57	0.94	1.80
	PM	2.46	3.14	10.77	15.27	12.41	12.41	4.02	6.43	11.01	20.55
	AU	8.04	7.05	7.48	7.88	9.15	9.15	7.89	8.85	8.51	8.76
KLTCB	ROA	1.26	0.86	0.84	0.70	0.66	0.58	0.79	0.83	0.86	0.72
	PM	8.91	7.01	7.41	6.59	5.91	5.72	8.25	10.03	11.46	9.57
	AU	14.11	12.24	11.37	10.67	11.10	10.18	9.57	8.29	7.48	7.49

NOTE: "**" denotes that KorAm Bank was not established in 1982

<Table 4.19> (Continued)

<B> By Groups

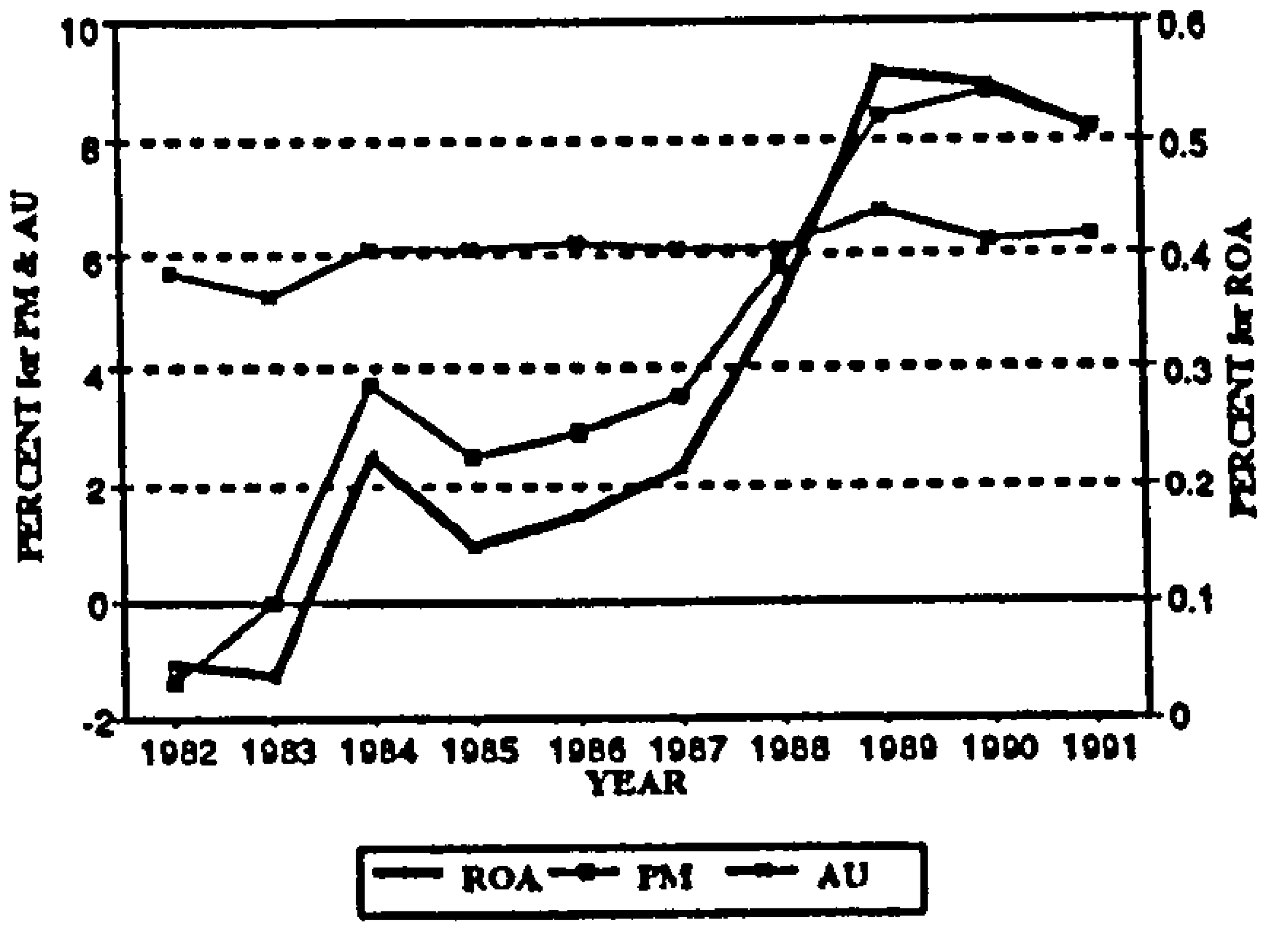
Unit: %

BANKS\YEAR		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
NCBs	ROA	0.05	0.03	0.22	0.14	0.17	0.21	0.36	0.56	0.55	0.51
	PM	-1.38	-0.10	3.73	2.42	2.84	3.47	5.79	8.42	8.92	8.24
	AU	5.76	5.29	6.15	6.12	6.26	6.12	6.20	6.76	6.22	6.35
RBs	ROA	0.28	0.25	0.60	0.53	0.44	0.34	0.54	0.66	0.99	0.86
	PM	3.16	3.46	7.67	6.17	5.12	4.28	6.67	8.39	13.94	11.49
	AU	8.67	6.78	7.37	8.06	8.06	7.61	8.14	7.69	7.18	7.48
CBs	ROA	0.17	0.16	0.43	0.36	0.32	0.28	0.46	0.61	0.79	0.70
	PM	1.22	1.88	5.92	4.50	4.11	3.92	6.28	8.41	11.71	10.04
	AU	7.06	6.12	6.82	7.20	7.26	6.95	7.28	7.28	6.76	6.98

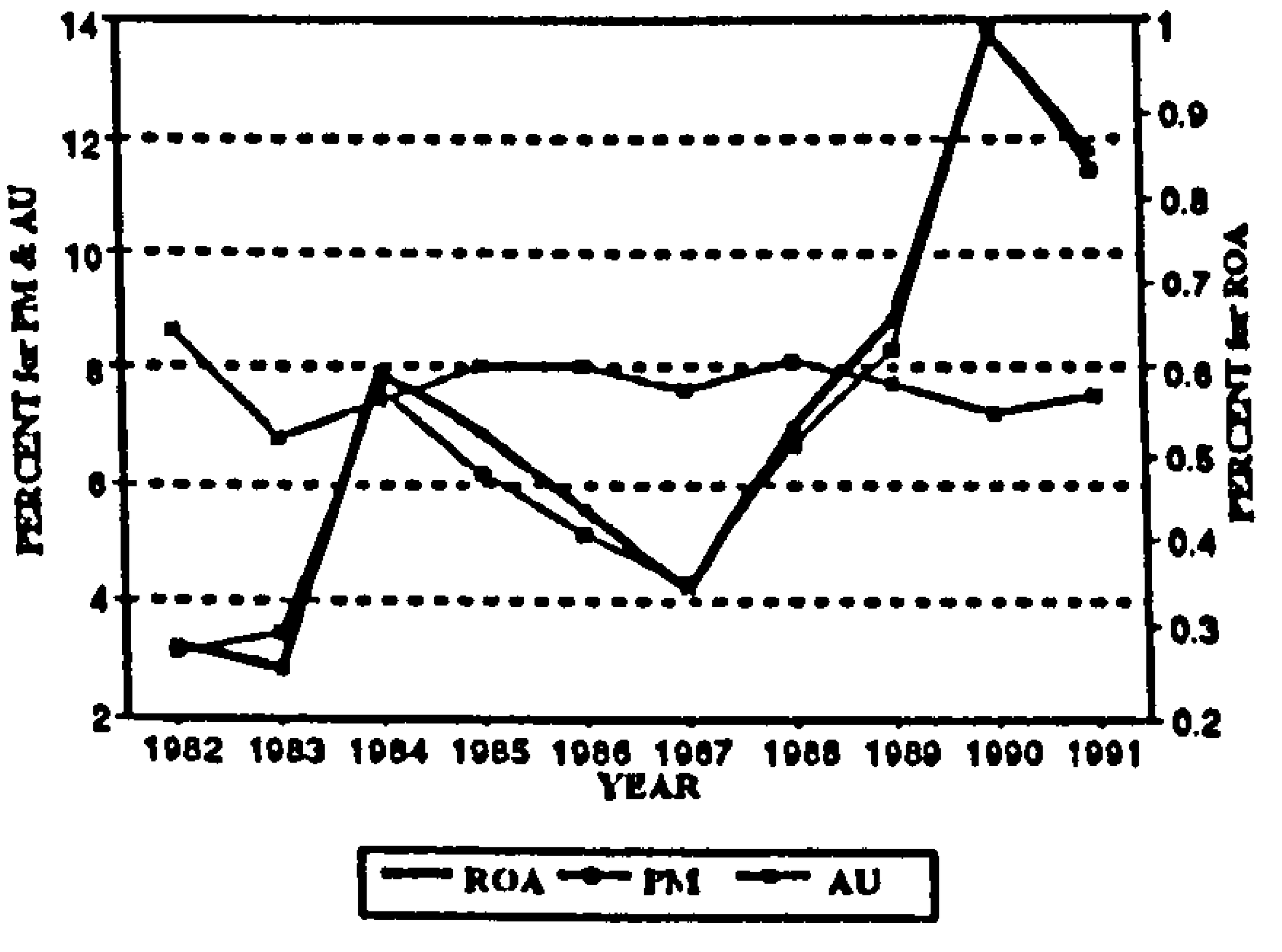
<Figure 4.25>

ROE Decomposition Analysis: Stage 2

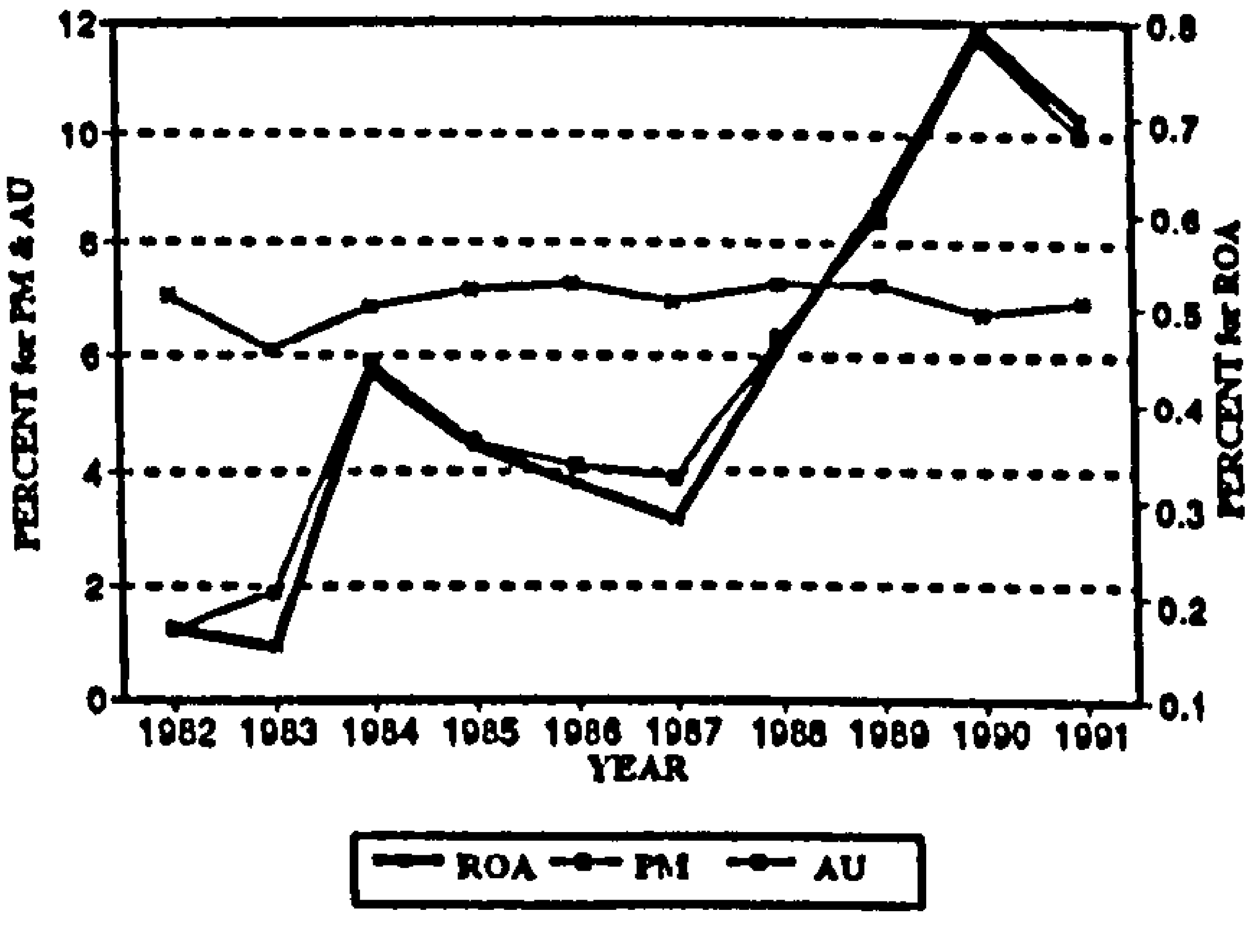
[NCBs]



[RBs]



[All Commercial Banks]



with similar AU but high PM compared with other banks. In 1991, the Cheju Bank shows a remarkable performance: this high performance of the Cheju Bank comes from highest PM (20.55%) and relatively higher AU (8.76%). The Shinhan Bank and the JBUK also achieve high performance: this high performance is achieved by higher PM than other banks.

The third stage of ROE decomposition analysis involves a detailed examination of both PM and AU. The standard diagram of the stage three is summarised in Figure 4.26. In the top branch of the diagram, net income is analysed. The interest expense can be further broken into deposit and non-deposit (e.g., call money). The operating expenses can also be examined further by four components as shown in Figure 4.26. The total income can be analysed in terms of four sources of revenue:

(1) interest and fees on loans;

(2) interest on investments;

(3) fees and service charges; and

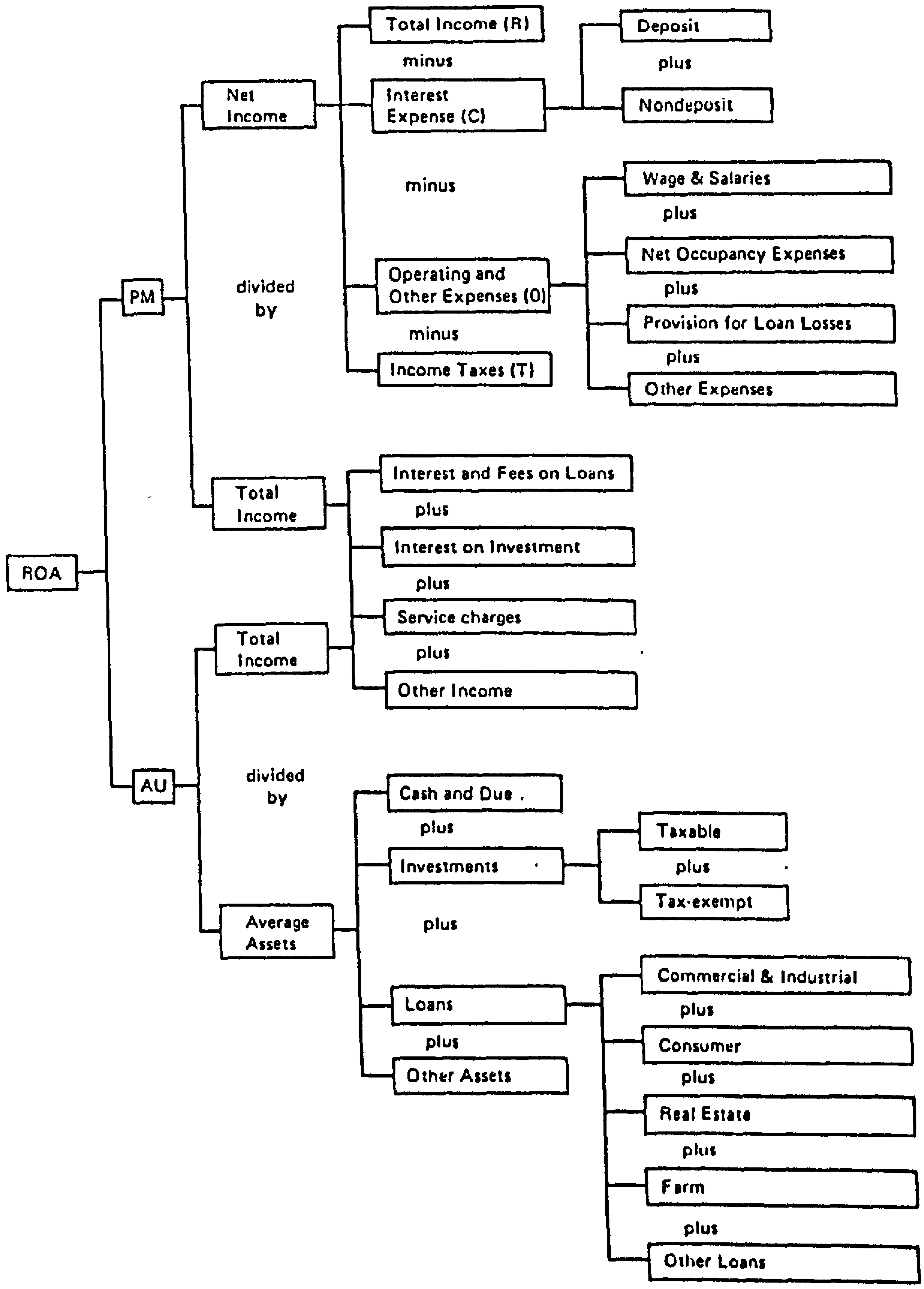
(4) other income.

The final asset branch consist of cash and due, investment, loans and other assets.

The objective of the third stage of ROE decomposition analysis is to identify symptoms of good or bad performance by pinpointing trends or significant differences between groups. The in-depth study of the third stage following Figure 4.26 is beyond the immediate needs of this research. However, we can look at stage three in another way through an investigation of PM using a ratio analysis such as net interest margin ratio, the ratio of interest income to earning assets, the ratio of interest expenses to earning assets, net burden ratio, and operating ratio.

At the second stage of ROE decomposition analysis, we found that RBs had higher ROA and this higher ROA comes from higher PM and AU than NCBs during the entire period. Set aside examining AU, let us focus on PM. The higher PM of RBs is generated by the higher net interest margin ratio in Table B.3 in Appendix B. The net interest margin ratio of RBs is almost three times higher than NCBs during the period as a whole. This higher net interest margin ratio of RBs is generated by the higher ratio of interest income to earn-

<Figure 4.26> ROE Decomposition Analysis: Stage Three



Source: Adapted from Sinkey (1992), p.272

ing assets as shown in Table B.4 in Appendix B, but with a similar ratio of interest expenses to earning assets as the NCBs as shown in Table B.5 in Appendix B. Net burden ratio of NCBs in Table B.6 in Appendix B is lower than that of the RBs. This implies that NCBs control overhead more effectively than RBs. However, the operating efficiency in Table B.7 in Appendix B indicates that the overall costs of NCBs is slightly higher than RBs. One cause of this higher costs of NCBs is the higher ratio of provision for loan losses to total loans as shown in Table B.17 in Appendix B. Table B.17 in Appendix B shows that the ratio of provision for loan losses to total loans of NCBs is much higher than RBs. This means that NCBs may have failed in control of cost, due to failure of loan quality management. Therefore, we may conclude that the lower PM of NCBs stems from the relatively lower net interest margin ratio and higher costs.

In sum, the findings through ROE decomposition analysis are as follows. First, the first stage of ROE decomposition analysis reveals that the changes in ROE for the Korean banks are affected by the changes in both ROA and EM. Although the adverse impact of a drop in EM on ROE was offset by the improved ROA in some years, the decline in ROE was basically and mainly attributable to the precipitous fall in EM. However, it seems that the adverse impact of the decline in EM on ROE is relatively more severe for RBs than NCBs. Nevertheless, the level of ROA for NCBs is much lower than for the RBs during the entire period. Second, the second stage of ROE decomposition analysis shows that the changes in ROA were directly and entirely attributable to the changes in PM. In addition, the higher ROA for RBs stems from higher PM than NCBs. Finally, the third stage of ROE decomposition analysis reveals that the higher PM for RBs is generated by higher NIM.

4.4 CHARACTERISTICS OF HIGH PERFORMANCE BANK

Many researchers in the USA have explained the financial characteristics of high performance commercial banks. These studies have produced several interesting conclusions about the attributes of high performance banks. High performance US banks, regardless of size, have dramatically higher ROAs than their peer groups. This higher ROA is due to both higher revenues and lower expense per dollar of assets. Interest payment, personnel costs, and occupancy expenses were all lower for high-performance commercial banks. In addition, the high performance group held fewer Treasury securities and fixed assets and more tax-exempt issues than the average commercial banks. While it is true that high-performance commercial banks were more highly leveraged than other commercial banks, their extraordinary profitability was due mainly to the ROA rather than EM (Graddy & Spencer, 1990; Sinkey, 1989).

One US study reported that even if high-performance US commercial banks maintained a capital ratio equal to that of the average commercial banks, their ROA would still have been 8% points higher than the mean for the industry. Superior management explains these higher profitability positions (Graddy & Spencer, 1990). According to Ford and Olson (1978), the high-performance banks have three general traits and they include:

(1) maximisation of revenues;

(2) expense control; and

(3) consistently good management.

Although we did not conduct the in-depth study of the third stage of ROE decomposition analysis, we found the same characteristics of high-performance banks in our Korean sample. We identify two high-performance banks based on ROE and ROA: the Shinhan Bank which is a NCB and the Kangwon Bank which is a RB. During the entire period , the average ROE of these two banks are 8.31% for the Shinhan Bank and 11.13% for the Kangwon Bank. The corresponding ROA of these two banks are 0.57% and 1.32%, respectively. These two banks are ranked at the top in each group. However, the performance in terms of ROE for Kangwon Bank has been relatively lower than Shinhan Bank since 1987.

Table 4.18 shows that the EM of these banks is the lowest, while their corresponding ROA is the highest of our bank sample. Therefore, at this stage, we may conclude that the

Shinhan Bank and the Kangwon Bank make very conservative use of financial leverage. In other words, they maintained high capital adequacy ratios. Where does the higher ROA of these two banks come from? Tables 4.19 and B.1 in Appendix B show that it comes from higher PM, and from lower overall costs as shown in Table B.7 in Appendix B. Although the ratio of provision for loan losses to total loans of the Shinhan Bank is the highest, reflecting management's conservative attitudes toward risk as shown in Table B.17 in Appendix B, Table B.7 in Appendix B shows that the overall costs of these two banks are the lowest ones (88.7% for the Shinhan Bank and 80.6% for the Kangwon Bank).

In brief, it is apparent that the first two traits of high-performance US banks identified by Ford and Olson (1978) were also found in our Korean banks. It is also generally known in Korean financial circles that the management of Shinhan Bank is superior to other banks.

4.5 CRITIQUE ON ACCOUNTING APPROACH

This chapter analysed the performance and condition of Korean banks based on accounting data. As discussed earlier (see Section 4.1), accounting data are widely used in practice by bankers and regulators in analysing banking risk and return. Although accounting data reflect some of the impact of prudential bank regulation, they have limitations in monitoring changes in the return and risk profile of banks compared with market-based approach. We will expand on the comparative attractions in this connection of market data in the next chapter.

Criticisms on the accounting approach centre on the following. First, accounting numbers may be manipulated by management. For example, the provision for loan losses relies heavily on management judgment and their attitudes towards risk and, as a result, accounting profits are likely affected. Therefore, accounting data may result in a partial and even incorrect analysis of the risk and return profile of a bank. Second, accounting data do not reflect the true market value of a bank, because those data were booked by historical values. For instance, when the book value of a bank's capital and corresponding market value diverge widely, book value of a bank's capital may not reflect a bank's current risk exposure (see Section 5.2.3 in Chapter 5). Market values are likely to incorporate the true value of capital so long as the capital market is efficient. Third, accounting data are too insensitive to monitor changes in the risk and efficiency of banks (see Chapters 5 & 6; Morgan,III, 1984;Saunders and Ward, 1976). However, market data quickly and accurately reflect available information so long as the market is efficient and, therefore, the market data appears likely to add a useful, additional dimension to evaluating banking risk and return profile for supervisory purposes. Finally, any single ratio or system of ratios based on accounting data or regulatory accounting data, no matter how complex, can never incorporate all of the risk that a bank assumes and, therefore, the supervisory authorities have attempted to incorporate multiple factors into their rating system in order to evaluate the safety and soundness of banks (e.g., the CAMEL rating system in the USA). If the necessary information is provided, however, the market data can evaluate all of these many factors (which influence the risk and return of a bank) into a single number (i.e., stock price).

Taking into account the above criticisms, we will analysed further the market-based approach in evaluating banking risk and return profile for supervisory purposes in subsequent chapters. For present purposes it seems clear that although accounting ratios are still widely used in practice (and, therefore, they are important), market-based analysis offers potential significant advantages in analysing and evaluating banking risk and return. The next chapter and the rest of this thesis will develop this argument.

4.6 SUMMARY

Bank supervision may affect the risk and return profile of the banking firm. Thus, the aim of this chapter was to construct a financial picture of the Korean banks within a risk-return framework. To examine the performance and condition of the Korean banks, nine return measures and five risk measures were analysed. This analysis confirmed *inter alia* that the fundamental trade-off between risk and return exists in Korean banking. Returns (measured by ROE) for Korean banks decreased gradually since 1984. However, the decreases in profitability were followed by the drastic decreases in their risk exposure (measured by variance of ROE). The recent sharp increases in capital adequacy ratios imply that Korean banks became safer in terms of their capital cushion against the unexpected losses.

Finally, some additional caution should be exercised in interpreting the results reported in this chapter. Balance sheet data utilised in our analysis included only the banking account of each bank. The trust account was not included because it was simply not available to the researcher. Therefore, the performance and condition of banks were distorted by this data limitation. The degree of distortion is relatively high in recent years, especially in the case of the Bank of Seoul.

CHAPTER 5

CAPITAL ADEQUACY AND RISK CONTAINMENT: THE ROLE OF THE MARKET

5.1 INTRODUCTION

This chapter examines in more detail the issue of capital adequacy which lies at the heart of bank supervision, and which is central to this thesis. One of the most critical of all banking problems in recent years is the raising and maintenance of 'adequate' capital. Although there is no general agreement on how much capital is 'adequate', one general definition is the amount required to assure that the probabilities of future insolvency are reduced below a predetermined level (Maisel, 1981). An operational problem with this general definition, of course, is deciding the value of these *a priori* probabilities. In fact, capital adequacy is a functional concept that relates bank capital to the overall risk exposure of a bank and, therefore, the level of capital a bank needs should reflect a bank's corresponding risk profile. In this context, capital regulation by the regulatory authorities has become an increasingly important policy tool to help curb the amount of risk exposure that a bank can accept, thereby helping to preserve public confidence in a bank and the banking system as a whole.

The aim of this chapter is to provide a theoretical framework to evaluate the impact of capital adequacy requirements on the Korean banks' risk-return profile. Section 2 focuses on the nature of capital adequacy requirements - the importance and vital roles of capital, the definition of capital, the measurement of capital and modern capital-adequacy appraisal methods. Section 3 examines the micro-finance foundations of capital adequacy, such as the nature of the banking firm, the goals and optimal behaviour of banks, the optimal capital structure and value of the banking firm. Section 4 analyses the impact of capital adequacy regulations on a bank's capital structure and portfolio composition using micro-finance models. Section 5 explores the impact of capital adequacy regulations on banks from the perspective of modern finance theories such as the CAPM, the APT and option pricing theory. Section 6 examines the market's role in bank risk evaluation in order to evaluate the impact of capital regulations and develops a bridge to carry out the empirical studies, which are the main tasks of Chapters 6 and 7. It will be recalled from the last chapter that portfolio theory uses market (real or economic) data in its risk and return analysis. We also examine the comparative, potential advantages of market over accounting data in bank risk analysis.

5.2 THE NATURE OF CAPITAL ADEQUACY REGULATION

5.2.1 The Importance and Roles of Bank Capital

After observing a secular decline in capital ratios in both the UK and the USA during this century, bank regulators in a number of countries have moved in recent years to raise bank capital ratios (Lewis and Davis, 1987). In fact, the re-regulation of bank capital adequacy has been one of the hallmarks of banking throughout the 1970s and 1980s. In all countries and internationally there has been a dramatic re-regulation of bank capital adequacy (Gardener, 1991). However, why have bank supervisors attempted to increase bank capital adequacy? What precise effects do they expect from capital adequacy regulations? The reasons why bank supervisors regulate bank capital are closely related to the roles and/or functions played by bank capital.

Bank capital plays several vital roles in supporting a bank's daily operations and in ensuring the long-run viability of the banking firm. They include (Rose, 1991; Hempel, Coleman & Simonson, 1990; Pecchioli, 1987; Taggart & Greenbaum, 1978):

(1) providing a cushion against the risk of failure (insurance function);

(2) promoting public confidence (public relations aspects);

(3) providing funds to enable banks to obtain a charter and purchase earning assets; and

(4) serving as a regulator of unjustified bank growth (management constraint).

Although the above functions of bank capital are all emphasised, the risk-absorbing role of bank capital seems to attract more widespread emphasis (Hempel, Coleman & Simonson 1990), both in theory and practice. Vojta (1973) stated that bank capital should 'provide protection against unanticipated adversity leading to loss in excess of normal expectation'. In other words, bank capital should absorb unanticipated losses with enough margin to inspire continuing confidence to enable the bank, when under stress, to continue as a going-concern. The risk-absorbing function in order to maintain public confidence in banks and the banking system as a whole is widely accepted as the most important and primary function of bank capital; this is certainly the supervisory emphasis.

Bank safety and the stability of the banking and financial system depend upon the public confidence that depositors and other creditors have in banks and the banking system. Furthermore, since it is a generally accepted view that bank capital acts as a short-term buffer or cushion to absorb unexpected losses arising from all of the risks which banks assume in their operations, bank capital serves as the critical element in generating confidence in a bank's ability to handle uncertainty and as the ultimate defence against loss (Sinkey, 1992; Hempel & Simonson, 1991). This primary, risk-absorbing function of bank capital implies that capital adequacy depends upon the overall riskiness of the bank's portfolio. The probability of insolvency for portfolios with specific variabilities can be reduced to a given level by the requirement of adequate capital. This means that the greater the initial capital cushion against unanticipated losses, the less the probability of insolvency *ceteris paribus* .

In view of the fact that the viability of a bank depends ultimately on the public confidence which depositors and creditors have in banks and the banking system, there is a strong link between capital adequacy and the public policy concern of maintaining confidence. In this regard, Pecchioli (1987) points out: "It is generally recognised that the availability of capital is neither a perfect indicator of the state of health of a bank nor a sufficient condition to ensure the maintenance of confidence by depositors and creditors, but no doubt it represents a major element in shaping their perception of the solidity of an institution".

From the bank safety viewpoint, bank capital has a key role to play in helping to instil discipline on bank management. In this regard, regulators are empowered to impose prudential, mandatory standards on the level and composition of capital and its relationships to risk factors. By acting on the required level of capital adequacy, supervisors are in a position to impose constraints by setting definite boundaries on the potential for expansion of a bank's business (Pecchioli, 1987).

Since bank capital plays several important roles in the operation of a bank and bank capital regulation may play a critical role in the 'risk containment' of banks, capital adequacy requirements have become a central instrument for strengthening supervision. However, the co-existence of different roles played by bank capital leads inevitably to potential differences in defining and measuring bank capital, and in defining and appraising the adequacy of capital from one country to another. Therefore, we will discuss these in the following subsections.

5.2.2 The Definition of Capital

It is not easy to define exactly all of the components of bank capital. These difficulties arise from several causes. Setting aside the co-existence of different functions played by bank capital, they stem mainly from institutional differences, different supervisory approaches, different accounting practices and different approaches towards the handling of non-equity capital instruments. Hence, the definition of capital varies from one country to another. In spite of all these differences, however, there is a certain consensus among supervisors about what comprises capital for supervisory purposes. As explained earlier in this chapter, the key function of capital is to absorb unexpected losses or to act as a kind of 'internal insurance fund' against uncertainty. Therefore, the definition of capital should include that part of capital which is freely available to meet any future losses.

Table 5.1 shows a comparative view of the basic components of capital for solvency purposes in the OECD countries and Korea. It is important to note that this table provides only a summarised picture of capital definitions; many of these definitions are complex. This table shows clearly that all countries emphasise the role of 'core' capital in solvency appraisals (Gardener, 1989).

General agreement obtains on the functions of core capital in bank supervision. Pecchioli (1987) summarises these as follows:

(1) they must be permanently available to absorb losses;

(2) they must not impose contractual charges against earnings; and

(3) they must not be redeemable at the owner's request.

Several balance-sheet items which meet the above criteria include:

(1) paid-up ordinary shares;

(2) irredeemable and mandatorily convertible preference shares;

(3) share premiums; and

(4) disclosed reserves and retained profits.

However, besides core capital, there are many other controversial elements in defining capital which have only some of the characteristics of capital; these include hidden reserves, asset revaluation reserves, loan loss reserves and long-term debt. Whether or not these items are included in capital depends upon the expected roles of bank capital.

Hidden reserves, measured by the differences between the book value and market value of equity stock, may be counted so long as these can absorb unexpected losses. Although there is no general agreement on the inclusion of the revaluation of fixed assets, some countries (e.g., Korea) include revaluations of fixed assets into the definition of bank capital. General provisions for loan losses also have some characteristics of capital in the sense that they can absorb unidentified losses. Over the years, a major debate has developed over whether or not capital notes and debentures should be counted as a part of capital, and

<Table 5.1> Basic Components of 'Capital' For Solvency Purposes

	'Core' Capital (1)	Capital-like Instruments (2)	Asset Revaluation Reserves (3)	Undisclosed Reserves (4)	General Provisions	Subordinated Debt (5)
Australia	Yes		Yes	No	Yes	Yes
Austria	Yes (*)	Yes	NP	No	Yes	(6)
Belgium	Yes		Yes	Yes	Yes	Yes
Canada	Yes (*)		NP	NP	Yes	Yes
Denmark	Yes (*)		Yes	NP	No	Yes
Finland	Yes		No	No	Yes	Yes
France	Yes	Yes	Yes	NP	Yes	Yes
Germany	Yes (*)	Yes	NP	No	No	No
Greece	Yes		Yes	No	No	No
Ireland	Yes		Yes	No	No	Yes
Italy	Yes	Yes	Yes	NP	Yes	No
Japan	Yes (*)		NP	No	Yes	No
Luxembourg	Yes		Yes	No	Yes	Yes
New Zealand	Yes		NP	No		
Netherlands	Yes		Yes	Yes	Yes	Yes
Norway	Yes		Yes	No	No	Yes
Portugal	Yes	Yes	Yes	NP	No	No
Spain	Yes	No	Yes	No	Yes	Yes
Sweden	Yes (*)		No	NP	Yes	Yes
Switzerland	Yes		No	Yes	Yes	Yes
Turkey	Yes	No	Yes	Yes	No	No
U.K.	Yes		Yes	Yes	Yes	Yes
U.S.	Yes (*)		NP	NP	Yes	Yes
Korea	Yes	No	Yes	Yes	Yes	No

Notes: 1) Paid-up capital--including irredeemable preference shares and preference shares mandatorily convertible into ordinary shares, share premium, statutory and legal reserves, and retained profits. In some countries--indicated with (*)-- the inclusion of some of these elements is made subject to certain conditions or other minor elements are also allowed.

2) Mainly participation certificates, and long-term redeemable preference shares.

3) To the extent that they are disclosed in balance sheet.

4) Provided that they are quantified and accepted by the supervisor.

5) The inclusion of subordinated debt may be subject to specific limits.

6) A stricter form of subordinated capital has replaced the former subordinated debt.

NP = Legal or accounting rules do not permit the formation of such reserves.

N.B.: The table is intended to provide a skeleton view of the definition of 'capital' for solvency purposes in OECD member countries and Korea.

Source: Pecchioli (1987), Table 9, p.108.

these have been the major sources of incremental capital during recent years. The answer depends on the purpose for which capital is being defined (Maisel, 1981). If capital is to protect deposit insurance funds and uninsured depositors, then subordinated notes and debentures serve as capital, but if capital is to protect against the occurrence of potential negative net worth this may not hold. Supervisory capital may also include other balance-sheet items, like minority interests in affiliates, in some countries. Balance-sheet items like goodwill, non-consolidated participations and own shares held by banks may also be deducted for solvency purpose (Gardener, 1989), and to avoid 'double-gearing', a bank's equity participations in other banks must also be deducted from the definition of bank capital.

Together with the co-existence of different functions of bank capital, the above factors help to vary the definition of capital across countries. In the early 1980s, however, increased competition internationally led to concern over declining capital levels in international banks and the erosion of reasonable risk-return relationships for banking business. This concern was exacerbated by several financial crises like the continuation of the international debt crisis, the Floating Rate Note (FRN) crises in 1986 and the 1987 stock market crash in the major developed countries. All of these events are indicative of an apparent need for effective, coordinated and comprehensive supervision in international banking (see Gardener in Norton 1991, Price Waterhouse 1991). Furthermore, by the mid-1980s, development of off-balance sheet instruments and techniques also required banks and supervisors to address a range of risks other than those traditionally arising from a bank's loan portfolio. In addition, with supervisors pressing for substantial increases in bank capital, complaints rapidly increased from banks and other parties against unfair competition owing to inconsistencies in regulatory standards of capital adequacy between countries. The Japanese banks in particular came in for a great deal of criticism. A strong impetus developed to remove these kinds of 'competitive inequalities' (Cooke in Gardener, 1990; Gardener, 1991).

All of these factors produced a growing sense of unease among central banks, regulatory authorities and international banks, and made it clear that different approaches to bank supervision in general, and capital measurement in particular in different countries, was making comparisons from one banking system to another very difficult, and that some more consistent approach would be desirable (Price Waterhouse, 1991). Paul Volcker, the former Chairman of the US Federal Reserve Board, proposed to his fellow governors early in 1984 that efforts should be made towards reconciling the different systems of capital adequacy utilised in the individual G-10 countries. Volcker suggested that a test of 'functional equivalence' should be developed (Gardener in Norton, 1991; Cooke in Gardener, 1990). Following this proposal, the chairman of the Basle Committee was charged by the G-10 governors in March 1984 to initiate positive action towards capital adequacy convergence (see Gardener, 1991).

The Basle (1988) proposals for capital convergence are the result of a long and continuing process of co-operation between the supervisory authorities in different countries. After a period of consultation with banks around the world, the risk-based capital requirements established by the Basle Committee were adopted formally in July 1988 and widely endorsed by the regulatory authorities worldwide at the International Conference of Banking Supervisors in Tokyo in October of that year (Price Waterhouse, 1991). The purpose of the Basle Agreement is to promote more equitable competition, as well as increased safety for the international financial system (Sinkey, 1992; Gardener, 1991; Cooke in Gardener, 1990; Basle, 1988).

The Basle Accord (1988) for convergence of capital adequacy is based on a risk assets ratio (RAR). According to Basle (1988), a bank's capital base consists of two components: core capital (Tier 1) and supplementary capital (Tier 2). Core capital comprises equity capital and disclosed reserves, while supplementary capital includes undisclosed reserves, asset revaluation reserves, general provisions/general loan-loss reserves, hybrid capital instruments and subordinated term debt. The inclusion of the individual Tier 2 elements is at national discretion. Equity capital is regarded as the foundation of the two-tiered definition of capital: the allowable total of Tier 2 in the Basle capital adequacy ratio is limited to 100 % of Tier 1. Within the Basle system, certain assets, like goodwill and investments in unconsolidated financial subsidiaries and, at national discretion, holdings of other bank capital, are deducted from the capital base and risk-adjusted assets.

The Basle system uses five risk weights: 0%, 10%, 20%, 50% and 100%. A system of credit conversion factors is used in order to convert off-balance items into 'deemed credit equivalents', then risk weights are applied to the latter. These include such categories as commitments and contingencies. The conversion factors are applied to the nominal principal amount of exposure to produce a credit equivalent amount which in turn is weighted according to the category of the counterparty. Interest rate and foreign exchange rate contracts are treated similarly, but with adjustments to take into account their particular nature.

Tier 1 plus Tier 2 capital make up a bank's total capital, which by 1992 must be a minimum of 8% of risk-adjusted assets. Moreover, a minimum of 50% of total capital must be in Tier 1 capital. A five year transition period (1988-1992) was established for the new capital adequacy standards. An interim standard of 7.25% was established and must be reached by year-end 1990.

Gardener (1991) argues that the Basle system really relates capital to specific kinds of losses. However, capital adequacy is fundamentally concerned with unexpected losses and these are essentially unpredictable. Further, there is a danger that the Basle system may lead to bank managerial 'fixations' with the way that risks are handled within the framework and related to capital adequacy. In this respect, there are several basic limitations. Although the Basle system is complex in practice, the emphasis is still on credit risk. Other risks are currently being considered into the appraisal scheme, but a ratio based system alone is unlikely to be able to handle all risks (Gardener in Norton, 1991). There is also no explicit considerations for diversification in the asset structure: a lack of risk diversification. Gardener (1992, p.4) argues that 'Alongside liquidity and capital adequacy, diversification of risk exposure is one of the most important components of practical banking supervision.' Furthermore, the risk weights utilised in the Basle system are not based on any kind of actuarial assessment. In addition, the Basle RAR implicitly assumes a linear, additive relationship between total risk and asset quantities in the portfolio. However, the overall risk of a portfolio is nonlinear (because of covariance effects). The Basle system does not take into account the diversification effect on the riskiness of the portfolio structure; in a well-diversified portfolio, the unsystematic risk can be diversified away. The Basle (1988) system also does not really tackle the issue of large exposure, which now tend to be part anyway of a separate regulatory regime. In this latter area, the EC's Large Exposure Directive (LED) is leading the way in international convergence (see Gardener, 1992).

Another critique centres on an additional aim of the Basle Accord, which is (as noted earlier in this section) to promote competitive equality. There are both practical and conceptual difficulties in achieving this objective (see Mayer, 1980). Competitive equality is difficult to define and to operationalise across-the-board. Further, Mayer (1980) argues that equitable treatment should be directed not towards institutions, but at their owners and customers; a basic problem is that the Basle system (like most supervisory systems) is directed primarily towards institutions rather than functions. 'Competitive neutrality' and 'level playing fields' are now seen as more practical policy objectives compared with the elusive and difficult (to operationalise) conceptual competitive equality. Our present concern, however, is primarily with capital adequacy and its related risk and return aspects.

In Korea, the GBA stipulates bank capital as paid-in capital plus reserve funds and the other surpluses. The 'Guidelines for Bank Management (July 16, 1992)' and 'Implement Rules of the Guidelines for Bank Management (July 16, 1992)' of the OBS of the BOK define capital more specifically than the GBA. The new definition of bank capital established by the OBS recognises two types of capital: core capital (Tier 1) and supplementary capital (Tier 2) (see Table 5.2).

Core capital (Tier 1) consists of equity stocks ('Kap-Funds' for foreign banks' branches in Korea) plus capital surplus and earned surplus (excluding dividends expected) plus minority interests in equity accounts of consolidated subsidiaries, minus goodwill, difference on consolidation, own shares held by banks, non-consolidated participation in financial firms and a bank's equity participations in other banks.

Supplementary capital (Tier 2) consists of asset revaluation reserves plus 45% of the differences between the book value and market value of securities held in banking account plus general loan-loss reserves. The total of supplementary capital is limited to 100% of core capital. Within supplementary capital, general loan-loss reserves are limited by year-end 1995 to 1.25% (1.5% during the transitional period) of weighted-risk assets.

<Table 5.2> Capital Definition and Standards

[Core Capital (Tier 1)] (1) Equity capital ('Kap-Funds' for foreign banks branches in Korea) (2) Capital surplus (3) Earned surplus (excluding dividends expected) (4) Minority interest in equity accounts of consolidated subsidiaries
[Supplementary Capital (Tier 2)] (1) Asset revaluation reserves (2) 45% of the differences between the book value and market value of securities held in banking account (3) General loan-loss reserves
[Deductions from Core Capital] (1) Goodwill, difference on consolidation and own shares held by banks (2) Non-consolidated participations in financial firms (3) Holdings of other bank's equity, but may not be deducted in case that 100% risk weight is applied for this item
[Total Capital] - Total capital (Core Capital + Supplementary Capital) must equal or exceed 8% of weighted-risk assets. Supplementary capital is only eligible up to 100% of core capital and allowances for loan losses are limited to 1.25% (1.5% during the transitional period) of risk assets.
[Timetables] - All commercial banks should report new capital ratios to the Superintendent of Banks after July 16, 1992. An interim standard of 7.25% set up to be reached by year-end 1993 and beyond, followed by the 8% standard by year-end 1995 and beyond.

Note: Effective from July 16, 1992.
Source: The OBS, 'The Implement Rules of the Guidelines for Bank Management', July 16, 1992.

Core capital plus Supplementary capital make up a bank's total capital, which by year-end 1995 and beyond must be a minimum of 8% of risk-adjusted assets. Moreover, a minimum of one-half of the total capital must be in the form of core capital. A transition period is established for the new capital standards. By year-end 1993 and beyond, all commercial banks in Korea have to meet an interim standard of 7.25% for total capital.

As for risk assets weightings, the OBS established Basle's five scales of risk weightings for on-balance sheet assets items: 0%, 10%, 20%, 50% and 100% (see Table 5.3). For off-balance sheet items, a system of credit conversion factors is utilised: 0%, 0-5%, 20%, 50% and 100% (see Table 5.4). These include such categories as unused commitments and short-term contingencies and direct credit substitutes. Interest rate and foreign exchange rate contracts are treated similarly, but with adjustments to consider their particular nature (see Table 5.5).

Table 5.6 shows the capital ratios of Korean banks during recent years. Data in 1991 show both total capital to total assets ratios and new risk-adjusted capital ratios (Basle standard). In 1991, only two banks (KorAm Bank and KEB) do not meet the international criteria (8.0%), but they meet transitional criteria (7.25%). Newly established NCBs (Donghwa, Dongnam, Daedong, Hana and Boram banks) and all RBs show high risk-adjusted capital ratios. Average risk-adjusted capital ratios are 11.7% for all commercial banks, 10.9% for NCBs and 17.1% for RBs, respectively.

To summarise, all commercial banks, including foreign bank branches in Korea, have to report under the new definitions risk-adjusted capital ratios relative to risk-adjusted assets to the Superintendent of Banks after July 16, 1992 and to meet a 7.25% standard during the transitional period, followed by the 8% standard by year-end 1995 and beyond. As discussed in the Basle Accord, however, the new capital standards also have their own limitations. It is important to recognise that they are not designed to appraise fully a bank's capital adequacy or to act as any kind of guarantee of no banking problems.

<Table 5.3> Risk Weights and Risk Categories for On-Balance Sheet Assets

[Category 1: 0%]
(1) Cash (domestic and foreign , and gold)
(2) Balances due from and claims on, or guaranteed by the central governments and central banks of the first group countries
(3) Local currency claims on the central governments and central banks of the second group countries, to the extent the bank has local currency liabilities in that countries
(4) Portions of loans collateralised by cash on deposit in the lending bank

[Category 2: 10%]
(1) Claims on or guaranteed by the domestic local governments and public corporations

[Category 3: 20%]
(1) Claims on or guaranteed by the banks of the first group countries
(2) Claims on or guaranteed by the banks of the second group countries with a residual maturity of one year or less
(3) Claims on or guaranteed by official international development banks which include IBRD, IADB, ADB, AFDB and EIB
(4) Claims on or guaranteed by public sector entities in the second group countries, below the level of central government

[Category 4: 50%]
(1) Mortgages on residential property (ownership and/or rental purpose)

[Category 5: 100%]
(1) All other claims
0 Claims on private sector
0 Claims on the central governments and central banks of the second group countries (excluding local currency claims)
0 Premises, plant and equipment; other fixed assets (including business or non-business purpose)
0 Capital instruments issued by other banking organisations
0 All other assets

Notes: 1) The first group countries are Korea, OECD countries and countries which have concluded special lending arrangements with the IMF associated with the Fund's General Agreement to Borrow.
2) The second group countries are other countries except the first group countries.

Source: The OBS, 'The Implement Rules of the Guidelines for Bank Management',July 16, 1992.

<Table 5.4> Credit Conversion Factors for Off-Balance Sheet Items

[100% Conversion Factor]
(1) Direct credit substitutes such as general guarantees of indebtness and guarantee-type instruments

[50% Conversion Factor]
(1) Contingencies related to particular transactions
(2) Note Issuance Facilities (NIFs) and Revolving Underwriting Facilities (RUFs)
(3) Unused commitments with an original maturity exceeding one year
(4) Trust-related assets with compensation contract for principal

[20% Conversion Factor]
(1) Short-term, self-liquidating trade-related contingencies, including commercial letters of credit

[0% Conversion Factor]
(1) Unused commitments with an original maturity of one year or less, and unused commitments which are unconditionally cancellable at any time, regardless of maturity

[0 - 5% Conversion Factor]
(1) Transactions related to foreign exchange rates and interest rates

Source: The OBS, 'The Implement Rules of the Guidelines for Bank Management', July 16, 1992.

<Table 5.5> Treatment of Exchange Rate & Interest Rate Contracts

The Current Exposure Method is utilised, in principle, to calculate the 'credit equivalent amounts' of interest rate and exchange rate contracts. If the amounts of transactions are small, then it is possible to apply the Original Exposure Method. However, the maximum risk weight is limited to 50%. In this case, the credit equivalent amounts are calculated by:
0 Current Exposure Method: Replacement Cost + (Total notational principal x credit conversion factor).
0 Original Exposure Method: Total notational principal x credit conversion factor.

Classification	Maturity	Interest Rate Contracts	Exchange Rate Contracts
CEM	One year & less	0.0%	1.0%
	Over one year	0.5%	5.0%
OEM	One year & less	0.5%	2.0%
	1 - 2 year	1.0%	5.0%
	Adding 1 year	1.0%	3.0%

Notes: 1) CEM and OEM represent Current Exposure Method and Original Exposure Method, respectively.
2) Residual maturity is utilised for the CEM, while original maturity is used for the OEM.
Source: The OBS, 'The Implement Rules of The Guidelines for Bank Management' July 16, 1992.

<Table 5.6> Capital Ratios of Korean Banks[1)]

(Unit: %)

	1987	1988	1989	1990	1991	1991(Basle)
Chohung	4.7	5.7	9.1	7.4	7.0	9.8
Commercial	4.7	5.7	8.6	7.2	6.8	9.3
First	5.0	5.9	9.8	8.0	7.7	10.5
Hanil	5.1	6.2	10.0	8.5	7.9	11.6
Seoul	4.7	6.0	9.1	7.7	7.5	11.3
KEB	5.4	5.7	5.7	5.3	6.3	7.5
Shinhan	5.4	6.9	17.2	14.5	12.9	15.4
KorAm	4.4	6.1	14.5	10.5	8.9	7.8
Donghwa	-	-	21.6	19.9	15.2	26.7
Dongnam	-	-	21.8	17.3	12.3	17.3
Daedong	-	-	27.7	19.4	13.1	14.4
NCBs	4.8	6.0	9.5	8.5	8.0	10.9[2)]
Daegu	4.7	8.5	15.4	11.9	10.4	15.6
Pusan	4.8	7.5	9.8	8.0	7.9	10.3
Chungchong	7.1	11.1	15.8	12.4	11.2	17.8
Kwangju	7.8	11.8	19.2	14.3	14.4	22.9
Cheju	9.0	10.6	17.1	14.7	13.7	25.1
Kyunggi	7.3	12.0	17.3	13.0	11.4	18.4
Jeonbuk	9.7	22.4	27.5	22.9	18.9	30.3
Kangwon	14.0	20.6	24.2	18.7	13.6	21.2
Kyungnam	4.7	10.4	16.1	12.5	11.1	15.2
Chungbuk	5.0	16.5	21.9	18.5	14.1	17.0
RBs	6.1	11.4	16.5	13.0	11.6	17.1
Total	5.0	6.8	10.5	9.1	8.5	11.7

Notes: 1)The criteria of these ratios are different from those in Chapter 4.
2)Includes Hana Bank (14.3%) and Boram Bank (14.1%).

Sources: 1)The OBS, 'Statistics for Bank Management', April 1991, p.231.
2)Unpublished internal materials for data in 1991.

5.2.3 The Measurement of Bank Capital

5.2.3.1 Measuring Bank Capital: Three Approaches

Having defined bank capital, the next problem is how to measure capital. There are several different capital measures in use today, and they frequently conflict in the messages they send to the public, bank management and the supervisory community. Three ways of measuring bank capital are generally utilised (Rose, 1991; Sinkey, 1992): book-value accounting, regulatory accounting and market value accounting. The first two methods are referred to as generally accepted accounting procedures (GAAP) and regulatory accounting procedures (RAP), respectively.

Banking books are generally kept on a *book value* or *historical cost* basis. According to the book-value approach, bank capital can simply be calculated by subtracting the book-value of liabilities from the book-value of assets.

$$E = A - L \tag{5.1}$$

where E = book value of bank capital

A = book value of bank assets

L = book value of bank liabilities.

This approach is sound so long as the book-value of bank capital and corresponding market valued bank capital do not diverge too widely. When they do, however, the accounting value of bank capital is correspondingly overstated or understated, and it becomes a poor indicator of a bank's exposure to risk. For example, in periods when a bank's loans and securities are plummeting in value due to sharply higher interest rates or a recession in the economy with many customers declaring bankruptcy, book value capital may not reflect whether a bank has enough capital to deal with its current exposure to risk in so far as book value diverges from market value (see further discussion in Section 5.2.3.2).

An alternative measure of bank capital is regulatory capital measured by RAP. Under RAP, the concept of bank capital as being primarily equity has become diluted. For many years, bank supervisory authorities attempted to define the capital of a bank as a blend of stockholders' equity, reserves for loan losses, and subordinated notes and debentures, etc. In general, banks have been required or encouraged to operate with lower a gearing ratio, that is, a higher capital ratio. However, the costs to many banks of raising new capital were high, in large part as a consequence of the same asset quality problems that prompted the regulators' demands for enhanced capitalisation (BIS, 1986). Regulatory pressures for increased capitalisation led to high rates of financial innovation by banks and financial markets: this reflects, in part at least, the so-called regulatory-dialectic process (see Kane, 1980; Eisenbeis, 1981). As a result, banks developed equity-generating innovations like the mandatory convertible debenture and other debt capital instruments which have some of the characteristics of bank capital.

These components of bank capital can be valued by GAAP and/or market value accounting. For example, equity stocks held by banks are priced by market value and only 45% of the differences between the book value and corresponding market value are included as supplementary capital in Korea. Therefore, even though these capital components are valued by GAAP, RAP capital and GAAP capital are likely to differ. RAP capital requirements vary with bank size, with large banks permitted to have lower standards reflecting the 'too-big-to-fail doctrine (TBTF)' or that big banks generally have more diversified portfolios than smaller banks and, as a result, can reduce their overall riskiness. Prior to July 16, 1992, the OBS of the BOK imposed a minimum capital adequacy ratio of 8% for NCBs and 9% for RBs of a minimum capital ratio, respectively. On July 16, 1992, however, the OBS adopted common standards of capital for all commercial banks in Korea (as discussed in Section 5.2.2).

Another way to measure bank capital is by the market value approach. There is little rationale from the point of view of financial theory for any of the GAAP and RAP definitions of bank capital. Of far greater relevance for both students of the banking system and investors is market-value capital (Rose, 1991). The market value of bank capital can be calculated by simply subtracting the market value of liabilities from the sum of the market value of assets and the market value of unidentifiable intangible assets as below (Sinkey, 1992):

$$E^* = (A^* + I^*) - L^* \qquad (5.2)$$

where E^* = market value of bank capital;

A^* = market value of assets;

I^* = market value of unidentifiable intangible assets;

L^* = market value of liabilities.

To measure market value of bank capital, an assessment of the economic values of all assets and liabilities is needed. The assessment involves calculating 'present values' or market values of all assets and liabilities, including OBSAs. Of course, it is not easy to calculate a 'present value' or market value because market values are not always available for all assets and liabilities, and there are difficulties in choosing an 'appropriate discount rate'.

Furthermore, as Copeland, Kollen and Mullin (1990) point out, 'valuing banks is conceptually difficult (p.376)' because 'it is hard to determine the quality of their loan portfolio, to figure out what percentage of their accounting profits results from interest-rate mismatch gains, and to understand which business units are creating or destroying value (p.381)'. Although Copeland *et al* (1990) recommend the *entity* approach for valuing non-financial business, therefore, they favour the *equity* approach for valuing banks. The entity approach focuses on after-tax, free cash flow from operations discounted by the weighted average cost of capital to estimate entity value. Equity value equals entity value minus the market value of debt. Because of difficulties in valuing banks using the entity method (e.g., estimating the cost of capital for demand deposits), Copeland *et al* recommend using the equity approach for valuing banks. This method equates equity value with the forecast free cash flow (FCF) to equity holders discounted at the cost of equity.

One method of measuring market value of a bank's capital is to look at the stock market's estimate of its net worth. In a marketplace, only the residual value of the balance sheet identity is observed. The total equity value of a bank is equal to:

$$\text{Equity Value} = \text{Market price per share x Number of shares outstanding} \quad (5.3)$$

This market value approach is likely to differ from the GAAP and RAP. Let us illustrate these relationships for selected banks as at December 31, 1992. Data are presented in Table 5.7. For example, with 132 million shares of common stock outstanding at KW10,900 per share, the market value of Hanil Bank capital was KW1,438.8 billion. In contrast, the book value of shareholders' equity and total capital were reported as KW660.0 billion and KW1,286.4 billion, respectively. The market/book ratios are 2.180 and 1.118, respectively. With year-end 1991 total assets of KW21,734.4 billion, capital ratios for the Hanil Bank were 6.62% for the market value, 3.04% and 5.92% for two GAAP, and 10.44% and 11.60% for two RAP (see Table 5.7). Capital ratios of other banks were calculated in the same way.

<Table 5.7> The Values of Selected Bank Capital and Assets
(At December 31, 1991)
(Unit: billion won, %)

	Hanil	Commercial	First	Chohung
[GAAP]				
0 Equity Capital	660.0	650.0	650.0	650.0
0 Total Capital	1,286.4	1,136.5	1,227.0	1,165.5
0 Total Assets	21,734.4	23,678.4	23,188.1	21,511.4
[RAP]				
0 Primary Capital	1,417.5	1,227.5	1,221.4	1,188.8
0 Total Capital	1,575.6	1,476.0	1,473.3	1,329.8
0 Total Assets	13,581.2	15,856.0	14,092.4	13,561.9
[Market Value]				
0 Capital	1,438.8	1,378.0	1,378.0	1,378.0
0 Shares (million)	132.0	130.0	130.0	130.0
0 Price (Won)	10,900	10,600	10,600	10,600
<Capital Ratios>				
0 Market Value[1)]	6.62	5.82	5.94	6.41
0 Book Value I[2)]	3.04	2.75	2.80	3.02
0 Book Value II[3)]	5.92	4.80	5.29	5.42
0 RAP I[4)]	10.44	7.74	8.67	8.78
0 RAP II[5)]	11.60	9.31	10.45	9.81
<Market/Book Ratio>				
0 Ratio I[6)]	2.180	2.120	2.120	2.120
0 Ratio II[7)]	1.118	1.212	1.123	1.182

Notes: 1)Market value is the ratio of market value capital to book value total assets.
2)Book value I is the ratio of book value equity capital to total assets.
3)Book value II is the ratio of book value total capital to total assets.
4)RAP I is the ratio of primary capital to total assets using the definition of July 1992.
5)RAP II is the ratio of total capital to total assets using the definition of July 1992.
6)Ratio I is the ratio of market value capital/equity capital (GAAP).
7)Ratio II is the ratio of market value capital/total capital (GAAP).
8)Total assets in book value are the total assets in banking and trust accounts.

Sources: 1)The KSE, Fact Book, 1992, p.129
2)The OBS, internal materials informally sent to researcher.
3)Figures in GAAP (i.e., book value) are from the balance sheet of each bank.

As shown in Table 5.7, the important point is that GAAP and RAP measures of capital ratios do not reflect fully the real worth of the relative buffer or cushion available for absorbing the realised risks of banking. Therefore, they may fail to provide all the necessary information for bankers', regulators', or depositors' decision-making.

Setting aside the afore-mentioned difficulties in calculating market values of banks' assets and liabilities, critics of market value accounting in banks argue that market values are more volatile than book values and the usefulness of market value capital is limited because most banks' stocks are not traded in the capital market and there exist problems of inadequate information to the market. Although this criticism is certainly valid, one has to consider the fact that when banks' stocks are traded in the capital market, market values are likely to incorporate the true value of capital so long as the capital market is efficient. In other words, the market value of bank capital is a far better reflection of how depositors and investors view the amount of real protection each bank has against the risk of ultimate failure. If a bank's assets and liabilities were valued at their true market value, depositors would be better able to gauge if their bank holds enough saleable collateral to back their deposits and, therefore, could make a more rational decision on which banks should receive their accounts. Nevertheless, RAP measures of bank capital continue to have a strong influence on bankers and bank supervisors.

5.2.3.2 Hidden Capital and the Relationship between Market and Book Value

When accounting net worth (NW) and real or economic net worth (NW^*) diverge, 'hidden' or unbooked capital exists (see Kane and Unal, 1990). Hidden capital has broadly two sources (Sinkey, 1992; also see Maisel, 1981):

(1) differences between the market and book values of items on the balance sheet;

(2) neglect of off-balance sheet items that GAAP do not permit to be booked formally.

Under a system of market-value accounting with formal booking of off-balance sheet items, practices absent from GAAP, hidden capital would not exist.

Several attempts to measure 'hidden capital' have been made. One of these is the 'hidden value index' developed by Morgan Stanley that shows the extent of under-disclosure of asset values as reflected in the respective share price (P) to book value (BV) ratios (see Table 5.7). Hidden values comprise items like excess provisions, undervaluation of investments, understated bond values and property held in balance sheets at the original purchase price (Morgan Stanley, 1990).

Kane and Unal (1990) have developed a way of estimating a bank's hidden capital that they call the *statistical market value accounting model* (SMVAM). In its simplest form, SMVAM relates the market value of a bank's equity or net worth to its book value as follows:

$$NW^{*} = a + b(NW) + e \qquad (5.4)$$

where a, b = estimated regression coefficients

e = error term

Equation 5.4 can be estimated over time or cross-sectionally. It is easy to see that if $a = 0$ and $b = 1$, then market and book values of net worth do not diverge, except for error terms that on average are expected to be zero. The important aspect of SMVAM is its economic interpretation. Let us consider, first, the slope coefficient (b) and assume that $a = 0$. Rearranging Equation 5.4, we have

$$b = \frac{NW^{*}}{NW} = \frac{\text{Market Value of Equity}}{\text{Book Value of Equity}} \qquad (5.5)$$

Thus, b is simply an estimate of the ratio of market value to book value or the market/book ratio. When $b>1$, the underlying stock trades at a premium relative to book, which implies that the market assigns a higher value to the bank's booked assets than does GAAP. In contrast, if $b<1$, then the stock trades at a discount relative to book, which implies that the market assigns a lower value to the bank's booked assets than does GAAP.

Next, let us consider the case in which $b=1$ and $a\neq 0$. In deriving Equation 5.4, Kane and

Unal (1990) note that a bank's total market value is calculated by Equation 5.3 and recognise that the market value may also come from both booked capital and unbooked capital. In this context, if b=1 and a>0, then market value exceeds book value by the amount of the intercept's estimated value which is the market's valuation of unbooked equity. When b=1 and a<0, then unbooked equity lowers market value.

Unless both a=0 and b=1, accounting or book value estimates of a bank's capital are likely to differ from estimates of the market value of shareholders equity. Either an intercept or a slope bias or both may exist. If only an intercept bias exists, changes in the accounting value of bank equity could reflect changes in its market value of equity. An intercept bias can be traced to the neglect of off-balance sheet items by GAAP. The existence of a slope bias results in either a premium (when b>1) or a discount (when b<1) from the book value of bank equity. A slope bias can be traced to misvaluation of the items on a bank's balance sheet.

Table 5.8 shows the estimated relationships between market value and book value of equity for Korean banks. To do this, we simply regressed total market value of equity against total book value for each bank following Equation 5.4 originally developed by Kane and Unal (1990). The sample includes 16 banks (8 banks for NCBs and 10 banks for RBs). Regression equation comprises 2 year pooling data (1990-1991) for each group in order to increase the degrees of freedom.

Let us consider first the intercept term. A negative intercept bias for NCBs and a positive intercept bias for RBs exist. However, the t-ratios suggest that the coefficient of the intercepts are statistically insignificant, which implies that these are not different from zero. Therefore, we may conclude that there is no increase or decrease in unbooked net assets as a source of bank capital for Korean banks.

Table 5.8 also shows that the estimated slope for NCBs is greater (i.e., 1.29) than 1, whilst that for RBs is smaller (i.e., 0.99) than 1; these estimators are statistically significant. A premium for NCBs exists, as a KW1 change in the book value of equity results in more than KW1 change in the market value of equity. This premium can be interpreted as a reward for the present value of future growth opportunities not captured by assets in place. In contrast, the estimated slope for RBs is less than 1: a KW1 change in book value results in less than a KW1 change in market value. This discount implies accounting overvaluation of changes in booked assets and liabilities relative to market valuations.

<Table 5.8> Estimated Relationships Between Market Value and Book Value of Equity

	NCBs	RBs
Intercepts	- 22.5	40.4
(t-ratio)	(- 0.23)	(1.16)
Slope	1.29*	0.99*
(t-ratio)	(13.40)	(7.70)
F-value	178.84*	59.23*
D.W.	3.25	3.10
R^2(adj)	92.2	75.4
Sample	16[1)]	20[2)]

Note: 1) NCBs includes 8 banks but 2 year pooling data.
2) RBs includes 10 banks but 2 year pooling data.
3)'*' represents significant at the 0.05 level.

However, the above results should be interpreted cautiously. When we diagnosed our regression models, heteroscedasticity was found. Heteroscedasticity does not destroy the unbiasedness and consistency property of the usual ordinary least square (OLS) estimators, but these estimators are no longer minimum variance or efficient. When heteroscedasticity exists in a model, the confidence intervals based on it will be unnecessarily wide and the tests of significance are less powerful. In other words, in this situation the conventional testing procedure is of dubious value (Gujarati, 1988).

5.2.4 Modern Capital Adequacy Appraisal Methods

The issues of how much capital a bank should have has been one of the most controversial public-policy questions considered by both academics and bank regulators. Capital adequacy is fundamentally concerned with a bank's corresponding risk exposure. Therefore, the term 'capital adequacy' has been used to capture the overall soundness or risk exposure of individual banks. The risk-absorbing function of bank capital, as discussed earlier, suggests an inverse relationship between the level of bank capital and risk exposure. Therefore, the higher a bank's risk exposure, the more capital is required *ceteris paribus*. It implies that the capital adequacy of a bank can only be evaluated in the context of its risk exposure, existing and planned (or likely). In this perspective, Maisel (1981, p.20) defined capital adequacy as ' capital is adequate either when it reduces the chances of future insolvency of an institution to some predetermined minimum level or, alternatively, when the premium paid by the bank to an insurer is "fair"; that is, when it fully covers the risks borne by the insurer. Such risks, in turn, depend upon the risk in the portfolio selected by the bank, on its capital, on the terms of the insurance with respect to when insolvency will be determined and what losses will be paid'.

Assessing the adequacy of a bank's capital involves two stages. As discussed in Section 5.2.3.1, the first, difficult but necessary, stage is to estimate the true economic values of all a bank's assets and liabilities, including all OBSAs. The second stage is to identify and measure all the risks a bank faces. As identified and discussed in Chapter 4, the risks faced by banks include three critical portfolio risks (credit risk, liquidity risk and interest rate risk), together with other important risks like foreign exchange risk, regulatory risk, technology risk, operating efficiency risk and market strategy risk, etc.. Against the background of this kind of risk taxonomy, each bank should analyse and evaluate its own risk exposure in order to develop a good operational knowledge of the kinds of risk exposure it faces and how this is affected by changing economic conditions (Gardener, 1989).

However, there are practical problems faced by supervisors in trying to assess capital adequacy. Pecchioli (1987, p.109) stated: " even though the concept of capital adequacy is easily definable in terms of the primary function of bank capital; viz, to perform as a cushion for the absorption of unanticipated losses, its translation into practical supervisory terms is surrounded with difficulties due to an inevitable lack of precision in the assessment of the quantity and size of risks to be protected by the capital base".

When the question of 'how much capital is adequate' is addressed, a related question arises; who decides 'what is adequate capital and how'? As we know, the capital positions of banks have been closely regulated for decades. As Wall (1985) notes, the fundamental purposes of regulating bank capital are threefold:

(1) to limit the risk of bank failure;

(2) to preserve public confidence in banks; and

(3) to limit losses to the federal government arising from insurance claims by depositors of failed banks.

There is an underlying assumption that the market cannot accomplish all of these objectives simultaneously:

(1) because the market does not correctly price the impact of bank failure on the banking systems' stability; and

(2) because the market does not correctly price the cost of bank failure to the deposit insurance fund.

(3) because the market does not have all the information it needs.

In this context, the supervisory authorities regulate bank capital and assess capital adequacy through ratio schemes.

In order to evaluate whether or not bank capital is adequate under RAP, the supervisory authorities have utilised various measures. Ratio measures are widely used and they include: capital-to-deposit ratio, capital-to-loan ratio, capital-to-total-asset ratio and capital-to-risky-asset ratio. However, they are variations of two basic complementary approaches: the gearing ratio and risk assets ratio (Pecchioli, 1987).

Historically, the ratio of capital to deposits was widely used as a measure of capital adequacy from early in the twentieth century until World War II. By regulating the gearing ratio, supervisors can effectively regulate the maximum ability of a bank to expand its overall operations for a given amount of capital resources. The major advantage of this approach is its simplicity. For banks, it permits maximum operational flexibility because it does not impose any constraint on the portfolio structure. For supervisors, it does not require any prior judgment on the relative riskiness of individual banking operations. However, the gearing ratio approach has some limitations due to its inflexibility in the treatment of the items to be considered. Firstly, this makes it difficult to incorporate into the measurement of capital adequacy those OBSAs that do not carry full credit risk. Secondly, the gearing ratio does not differentiate the relative riskiness between banks. These drawbacks have led several countries to develop a more sophisticated method based on weighted risk assets ratios, which is the system now adopted in all major banking systems under the 1988 Basle Accord.

In the 1930s in the USA the greatest risk which banks faced was defaults on loans. Therefore, the use of the ratio of capital to total assets became popular in the 1940s and early 1950s. The ratio of capital to total assets, like the ratio of capital to deposits, is not sensitive to differences in risks associated with banks' differing asset structures. For example, two banks of equal asset size would require an identical amount of capital, even though one of them might have all of its assets in cash and short-term government securities and the other have 80% of its assets in loans.

Both ratios - the ratios of capital to deposits and capital to total assets - have the virtue of simplicity and for this reason are widely used by bank analysts and regulators for assessing the capital adequacy of banks. Under both capital adequacy schemes, banks can simply circumvent capital regulations by restructuring their portfolio composition and/or moving into OBSAs. As a response, supervisory authorities attempted to overcome the inability of simple ratios to recognise differences in risks on different assets by introducing a new measure - the risk assets ratio (RAR)[1].

The RAR provides incentives *ceteris paribus* for banks to hold low risk assets. More risky assets require more capital cover (and, by implication, a higher 'return'). In the RAR, different weights are given to the different categories of asset. The weights are designed to reflect the relative risks which are perceived in the various types of banking operations.

1.However, early RAR did not include OBSAs.

The RAR is calculated by the following equation:

$$\text{RAR} = \frac{C}{W} = \frac{C}{\Sigma . w_i x_i} \qquad (5.6)$$

where C = bank capital;

W = total risk-adjusted assets including OBSAs;

w_i = risk weight given to asset category i;

x_i = assets in asset category i.

The RAR is designed to reflect the relative riskiness of the asset portfolio. Therefore, it can be regarded as a first step towards a more detailed risk analysis of the bank portfolio. As discussed in Section 5.2.2, however, it has several drawbacks. An important one, from the portfolio perspective, is its implicit assumption that risks are linearly additive: it does not formally incorporate covariance relationships.

Whatever measurement system of capital adequacy is adopted, it is obvious that a single ratio cannot incorporate all of the factors which determine a bank's exposure to risks and the corresponding potential calls on capital. Other factors must be considered such as the quality of management, the bank's earning potential, the strength of its provisioning policy and the adequacy of liquidity. A good example of a more general rating system to evaluate the safety and soundness of banks is the CAMEL rating system in the USA. CAMEL stands for *C*apital, *A*sset quality, *M*anagement, *E*arnings and *L*iquidity. It is generally agreed that the ratio-based, supervisory measurement of capital adequacy is only one, ***albeit*** very important, element in the overall process of assessment of bank soundness (Pecchioli, 1987).

5.3 MICRO-FINANCE FOUNDATIONS OF CAPITAL ADEQUACY

5.3.1 Introduction

Up to this point we have explained several key issues related to bank capital: for example, capital's important roles, the definition and measurement of bank capital, and the concept of RAR. Further, although there is no general agreement on how much capital is adequate, the issue of capital adequacy was also discussed. However, to enhance our understanding of the impact of supervisory policy in general, and capital regulations in particular, on the banking firm's risk and return, further in-depth analysis on the nature of banking firm and its optimal behaviour are needed. Knowledge of relevant banking theory and models of the banking firm are important for generating insights, academic and practical, about the impact of supervisory regulations on banks.

The optimal choice of capital decision is determined by the assumed financial environment and the *raison d'être* of the banking firm. Therefore, it is reasonable to begin by analysing the reasons why banks exist, and then move on to model the objectives of the banking firm. The analysis will then focus on the optimal capital adequacy of the banking firm, rather than on society (attempted by *inter alia* Santomero and Watson, 1977).

5.3.2 The Nature of the Banking Firm

Finance theory suggests that if capital markets were 'perfect and complete', banks as financial intermediaries would not exist. Since banks and other financial intermediaries exist, however, it is important to explore why. Examination of the reasons why banks exist enhances our understanding of the entire financial system that is being exploited by the banks, and provides insights of both the real and financial aspects of bank behaviour (Sinkey, 1992).

There are traditionally three important approaches to the reasons why banks exist in the financial market: the asset transformation function, the role of the bank's liabilities and the two-sided nature of the banking firm. Each approach focuses on a specific portion of banking activity[2].

The first important role of banks is as asset transformers. From this point of view, asset diversification and asset evaluation functions are emphasised. Asset diversification theory emphasises that banks can divide and transform large denomination assets into smaller units (see Klein, 1973; Benston & Smith, 1976; and Kane & Buser, 1979). Banks earn profits by providing such divisibility services to customers. Another and more modern explanation of banks emphasises their asset evaluation roles: banks act as evaluators of credit risk for (uninformed) depositors. Due to imperfect information, participants in the financial markets find it difficult to evaluate the quality of signals. This lack of adequate information on the quality of financial assets requires a set of firms whose primary output is signal evaluation (Leland and Pyle, 1977).

The second explanation for the existence of banks is the central role played by banks' demand deposit liabilities as a medium of exchange. One approach emphasises that the central feature of a monetary unit is its ability to minimise the cost of transactions in converting income into the optimal consumption bundle (Niehans, 1969, 1971 & 1978; Barro & Santomero, 1976), while another approach views the role of money holdings as part of a household's attempt to maximise its utility function (Brunner and Meltzer, 1971). For whatever reason, the private sector holds money, and the balances of money holdings may generate profit potential for the issuing institutions. The extent of these potential gains hinges upon the characteristics of the money-type liability issued and the explicit pricing structure of financial institutions. The demand for money literature is full of models that generate positive money holdings and views positive money holdings as a function of transaction costs, uncertainty, and relative rates of return. The monetary mechanism, along with bank pricing decisions, offers the financial firm the opportunity to attract deposits, which may be reinvested at a positive spread. The extent of this profit will depend on the nature of the composition and the transactions network itself. Ease of transfer between

2. This section is largely based on Santomero (1984).

accounts, and nationwide cash dispensing options are all central to the evolution of the banking system's monopoly position (Santomero, 1984).

The third reason for the existence of banks is the two-sided nature of the banking firm. It emphasises the conditions necessary for banks to exist as internal financial firms. Pyle (1971) who develops a model of the maximising firm in the financial market with uncertain rates of return concludes that covariance between the return on loans and deposits fosters intermediation by encouraging the risk-averse maximiser to transform deposits into loans. Sealey (1980) also concludes that a correlation between profits and the level of interest rates is equally important in explaining financial intermediation. In both cases, the covariance reduces the uncertainty around the expected profits and encourages intermediation. Because of different interest rates across markets, banks can engage in risky arbitrage (Santomero, 1984).

Finally, a new approach to the intermediation process developed from the information (asset evaluation) literature summarised by Santomero (1984) views banks as delegated monitors (Diamond, 1984; Berlin, 1987; James, 1987). By engaging in indirect finance, the depositor, as a surplus unit, does not have to monitor the financial condition and performance of the borrower (i.e., deficit unit): this task is delegated to the intermediary. For most depositors, this is a rational choice because they do not have the time, inclination, money, or skill to assess the performance of borrowers. Accordingly, they pass on the agency problem and costs to the intermediary, who acts as their agent. The depositors are better off in terms of costs saved by delegating the task of monitoring borrowers to the financial intermediary in the monitoring process. This new approach focuses on the role of banks in the financial system and the differences between direct finance (i.e., issuing securities) and indirect finance (i.e., bank loans) (Sinkey, 1992).

5.3.3 The Objective(s) and Optimal Behaviour of Banking Firm

5.3.3.1 The Objective(s) of Banking Firm

A business firm is confronted with many decisions - some important and others less so. By its very nature, financial decision-making involves purposeful behaviour, which implies the existence of a objective or, what is much more likely, some combination of objectives. In the absence of any objective, the firm would have no criterion for choosing among alternative investment strategies and projects (Levy & Sarnat, 1990). Therefore, most economic or financial models of managerial behaviour are based on the optimisation of some variable like utility, wealth, or profit. To the extent that managers have other objectives, these maximisation models and their derivatives are open to challenge (Sinkey, 1992).

In finance theory, a bank is viewed as a micro-economic firm which maximises the terminal wealth of shareholders (Santomero, 1984). An alternative objective function to value maximisation is utility maximisation, and others include objectives such as profit maximisation, satisfying profit, size maximisation or expense-preference behaviour (Sinkey, 1992; Levy & Sarnat, 1990; Edwards, 1977; Heggestad 1977). The bank's objective which should be the shareholders' wealth maximisation is shaped by three basic forces:

(1) owners' preferences;

(2) management's attitudes and decisions;

(3) society, as manifested by its regulatory and economic environments.

Reflecting the differences of these basic forces, no single objective can express all of the complexity of the decision-making process. Since the goal of the banking firm serves as a foundation for the bank's critically important investment, financing and dividend decisions, however, a closer scrutiny has to be undertaken.

The profit maximisation objective appears in a large number of (almost every) introductory textbook in economics and especially those in price theory. This objective function implies that when the firm chooses among alternative strategies, it can forecast with 'certainty' all of the relevant future revenues and costs, and hence profit, associated with each policy. However, reality is not so accommodating. Yet even if we are willing to accept the 'certainty' assumption, the objective of profit maximisation is at best ambiguous. Consider the following question. What profit should the firm maximise? Short-run profits or long-run profits? Since the banking firm is a 'going-concern' organisation, it is almost intuitively obvious that profits are the long-run profits. The long-run profit maximisation objective implies that the firm should choose that strategy which maximises the discounted present value of the stream of long-run profits. However, the goal of maximising long-run profits is neither simple nor obvious once we relax the assumption of certainty. Further criticisms (Cooley & Roden, 1988; Gup, 1983; Mao, 1976; Ross *et al*, 1990; Scott *et al* 1988) of this goal are :

(i) profit maximisation does not take into account the timing of the project's returns. Since money has a definite time value, we are not indifferent to the timing of the returns. Given equivalent cash flows, the sooner the better. Thus, ignoring the timing of the returns can result in incorrect investment decisions;

(ii) profit maximisation does not recognise risk. In reality, investment projects do differ with respect to risk characteristics, and therefore failure to recognise these differences can result in incorrect decisions;

(iii) the final problem concerning the use of profit maximisation as the financial goal of the firm is the ambiguity in measuring profits. The amount of profits for any firm can be changed appreciably by using different accounting techniques. However, these different methods do not change the 'economic value' of the firm. Investors pay attention to accounting profits only insofar as they believe that reported profits reflect real cash flows (Ball & Brown, 1968; Kaplan & Roll, 1972).

Another objective frequently quoted is 'satisfying' profit. According to an organisational or behavioural approach, the firm is viewed as a complex pattern of personal relationships

(Simon, 1957 & 1964; Cyert & March, 1963). Although Simon argues that the concept of a goal is indispensable to organisation theory, he emphasises that the objective of corporate action is seldom single-valued. In his view, the decision-making mechanism is imperfect: the firm is confronted by the necessity to choose among alternatives without knowing exactly the results of each choice. Not knowing the *best* alternative, the decision-maker does not seek a maximum profit, but is content with some satisfactory level of profit. Thus, in Simon's view, it is 'satisfying' rather than 'maximising' behaviour which characterises the business firm. The major drawback of this approach is its complexity: that is, the large number of variables which must be considered.

The utility maximisation objective has been rationalised as being more applicable than value maximisation to smaller, owner-managed banks because the investment opportunity set for such banks and their owners may be one and the same. The assumption behind this rationalisation is that the owner-manager cannot attract capital in addition to his/her own and that most of his/her portfolio is invested in the bank. Consequently, unlike a bank that is maximising its current market value, the owner's preference toward risk would influence the bank's portfolio decision (Keeley & Furlong, 1987). It is often assumed that the owner-managers are risk-averse. Risk aversion means that utility functions are concave with respect to the origin. That is, future wealth has diminishing marginal utility. As reviewed in Section 5.4.3.1, a large part of the literature analysing the impact of capital regulation on bank's risk-return profile assumes the utility maximisation objective function (see also Di Cagno, 1990). However, one thing which we should keep in mind is that utility functions are specific to individuals. There is no way to compare one individual's utility function to another's; Inter-personal comparison of utility functions is impossible. If it were not, we could establish social welfare functions that would combine everyone's utility, and we could then use them to solve such problems as the optimal distribution of wealth. We could maximise society's utility by taking wealth from individual i and giving it to individual j. However, it is not possible to know how real-world utility functions for different individuals should be aggregated. It follows that group utility functions, such as the utility function of a firm, have no meaning (Copeland & Weston, 1988). Furthermore, it is difficult to obtain at the same time the desirable property of absolute risk aversion and a tractable utility function (Di Cagno, 1990). Although utility maximisation is an excellent objective, the problems associated with defining and measuring utility pose such overwhelming difficulties that utility maximisation becomes an impossible objective for a bank financial manager (Cooley & Roden, 1988).

The value maximisation objective is the normative objective that underpins much of modern finance theory. One study which examined the objectives of a sample of 326 management-controlled firms in the USA over the period 1967-1975 indicated that maximising stock price (i.e., shareholders' wealth maximisation) is the dominant objective of such corporations (Fatemi, Ang & Chua, 1983). The maximisation of shareholders' wealth can be achieved by the maximisation of stock price of the banking firm. This is the most comprehensive objective, because it takes into account all factors which affect stock price of the banking firm (Mao, 1976). By making decisions that maximise stock price, bank managers have done all they can in order to maximise shareholders' wealth (Cooley & Roden, 1988). Although other objectives discussed above are often pursued by bank management, none is as encompassing as the maximisation of stock price. No other objective so fully accounts for differences in the amount, timing, and riskiness of future cash flows, which are the basic determinants of stock price (Cooley & Roden, *ibid*; Scott *et al*, 1988; Shapiro, 1990).

As discussed above, utility maximisation might be appropriate for certain smaller, closely held banks, whereas value maximisation may be more suitable for other banks, particularly the large publicly held banks whose stockholders can hold diversified portfolios. A value-maximising bank chooses its portfolio solely to maximise the current market value of equity[3]. By establishing shareholders' wealth maximisation as the basic criterion or per-

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3. The formal equivalence between wealth maximisation and the maximisation of the market value of a bank's common stock is shown in Levy and Sarnat (1990) in pp.393-396.

formance measure, risk and return can be considered simultaneously. Maximisation of shareholders' wealth implies that each decision by the banking firm is evaluated in terms of its impact on the value of a bank's stock (Graddy & Spencer, 1990; Levy & Sarnat, 1990). Therefore, the banking firm should choose its loan and investment projects and financing policies so as to maximise the price of its common stock.

Let us discuss further the basic determinants of stock price. Stock price is positively correlated with expected cash flows. As we have explained, cash flow is not subject to accounting manipulation and it is recorded at a specific point in time. Therefore, as expected cash flows rise and fall, the stock price rises and falls in the same direction. By making financing and investment decisions that increase shareholders' expected cash flows, bank managers increase stock price. Defining the goal of the banking firm in terms of market value of the stock (i.e., shareholders' wealth maximisation) makes it possible to take simultaneously into account the amount, risk or uncertainty, and timing of expected cash flows that are important to shareholders. The shareholder wealth maximisation framework, therefore, allows for a decision environment that encompasses the complexities and complications of the real world. Of course, the essential requirement in achieving this ideal is the provision of adequate information to the market.

A value-maximising bank's portfolio decisions are independent of the risk preferences of its individual owners because the owners are able to adjust fully the composition of their personal portfolios to attain any level of risk they desire. As discussed earlier, interpersonal comparison of individuals' utility functions is not possible. How then can a bank manager maximise shareholders' utility? The capital market provides the answer to this question. If capital markets are perfect, then the Fisher separation theorem obtains. This means that individuals can delegate investment decisions to the bank managers. Regardless of the shape of the shareholders' utility functions, the bank managers maximise the owners' individual and collective wealth positions by choosing to invest until the rate of return on the least favourable project is exactly equal to the market-determined rate of return. If the marginal return on investments equals the market-determined opportunity cost of capital, then the shareholders' wealth is maximised. Therefore, even though actual returns on the bank's portfolio are uncertain (risky), a value-maximising bank does not consider the risk preferences of its owners (Keeley & Furlong, 1987). Furthermore, since banks (or bank managers) may fail to optimise non-financial variables, the objective of value (wealth) maximisation needs to be kept in perspective (Sinkey, 1992).

The assumed goal of the banking firm throughout this study is maximisation of shareholders' wealth. In addition to the above discussions, there are several reasons why this wealth maximisation objective is appropriate for our research. First, wealth maximisation objective, as we discussed earlier, permits us to combine the risk and return of alternative courses of action into one quantitative measure - stock price. Measuring stock prices is more easy and objective than the utility function which remains in the psychological domain and is essentially subjective. Second, equity stocks of the Korean banks are widely held by the public and are the ones most actively traded. Furthermore, the GBA regulates that no single person may own or actually hold a bank's stocks in excess of 8% of the total voting stocks of the pertinent banks. Therefore, there is little need to consider owners' risk preferences. The third reason is closely related to our research methodology for empirical analysis. As discussed earlier, shareholders' wealth maximisation objective directly implies that a bank should choose its loan, investment and financing decisions so as to maximise stock price. This, in turn, requires some sort of model of the forces which influence and determine stock prices. To evaluate the impact of the new capital adequacy requirements on banks' risk-return profile, we will utilise the variations of the market model in order to measure wealth effects and the market model in order to measure risk effects.

Finally, as discussed in Chapter 2, since the early 1980s, wide-range structural deregulation has been implemented. As a result, the financial and banking markets have become more competitive and unpredictable, implying that the need is re-emphasised for effective risk appraisal and management in banks within new financial environment created by deregulation. This new environment requires the goal of the banking firm, practical as well as normative, should be shareholders' wealth maximisation which can effectively and simultaneously incorporate the risk and return, and that the role of the market should be enhanced in regulating and monitoring a bank's risk (see Section 5.6). After all, the basic objective of structural deregulation is a greater emphasis on the 'free market' in resource allocation. Thus, a shareholder wealth maximisation objective is more appropriate for our study than a utility maximisation objective.

5.3.3.2 The Optimal Behaviour of Banking Firm

A bank can maximise shareholders' wealth by either controlling the prices or quantity of assets and liabilities , subject to the financial environment and regulation. Therefore, the bank's objective function can be specified generally as (Santomero, 1984)

$$\text{MAX}\ E\,[V(W_{t+q})] \qquad (5.7)$$

subject to

$$W_{t+q} = W_t(1 + \Pi_{t+1})(1 + \Pi_{t+2})\ldots(1 + \Pi_{t+q}) \qquad (5.8)$$

$$\Pi_{t+k} = \frac{\Sigma_i r_{Ai} A_i - \Sigma_j r_{Dj} D_j - C(A_i, D_j)}{W_{t+k-1}} = \frac{\pi_{t+k}}{W_{t+k-1}} \qquad (5.9)$$

where

$V(.)$ = the objective function, where $dV/dW_{t+q} > 0$ and $d^2V/dW^2_{t+q} \leq 0$

(W_{t+q}) = the value of terminal wealth at the horizon time q

Π_{t+k} = the stochastic profit per unit of capital during period $t + k$, where $0 \leq k \leq q$

r_{Ai} = the stochastic return from asset i

A_i = asset category i, where $1 \leq i \leq n$

r_{Dj} = the stochastic cost for deposit j

D_j = the deposit category j, where $1 \leq j \leq m$

$C(.)$ = the operations cost function, where $dC/dA_i \geq 0\ \forall_i$ and $dC/dD_j \geq 0\ \forall_j$.

Equation (5.7) is the objective function to be maximised by the bank and as such allows for two distinct types of behaviour. The first derivative indicates that more wealth is preferred to less. However, the second derivative determines the extent of the value maximisation of a banking firm. Equation (5.8) is cast as a multi-period valuation model. Equation (5.9) is a definition of profit per unit of capital invested by shareholders; in the second specification, this equation also indicates that the optimisation procedure involves the dual choice of leverage and portfolio components.

Sinkey (1992) suggests a more detailed strategy to implement the shareholders' wealth maximisation objective. There are six policy strategies that can be employed to achieve that objective. These policies are shaped by three forces: the objective itself; management's attitude and decisions; and society. The six policy strategies are:

(1) spread or gap management;

(2) control of 'burden';

(3) liquidity management;

(4) capital management;

(5) tax management;

(6) management of OBSAs.

Each of these policy strategies, either directly or indirectly, affects the bank's bottom line and its risk exposure, and hence affects its cash flow, cost of funds, and market value.

To make a long story short, banks exist because they play several important roles: to provide divisibility services, to engage in risky arbitrage across markets, to produce information about the value of assets and to act as delegated monitors. Exploiting market imperfection, the banking firm maximises shareholders' wealth. With this overall understanding on the nature, objective and optimal behaviour of banking firm in mind, we will discuss further the issues related to the optimal capital adequacy of a bank in the following subsection.

5.3.4 Theories of Optimal Capital Adequacy

5.3.4.1 The Value and Optimal Capital Structure of the Uninsured Bank

In a perfect capital market without bankruptcy costs and taxes, Modigliani and Miller (M-M, 1958, p.268) have shown that 'the market value of any firm is independent of its capital structure and is given by capitalising its expected return at the rate ρ appropriate to its risk class.' In other words, the method of financing is irrelevant. Therefore, the value of the unlevered firm is the same as the value of the levered firm, that is,

$$V_l = V_u \qquad (5.10)$$

where V_l = the value of the levered firm

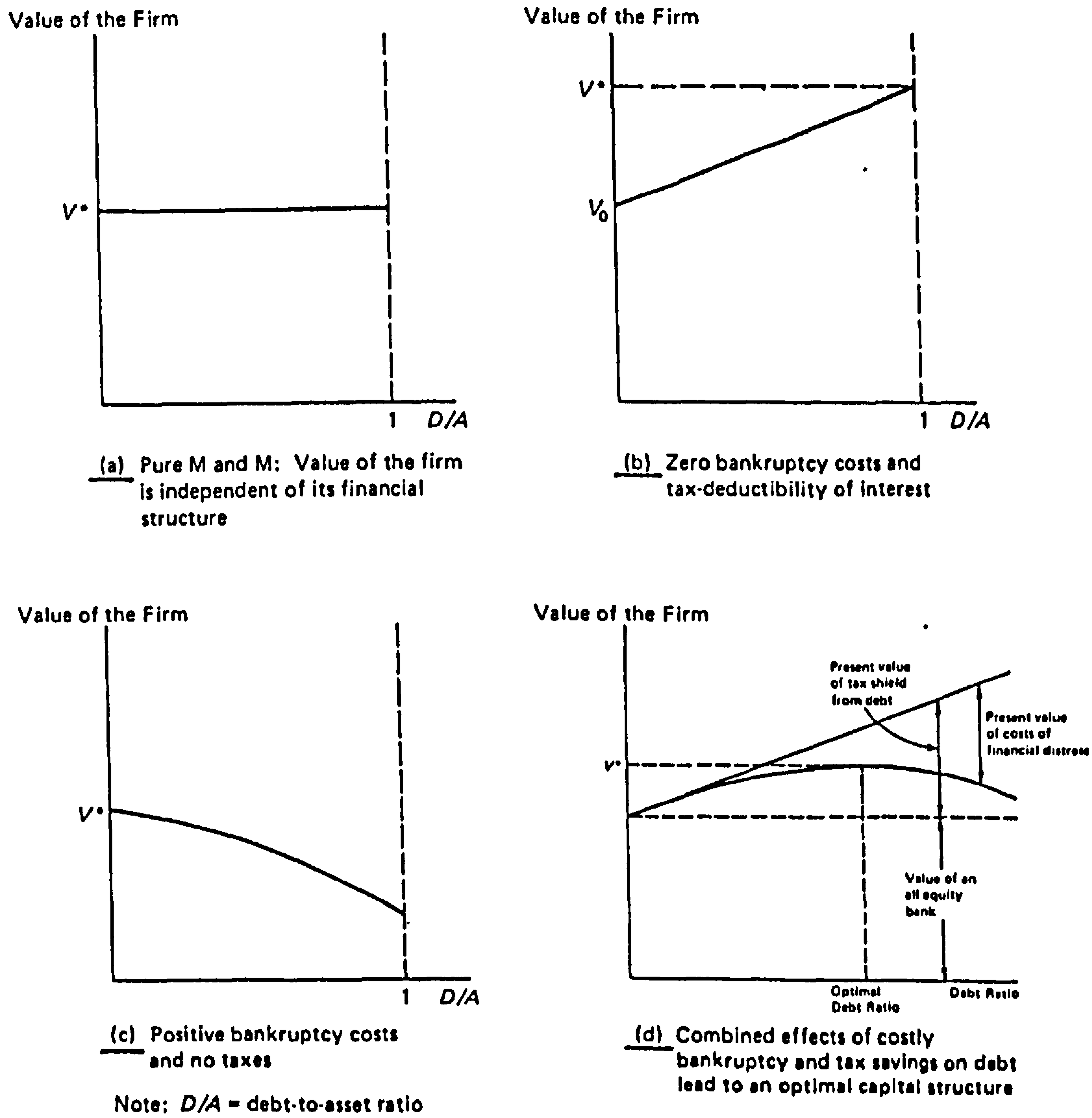
V_u = the value of the unlevered firm

M-M argue that the firm's overall cost of capital cannot be reduced as debt is substituted for equity, even though debt seems to be cheaper than equity. The reason for this is that as the firm adds debt, the remaining equity becomes more risky. As this risk rises, the cost of equity capital rises as a result. The increase in the cost of the remaining equity capital offsets the higher proportion of the firm financed by low-cost debt. In fact, M-M prove that the two effects exactly offset each other, so that both the value of the firm and the overall cost of its capital are invariant to the capital structure (see Figure 5.1 (a)).

The crucial support for the argument of this irrelevance proposition is the presence of arbitrage in capital markets and 'homemade leverage'. Arbitrage precludes perfect substitutes from selling at different prices in the same market. In these cases, the perfect substitutes are two or more firms in the same homogeneous risk class that differ only with respect to capital structure. M-M argue that the total value of the firms has to be the same, otherwise, arbitragers will enter and drive the values of the two firms together.

Similarly, Crouchy and Galai (1986) argue that in competitive markets, no optimal capital structure would exist for banks. Bank with a higher level of riskiness can either pay

<Figure 5.1> The Value and Optimal Capital Structure of the Uninsured Bank



Source: Sinkey (1992, p.70 and p.729)

higher rates of interest to depositors or increase their level of capital in line with the riskiness of the portfolio. Therefore, the regulation of bank capital is irrelevant. Levy and Sarnat (1990) also show that the value of the firm in a CAPM framework is invariant to changes in its financial structure.

Although the M-M theory gives insights into the analysis the capital structure of banking firms, it has limitations when applied to the real world, mainly due to its unrealistic assumptions. In reality, capital markets are not perfect. One of the main rationales of financial intermediation is information asymmetries, that is, market imperfections. Bankruptcy costs, agency costs, transaction costs and corporate taxes exist. Therefore, we need to mitigate the restrictive assumption of M-M theory.

The introduction of corporate tax without bankruptcy costs into the theory of capital structure could increase the value of the bank by T_cB (tax shield from debt financing) and the value of the bank is positively related to its debt. In this case, the value of the bank is

$$V_l = V_u + T_cB \qquad (5.11)$$

where T_c = corporate tax rate

B = value of debt

The value of the levered bank is the value of an all-equity bank plus T_cB, the tax rate times the value of the debt. T_cB is the present value of the tax shield in the case of perpetual cash flows. Since the tax shield increases with the amount of debt, the bank can raise its value by substituting debt for equity. In fact, the government pays a subsidy to the levered bank for the use of debt financing. The greater the amount of debt employed, the greater the subsidy and the greater the value of the bank, *ceteris paribus*. The strong forces that operate to maximise the value of the bank would seem to push it towards an all-debt capital structure as shown in Figure 5.1 (b).

The above discussion is inconsistent with the real world, where banks generally use some quantum of equity. Although debt provides tax benefits to the bank, however, debt puts pressure on the bank, because interest and principal payments are obligations. If these obligations are not met, the bank may risk some sort of financial distress. The ultimate distress is bankruptcy, where ownership of the bank's assets is transferred from the stockholders to the bondholders. These debt obligations are fundamentally different from stock obligations (Ross *et al*, 1990). Furthermore, the possibility of bankruptcy is not usually a linear function of the debt/equity ratio, but increases rapidly beyond some threshold. As a result, the expected costs of bankruptcy increase similarly and would be expected to have a corresponding negative effect on the value of the bank (see Figure 5.1 (c)). Because bankruptcy costs represent a " dead weight " loss, investors are unable to diversify away these costs even though the market equilibrium process is assumed to be efficient. As a result, investors are likely to penalise the price of stock as leverage increases. As debt is added, the required rate of return rises and this increment represents a financial risk premium. In the absence of bankruptcy costs, the required rate of return would rise linearly according to M-M. With bankruptcy costs and an increasing possibility of bankruptcy with leverage, the required rate of return would be expected to rise at an increasing rate beyond some point. As increasing leverage occurs, an increasing penalty is found. For extreme leverage, the penalty becomes very substantial.

The integration of tax effects and financial distress costs appears in Figure 5.1(d). The diagonal straight line in the figure represents the value of the bank in a world without bankruptcy costs. The reversed U-shaped curve represents the value of the bank with these costs. The reversed U-shaped curve rises as the bank moves from all-equity towards more use of debt. Here, the present value of the distress costs is still minimal with low amounts of debt, because the probability of distress is small. However, as more and more debt is added, the present value of these costs from employing more debt equals the increase in the present value of the tax shield. This is the debt-level maximising the value of the bank - the optimal amount of debt (and also a theoretical, optimal capital adequacy). Bankruptcy costs increase faster than the tax shield beyond this point, implying a reduction in the value of the bank from further leverage (Ross *et al*, 1990). The integration of tax and bankruptcy costs could lead to an optimal capital structure and accordingly an optimal, overall cost of bank capital. Conceptually, the value of the levered bank can be expressed as:

$$\text{PV Bank} = [\text{PV All-equity Bank}] + [\text{PV Tax-shield}] - [\text{PV Cost of FD}] \quad (5.12)$$

where PV = the present value

FD = financial distress

The value of debt is equal to the sum of the present value of the tax-shield from debt and the costs of financial distress. Once the bank becomes levered, the tax benefits and the costs of financial distress interact to determine the bank's optimal capital structure. In banking, the costs of financial distress are a complex interaction of liquidity costs, bankruptcy costs, capital adequacy and deposit insurance. Moreover, if the costs of financial distress are absorbed by the government through deposit insurance, then the way to maximise the value of the bank is to take on as much debt as possible. To prevent the full use of this government subsidy or guarantee, the supervisors of banks require the banks to maintain " adequate capital " so as to reduce the degree of financial leverage (Sinkey, 1992).

5.3.4.2 The Value and Optimal Capital Structure of the Insured Bank

The optimal capital structure of the value-maximising bank without having a regulatory authority guarantee a bank's deposits is presented in Figure 5.1 (d). This sub-section centres on the combination effects of an explicit deposit insurance premium and regulation, mainly capital regulation which is an implicit insurance premium (Sinkey, 1992), on the optimal capital structure and, accordingly, the value of the banking firm[4].

From a financial theory perspective, rational bank managers must consider both explicit and implicit fees when analysing the costs and benefits of deposit insurance and when optimising the value of shareholders' wealth. The discussion on the value and optimal

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4. This section is largely based on Buser, Chen and Kane (1981).

capital structure of the insured bank is particularly useful in Korea because the Korean authorities have recently begun to discuss the introduction of a deposit insurance scheme for banks[5].

To examine the combination effects of a deposit insurance premium and capital regulations on the optimal capital structure of the insured bank, Buser *et al* (1981) assumed that although deposit insurance covers, in reality, only up to a specific limit per account, deposit insurance coverage applies to all deposit balances and there are no doubts about the ability or willingness of the insurance agency (e.g., the FDIC in the USA) to meet its insurance obligations. These assumptions are realistic in the USA, for example, because of the widespread use of the deposit-assumption technique for handling failed banks (Sinkey, 1992).

To show the insights that M-M's framework has for analysing the effects of deposit insurance on the value of the bank, Buser *et al* (1981) explore the US system, and they begin with the case where the FDIC offers free deposit insurance, which means that there are no fees, either explicit in the form of insurance premiums or implicit in the form of regulation (e.g., capital regulations). In this case, the FDIC simply agrees to pay off all depositors in full in the event of bankruptcy without imposing any restraints on the bank. In effect, free insurance leads to the all-debt (i.e., zero-equity) corner solution as shown in Figure 5.1 (b).

Figure 5.2 (a) provides a comparison between the value of the bank with free deposit insurance (V_f) and the value of the bank without deposit insurance (V), which is the value of the uninsured bank determined by the market (as discussed in Section 5.3.4.1). This figure is actually the same as Figure 5.1 (d). The vertical distance between the two curves (V_f and V) portrays the value of free insurance to the bank at any capital structure as measured by the deposit/asset ratio.

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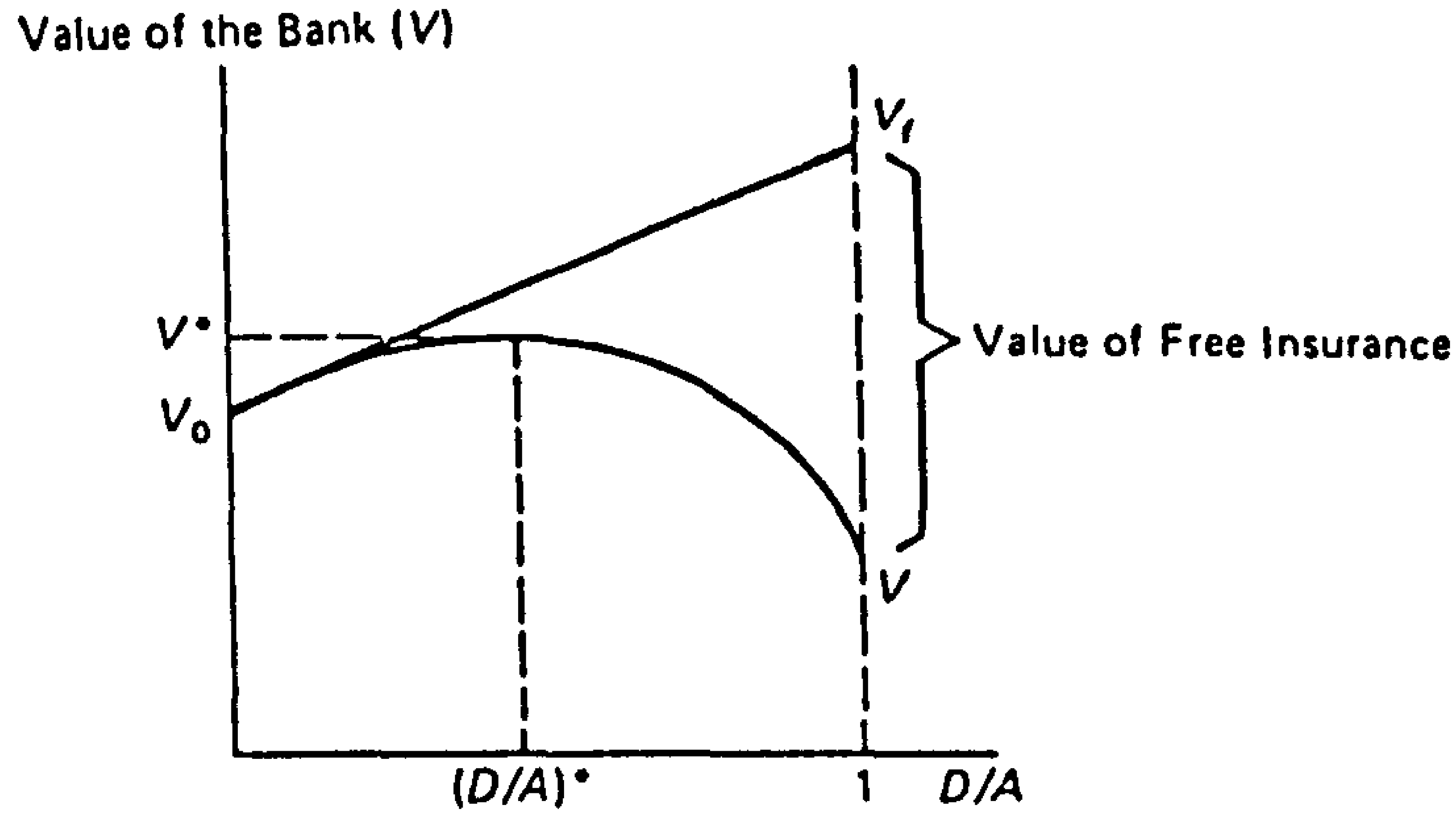
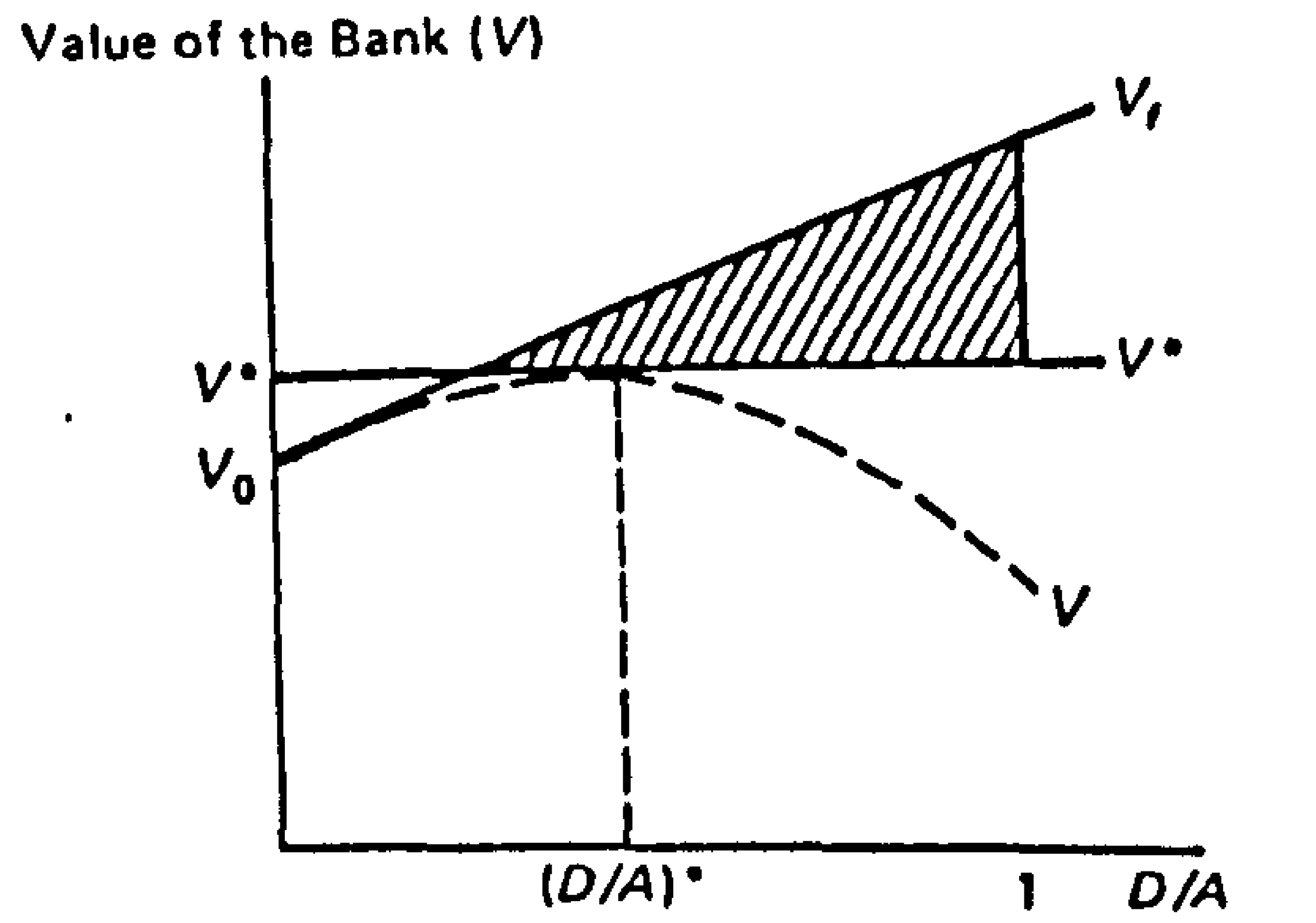
5. Deposit insurance for NBFIs was already introduced in Korea (see Section 2.4.3 in Chapter 2).

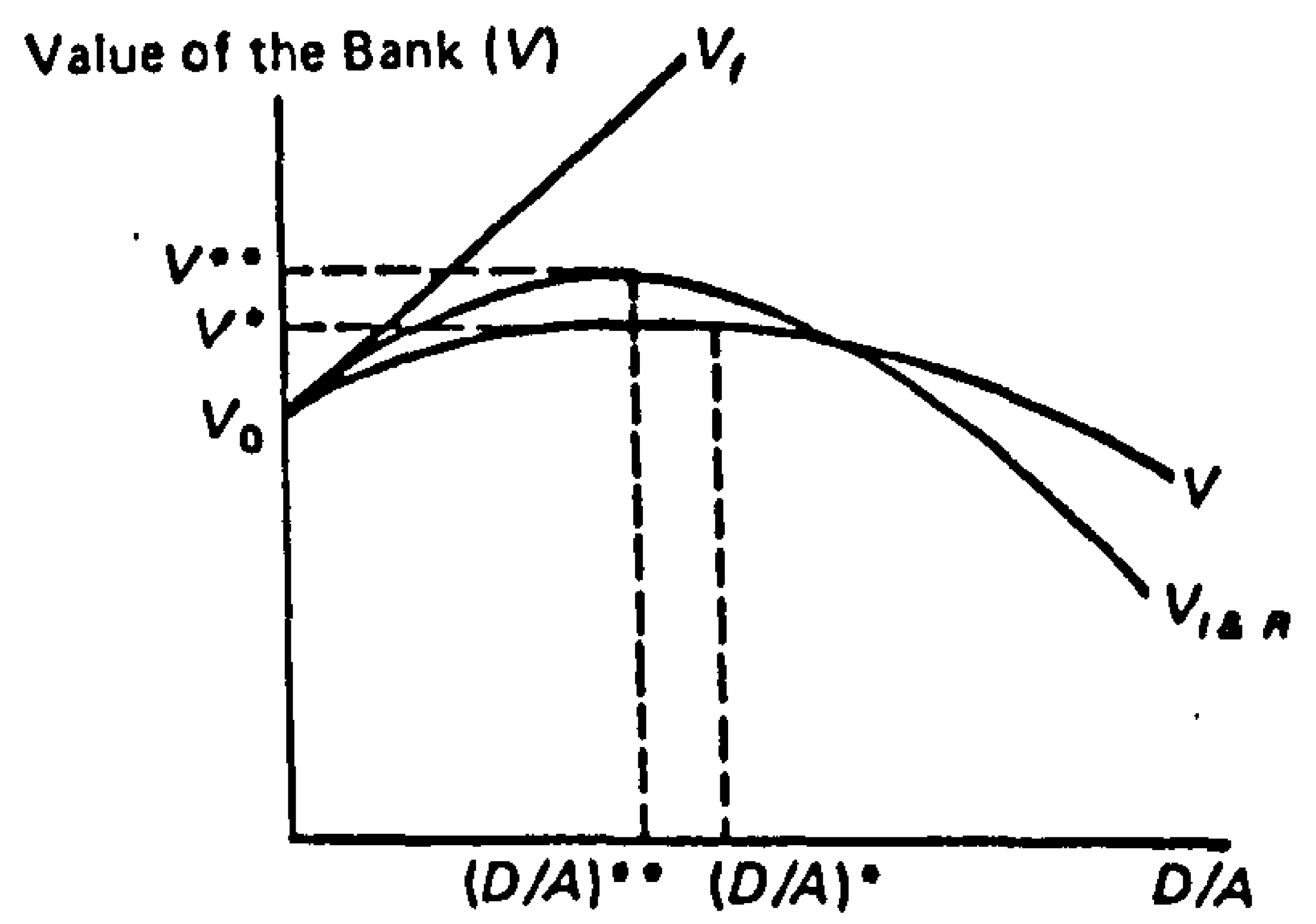
<Figure 5.2> The Value and Optimal Capital Structure of the Insured Bank



(a) Impact of "Free" Insurance on the Value of the Bank



(b) The Opportunity Set of "Acceptable" Insurance Contracts



(c) The Impact of Costly Insurance and Regulatory Interference on the Value of an Insured Bank

Source : Adapted from Buser, Chen and Kane (1981), Figure 2, 3 & 5, pp.55 & 58

Merton (1977), Sharpe (1978) and others argue that the FDIC should charge an explicit insurance premium sufficient to exhaust this increase in value. When these 'fair value' insurance fees are enforced, the V_f curve would collapse onto the V curve, as the value of the free insurance would be wiped out by the insurance premium. In this case, with or without deposit insurance, bank managers who attempt to maximise the shareholders' wealth would operate at $(D/A)^*$ and the value of the bank would be V^*.

Since such a neutral insurance contract might exist in a competitive market for deposit insurance, however, a 'fair value' pricing scheme for deposit insurance seems to give little incentive for banks to accept FDIC regulation. To establish and enforce regulation, the FDIC must price and administer its insurance contract so that it offers an insured bank the opportunity to increase its value above the market-determined value V^* (i.e., the value of an uninsured bank). The opportunity set of acceptable deposit insurance contracts is depicted by the shaded triangle in Figure 5.2 (b). The boundaries of the set are defined by V_f, V^* and $D/A = 1$. The latter assumes that the FDIC requires an insured bank to have some positive amount of equity capital. Excluding boundary lines, the area inside the shaded triangle portrays the set of mutually acceptable contracts opportunities (Buser *et al*, 1981; Sinkey, 1992).

Capital regulation is usually administered by calling for an infusion of capital into the bank and/or by restricting the bank's growth opportunities. Therefore, the joint impact of deposit insurance and supervisory regulations needs to be analysed. The impact of deposit insurance and supervisory regulation (i.e., explicit and implicit insurance premiums) on the value of an insured bank is portrayed in Figure 5.2 (c). The curve $V_{I\&R}$ (I & R represents insurance plus regulation) lies between the V_f and V at the safe levels of deposit liabilities when capital is adequate. However, when capital is inadequate, $V_{I\&R}$ falls below V. The vertical distance between V and $V_{I\&R}$ measures the net benefit to the bank of the insurance contract. The net benefit is positive when capital is adequate, but negative when capital is inadequate. The optimal capital structure with implicit and explicit insurance premiums occur at $(D/A)^{**}$. The bank would be worth V^{**} which is greater than V^{*}. Since V^{**} is greater than V^{*}, a value maximising bank is willing to sign up for deposit insurance contract.

In sum, Buser *et al* (1981) show that recognising the existence of implicit as well as explicit premiums for deposit insurance, the FDIC as a deposit insurance agency can achieve its objectives (i.e., discouraging excessive risk-taking of banks) by employing a risk-related structure of implicit premiums in the form of capital regulation. This implies that in analysing the pricing of deposit insurance, both the explicit and implicit aspects of it must be considered, and that the total insurance premium is a variable-rate one with adjustment for bank risk based on examiner's ratings and judgments.

5.4 MICRO-FINANCE MODEL(S) AND THE IMPACT OF CAPITAL ADEQUACY REQUIREMENTS

5.4.1 Analytical Frameworks for the Impact of Capital Regulation

In the former section, the optimal capital structure of the uninsured and insured banking firm was analysed from a theoretical point of view. The implication was that supervisory capital regulation may affect the capital decision of the banking firm. In reality, can supervisory capital regulation influence the capital structure of banks? If so, in which direction? Are the effects the same as those supervisors intend to achieve or are they perverse? These are the questions that now need to be addressed.

As discussed earlier, bank capital primarily functions as a short-term buffer or cushion to absorb unexpected losses arising from all the risks which a bank faces, and it serves as the critical element in helping to generate and maintain public confidence in banks and the banking system as a whole. Since bank capital regulation may play a vital role in the 'risk containment' of banks, therefore, capital adequacy requirements have become a central supervisory instrument among the bank supervisory authorities during recent years. These supervisory measures, in part, are reactions to secular declining trends of capital positions (especially in countries like the UK and the USA), and heightened concerns over the risk exposure of the deposit insurance system (Furlong & Keeley, 1987).

It is typically assumed that the mere addition of capital to the bank's balance sheet reduces risk (Di Cagno, 1990; Koehn & Santomero, 1980). This implies that as long as there are supervisory efforts to contain asset risk in banking, the increase in bank capital will lower the probability of failure, *ceteris paribus*. Following this approach, it seems that any regulation which increases the minimum capital adequacy requirement should be considered not only acceptable but also desirable (Di Cagno, 1990). In this context, regulatory and supervisory authorities have placed a greater emphasis on the regulation of bank capital in most industrial countries[6].

However, as Furlong and Keeley (1987) point out, the move to more stringent capital standards in banking has resulted in considerable controversy as well as some skepticism. A large number of empirical studies have been carried out to evaluate the effectiveness and the impact of capital regulation on banks. In order to measure and evaluate the effectiveness and the impact of capital regulation, two analytical frameworks have been employed. One is to analyse the impact of capital constraints on actual capital ratios: this approach focuses on the percentage change in bank capital. In other words, this approach is specifically concerned with whether supervisors have succeeded in causing capital deficient banks to raise their capital ratios (see Peltzman, 1970; Mayne, 1972; Mingo, 1975; Dietrich & James, 1983; Wall & Peterson, 1987 & 1988; Keeley, 1988; and Dahl & Shrieves, 1990). Where the results of these analyses deny that supervisors have succeeded in imposing their new capital standards upon the bankers they supervise, capital adequacy requirements on banks are ineffective and indicate *ceteris paribus* that capital adequacy requirements have failed to reduce the overall riskiness of banks' portfolio compositions. This

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6. One example of these efforts is the Basle Accord.

approach is based on the assumption that there are strong inverse relationships between the level of bank capital and the overall riskiness of a bank's portfolio. In other words, this approach assumes that the mere addition of capital reduces the overall riskiness of a bank's portfolio. However, this assumption is open to serious question and strong doubts.

The second approach to overcome the above drawback is to measure directly the overall riskiness of a bank's portfolio and to compare and evaluate the results both before and after the imposition of stringent capital standards. Empirical studies within this area can be divided into three categories according to their assumption on the objectives of the banking firm and their analytical frameworks: utility maximisation objective and mean-variance framework (Kahane, 1977; Koehn & Santomero, 1980; Kim & Santomero, 1988); value maximisation objective and state-preference framework (Sharpe, 1978; Dothan & Williams, 1980; Furlong & Keeley, 1987 & 1989); and market-based asset pricing models (Saunders & Ward, 1976; Swary, 1990; Morgan III, 1984; Lam & Chen, 1985; Eysell & Arshadi, 1990; Cooper, Kolari & Wagster, 1991).

In these empirical literatures, there has been considerable debate over whether bank capital regulation has any effect and if it has, in which direction it affects bank's overall riskiness. However, the results derived from the empirical analysis are not unambiguously determined and are quite often contradictory. The difficulty of getting an unambiguous statement from the empirical point of view is related to the different periods analysed and to the different variables involved (Di Cagno, 1990). Therefore, the results are model specific (also see Santomero, 1984).

In the following sub-section, first, the empirical studies are reviewed on whether or not supervisory efforts achieve the desired (targeted) change of actual capital ratios. Second, the empirical works on whether capital regulation affects the overall riskiness of bank's portfolio are analysed. However, the empirical studies based on the most important market-based asset pricing models such as the CAPM, the APT and the OPM are reviewed in a later, separate section.

5.4.2 The Impact of Capital Regulation on the Capital Structure of Banks

Early empirical studies focused on analysing the impact of capital regulation on actual bank capital ratios. These empirical studies often show contradictory results. Some argue that bank capital regulation does not influence the bank capital decision (Peltzman, 1970; Mayne, 1972; Dietrich & James, 1983), while others contend that they find evidence of regulatory influence on bank's capital decision (Mingo, 1975; Wall & Peterson, 1987 & 1988; Keeley, 1988; Dahl & Shrieves, 1990).

Peltzman (1970), who estimated the magnitude of the impact of government regulation on capital investment in banking, found empirical evidence of the persistence of discrepancies between what regulators want the bank capital stock to be and what it is: this implies that capital regulations are ineffective. Peltzman tested a simple capital investment model for a bank to explain investment in commercial banking; he used cross-sectional data for US banks for the period 1963-1965. To measure the effectiveness of bank capital regulation, Peltzman incorporated two variables into equation: the percentage of deposits insured by the FDIC and the ratio of adequate capital to capital actually held by banks. The expected coefficient of the latter variable should be positive if regulation is effective and equal to zero otherwise.

The estimates of that equation show that bank capital regulation is and has been an almost total failure. The coefficient of the capital adequacy variable is significantly negative in every specification of the model. This result holds when any other adequacy formula is substituted for the Board of Governor's formula - the more inadequate their existing capital, the less banks invest. This rather unexpected result has been interpreted by Peltzman by the fact that regulation is not only ineffective now, but it has also been ineffective in the past. The implication is that investment in bank capital has been responding to market forces which do not, in turn, affect regulatory preferences. Peltzman also found other evidence supporting this conclusion. He found a significantly negative coefficient for the deposit insurance percentage which indicates that bankers reduce capital investment where more of their deposits are insured. Furthermore, the correlation between the level of the regulation-desired capital/deposits ratio with the actual ratio indicates that regulation is ineffective. In brief, Peltzman concluded that there was no evidence that bank investment behaviour conforms to the regulators' standards of capital adequacy and there is strong evidence that it never has.

Mayne (1972) analysed differences in the amount of capital funds held by the US banks in each of the examination classes (national, state Federal Reserve member and non-member). Since there are marked differences in the capital standards of each of the agencies, effective implementation of regulatory standards should lead to marked differences in observed capital positions between banks of the three examination classes. However, Mayne (1972, p.650) found that "the differences that are evident are rarely of such magnitude as to be important either in a statistical or economic sense.... It is conceivable that systematic differences among the bank classes in management conservatism or responsiveness to bank examiners suggestions for additional capital, may offset differing agency standards thus negating supervisory impact on capital."

Contrary to Peltzman and Mayne, Mingo (1975) found strong evidence of the effect of regulation on banks' capital decisions. This analysis followed Peltzman's approach with correction[7] of two errors in Peltzman's equation. Using a sample of 323 banks in 1970, Mingo's first finding supports Peltzman's conclusion that bankers treat deposit insurance as a substitute for bank capital. In addition, he also found that regulators have made no attempt to reduce this 'substitution effect'. However, this result does not necessarily imply

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7. Mingo argues, first, that aggregated data (mean ABC ratios) may be inadequate for purposes of measuring regulatory influence on bank capital. The reason is that because Peltzman employed data aggregated by state, he utilised the mean state ABC ratio as a proxy for regulators' desires. However, there may be wide variation in individual ABC ratios across banks in a state. Furthermore, even though two states have identical mean ABC ratios, distributions of ABC ratios among individual banks may be vastly different. This can be potentially misleading, because regulators are likely to pressure a bank to increase capital when its ABC ratio is low, otherwise not. Second, once individual bank data are used, other explanatory variables may be included, which may not be appropriate when aggregate data are utilised. The only statistically significant variable in this category is Federal Reserve System membership.

that regulation is ineffective. His second important finding is that the lower the ratio of actual capital to capital desired by the regulators, the more likely it is that a bank adds to capital over the next period, *ceteris paribus*, to satisfy the demands of the bank examiner. Furthermore, the magnitude of the effect of regulation on bank capital investment is not small. For the 'average' bank, a decline of 10 percent in the ratio of actual to regulator-desired capital will result in an 11 percent increase in the rate of capital investment, *ceteris paribus*. Based on his findings, Mingo concluded that the level of bank capital in the presence of bank capital regulation is greater than it would be in the absence of regulation, and the consolidation of the examination function into a single agency would not appreciably change the impact of such regulation.

Dietrich and James (1983) also tested empirically the effectiveness of bank capital adequacy requirements, without finding a significant relationship between changes in bank capital and the capital standards imposed by regulators. Dietrich *et al* (1983) estimated almost the same regression model as Peltzman (1970) and Mingo (1975), and utilised a much larger sample of banks (more than 10,000 banks operating exclusively in the USA) and a different time period (1971-1975) than the previous studies of Peltzman and Mingo; this allowed for a statistical precision not possible in earlier studies.

To measure the regulatory influence on banks' capital decisions, Dietrich *et al* (1983) incorporated the ABC' variable which is the negative inverse ratio of each bank's observed accounting equity capital to the amount of capital desired by the regulator. Thus, the regression coefficient on the ABC' variable is interpreted as the change in capital due to regulatory influence. So if regulation is effective, the expected sign on the ABC' coefficient would be negative.

The results of the analysis are remarkably similar to those reported by Peltzman (1970): in none of the years studied is the estimated coefficient for the ABC' ratio both negative and significant as estimated by Mingo (1975). Rather, the coefficient of the ABC' ratio is not significantly different from zero in three of the five years and is positive and significant in two years. Moreover, the small values and low t-statistics on the capital regulation variable are evidence of the weakness of the hypothesis that regulation could influence bank capital. A finding of no relationship between the capital adequacy measure and the observed percentage change in capital seemed to support the view there is no influence of regulation on the banks' capital decisions. The conflict in findings with those of Mingo (1975) results from Mingo's failure to account for the effect of binding deposit rate ceilings.

Wall and Peterson (1987 & 1988) examined the hypothesis that the primary capital guidelines imposed by regulators are affecting large Bank Holding Companies' (BHCs) equity capital in 1982, 1983 and 1984; the sample consists of 105 publicly traded BHCs. Wall *et al* (1987 & 1988) argue that previous empirical studies (Peltzman, 1970; Mingo, 1975; Dietrich & James, 1983; and Marcus, 1983) rely on single equation, ordinary least squares (OLS) to estimate the effect of capital regulation and, as a result, this methodology does not allow for regulations to be binding on some BHCs, while the market-required capital exceeds the regulatory standards for others.

To overcome this deficiency in OLS estimation, Wall *et al* (1987) utilised a disequilibrium estimation procedure that allows BHCs to be influenced by binding capital regulation or by market factors. A disequilibrium framework represents a common dependent variable as the greater (or lesser) of that obtained from two different models. In their model, the dependent variable, the change in the equity capital to asset ratio, is represented as the greater of that obtained from a regulatory model on a market model. If the regulatory guidelines exceed the market requirements for a BHC, then the regulations are binding and it is operating in the regulatory model. Otherwise, the BHC is operating in the market model. To estimate the model, Wall *et al* utilised maximum likelihood techniques.

The results indicate that in 1982 and 1983, the overwhelming majority of BHCs are classified as having a 90% or greater probability of coming from the regulatory model. Most BHCs continue to have a greater than 70% probability of coming from the regulatory model in 1984, but the number of BHCs having a greater than 90% probability of coming from the regulatory model falls substantially. Only 16 observations have a 30% probability or less of coming from the regulatory model in any of the three years. Overall, the results suggest that the overwhelming majority of BHCs are heavily affected by regulatory forces, while a small number of BHCs in each year are primarily influenced by market forces. In addition, Wall *et al* (1987) recommended that given the theoretical evidence that regulatory control over bank capital leads to greater risk taking (Lam & Chen, 1985; Koehn & Santomero, 1980; and Kahane, 1977), the supervisory authorities should intensify their supervision of those BHCs increasing their equity capital due to regulatory pressures.

Keeley (1988) also investigated the effectiveness of bank capital regulation by examining the changes that took place during the period 1981-1985, analysing the data of the 150 largest bank holding companies whose stocks are publicly traded. Keeley's study examined whether the new capital requirements caused banks with capital ratios below the minimum to raise their book value capital ratios to meet the new standards. In addition, his study also analysed whether an actual increase in book value capital represents an actual market-value capital infusion or whether they merely result from accounting changes.

The issue of whether a market value capital infusion took place is particularly important in evaluating the effectiveness of the capital regulations because the risk exposure of the insurance fund depends ultimately upon the market values of banks' assets and liabilities - not on their book values. However, only book value capital ratios are subject to capital regulation and there is not a close correspondence between book and market values. For example, banks might respond to more stringent capital regulation by selling and then repurchasing appreciated assets. This would have the effect of increasing book value of capital and assets by the amount of the capital gain and thereby increasing the book value capital/assets ratio, but it would not affect the market value ratio or risk exposure of the deposit insurance system. In this context, Keeley (1988) analysed, first, the changes in banks' book-value capital ratios caused by regulation; second, the sources of these changes; and third, the effects on market value capital/assets ratios using a measure based on stock prices.

Their empirical results indicate that banks with low book-value capital ratios increased their ratios to meet the new standards introduced in the 1980s apparently in response to the regulations. Therefore, capital regulation is effective on average, at least in a book value sense. The results also indicate that the standard deviation of the primary capital ratio across all sample banks fell from 1.54 to 1.16. Moreover, they do not allow the hypothesis to be rejected that the standard deviation across capital-deficient banks was unchanged, whereas they do indicate that the standard deviation across capital-sufficient banks declined by a statistically significant amount. In addition, the standard deviation across all sample banks declined more than the standard deviation of capital-sufficient banks, implying that differences among banks in the two groups (i.e., capital-sufficient banks and capital-deficient banks) also declined - a result consistent with the regulatory intention that all banks should reach capital ratios near the minimum required level (plus a buffer). However, the evidence also indicates that banks increased their book value capital ratios mainly by slowing asset growth; this suggests that an actual increase in capital ratios took place. With regard to the effects on market value capital ratios, even though the changes in stock-price-based, market-value capital ratios are consistent with regulatory increases in capital for the capital-deficient banks, they are also consistent with several other hypotheses and thus not provide independent support for the regulatory hypothesis.

Dahl and Shrieves (1990) also analysed the relationship between the likelihood of a bank issuing capital and various financial and market characteristics which are predicted to be associated with equity infusions. They used a binary logit methodology and adopted a perspective similar to that utilised by Dietrich and James (1983), Mingo (1975), Peltzman (1970), all of whom analysed the impact of regulation on changes in bank capital over time. However, Dahl *et al* (1990) focused on external equity infusions by banks as a specific element of changes in overall bank capital. They argue that previous research confounds the impacts of 'current' decisions affecting bank capital with the impacts of residual fluctuations in retained earnings that are the result of 'prior' decisions on operational policies.

As a result, Dahl *et al* (1990) tried to isolate changes in bank capital which are both significant in magnitude and identifiable as signals to regulators of 'current' capital decisions made by bank management. They argue that this methodology offers greater chronological precision in determining the response of banks to capital regulation. The sample consists of 11,800 banks to examine potential causes for 753 capital issues occurring during 1986-1987.

Their results indicate that, first, among adequately capitalised banks (according to the regulatory authorities), the likelihood of equity infusions was negatively related to return on investment and the beginning-of-period capital ratio. However, the likelihood of equity infusion was positively related to growth, market concentration and location in an urban market area. These results are consistent with the existence of market forces for adjustment of capital ratios in excess of the regulatory minimum, and indicate that deposits do not entirely dominate equity as a source of bank funding for most banks. Second, undercapitalised banks by regulatory authorities were found to be more likely to issue equity than adequately capitalised banks. Furthermore, the analysis of the coefficients of the logit model from the sample of adequately capitalised banks to the sample of the undercapitalised banks indicates that the portion of infusions observed was statistically larger than it would have been in the absence of regulation and it was important in an economic sense. Overall, the results indicate that adequately capitalised banks pursue growth through increases in equity capital as well as through insured deposits. However, undercapitalised banks are likely to issue equity reflecting regulatory pressure rather than an investment based on a specific consideration of bank and market characteristics which encourage higher capital levels.

In sum, there has been considerable debate over whether capital regulation is effective - specifically, whether regulators have succeeded in causing capital-deficient banks to raise their capital ratios. In the seminal paper on this subject, Peltzman (1970) found no evidence that regulation affected banks' capital decisions; neither did Mayne (1972). On the contrary, Mingo (1975) seemed to find evidence of an effect. However, Dietrich and James (1983) argued that Mingo's findings were due to a failure to account for the effects of deposit rate ceilings on banks' capital decisions and supported Peltzman's findings. Wall and Peterson (1987 & 1988) found that the overwhelming majority of BHCs and large banks affiliated with BHCs were heavily influenced by regulatory forces. Keeley (1988) also found strong evidence of the effectiveness of capital regulation on banks' capital decisions, at least in a book value capital sense. Dahl and Shrieves (1990) also found some evidence of a regulatory impact on bank capital decisions, especially for undercapitalised banks. Table 5.9 summarises these studies. To conclude, there is still controversy over whether or not capital regulation affects banks' capital decisions. However, recent empirical studies suggest that the capital guidelines of the regulatory authorities do influence significantly banks' capital structures.

5.4.3 The Impact of Capital Regulations on the Portfolio Composition of Banks

5.4.3.1 The Impact on the Utility Maximising Banks in a Mean-Variance Framework

A number of studies have attempted to analyse the impact of capital adequacy requirements on the asset risk of banks and the probability of bank failure while assuming that banks maximise utility in a mean-variance framework (Kahane, 1977; Koehn & Santomero, 1980; Kim & Santomero, 1988). These studies focusing on utility maximising banks question the effectiveness of capital adequacy requirements to reduce the overall riskiness of banks. In particular, these studies have shown that, in a Markowitzian two-parameter portfolio model, more stringent bank capital regulation will cause a utility- maximising bank owner-manager to increase the portfolio risk of a bank and may, as a result, increase the risk of bank failure. This state of affairs, implicitly, increases the expected liability on the deposit insurance funds.

<Table 5.9> The Impact of Capital Regulation on the Capital Structure of Banks

Author	Year	Source	Model Description and Comment
Peltzman	1970	JOPE	-A capital investment model utilising multi-regression technique to explain investment in commercial banking. -Capital regulations are ineffective.
Mayne	1972	JOF	-A cross-sectional multi-regression model to explore differences in the actual amount of capital funds held by banks in each of the examination class (i.e., FDIC, FRS and OCC) -No significant differences exist.
Mingo	1975	JOF	-Following Peltzman's approach with some modification in model and data. -Capital regulation is effective.
Dietrich & James	1983	JOF	-Similar approach to Peltzman and Mingo but with much larger sample of banks and a different time period. -Capital adequacy requirements are ineffective.
Wall & Peterson	1987	JB&F	-A disequilibrium framework to examine the impact of of capital adequacy guidelines on large BHCs. -Capital regulations are effective.
	1988	JFSR	-A disequilibrium framework to analyse capital changes at large banks affiliated with BHCs. -Capital regulations are effective.
Keeley	1988	ER	-Examines the changes in bank's book value capital ratios caused by regulation together with the sources of those changes and the effects on market value capital/asset ratios. -Capital regulations are effective.
Dahl & Shrieves	1990	JB&F	-A binary logit model to examine the extent to which regulatory capital standards influence infusions of external equity into commercial banks. -Regulatory minimum capital constraints influence the the financing decisions made by banks.

Notes: 1) JOPE represents Journal of Political Economy.
2) JOF represents Journal of Finance.
3) JB&F represents Journal of Banking and Finance.
4) JFSR represents Journal of Financial Service Research.
5) ER represents Economic Review issued by Federal Reserve Bank of San Francisco.

Kahane (1977) examined the effectiveness of regulatory instruments in protecting the financial intermediary's solvency. The analysis was carried out by examining the relationships between the intermediary's opportunity set and probability of ruin. Kahane assumed that the purpose of regulation is to constrain the probability of ruin, defining 'ruin' as the case where equity capital is completely eliminated. The probability of ruin is a function of a firm's profitability which, in turn, depends on the composition of a firm's asset and liability portfolios. Further, Kahane assumed that returns are normally distributed and the firm is a price-taker and operates in a perfectly competitive market. In addition, the variance-covariance matrix must be such as to prevent the existence of a non-zero riskless portfolio. A single-period portfolio model, balancing the assets and liabilities of the intermediary, was utilised in calculating the distribution of the return on equity.

Kahane (1977) showed in his theoretical model that, in the case where an intermediary's capital is given and the leverage constraint is imposed as the ratio between the liabilities and the equity, imposition of a leverage constraint does not prevent the bank reaching excessive risk levels, i.e., probabilities of ruin beyond the level that the regulation intended to impose. However, this analysis can be extended in the case of a 'minimum capital requirement', i.e., where the capital is determined at a constant level, irrespective of liabilities. In this case, the results indicate that the intermediary may have an excessive probability of ruin and it is forced to hold a non-optimal portfolio, meaning that the intermediary has reached the same expected return with a lower risk level. Therefore, the minimum capital requirements apparently caused an unintended result: it worsened, rather than improved, the intermediary's condition and increased its probability of ruin. Kahane (1977) suggested that only a combination of capital regulation and constraints on portfolio composition enable bounding the probability of ruin. This is a key theoretical result with important practical implications for capital adequacy supervision.

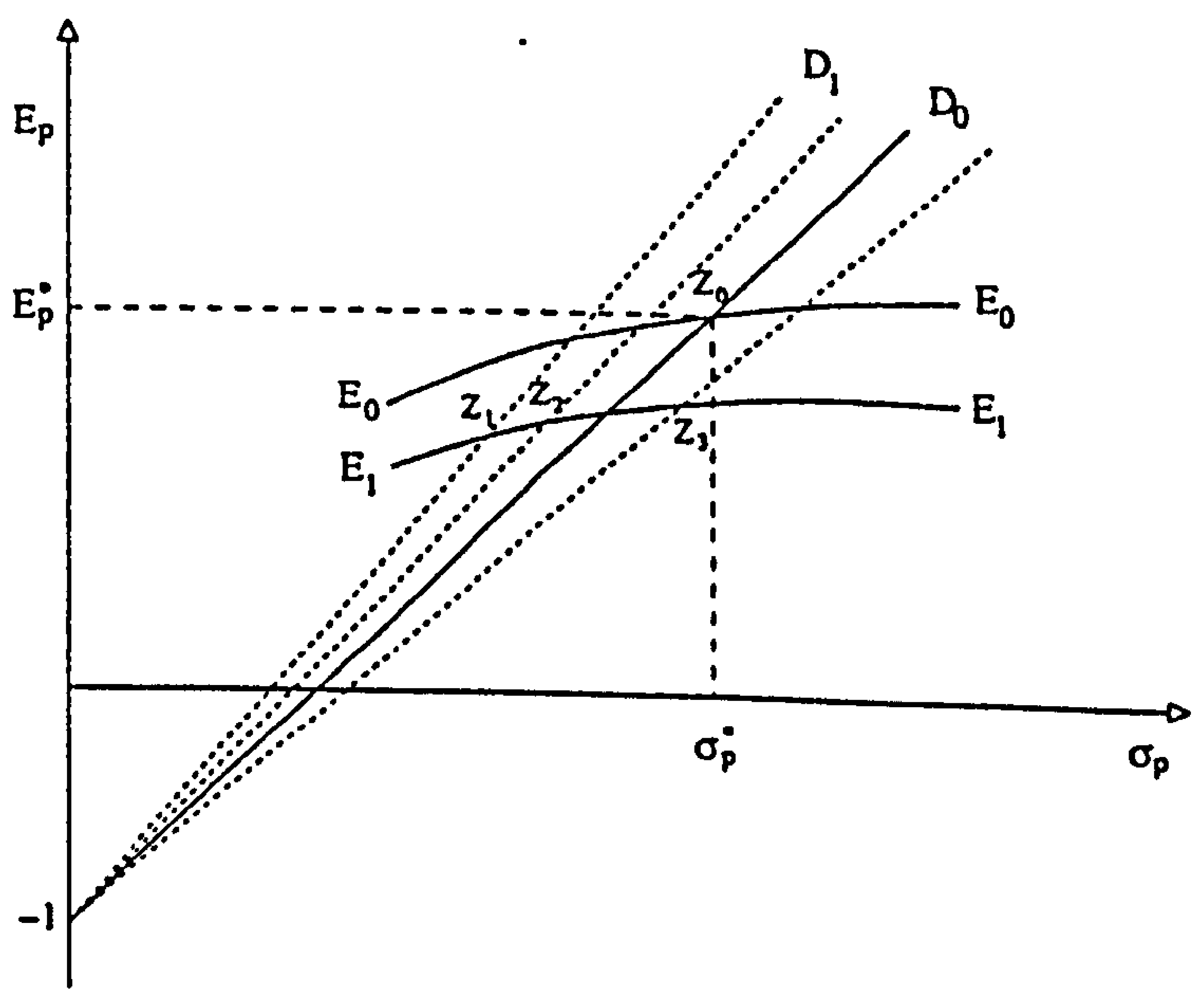
Koehn and Santomero (1980) investigated the effects of capital ratio regulation on the portfolio behaviour of commercial banks. The authors showed that the impact of stringent capital regulation in terms of influencing banks' portfolios from less risky towards riskier assets is unambiguous, while those on the average probability of failure of the bank is ambiguous. To examine the portfolio response of the commercial banks faced with a regulatory change, several assumptions were made in their model. First, total bank size is assumed to be under the control of bank management; so the amount of deposits becomes a choice variable. However, it is assumed that the capital ratio is effectively constrained by regulation. Second, there does not exist a risk-free asset for purchase by the bank, but the return paid to depositors is riskless. Third, the bank acts as if it were a single-period, risk-averse, expected-utility maximiser. Fourth, the objective function can be approximated by a Taylor series expansion of a general class of risk-averse utility functions, truncated after the second moment. Finally, the bank operates in a competitive market. With the above assumptions, in order to locate the efficient frontier, the authors included in the set of equations analysed the 'leverage' or capital constraint imposed by regulation, following the method originally developed by Merton (1972) and Hart and Jaffee (1974).

Koehn and Santomero (1980) showed that as the value of the capital ratio ($c = K/A$) varies from 0 to 1, the leveraging potential of the bank varies from the banks' unconstrained optimum to an amount equal only to its equity capital. The optimal portfolio chosen by the bank is then obtained by the simultaneous solution of a system of equations constructed by the authors. Given that the bank is assumed to have a general risk-averse utility function in end-of-period capital, with a constant coefficient of relative risk aversion (b) of the underlying utility function, the optimal portfolio of each risky asset in the portfolio to equity capital can be expressed in terms of the parameters of the joint distribution of returns, the coefficient of risk aversion utility function (b) and the capital asset constraint (c).

In the presence of an increase in c, the bank will not be able to leverage its capital as before because of the budget and capital constraints. Furthermore, because of the new stringent restriction on the leveraging capability of the bank, the bank's efficient frontier will move downward and to the left for any given value of capital (e.g., in Figure 5.3, the efficient frontier E_0 moves down to E_1). Over the entire permissible frontier the total variance of the portfolios falls, and the return on each set declines.

However, with the imposition of higher capital requirements, the bank reacts by reshuffling the composition of its assets portfolio per unit of capital. The effect on the composition of the bank's portfolio, given a small change in the required capital/assets ratio, can be evaluated by differentiating the optimal ratio of each risky asset in the portfolio to equity capital with respect to c. The results reveal that the imposition of new stringent capital requirements leads a bank to reshuffle its portfolio from less to more risky assets. The effect of stringent capital regulation on a bank's portfolio is perverse to what supervisors intend. The degree of this reshuffling, however, depends on the relative risk aversion of the bank. Banks which initially held relatively more risky assets per unit of capital will shift to offset the capital restriction to a greater extent than more conservative banks.

<Figure 5.3> The Effect of a Reduction in Allowable Leverage



Source: Adapted from Koehn and Santomero (1980), p.1242

With regards to the impact of capital constraints on the probability of bank failure, Koehn and Santomero (1980) utilised the capital/asset ratio, the expected return of the portfolio and the variance of the return, via the Chebyshev Inequality, to estimate the upper bound of the probability of failure. Given the characteristics of the bank portfolio described by E_p and σ_p, the probability of failure may be specified as follows (see Blair and Heggestad, 1978; Koehn and Santomero, 1980):

$$PR\,[R_p < -1] \leq \frac{\sigma^2_p}{(E_p + 1)^2} = P \qquad (5.13)$$

An increase in variance increases the probability of failure, while an increase in returns or capital ratio will, *ceteris paribus*, decrease failure risk (see Equation 5.13). This upper bound on the probability of failure can be graphically seen as the square of the reciprocal of the slope of a ray in mean-variance space. The ray has an intersect of [-1], in Figure 5.3 and is denoted as D_o. It intersects the efficient frontier at the point Z_o where the optimal allocation is indicated by the tangency of the objective function.

When bank regulators impose a higher c, the frontier moves down and to the left (see Figure 5.3). If a bank settles for the same risk-return relationship in its portfolio as initially, the portfolio set will shift to Z_1 (identical in risk-return trade-off to portfolio Z_0) on the new constrained frontier. Since the slope of D_1 through Z_1 is greater than the slope of D_0, the upper bound of the probability of failure decreases and the regulators achieved their desired result. However, a bank satisfying the conditions set above, will not move to point Z_1. Subsequent to the increase in c, the bank reshuffles its portfolio towards relatively more risky assets. The exact point will depend on the risk aversion of a bank's preference function. Then, two cases can be distinguished: the case where the new portfolio choice results in a reduction in the probability of failure (Z_2) and the case where it results in an increase of that probability (Z_3). This implies that there exists some value of b, denoted b^*, below which any increase in c will increase the probability of failure rather than decrease it. Thus, as the capital constraint increases, the probability of failure will decrease, increase or remain unchanged as b is greater than, less than or equal to the critical value b^*. To summarise, Koehn and Santomero (1980) showed that regulating bank capital through ratio constraints appears to be an inadequate tool to control the riskiness of banks and the probability of failure. The authors suggest that regulation should be imposed on both asset composition and capital. Essentially the same result was reached independently by Kahane

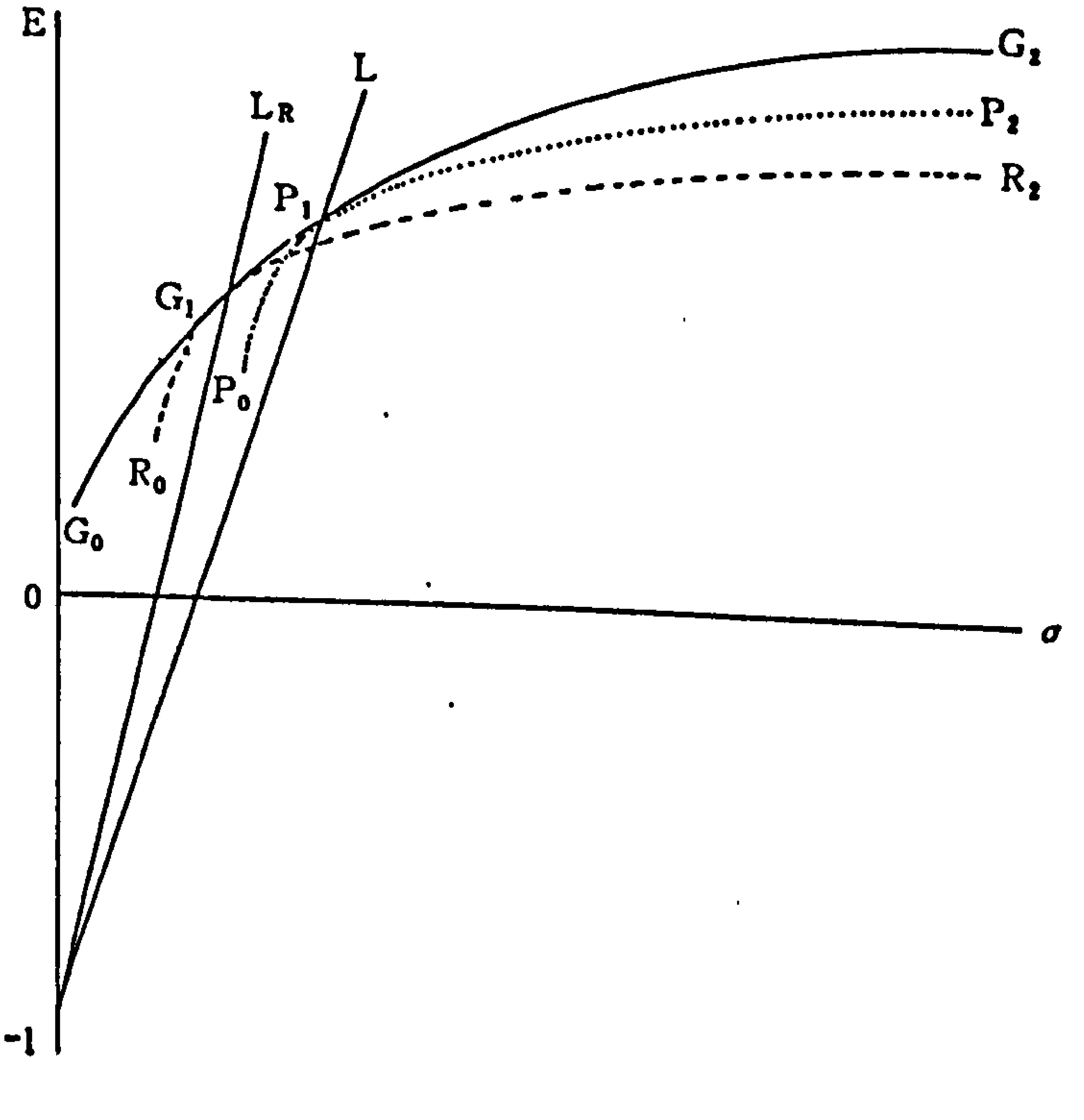
(1977).

Kim and Santomero (1988) evaluated the effectiveness of capital regulation in a banking industry characterised by fixed-rate deposit insurance pricing and implicit, not explicit, deposit guarantees. The authors considered both the uniform capital ratio requirement and the new risk-related capital plan (the Basle proposal) in controlling bank risk and maintaining a 'safe and sound' banking system. Kim and Santomero demonstrated that the traditional, uniform capital-ratio regulation is an ineffective way to control the probability of failure and, thus, to maintain a 'sound and safe' banking system, and that the recent move to the risk-related capital regulation is potentially more effective.

Kim and Santomero (1988) developed a mean-variance model utilised by Koehn and Santomero (1980) with almost the same assumptions. The authors showed that as the equity/assets ratio (k) increases (less leveraged), the efficient frontier moves down to the left in (E,σ) space (see Figure 5.4). Allowing full flexibility of k, the global frontier will be an envelope of efficient frontiers with all levels of k. As the capital ratio increases from k^* to k^R (where $k^* < k^R$), the efficient frontier moves down from $P_0P_1P_2$ to $R_0G_1R_2$. Each frontier touches the global frontier $G_0G_1G_2$ from below at P_1 and G_1, respectively. As the bank moves up along the global frontier (i.e., G_0--> G_1--> P_1--> G_2), the risk and return on equity of the underlying portfolio increases. The actual portfolios held by banks will depend on their utility function and will be determined at the point which equals the bank's marginal rate of substitution (MRS) between risk and return to the marginal rate of transformation (MRT) along the derived efficient frontier. In the absence of capital regulation, the global frontier becomes feasible to a bank.

Since the efficient frontier with the capital ratio of k^R, $R_0G_1R_2$, touches the global frontier $G_0G_1G_2$ at G_1, (E^R,σ^R), the regulators force banks to operate with an equity/asset ratio of at least k^R. By doing so, the regulators hope that when $k \geq k^R$ is binding, a bank will chose G_1 instead of those portfolios on G_1G_2 such as P_1. However, a risky bank may not move to G_1 in its reaction to satisfy $k \geq k^R$. The regulatory constraint on the capital ratio makes the area between G_1G_2 and G_1R_2 infeasible for a bank's portfolio choice, but the new constrained efficient frontier is not confined only to G_0G_1, which the regulators wish to achieve through ratio regulation. It still leaves portfolios on G_1R_2 feasible, which satisfies the capital ratio requirement but not the solvency standard. The authors suggest that any bank with a relative risk aversion parameter smaller than the critical value (Γ^c, b^* in Koehn and Santomero (1980)) would choose a portfolio along G_1R_2. Such banks reshuffle assets towards riskier ones to offset the impact of forced, higher capital-adequacy ratios, making capital adequacy requirements an ineffective way to bound the insolvency risk.

<Figure 5.4> The Effects of Capital Regulation on the Probability of Insolvency

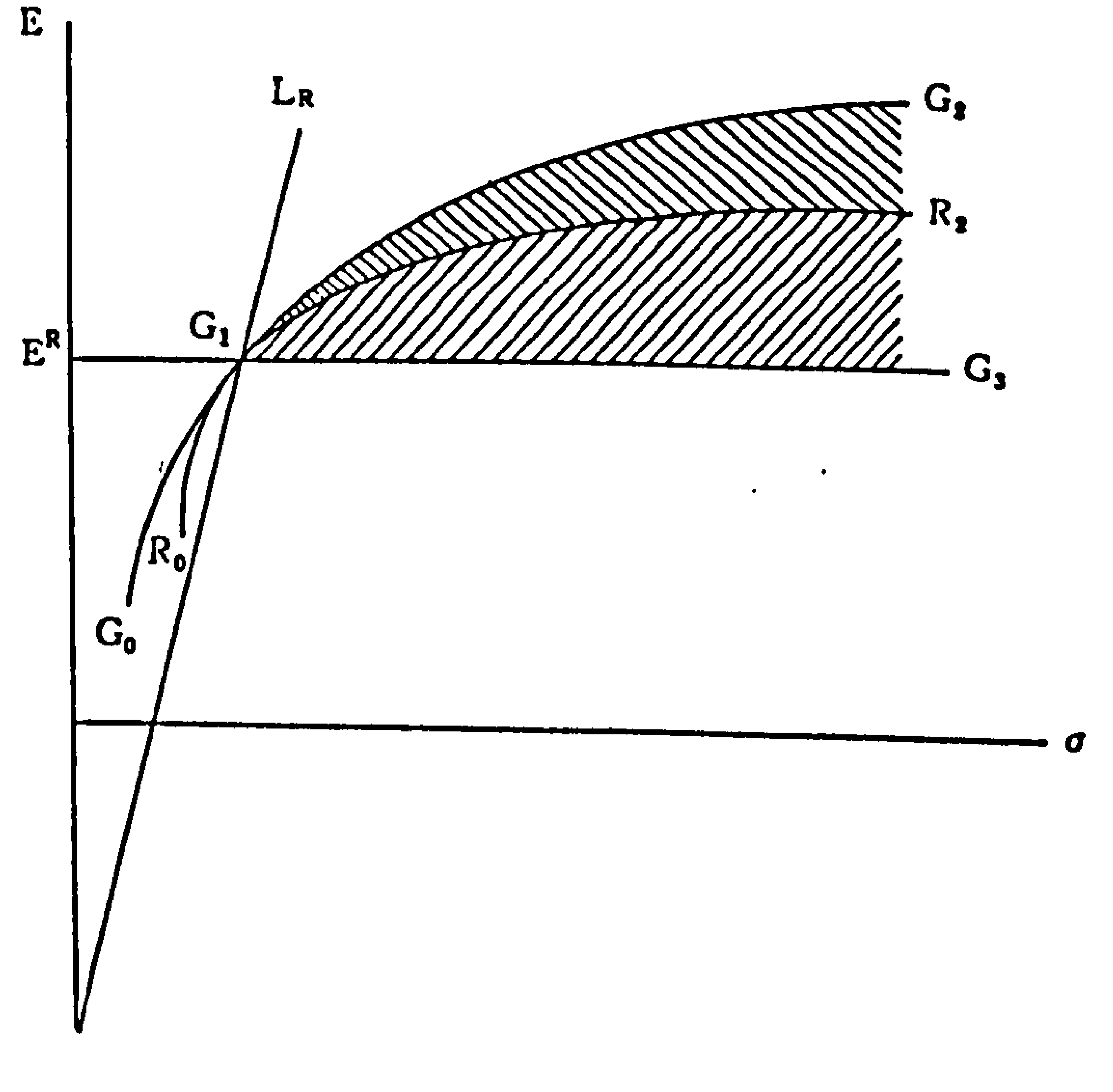


Source: Adapted from Kim and Santomero (1988), p.1223.

To be effective, banks should operate in the region to the left of the line L_R in Figure 5.5, regardless of the risk aversion parameters of banks. To eliminate the area between G_1G_2 and G_1G_3 from the efficient frontier, risk-related capital adequacy requirements should be imposed, or alternatively, the risk weights should be designed such that the highest expected return on the equity capital of banks is bounded by E^R. As shown in Figure 5.5, E^R is the expected return on equity at G_1, where the regulators' preference line L^R and the bank's global efficient frontier $G_0G_1G_2$ intersect, and is determined independently of the individual banks' preference.

Kim and Santomero (1988) conclude that traditional, uniform capital-ratio regulation is ineffective because it ignores the individual banks' different preference structure and allows 'risky' banks to circumvent the regulations via financial leverage and/or business risk. To be effective, risk-related capital adequacy requirements based on 'theoretically correct' risk weights should be imposed. The authors showed that the optimal risk weights depend only on three factors: the expected returns, their variance-covariance structure, and the upper bound on the allowable insolvency risk the regulators have in mind.

<Figure 5.5> The Necessary and Sufficient Condition to Bound Insolvency Risk



Source: Adapted from Kim and Santomero (1988), p.1227.

While the studies discussed above examined the general impact of capital constraints, Lackman's study (1986), using a bank portfolio model, tested the effect of three different types of capital adequacy ratios: the capital/deposits ratio, the capital/risky assets ratio and the capital/adjusted risky assets ratio. Lackman used Wallingford's (1978) two asset and one liability model of a commercial bank. Lackman employed differential calculus to find the rate of change in portfolios if capital adequacy constraints are imposed. All three ratios indicated a shift in the bank's portfolio, although the direction of the shift was different. The imposition of the capital/deposits ratio will always reduce the variance of return on equity, but to varying degrees among different banks. However, a lower variance is consistent with a lower expected return and this may increase the probability of failure. The capital/risky assets ratio causes a shift of bank portfolios towards less risky assets and reduces the variance of return on capital. The results of imposing the adjusted risky assets ratio indicate a shift of bank portfolios towards less risky assets and a reduction of variance of the return on capital. The imposition of the capital/risky assets ratio or the adjusted risky assets ratio produce results which supervisors would expect to obtain. The effects of these two ratios are to shift bank portfolios to safer assets and reduce the risk (variance), thereby reducing the probability of failure.

To sum up, studies focusing on utility maximising banks in a mean-variance framework question the effectiveness of capital adequacy requirements alone to reduce the overall riskiness of banks and, thus, the probability of bank failure. These studies indicate that higher capital requirements will cause utility maximising banks simply to invest in more risky assets, and thereby offset, or even more than offset, any desired risk reduction; as a result, they may paradoxically increase the probability of failure. To be effective, researchers in this area suggest that the regulators should impose both capital regulation and portfolio restriction (Kahane, 1977; Koehn and Santomero, 1980), or a risk-based capital adequacy system should be imposed (Kim and Santomero, 1988). The Lackman study (1986) suggests that risk-adjusted capital adequacy system can reduce the overall riskiness of banks and, thus, the probability of failure.

5.4.3.2 The Impact on the Value Maximising Banks in a State-Preference Framework

Contrary to the conclusions obtained for utility maximising banks in a mean-variance framework, this section shows that value maximising banks would have less of an incentive to increase asset risk as a result of more stringent capital adequacy requirements. Thus, more stringent capital regulation will reduce the risk exposure of the deposit insurance system as long as the stringency of the regulation of asset portfolio risk remains unchanged. The analytic framework used in the literature focusing on value-maximising banks is the state preference model (SPM). Studies in this vein include Sharpe (1978), Kareken and Wallace (1978), Dothan and Williams (1980), and Furlong and Keeley (1987, 1989). The market-based asset pricing methods which will be reviewed in the following section also assume that the objectives of banks are maximising the value of the bank.

Sharpe (1978) analysed the capital adequacy of banks with fixed-rate deposit insurance and showed that the increase in bank capital can reduce the risk exposure of the deposit insurance fund. Sharpe made several assumptions in his model, and these include: the FDIC as insurer insures a bank for one period; all deposits are insured; the bank issues CDs that promise total payments of $[P_1, P_2,...,P_N]$ at times 1, 2,..., N; and the bank operates in a complete market. Utilising the state-preference model, Sharpe demonstrated that, given the relevant risks (i.e., the value of the return on the bank's assets in state s and the 'default-free' return on the bank's deposits in state s), an increase in the ratio of assets to the default-free value of deposits will reduce the per-unit value of the FDIC liability. However, this value will decrease at a decreasing rate. For any amount of risk, there will be some amount of capital that will make the per-unit liability equal to any pre-determined premium which is an adequate amount of capital. In other words, when the value of the insurer's liability is no larger than the insurance premium, bank capital is 'adequate'.

Kareken and Wallace (1978) examined the equilibrium of the banking industry under various regulations. The authors made several assumptions to analyse the impact of regulations, and these include: there are complete contingent-claims market; the banking industry is a monopoly supplier of deposits services, but is otherwise 'small'; banks are limited-liability corporations and are subject to bankruptcy costs. Utilising the state-preference model, the authors showed, first, that in the absence of deposit insurance and regulations, bankruptcy does not occur. Second, under a US FDIC-type insurance scheme (i.e., a fixed-rate insurance premium) the banking industry holds as risky a portfolio as regulations allow. Finally, a capital adequacy requirement, by itself, does nothing to forestall bankruptcy. However, if bank liabilities are insured at a fixed-rate insurance premium, capital regulations are required and the threat of bankruptcy can be eliminated by requiring banks to have sufficient amounts of capital.

Dothan and Williams (1980) explored the effects of public regulation on banks and showed that capital regulation can reduce the probability of bank failure. The authors developed a simple state-preference model with a finite number of states, two time periods and a complete capital market. The model permits banks to exercise market power over local loans and deposits, setting rates, terms and services, while simultaneously trading in government bonds and bank equity. Banks are then analysed under various regulations.

The results indicate that to restrict a bank's probability of failure, supervisors must control only the composition and size of a bank's portfolio of competitively priced securities relative to either its deposits or capital. Although constraining the feasible set of returns requires restricting a bank's bonds, loans and equity, bankers always construct an optimal portfolio of loans. Consequently, supervisors need only restrict the risk of each bank's portfolio of completely priced marketable securities, while simultaneously requiring at least a minimal level of capital. The authors suggest, alternatively, that this can be achieved by regulating both the composition and size of each bank's portfolio of securities relative to either its deposits or equity.

Furlong and Keeley (1987 & 1989) examined theoretically the effects of more stringent capital adequacy requirements on bank asset risk. The authors showed that a higher bank capital ratio (lower leverage) does not lead value-maximising banks to increase asset risk. On the contrary, more stringent capital adequacy requirements reduce the gains to a bank from increasing the risk of its portfolio. To analyse the portfolio and finance decisions of an insured value-maximising bank, the researchers utilised a state-preference model in two periods and two possible future states. The current prices of payouts in future states are assumed to be taken as given and unaffected by the portfolio decisions of banks.

Under the deposit insurance system, the value of a bank that can meet its obligations to depositors in both states is equal to its initial capital. There is no deposit insurance subsidy. However, in the bankruptcy state, a bank benefits from deposit insurance. Given the initial capital, a bank seeking to maximise the current value of its equity will try to maximise the value of the deposit insurance subsidy and the current value of the deposit insurance subsidy increases with leverage. Therefore, with subsidised deposit insurance, a value-maximising bank would limit its leverage only if forced to do so by regulation.

Furlong and Keeley (1987 & 1989) showed that the gain from increasing asset risk depends on asset size but not on the bank's leverage *per se*. Under the assumption of fixed capital, however, a change in leverage directly affects the volume of assets. The authors also demonstrated that the marginal gain from increasing asset risk is positively related to a change in leverage. With low levels of leverage and asset risk, the marginal value (gain) to increasing asset risk is zero. However, for higher levels of leverage, the marginal value of increasing asset risk increases with leverage. Put another way, as the capital of an insured bank increases, the marginal value to that bank of shifting to a riskier composition of assets falls. This means that more stringent capital requirements would not give banks a greater incentive to invest in riskier assets, and would reduce the liability of deposit insurance system.

In brief, a value-maximising bank chooses its portfolio solely to maximise the current market values of equity. Such a bank's portfolio decisions are independent from the risk preferences of its individual owners. Even though actual returns on the bank's portfolio are uncertain (risky), a value-maximising bank does not consider the risk preferences of the owners. Some of the implications of bank capital regulation for value-maximising banks within the state-preference framework were discussed in Furlong and Keeley (1987, 1989), Dothan and Williams (1980), Kareken and Wallace (1978) and Sharpe (1978). Table 5.10 summarises these studies. All of these studies provide theoretical support for restricting leverage in banking when there is subsidised deposit insurance.

<Table 5.10> The Impact of Capital Regulation on the Value-Maximising Banks

Author	Year	Source	Model Description/Comment
Sharpe	1978	JFQA	- A single period SPM to analyse the capital adequacy of banks with flat-rate deposit insurance scheme. - The increase in bank capital will reduce the risk exposure of the deposit insurance fund.
Kareken & Wallace	1978	JOB	- A SPM to analyse the impact of bank regulations. - Capital regulation is required under a fixed-rate deposit insurance scheme and is not an alternative to deposit insurance but rather a necessary complement.
Dothan & Williams	1980	JB&F	- A two time periods SPM to explore the impact of public regulation on banks. - Capital regulation can reduce the probability of bank failure.
Furlong & Keeley	1987 1989	ER JB&F	- A two periods SPM to examine the impact of more stringent capital regulation on a bank's incentive to increase asset risk and on the expected liability of the deposit insurance system. - Capital regulation can restrain asset risk of a bank and will reduce the expected liability of the deposit insurance system.

Notes: 1) JFQA represents Journal of Financial and Quantitative Analysis.
2) JOB represents Journal of Business.
3) JB&F represents Journal of Banking and Finance.
4) ER represents Economic Review issued by the Federal Reserve Bank of San Francisco.

5.5 Market-based Asset Pricing Theories and the Impact of Capital Adequacy Requirements on Banks

5.5.1 The Capital Asset Pricing Model (CAPM)

The CAPM, an extension of Markowitzian portfolio theory, is an equilibrium model in order to determine the market price for risk and the appropriate measure of risk for any asset. The CAPM shows that the equilibrium rates of return on all risky assets are a function of their covariance with the market portfolio. This model was simultaneously and independently discovered and developed by Sharpe (1964), Lintner (1965), Mossin (1966) and Black (1972). The CAPM is derived under the following assumptions about investors and the opportunity set (Haugen, 1990).

(1) Investors can choose between portfolios on the basis of expected return and variance.

(2) All investors are in agreement regarding the planning horizon and the distributions of security returns.

(3) There are no frictions in the capital market.

Under the above assumptions, the expected rate of return on any asset is calculated by

$$E(R_i) = R_f + [E(R_m) - R_f]\,\beta_i \qquad (5.14)$$

where R_f = return on the risk-free asset

R_m = return on the market portfolio

$\beta_i = Cov(R_i, R_m)/Var(R_m)$

The equation states that the expected rate of return on any asset is equal to the risk-free rate plus a risk premium. The risk premium is the price of risk multiplied by the quantity of risk. For the terminology of the CAPM, the price of risk is the slope of the security market line (SML), the difference between the expected rate of return on the market portfolio and the risk-free rate of return. The quantity of risk is often called beta (β): the covariance between returns on the risky asset(s) (I) and market portfolio (M) divided by the variance of the market portfolio. The risk-free asset has a beta value of zero because its covariance with the market portfolio is zero. The market portfolio has a beta value of one because the covariance of the market portfolio with itself is identical to the variance of the market portfolio.

Examples utilising the CAPM framework to evaluate the impact of capital regulation on banks are Saunders and Ward (1976), Swary (1980), Morgan,III (1984), Lam and Chen (1985), and Eyssell and Arshadi (1990). In these studies, the general methodology has been to select particular events, to select periods before and after these respective events, and then to calculate the β of the various securities examined. Abnormal returns, cumulative abnormal returns and variances are calculated and tested before and after the changes in supervisory policy.

Saunders and Ward (1976) evaluated the impact of regulatory policy changes on the risk, return and efficiency of the UK 'Big four' clearing banks over the period May 1965 - August 1975. To analyse the effects of regulatory policy changes, the authors utilised, firstly, the accounting ratio analysis and concluded that while accounting ratios are indicative of trends in bank risk and return, they are neither sufficiently precise nor sensitive enough to test their hypotheses[8]. Therefore, the authors utilised, secondly, the CAPM to assess the impact of regulatory policy changes on clearing banks' risk and return profile. The results indicate that the introduction of the competition and credit control (CCC) policy in 1971 led to a significant increase in clearing banks' riskiness, but that this was accompanied by a significant improvement in their relative performances *vis-a-vis* the merchant banks. Furthermore, the quantitative lending controls imposed in the periods before and after CCC seem to have had a considerable adverse effect on the relative performance of clearing

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8. Saunders and Ward (1976) established four hypotheses. These include: H_1 implied that when clearing bank portfolios were rigidly regulated, their operations would be significantly less risky than those of other banks, in particular, the merchant banks; H_2 suggested that the riskiness of the clearing banks would increase with the implementation of CCC; H_3 suggested that the relative strengths of (a) the reintroduction of direct controls and (b) the failures in the secondary bank sector would determine the effective change in the β's of the clearing banks between the second and third periods; H_4 suggested that the failure of the secondary banks would tend to affect the β of merchant banks more strongly than the reimposition of controls.

banks, even after their lower level of risk is taken into account. Saunders and Ward (1976) suggest that the market model can significantly increase the sensitivity of the risk-return monitoring process and could, therefore, provide a useful additional dimension to the supervisory authorities when they analyse the impact of supervisory policy changes on the risk and return of banks.

Swary (1980) analysed the impact of capital adequacy regulations on the decision-making process of individual banks and evaluated the efficiency of regulatory intervention. Based on a market model, the author also examined and tested the effects of the 1970 Amendment of Bank Holding Company Act on the risk and return of bank holding companies (BHCs). The theoretical analysis suggests that portfolio (solvency) constraints are inefficient and lead to a larger reduction in banks' market values than could have been caused by the direct chance constraint on the level of the probability of failure. Systems that include both deposit insurance and portfolio constraints are effective, but they suffer from a misallocation of resources (real costs) induced by the portfolio constraints, which is a major consideration of cost-benefit analysis of bank regulation, and from the distorted investment opportunity by capital adequacy requirement and regulators' agency costs. To improve the existing regulatory systems, the author recommend elimination of portfolio constraints, assessment of banks' riskiness through the capital market and adoption of risk-related deposit insurance premiums.

The empirical analysis of the US Federal Reserve Board's 'go-slow' policy[9] on BHC expansion into non-bank activities indicates that Board's decision rules were not effective measures for protecting the public's best interest as defined by the 1970 Amendment. To

9. During the 1970-1974 period, expansion of US BHCs into both bank and nonbank activities was significant. The Federal Reserve Board's positive attitude toward this expansion is evidenced by the short processing time of each application and the high percentage of approvals (93% of all applications). In mid-1974, however, the Federal Reserve Board became concerned that the activities of BHCs and their nonbank affiliates would increase the risk of bank failure and of losses to depositors and the FDIC. Therefore, the Federal Reserve Board adopted a so-called 'go-slow' policy that extended the processing period of applications, increased the rate of denial orders, and did not approve any additional nonbank activities. This 'go-slow' policy reflects the existing confusion about the social costs and benefits resulting from the nonbank expansion of BHCs (Swary, 1980, pp.63-64).

the extent that the Board's decision rules were used as measures to impose capital adequacy requirements or were used as a device to indicate insufficient capital in a bank, they are found to be both ineffective and inefficient. The sample of denied acquisitions shows significant and substantial risk increases during the period following the announcement of the Board's decision. Furthermore, because regulatory measures other than the denial orders are required to reduce bank risk, any foregone profit opportunity caused by the denial order results in additional costs and inefficiencies.

Morgan,III (1984) analysed theoretically how, given a particular regulatory structure and a particular level of risk in a banking system, bank regulators can pursue the optimal regulatory policies with respect to bank capital regulation. The author assumed that regulators choose to minimise the probability of multiple bank failures (objective function). By changing the degree of financial leverage, the regulators can influence the probability of failure (the probability of bank failure here is defined as the same as Equation 5.13). The probability of failure will be different among banks because banks may choose different asset portfolio from one another due to different loan or deposit market imperfections that they may face.

Morgan,III (1984) showed that there are two optimal regulatory strategies for regulators to achieve the objective function. One is to allocate resources in such a way that the ratio of the marginal benefit to the marginal cost of regulatory resources is equated across banks. Unfortunately, there is little more to be said about the attributes of the solution without additional assumptions and specifying functional forms. Without being more specific, every bank becomes a special case because there is no general statement of strategy. Another strategy based on a market model indicates that the optimal regulatory strategy is to have all bank's equity β equal (i.e., $\beta_i = \beta_j$ for all i, j). There should be no banks with β lower or higher than those of other banks. Given the fact that the same insurance premium is paid by each bank, this result can be interpreted as a matter of avoiding adverse selection by bank managers and creating equal risk at every bank that pays the same premium. The author suggested that market-based measurement of the adequacy of bank capital regulation could be a highly useful tool for bank supervisors. One advantage for regulators is the rapidity with which feedback on the optimality of regulation is received. Another advantage is that the use of market measures allows regulators to appeal to bank management on a much less subjective basis.

Lam and Chen (1985) analysed the joint impact of interest rate deregulation and capital requirements on the portfolio behaviour of a value-maximising bank based on the cash flow version[10] of the CAPM. The authors showed that the effect of capital regulation on portfolio behaviour may differ according to whether Regulation Q is in effect or is phased out.

When Regulation Q is prevalent, a value-maximising bank reacts to a more stringent capital requirement by readjusting its asset portfolio, possibly reshuffling its assets towards more risky assets. The magnitude of reshuffling its assets, however, depends on the variances and covariances of the assets. This portfolio readjustment will reduce the bank's internal risk, but the bank may increase or decrease its expected portfolio profit. This conclusion agrees with that of Koehn and Santomero (1980) on the direction of the portfolio variance, but do not coincide with the effect on expected bank profit (see Section 5.4.3.1).

When deposit rate is stochastic, portfolio adjustment to changes in capital adequacy requirements are more complex. The effect of more stringent capital regulations on the bank is not only indeterminant but may also be a function of the existing capital (size) of the bank. This implies that banks with different capitals may react differently to changes in stringent capital adequacy requirements after interest rate deregulation.

As for the effect of the capital requirement on the probability of failure, the authors

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10. Lam and Chen (1985) assume that the bank maximises its market value, which is the present value of the certainty-equivalent of the end-of-the-period cash flow profit within the CAPM. Thus, the market value of the banking firm's common stock is the present value of the expected cash profit at the end of the period adjusted by a risk premium (see Lam & Chen, 1985, pp564-567).

demonstrate that when Regulation Q is in effect, a more stringent capital regulation may not necessarily reduce the probability of failure nor induce portfolio behaviour as originally intended. In a deregulated environment, a more stringent capital adequacy requirement may induce a result exactly opposite to that intended - an increase in the probability of bankruptcy and/or undesirable portfolio behaviour. Since the optimal portfolio adjustment in a deregulated environment depends on the level of existing bank capital, a uniform capital regulation for all banks may invoke a desirable response by some banks and exactly the opposite unintended response by others.

Eyssell and Arshadi (1990) examined the wealth effects of the risk-based capital requirement announcement on the common stocks of 27 large USA banks with asset values ranging from \$3.5 billion to \$155 billion at year-end 1987. The authors selected four events in change in bank capital requirement announcement over the period January 24, 1986 - July 11, 1988. The authors tested the null hypothesis that all banks will be affected equally by the announcement of risk-based capital adequacy requirements. If capital market participants believe that the costs of compliance will be substantial, and if they are able to distinguish between those banks which are most likely to be affected and those which are not, then the difference between daily average returns on portfolios of non-compliant banks and compliant banks will be negative and significant.

Based on a market model analysis of residual returns, the authors found, first, that negative stock market reactions were associated with both the initial announcement by the Federal Reserve proposing risk-based capital requirements for domestic banks on January 24, 1986 as well as the later press release in December, 1987 by Federal bank regulators in the USA on the Basle Committee's revision of the risk-based capital requirements. This implies that the announcement of the regulatory change was viewed by capital market participants as generally unfavourable. Second, there is some indication that the diversity in excess returns between the non-compliant and the compliant banks reflects the degree to which the sample banks might be affected differentially by the imposition of risk-based capital requirements. Specifically, those banks whose capital ratios were deficient at the time of the announcements suffered the greatest value losses.

In brief, to evaluate the impact of capital regulation on the risk and return profile of banks, several studies (see Table 5.11) have employed the CAPM framework. Saunders and Ward (1976) showed that the introduction of CCC policy significantly increase the overall riskiness as well as performances of the UK clearing banks. The quantitative lending control had a considerable adverse effect on the relative performance of the UK clearing banks. Swary's US study (1980) indicates that solvency constraints are inefficient and lead to a larger declines of bank market values. Swary also showed that the FRB's decision rules on BHC's acquisition were both ineffective and inefficient. Lam and Chen's (1985) theoretical model showed that although the effects of stringent capital regulation on portfolio behaviour and the probability of failure of banks depend on whether the bank deposit rate is under control or stochastic, more stringent capital requirements possibly lead to a value-maximising bank reshuffling its assets towards more risky assets as a whole and may not necessarily reduce the probability of bank failure. Eyssell and Arshadi (1990) demonstrated that capital market participants viewed the announcements of regulatory policy change as generally unfavourable, and capital deficient banks at the time of the announcement experienced greater value losses than capital sufficient banks. In contrast to the above studies, Morgan,III (1984) showed that, given a regulatory structure and the level of banking system risk, the optimal supervisory strategy is to equalise bank β. Finally, all these studies strongly recommend the use of stock market data to improve regulatory process. Table 5.11 summaries these studies.

5.5.2 The Arbitrage Pricing Theory (APT)

The CAPM is intuitively pleasing, but it can be argued that it is not testable (Roll, 1977 & 1978). The arbitrage pricing model, first developed by Ross (1976), has been suggested as a testable alternative. The APT is based on similar intuition to the CAPM, but it is much

<Table 5.11> The Impact of Capital Regulations on Banks: the CAPM Approach

Author	Year	Source	Model Description/Comment
Saunders & Ward	1976	JIE	- CAPM to assess the effects of changes in UK banks regulation on risk, performance and efficiency of the 'Big Four' clearing banks. - CCC increased the overall riskiness as well as performance of clearing banks and quantitative lending control had a considerable adverse effect on clearing banks' performance.
Swary	1980	UMI	- CAPM to analyse the impact of capital adequacy requirements on the risk-return of BHCs. - Solvency constraints are inefficient and lead to a larger reduction in bank's market values.
Morgan,III	1984	JFQA	- CAPM to pursue the optimal regulatory strategy with respect to bank capital regulation. - The optimal strategy is to equalise all bank β.
Lam & Chen	1985	JOF	- A cash flow version of the CAPM to analyse the joint impact of interest rate deregulation and capital regulations on the portfolio behaviour of a bank. - More stringent capital requirements possibly lead to a value-maximising bank reshuffling its assets towards more risky asset as a whole.
Eysell & Arshadi	1990	JB&F	- A market model approach utilising seemingly unrelated regression estimation (SURE) technique to examine the wealth effects of the risk-based capital requirement announcements on the common stocks of banks. - Capital market participants view the announcements of supervisory policy changes as generally unfavourable and capital deficient banks are most likely to be affected.

Notes: 1) JIE represents Journal of Industrial Economics.
2) UMI represents UMI Research Press.

more general. The APT assumes that the rate of return on any security is a linear function of k factors a shown below.

$$R_i = E(R_i) + \beta_{i1}F_1 + ...+ \beta_{ik}F_k + \varepsilon_i \qquad (5.15)$$

where

R_i = the random rate of return on asset i,

$E(R_i)$ = the expected rate of return on asset i,

β_{ik} = the sensitivity of asset i's return to the kth factor,

F_k = the mean zero kth factor common to the returns of all assets under consideration,

ε_i = a random zero mean error term for the ith asset.

The APT is derived under the usual assumptions of perfectly competitive and frictionless capital markets. Furthermore, individuals are assumed to have homogeneous beliefs that the random returns for the set of assets being considered are governed by the linear k-factor model in equation (5.15). The theory requires that the number of assets under consideration (n) be much larger than the number of factors (k) and that the error term (e_i) be the unsystematic risk component for the ith asset. The latter must be independent of all factors and all error terms for other assets.

The APT is based on the proposition that investment opportunities that provide "something for nothing" cannot exist in equilibrium. Arbitrage will ensure that all portfolios of a single factor or combination of the same factors will have the same expected return.

$$E(R_i) = R_f + \beta_{i1} l_1 + \beta_{i2} l_2 + \ldots\ldots + \beta_{ij} l_j \qquad (5.16)$$

where

R_f = return on the risk less asset,

β_{ij} = sensitivity of security i to factor j,

l_j = expected return premium (i.e., in excess of R_f) per unit of sensitivity to factor j.

The equilibrium achieved in equation (5.16) predicts that security expected returns will be linearly related to the sensitivities of the pervasive factors, with a common intercept equal to the riskless rate of interest.

Empirical studies utilising the APT to evaluate the impact of capital adequacy requirements on the risk and return profile of banks are few. If the APT includes the two index model, then one empirical study implemented by Cooper, Kolari and Wagster (1991) falls into this category.

Cooper, Kolari and Wagster (1991) analysed the wealth effects of risk-based capital regulations by examining market reactions in different countries. Large banks in the USA (12 banks), Canada (4 banks), the UK (6 banks) and Japan (5 banks) were examined comparatively with respect to their stock price reaction to numerous announcements made in 1987 and 1988. Three events were selected. These include: the US-UK agreement (analysis period: Dec. 24, 1986 - April, 1987), Accord among industrialised countries (analysis period: July 1, 1987 - Jan. 27, 1988), and Basle conference (analysis period: May 4, 1988 - Sept. 21, 1988). A two-index regression model was utilised to calculate prediction errors in periods with numerous announcements concerning the new capital rules.

The empirical evidence indicates that there are significant declines in stock returns for the US, Canadian and the UK banks in response to news announcements, with the US banks exhibiting the largest negative reaction among the countries studied. However, the equity returns for Japanese banks are mixed, reflecting uncertainty among investors regarding the handling of their hidden reserves under the new capital adequacy requirements. The evidence also indicates that, in the analysis period corresponding to the Basle conference, the market had already impounded information regarding risk-related capital requirements in bank stock prices.

5.5.3 The Option Pricing Model (OPM)

In banking and finance, contingent claims and options are quite prevalent and financial managers need to know how to value them: option pricing model deals with the analysis of the determinants of the prices of these contingent claims and options. Options, in general, are contracts to buy (call option) or sell (put option) a particular stock for a fixed price at (European option) or before (American option) a specified date in the future.

The pioneering work on valuing options was done by Black and Scholes (1973). Under certain assumptions, they valued the current call option price (C_0) by

$$C_0 = S_0N(d_1) - Ee^{-rt}N(d_2) \qquad (5.17)$$

where

$$d_1 = \frac{\ln(S_0/E) + (r + 1/2\sigma^2)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

$N(d)$ = cumulative normal probability density function

S_0 = the current stock price

E = the exercise price

e = the base of natural logarithms (=2.7128)

r = the continuously compounded annual riskless rate of interest

t = the remaining time to the expiration of the call expressed as a fraction of a year

σ = the standard deviation of the continuously compounded annual rate of return, representing the volatility of the stock price

From this formula, we see that the parameters S_0, E, r, t and σ determine the call option value. The higher the current stock value S_0, and the lower the exercise price E, the higher the call option value C_0. Also the longer time to expiration t, the greater the chance that a profit will be made on the call and the higher the call option value. The higher r and σ, the higher the call price C_0. These properties of the call option price can be summarised as follows:

$$C_0 = f(\overset{+}{S_0}, \overset{-}{E}, \overset{+}{\sigma^2}, \overset{+}{t}, \overset{+}{r}) \qquad (5.18)$$

where f is the valuation function, '+' means that an increase in the appropriate parameter is followed by an increase in the call value, '-' implies that an increase in the parameter is followed by a decrease in the call option.

Application of the OPM in bank regulation is closely related with the introduction of deposit insurance system. The development of the deposit insurance pricing model has, as its foundation, the isomorphic relationships between the equity and a call option, and insurance and a put option (Merton, 1977; Ronn and Verma, 1986). Based on these relationships, Merton (1977) showed that 'fair premium' of deposit insurance can be calculated by Black and Scholes' option pricing model.

One of the advantages of the OPM is that it permits the simultaneously consideration of the deposit insurance premium and capital adequacy issues (Ronn and Verma, 1986). The regulatory authority can use either tool to exact an appropriate deposit premium: (1) it can increase the per-dollar deposit insurance premium; or (2) it can require the bank to increase its equity values, thus, reducing the value of the limited-liability put. Options analysis provides a method of computing the required equity capital injection designed to reduce the put value to that exacted by the deposit insurance premium. Thus, under a flat-rate deposit insurance premium, banks displaying higher risk levels would be required to maintain higher capital adequacy standards (*ibid*, p.873).

As noted above, most empirical studies using the OPM have focussed on estimating the 'fair premium' and valuing the deposit insurance premiums, in particular of the FDIC deposit insurance in the USA. These include, for example, Marcus and Shaked (1984), McCulloch (1985), Pennacchi (1987), Levonian (1988), Giammarino, Schwartz, and Zechner (1989; for Canadian case), Ronn and Verma (1989), Cordel and Gordon (1990), and Kueser and O'Brien (1991).

5.6 THE ROLE OF THE MARKET

5.6.1 Market, Accounting and Regulatory Appraisal Models of Capital Adequacy

As discussed earlier (see Section 5.2.3), bank capital may be measured by the GAAP, RAP and/or market values. The values of bank capital measured in these ways are likely to differ (see Table 5.7). Thus, there exist often very marked differences between these different values of bank capital. These differences actually reflect the different objectives of each measurement procedure. Several attempts have been made in order to measure these differences, especially, between market and book values: for example, the 'hidden value index' developed by Morgan Stanley and the concept of 'hidden capital' by Kane and Unal (1990). The misvaluation of on-balance-sheet items and the failure to value OBSAs result in divergences between market and book values; the SMVAM highlights such differences. By utilising the SMVAM, the relationships between market and book values of equity for Korean banks were estimated (see Section 5.2.3.2). Although some cautions should be made from a statistical point of view, there appears to be accounting undervaluation for NCBs and overvaluation for RBs of changes in booked assets and liabilities relative to market valuations.

However, the important point is that the GAAP and RAP measures of capital ratios do not reflect the real value of the relative cushion available for absorbing the realised risks of banking (Sinkey, 1992). Keeley (1988), for example, observed that only book value capital ratios are subject to capital regulations and there is not a close correspondence between book and market values. For example, banks might respond to more stringent capital adequacy requirements by selling and repurchasing appreciated assets, which is very common in Korea. This would increase the book value capital and assets by the amount of the capital gain, but it would not increase the market value capital ratio because accounting manipulations do not increase the expected cash flows and therefore do not increase the value of a bank (see discussion on the value maximisation objective of the banking firm in Section 5.3.3). Since the risk exposures of banks and the insurance fund (or LLR facility in Korea) depend ultimately upon the market values of banks' assets and liabilities, market values are particularly important in evaluating the capital adequacy of banks and the effectiveness of the capital regulations.

Despite the importance of market values in bank capital regulations, however, market value accounting may not be a panacea. As discussed earlier, some difficulties are involved in estimating economic or real values of bank equity. Even though bank stocks are actively traded in capital markets, there appears to exist some doubts on market efficiency. Nonetheless, market value accounting provides a potentially less-noisy information stream than that from both GAAP and RAP. Market value measures are also more consistent with the free market ethos of structural deregulation. Over time, market-value accounting should become less noisy as financial markets evolve. Furthermore, market values of capital are likely to reflect the real value of a bank's capital with respect to a bank's exposure to risks so long as the capital market is reasonably efficient. Taking into account all of these arguments on measuring bank capital, one needs to use more market data in order to measure the 'true value' of bank capital. Nevertheless, RAP measures continue to have a strong influence on bankers and bank regulators.

Supervisory authorities assess the capital adequacy of banks through ratio schemes. As discussed earlier, these include: capital/deposits ratio, capital/total assets ratio and RAR (including the Basle system). However, these regulatory appraisal schemes are likely to fail to capture all aspects of a bank's risk exposure. For example, although the Basle scheme - the most developed, sophisticated scheme - is much more improved than those of many of the past ratio schemes, it is still far from perfect and has several drawbacks.

Therefore, the above arguments relating to the measurement of bank capital are also valid to appraisal schemes of capital adequacy. Since any single appraisal system may fail to capture all aspects of a bank's exposure to risks, it may be better to use these different capital adequacy appraisal systems as mutually acceptable or complementary systems. To improve the regulatory process, it appears useful to utilise more market-value accounting or market data because the GAAP and RAP are insensitive to monitor risk-return profile of banks. Empirical studies utilising the market-based asset pricing models (Saunders & Ward, 1976; Swary, 1980; Morgan,III, 1984) also recommend that the use of stock market data may improve considerably the supervisory and regulatory process.

The use of market data may shed light on bank supervision in Korea. As discussed in Chapters 2 and 3, since the early 1980s, wide-ranging structural deregulation has been implemented in order to vitalise the banking and financial sector and to enhance financial efficiency. In this process, the role of the market in influencing the risk and return profile of banks should have been enhanced. In this setting, the role of bank supervisors is to achieve a proper balance between market forces and supervisory policies in order not to 'undo' the economic benefits (better resource allocation) sought by the structural deregulation (see Chapter 3). Nonetheless, the efforts or attempts to use market data in order to improve the regulatory process have not been investigated before for Korea. In this context, the author's thesis focuses on how to utilise market data in evaluating the new capital adequacy requirements and in monitoring the risk profile of banks.

5.6.2 The Role of The Market In Capital Adequacy Appraisal

5.6.2.1 General Implications

Throughout this study, we have discussed from time to time whether or not the market affects bank supervision in general, and capital adequacy in particular. In Chapter 3 (Section 3.5.4.2), whether or not the market can replace or complement bank regulation and supervision was discussed and the conclusion is that because of market imperfections such as the existence of unfavourable externalities and information asymmetries, the market cannot totally substitute for (at least for the moment) but may complement bank supervision. As Gardener (1986) noted, prudential bank regulation and supervision will ultimately be subject to market forces: the market pushes and pulls at supervisory constraints. If bank supervision ignores the realities of the market, it may breed and foster inefficiencies. Realistic supervision has to recognise and develop alongside these market forces. This is necessary in order to ensure that supervision remains effective, that possibly risky, avoidance innovations do not become a problem, and that the benefits of increased and improved (freer) competition are secured. Therefore, the role of supervision is to achieve a proper equilibrium between supervisory policy and market discipline.

As discussed in Section 5.3.4, in a perfect capital market there exists no optimal capital structure for the banking firm (M-M, 1958; Crouchy & Galai, 1986; Levy & Samat, 1990). With the existence of bankruptcy but without bank regulation, there exists an optimal capital structure of the banking firm. Buser *et al* (1981) showed theoretically that bank regulation represented by capital regulation and deposit insurance may influence the optimal capital structure of a bank.

The starting point of economic analysis and/or models is the ideal perfect market as an analytic tool in order to analyse a real world phenomenon, because such a 'laboratory' is convenient to derive meaningful (clear) conclusion(s). These restrictive assumptions of perfect markets are gradually mitigated in order to help explain more precisely the workings of the real world. However, using this approach does not necessarily conclude that the market solely decides the optimal capital structure of banking firm. There exists no definite evidence whether or not the capital structure of a bank is solely determined by market forces. Other factors also influence the capital structure of banking firm.

A large number of studies on the impact of capital regulation on the capital structure of banking firm send contradictory messages. Some find evidence that capital adequacy requirements affect the capital structure of a bank, whilst others imply that market forces are more important. These contradictory messages arise from a basic difficulty in disentangling the impact of regulation and market forces. Furthermore, strong market forces have led to structural deregulation or liberalisation in order to improve the efficiency of the banking system. However, deregulation has accelerated the release of intense competitive pressures and is likely to increase the overall riskiness of banks and the banking system, at least, in the short-run. In other words,structural deregulation is likely to intensify the competitive environment, in particular, in the early stages of adjustment of portfolios and, in turn, increased competitive pressures may tend to lead the financial system towards over-reaction (see Llewellyn, 1986). Llewellyn (1986, p.66) concluded that: 'Clearly while practitioners publicly espouse the virtues of deregulation, in practice it is frequently a more aggressive, more risky and generally less profitable environment.' Capital adequacy requirements are one possible policy response to the rapid 'build up' of such associated risks in the system as banks react to the new environment (Gardener, 1986).

In the face of this situation, supervisory authorities have re-regulated (i.e., adopted supervisory re-regulation policies) the banking industry in order to preserve a safe and sound banking system. Regulation of banks' activities affects the banking markets and, in turn, market forces also influence the regulatory actions, interacting with each other. When capital regulation is introduced, it becomes clear that the impact of such regulation depends on market forces. For example, the response of bank financial leverage to stringent capital regulation may depend on market factors such as tax rates, and the general movement of the capital market. This implies that evaluations of capital regulation should take into account the wider market influence on the bank's financial leverage decision (Osterberg, 1990).

Bank supervisors could rely on the capital markets for estimates of bank risk rather than attempting to calculate it themselves. The capital markets already evaluate the riskiness of banks' assets and liabilities. If the capital markets' risk premiums could be determined, they would provide an independent evaluation of a bank's risk. The recent empirical studies of the impact of capital regulation on banks suggest that the use of market data may be a useful tool for bank supervisors to help assess the impact of the changes in supervisory policies.

The use of market data is necessarily limited to banks with publicly traded common stocks. The number of such banks is relatively small in the USA, but they control a majority of the banking system's assets. Perhaps, the most significant objection to utilising market data is that bank supervisors possess better information than the markets: bank supervisors can examine individual bank assets and internal documents. According to Wall (1985), however, this advantage is countered by two advantages of the market. First, as long as the capital market is efficient, the market can incorporate all information that is available, while the supervisors face political constraints. Second, the number of market participants far exceeds the number of regulators. If an investor makes a mistake, he or she can at most have only a minuscule effect on the price of a bank stock. If a supervisor makes a mistake, it can be corrected by a bank only through a costly appeal to the courts. Furthermore, as Guttentag and Herring (1984) point out, market participants who make systematic mistakes in evaluating what they call 'project-specific' risk eventually will be driven out of business.

The use of market data has several advantages for bank supervisors. First, it may increase the sensitivity of the monitoring process, because if the stocks of a bank are traded in the capital market, market data are readily available and would provide a useful additional dimension to the supervisory authorities when they analyse the impact of supervisory policy changes on the risk-return profile of banks. Second, it allows bank supervisors to appeal to bank management on a much less subjective basis.

However, there appears to exist some danger for bank supervisors in relying solely on market measures to evaluate the impact of capital regulation on banks. As Gardener (1986) points out, the market has no incentive to take into account the wider social costs inherent in actual and potential bank failures. Therefore, the market measures should be utilised as a complementary measure for bank supervisors. However, we explained this policy dilemma in Chapter 3. The main message for present purposes is that market data appears likely to add a useful, additional dimension to evaluating banking risk and return trade-offs for supervisory purposes.

5.6.2.2 Implication for Korea

As discussed in Chapter 2, since the early 1980s the banking and financial market in Korea has been deregulated in order to vitalise the financial sector by ensuring the autonomy of banks and financial institutions through reduction of regulation in their management and other operational matters. Securities markets also grew rapidly, encouraged by government efforts and the improved environment for securities investment resulting from strong economic growth. All of these developments in financial markets imply that government involvement in economic matters gradually decreased and the market has increasingly played a greater role in the decision-making of financial institutions. In other words, market forces have increasingly affected the risk-return trade-off of financial institutions, and, therefore, cannot be ignored. However, despite the increased role of the market, there has been virtually no attempts to use market data in order to improve the monitoring process of the risk profile of banks in Korea.

To utilise market data in order to evaluate the impact of stringent capital adequacy requirements on banks' risk-return profile, the primary requirement is, by its nature, whether or not banks' securities are publicly traded in the capital market. As discussed above, the number of banks with stocks traded publicly is relatively small in the USA compared to the total number of banks. In Korea, however, equity stocks of the most commercial banks[11] are listed in the KSE and they are actively traded. Table 5.12 shows the percentage of trading value of banking stocks to total trading value of all securities in the KSE during the period 1988-1991. The percentage of trading value of banking stocks ranges from 24.3% in 1988 to 16.4% in 1989. Table 5.13 shows that the common stocks of bank are actively traded; 8 banks were ranked in the thirty most actively traded stocks in terms of volume in 1988 and 1989, 11 banks in 1990 and 8 banks in 1991. Furthermore, banks' stocks were ranked in the top three except for 1989. These tables show that a basic requirement for the use of market data is fulfilled and imply, therefore, that the use of market data may be useful for bank supervisors to assess the impact of capital regulation on banks' risk-return trade-offs.

<Table 5.12> Trading Value of Banking Industry

(Unit: %)

	1988	1989	1990	1991
Finance	38.5	32.1	37.5	45.6
o Banks	24.3	16.4	18.4	17.3
o Securities	9.5	12.5	14.9	23.3
o Short-term financing	4.7	3.2	4.2	5.0

Source : The KSE, 'Fact Book', various issues.

11. 19 banks out of 23 commercial banks are listed in the KSE at the end of 1991.

<Table 5.13> Bank Stocks Ranked in the Thirty Most Active Stocks by Volume

1988	1989	1990	1991
Commercial (1)	Commercial (2)	Seoul (1)	Commercial (1)
Chohung (2)	Seoul (3)	Commercial (2)	Seoul (2)
Seoul (3)	Chohung (4)	Chohung (3)	Chohung (3)
First (4)	First (6)	First (5)	First (8)
Hanil (5)	Hanil (9)	Hanil (8)	Hanil (9)
Chungbuk (12)	Daegu (14)	Kwangju (16)	Kwangju (22)
Daegu (16)	Chungbuk (19)	Daegu (17)	Boram (23)
Kyunggi (20)	Kyunggi (25)	Chungbuk (18)	Shinhan (25)
		Kyunggi (21)	
		Kyungnam (23)	
		Shinhan (30)	
Total: 8 banks	8 banks	11 banks	8 banks

Note : Numbers in parenthesis represent the rank of individual bank traded in the KSE in terms of volume.
Source : The KSE, 'Fact Book', various issues.

The degree of usefulness of market data also depends upon whether or not the capital market is efficient. Although tests of Korean stock market efficiency are beyond the scope of this study, other researchers have reported on Korean stock market efficiency. Evidence supports the weak-form efficiency of Korean markets (Sim, Ann, Yoo & Yoon, 1980; Yoon, 1982). However, the literature review (Lim & Song, 1982; Sim, Ann, Yoo & Yoon,1980; Kang, 1982; Lee, 1982) indicates that the evidence, taken as a whole, is not strongly consistent with the semistrong-form efficiency of Korean markets. Some studies do support the semistrong-form efficiency (Lim *et al*, 1982; Sim *et al*, 1980), while others do not (Kang, 1982; Lee, 1982). As discussed in Chapter 2, the Korean stock market is not fully-fledged yet compared with the USA and the UK. Therefore, there appears to exist some doubts on market efficiency. Taking recent developments in capital markets (see Section 2.4.4 in Chapter 2) into account, however, we may conjecture that market efficiency has improved since the early 1980s.

In brief, market data appear to be potentially important and useful in Korea for assessing the impact of capital adequacy requirements on banks corresponding risk exposure. This is because the market is an operational transmission mechanism between risk and return. Furthermore, since banks operate in the market and respond to its forces, it is clearly important and cannot be ignored.

5.6.3 Theoretic and Empirical Framework

The present study utilises security prices in order to examine the impact of capital regulation on banks' risk-return profile that may be associated with announcements concerning new capital standards. To examine changes in bank risk at the time of regulatory changes, we analyse the risk characteristics of bank stocks before and after the announcements of the new capital adequacy requirements. In order to identify the wealth gains and losses accruing to bank shareholders in the vicinity of the announcements of the new capital adequacy requirements, an event study methodology will be developed and various hypotheses will be tested. The underlying models are ones by appending a vector of (0,1) dummy variables to the right-hand side of the market model. The market model is an empirical version of the CAPM (Sharpe 1963, 1964) and was first applied by Fama, Fisher, Jensen and Roll (1969) to examine stock price changes in response to stock split announcements.

However, there are some econometric problems in the standard event-study methodology. The fact that the 'events' in this study are regulatory changes which potentially affect all the firms in a given industry (*albeit* differentially) means that the standard event-study methodology must be supplemented with a technique better suited to the analysis at hand. The power of standard significance tests is substantially weakened when the event periods for the sample firms overlap. Brown and Warner (1985) refer to this phenomenon as 'event-date clustering' and note that its existence violates the standard assumption of independence across residuals. This, in turn, result in a misstatement of significance levels in the t-tests typically used to assess the significance of the residual returns in standard event studies. Specifically, calculated t-values tend to be overstated, resulting in greater likelihood of

Type I errors. Regulatory event studies such as this one represent the extreme case of event-date clustering because all of the affected firms have identical (i.e., contemporaneous) event periods.

Further, it is demonstrated by Binder (1985) that, in samples characterised by industry homogeneity, cross-correlated residuals will result. As with event-date clustering, the practical significance of this is that the assumption of the independence of residuals returns is likely to violated (see Kane & Unal, 1988; Unal, 1989). In order to circumvent all of these problems, we will employ Zellner's (1962) seemingly unrelated regression estimation (SURE) technique (see Chapter 6 in details) to estimate the coefficients of dummy variables designed to measure the magnitude of any abnormal return on the announcement dates.

5.6.4 Testable Propositions

It is a generally accepted view that bank capital acts as a buffer to absorb unexpected losses arising from all the risks which banks face. Therefore, capital adequacy requirements which may play a critical role in the 'risk containment' of banks, become a central supervisory instrument across the countries. As examined in this chapter, however, there has been considerable debate over whether or not capital regulation affects bank's capital decisions and reduces the overall riskiness of banks.

Two effects of supervisory policy changes in bank's capital can be investigated with capital market data: wealth effects and risk effects. Analyses of wealth effects seek to identify the interested groups (debtholders or shareholders of banks, and large or small banks, etc.) who benefit and lose from capital regulation. These studies assume efficient capital markets in the semistrong sense that all publicly available information is reflected in security prices. To the extent that a change in regulation is unanticipated, market participants evaluate its effect on future cash flows and embody their revised expectations into security prices at the time of the announcements. Wealth effect studies test for abnormal returns around the announcement date. Such returns constitute evidence of economic rents rooted in regulatory arrangements. The empirical studies on wealth effects of capital regulation are found in Eyssell and Arshadi (1990), and Cooper, Kolari and Wagster (1991).

Risk effect studies analyse security returns prior and subsequent to announcement, with the goal of identifying changes in the riskiness of the regulated firms or industry. Bank regulators tend to be more interested in these risk effects than in any corresponding wealth effects of bank supervision and regulation. The standard technique to test for risk changes is the variance-partition procedure: Benston (1973), Swary (1980), Aharony and Swary (1981), Smirlock (1984), and Aharony, Saunders and Swary (1986, 1988) exemplify the application of this procedure to regulatory events.

The above empirical strands imply that the effects of capital regulation on the Korean banks can be investigated in the same way. As proposed in Chapter 1, the primary aim of this study is to analyse the impact of the new capital adequacy requirements on the Korean commercial banks' risk-return profile. For this purpose, we may ask 'What is the impact of the new capital adequacy requirements on the banking industry?' and may hypothesise and test the null hypothesis that the new capital adequacy requirements have no influence upon banks' risk and real profitability before and after the announcement. This broad question and hypothesis may be decomposed into subsidiary questions and hypotheses, which have been dealt with in various empirical studies.

First, what is the impact of the new capital regulations on the value of equity holders' shares (wealth effects)? More specifically, we can test the null hypothesis that there are no significant differences between the excess returns on the shares of banks before and after the announcement of the new capital standards. This wealth effects can be further decomposed and tested by bank size. As Stigler (1971) points out, the regulatory process transfers wealth from one economic group to another. Therefore, we may test the null hypothesis that there are no significant differences between the excess returns of larger banks (i.e., NCBs) and smaller banks (i.e., RBs) before and after the announcement of new capital standards.

Second, what is the impact of capital regulation on the overall riskiness of banks? Can bank capital regulation reduce the overall riskiness of banks (risk effects)? We can test the null hypothesis that there are no significant differences between the overall riskiness of banks before and after the announcement of the new capital adequacy requirements. As with the corresponding wealth effects, the risk effects may be further investigated by bank size.

The above hypotheses will be tested in the following Chapters 6 and 7. The models utilised are multivariate regression models based on, but further developed from a single index market model.

5.7 CONCLUSION

A bank's capital may serve as a buffer or cushion against unexpected losses from risks which a bank faces. Therefore, bank capital regulation which may play a crucial role in the 'risk containment' of banks, becomes a central instrument of supervisory policy. The aim of this chapter was to provide a theoretical framework to evaluate the likely impact of capital adequacy regulation on a bank's risk-return profile. In this context, the issues relating to capital adequacy - the important roles, definition and measurement of capital, and modern adequacy appraisal system - were discussed. Micro finance theories on the optimal capital adequacy and the value of banking firm were also examined. The review of theoretical and empirical studies on the impact of capital regulation reveals that whether or not capital regulation affects banks' capital decisions and reduces the overall riskiness of banks are contradictory and model specific. However, recent studies indicate that regulation of bank capital affects banks' risk-return profile.

The following chapters will explore the likely impact of capital adequacy requirements on Korean banks using a multivariate regression model which is an extended single-index model. Two effects of capital regulations will be examined: wealth effects and risk effects. To explore these effects of capital adequacy requirements on banks, abnormal returns, cumulative abnormal returns and variances of returns on bank stocks will be calculated and tested before and after the announcements of new capital standards.

CHAPTER 6

CAPITAL ADEQUACY REQUIREMENTS AND BANK PROFITABILITY: WEALTH EFFECTS

6.1 INTRODUCTION

This chapter examines the impact of the new capital adequacy requirements on bank shareholders' wealth. A large number of studies have suggested using stock prices to measure the impact of regulation on producer profits or shareholders' wealth (for example, Aharony *et al*, 1981, 1986 & 1988; Binder, 1985; Cooper et al, 1991; Eysell *et al*, 1990; Kolari *et al*, 1988; Morgan, III, 1984; Saunders *et al*, 1976; Schwert, 1981; Swary, 1980) and argue that tests with stock prices are more powerful than tests with accounting data. As long as the market is efficient, stock price data quickly and accurately reflect available information (i.e., amount, timing, and risk of expected cash flows). Furthermore, stock price data generally provide a greater number of observations to estimate the models. In addition, well-specified models of expected return can be utilised to separate firm-specific effects from market-wide impact.

To examine the likely impact of capital regulation on bank stock prices, an event-study methodology is developed to identify the wealth gains and losses accruing to bank shareholders around the time of imposition of new capital standards. The event-study methodology has been extensively used elsewhere to examine firm-specific events (e.g., earnings and dividend announcements), economic, legal and regulatory changes in a wide range of industries other than in banking (see Schwert, 1981 for a general review; and Fama, 1991). In banking, the event-study methodology has been more frequently utilised in order to examine the impact of monetary and other regulatory policy changes (e.g., changes of deposit-rate ceilings or reserve requirements) rather than capital regulations.

Before proceeding to implement the empirical analysis, we need to discuss the main methodological issues and construct the relevant hypotheses in order to examine the likely impact of capital adequacy requirements on bank stock prices. In this context, Section 2 states our main questions and formulates some testable hypotheses. Section 3 provides the basis of the empirical tests. The event study methodology is discussed and empirical studies are reviewed in order to provide the basis for our econometric models. Section 4 specifies the econometric models to investigate the impact of new capital standards. Section 5 discusses estimation procedures such as ordinary least squares (OLS) and seemingly unrelated regression estimation (SURE). Section 6 identifies our data information including event date and sample banks with available stock price information; the properties of the data are also analysed. Section 7 presents the empirical results. First, we examine the impact of capital regulations utilising OLS estimation. To generate estimates which are more efficient than those produced in OLS estimation and test joint hypotheses, SURE is employed. Section 8 concludes this chapter. The estimation of models is mainly carried out by LIMDEP - a econometric software package, and most of the data are processed using Quattro Pro and Minitab. Diagnostic tests are carried out using Microfit.

6.2 TESTING OBJECTIVES AND HYPOTHESES

The present analyses of stock prices seek to examine the effects on commercial banks' profitability that may be associated with announcements concerning new capital adequacy requirements. These analyses will endeavour to answer the following broad questions.

(1) What is the impact of the new capital regulations on the value of equity holders' shares? Are there any significant differences between the rates of return on the shares of banks before and after the announcements of the new capital standards?

(2) What is the impact of a uniform capital adequacy standard on commercial banks? Is the impact different across banks?

(3) Are there any significant differences between the excess returns of large banks (i.e.,

NCBs) and small banks (i.e., RBs) before and after the announcements of new capital standards? This chapter also investigates the existence of systematic intra-industry differences in the effect of the new capital adequacy regulations on the market value of commercial banks.

To answer the above questions, the following specific joint hypotheses will be tested.

(i) *Hypothesis 1*

For each bank, the abnormal return (AR) is the same on all days during the event period. If γ_{jn} represents the AR earned by shareholders of bank j on day n (j=1,..,J, t=T+1, ...,T+N), this can be expressed as

$$H_0: \gamma_{jn} = A_j \qquad (6.1)$$

where A_j represents the AR for bank j which is constant over time if H_0 is true. There are two reasons to test Hypothesis 1. One is to examine whether investors earned larger ARs on some days than on other days during the event period. Another is to reduce the computational cost involved in testing further hypotheses; if hypothesis 1 is accepted, a separate AR for each day during the event period does not have to be estimated for every bank. The econometric software used for the analysis in this chapter (LIMDEP) does not have the capacity to estimate separate ARs in this way when equations are estimated for all banks collectively as a system.

(ii) *Hypothesis 2*

The sum of all the ARs earned by all the banks on all days within the event period is zero. This can be expressed as

$$H_0: \Sigma^{T+N}_{T+1} \Sigma^{J}_{j=1} \gamma_{jn} = 0 \qquad (6.2)$$

If the Hypothesis 1 is accepted, this can be tested as

$$H_0; \Sigma^{J}_{j=1} A_j = 0 \qquad (6.3)$$

This hypothesis states that although there may be winners and losers among the banks, and although there may be days on which industry-wide ARs are positive and other days on which they are negative, overall, for the industry as a whole over the entire event period, there is no net gain or loss.

(iii) *Hypothesis 3*

The AR is the same (but not necessarily zero) for all banks in all periods. This can be expressed as

$$H_0: \gamma_{jn} = A_j = A \qquad (6.4)$$

(iv) *Hypothesis 4*

For all banks, the AR is zero on all days during the event period. This can be expressed as

$$H_0: \gamma_{jn} = A_j = 0 \qquad (6.5)$$

This hypothesis is a very strong one, which states that the new capital adequacy requirements have no impact on any bank shareholders' wealth in any period.

At this stage, we note that Hypotheses 1 and 4 can be tested in two ways: either for each bank individually, or for all banks collectively. The two types of tests may not always give the same results; e.g., it may be possible to accept these hypotheses for all banks collectively, while rejecting them for a small number of the banks when tested individually. Hypotheses 2 and 3, on the other hand, can only be tested on all the banks collectively, because these hypotheses imply cross-equation restrictions which cannot be applied if the banks are dealt with on an individual basis.

Hypotheses 1 to 4 above are specified in terms of the ARs earned by individual bank shareholders. However, it is also possible to test the same hypotheses by aggregating the shares of similar banks into portfolios. Following Thompson's (1985) suggestions, two equally weighted portfolios are constructed: NCBs for nationwide commercial banks and RBs for regional banks, and Hypotheses 1 to 4 are repeated over values of j from 1 to 2 for the two portfolios. In addition, Hypotheses 1 and 4 can be tested for a single portfolio which consists of all the banks in our sample.

6.3 THE BASIS OF EMPIRICAL TESTS: METHODOLOGICAL ISSUES

6.3.1 Event Study Methodology

In the finance literature, stock market data are widely utilised to investigate the effects of legal, regulatory and economic events; research of this type is generally classified as an 'event study' (Karafiath, 1988; Strong, 1992). In other words, empirical investigations into the co-determination of security prices and economic events are called event studies (Thompson, 1985). Most event studies have focused on the behaviour of stock prices in order to test whether their stochastic behaviour is influenced by the disclosure of 'firm-specific events' or 'new events'. Since the original event study of Fama, Fisher, Jensen and Roll (1969), a number of researchers have utilised their so-called event-study methodology in order to examine the effect of new information on stock prices. Fama *et al* (1969) estimate the market model for the stock of firm i with data during the 1926-1960 period. ARs for the sample firms are measured as the residuals from the market model and the residuals are then cross-sectionally averaged in event time. The hypothesis that the average abnormal return equals zero is tested, utilising a cross-sectional estimate of the standard deviation of the residuals. This methodology has been adapted and refined by numerous other researchers (Karafiath & Spencer, 1991).

The event study methodology assumes (Aharony, Saunders and Swary, 1986):

(i)that an announcement of the event under consideration is the only relevant information impacting on bank (firm) stock returns during the period immediately surrounding that event (the so-called event period);

(ii)that investors can perceive future implications of the event and will impound these perceptions in the respective event period.

Under the above assumptions, researchers estimate and test the significance of abnormal returns (ARs) and cumulative abnormal returns (CARs) summing estimated ARs under the null hypothesis. Broadly speaking, there are two competing approaches to the estimation of ARs and CARs in event studies: the traditional standard approach and the dummy variable approach.

The basic structure of a traditional standard event study can be expressed as follows (Strong, 1992):

(i)identify event dates for a sample of firms subject to the disclosure information of interest, and group observations into a common event period;

(ii)within the overall event period, estimate ARs and CARs for each firm and for each period around the event dates;

(iii)test the significance of ARs and CARs.

Although a number of alternative specifications of the benchmark expected return to estimate ARs have been utilised, the market model has probably been the most popular benchmark employed in event studies (Strong, 1992; Brown & Warner, 1980, 1985; Dyckman, Philbrick & Stephen, 1985). The market model assumes that returns are generated according to the following mechanism.

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt} \qquad (6.6)$$

where R_{jt} = the rate of return on security j over period t

R_{mt} = the rate of return on the market portfolio over period t

α_j, β_j = parameters for security j, where β_j is the measure of systematic risk.

The intercept term α_j is a constant equal to $E(R_{jt} - \beta_j R_{mt})$;

ε_{jt} = error term.

Equation 6.6 partitions R_{jt} into a systematic component linearly related to R_{mt} and an unsystematic component ε_{jt}, which is uncorrelated with R_{mt}. The effect of firm-specific events is intended to be captured fully in the unsystematic component, the assumption being that the information signal and R_{mt} are independent. The residual term (ε_{jt}) is interpreted to represent abnormal security returns because it represents the deviation of the security's return from its expected equilibrium return (Dann & James, 1982). Let $\hat{\alpha}_j$, $\hat{\beta}_j$ and e_{jt} be the estimates of α_j, β_j and ε_{jt} estimated over the period t=1,..,T. For each period in the event window t=T+1,..,T+N, an AR is estimated as

$$e_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt}) \qquad (6.7)$$
$$t = T+1,..,T+N$$

This procedure can be illustrated schematically in Figure 6.1 (Karafiath, 1988; Strong, 1992). The traditional method outlined in Figure 6.1 is a two-step procedure. First, estimates of the intercept (α_j) and slope (β_j) are obtained with an OLS regression using the T observations in the estimation period only. Second, ARs are calculated as the actual minus estimated value for each observation in the event window as in equation 6.7.

<Figure 6.1> Outline of Traditional Event Study

```
<--------------Estimation Period--------------> <------ Event Window or Testing Period------->
              (T observations)                               (N observations)
|----------------------------------------------|----------------------------------------------|
Obtain estimates of α_j and β_j                  Calculate ARs; calculate t-ratios
```

Source: Karafiath (1988), p.352 and Strong (1992), p.538.

This standard event study methodology has been widely utilised and implemented to examine the likely impact of new events such as dividend or earnings announcements, changes of legal and other regulations, or other economic events on firms and industry. The literature on this type of event study is now so large that a full review would probably comprise several volumes and is not attempted or necessary here (see the selective reviews: Ball, 1990; Binder, 1985; Fama,1991; Santomero, 1991). Research on methodological issues has been carried out *inter alia* by Brown *et al* (1980, 1985), Schwert (1981), Dyckman *et al* (1985), Strong (1992) and Salinger (1992).

In banking, Swary (1980) and Cooper *et al* (1991) examined the impact of bank capital regulations on BHCs and commercial banks, respectively. The analysis of the effects of other bank regulations has been focused on monetary policy (Aharony *et al*, 1986); deposit rate ceilings (Dann *et al*, 1982; James, 1983; Aharony *et al*, 1988); reserve requirements

(Kolari *et al*, 1988); and other regulations (Saunders *et al*, 1976). Relating to the international debt crisis, Musumeci and Sinkey (1990-a, 1990-b) examined the wealth effect of loan-loss reserve decisions by banks on bank stock prices.

An alternative and more often convenient empirical approach is the dummy variable approach. The dummy variable approach suggested by Gibbons (1980) is a one-step procedure to obtain the same results as the return-generating procedure by appending a vector of (0,1) dummy variables to the right-hand side of the traditional market-model regression (Karafiath, 1988; Salinger, 1992). For each observation in the event window, there is one dummy variable that has a value of 1 on that observation only and 0 otherwise. Thus, an event window of N observations in Figure 6.1 requires N dummy variables. The ARs estimated by dummy variable approach are numerically identical to those estimated using the standard event study methodology (return-generating procedure) (Karafiath, 1988; Salinger, 1992; Thompson, 1985). The underlying model of returns during the event period is

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \sum_{n=T+1}^{T+N} \gamma_{jn} D_{nt} + \varepsilon_{jt} \qquad (6.8)$$

$$t = 1, \ldots T, T+1, \ldots T+N$$

where R_{jt}, R_{mt}, α_j, β_j are as defined in Equation 6.6;

γ_{jn} = coefficient on dummy variable D_{nt}, equal to the AR to security j on observation n during the event period for n = T+1,...,T+N;

D_{nt} = a dummy variable that is equal to 1 on observation n and 0 otherwise (n=T+1,..,T+N);

ε_{jt} = residual for security j on observation t. Note that with the dummy variable technique, the residual will be zero for observations T+1 through T+N.

The ARs estimated in this way can be added to obtain CARs. Alternatively equation 6.8 can be rewritten as

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \sum_{n=T+1}^{T+N} \delta_{jn} CD_{nt} + \varepsilon_{jt} \tag{6.9}$$

where δ_{jn} = coefficient on dummy variable CD_{nt}, which is a measure of CAR from t=T+1 to n for n=T+1,...,T+N, that is, $\delta_{jn} = \Sigma^{n}_{i=T+1} \ \gamma_{ji}$ for n=T+1,..,T+N;

CD_{nt} = a dummy variable defined for n=T+1,..,T+N as follows:

for $t < n$, $CD_{nt} = 0$;

for $t = n$, $CD_{nt} = 1$;

for $t = n+1$, $CD_{nt} = -1$;

if $t > n+1$, $CD_{nt} = 0$.

Equation 6.9 is the basis of a regression in which the estimated coefficients are CARs, not ARs. As in the standard dummy variable procedure, the data from the event window are included in the estimation and N 'dummies' are added as explanatory variables.

The advantage of estimating the CARs as coefficients rather than estimating ARs and calculating CARs from these after estimation, is that standard errors for the CARs obtained from the estimation of Equation 6.9 are correct (Salinger, 1992) and are easy to compute.

6.3.2 Literature Survey: the Foundation for Model Specification

As discussed earlier in this chapter, the dummy variable approach is equivalent to but more convenient than the standard event study approach to estimate ARs (and CARs) and the correct test statistics in a one-step procedure. Furthermore, when combined with SURE, it may be a powerful analytical tool for various hypothesis tests in the event study. In this section, we review previous studies which have utilised a combined model with dummy variables and SURE -a multivariate regression model (MVRM) estimated using joint generalised least squares (JGLS) - in order to provide the basis for our model specification and methodology.

In the event study, a MVRM methodology to measure the effect of new information on stock prices was first suggested by Gibbons (1980, Appendix H). This methodology is proposed to overcome drawbacks involved in Fama *et al*'s (1969) approach. Fama *et al* (1969) assume that residuals are independent and identically distributed. Three problems with this approach may exist:

(i) the ARs (i.e., the expectations of the residuals) are likely to differ across firms;

(ii) there is evidence that residual variance differs across firms (Fama, 1976);

(iii) the residuals will not be independent if the event occurs during the same calendar time period for some firms and these firms are in the same or related industry (i.e., so-called 'event-clustering' and sample homogeneity). This contemporaneous correlation (cross-sectional dependence) is especially severe when both of these conditions exist for all of the sample firms.

When the event occurs during the same calendar time period for every firm, several recent event studies have utilised the MVRM in order to overcome the above statistical problems. Examples of this approach are Schipper and Thompson (1983, 1985), Malatesta (1986), Smith, Bradley and Jarrell (1986), Smirlock and Kaufold (1987), Allen and Wilhelm (1988), and Eysell and Arshadi (1990). These examples are not an exhaustive listing.

Schipper *et al* (1983) examined the impact of merger-related regulation changes (including the securities laws, the tax code, disclosure rules, and accounting principles) on the shareholders of 39 acquiring firms during 1966-1970. Schipper *et al* test for the existence of correlation between realisation of negative ARs to the sample of acquiring firms and the dates on which regulatory changes were announced. They constructed the following model.

$$(r_j - r_0) = \alpha_j + \beta_j(r_m - r_0) + \gamma_k\mu_{jk} + \varepsilon_j \qquad (6.10)$$

where

$r_j - r_0$ = the T x 1 time-series vector of excess returns to security j;

$r_m - r_0$ = the T x 1 time-series vector of excess returns to the market portfolio proxy;

r_m = the T x 1 time-series vector of realised returns to the market portfolio proxy (equal-weighted CRSP NYSE index);

r_0 = the T x 1 time-series vector of realised returns on a zero beta portfolio (TBs) ;

α_j = an intercept coefficient;

β_j = beta coefficient for security return sensitivity to market return movements;

γ_k = a T x K matrix of regulatory change variables, with one column for each regulatory change considered. With uniform treatment of announcement, each column contains ones and zeros to identify time periods in which regulatory changes were not announced (zeros) and time periods in which regulatory changes were announced (ones). With differential treatment, the APB Opinions (which was the official magazine issued by the APB to express its position on accounting matters) and segment disclosure reversals contain minus ones;

μ_{jk} = the K x 1 vector of event parameters multiplying the regulatory change variables. These parameters represent the shift in mean excess return associated with the K regulatory changes (K=4);

ε_j = a T x 1 vector of error terms assumed to be serially independent, independent of the excess return on the market and the regulatory change variables, and identically distributed normally.

Two sets of hypotheses are tested concerning the joint impact of the regulatory changes on the sample of acquiring firms. The first set imposes no cross-equation restrictions on the estimation of the parameters of the model and has a convenient block diagonal organisation of the combined matrix of independent variables. The null hypotheses include: (i) that the sum (across the J firms) of the event parameters for a particular type of regulatory change is equal to zero, and (ii) for a particular regulatory change, all of the individual event parameters across the sample of firms are equal to zero. The second set of hypotheses imposes several cross-equation restrictions which lead to a more complicated matrix of independent variables. The null hypotheses include: in addition to the first set of hypotheses, under the assumption that the event parameters are the same for each firm in the sample, the regulatory change months did not exhibit atypical return behaviour relative to the nonchange months. Schipper *et al* (1983) found that market participants predicted negative cash flow consequences for two of the regulations (i.e., the Williams Amendment and the 1969 Tax Reform Act) they examine. Although there is little support for a negative impact of the segment disclosure rules and APB Opinions 16 and 17, the evidence suggests that these regulations may have had redistributive effects across the sample.

Binder (1985-b) examined the ability of tests that use monthly and daily stock return data to detect the effects of regulation when the timing of new information (i.e., event date) is uncertain. Binder (1985-b) examined 20 major regulatory changes from the Interstate Commerce Act of 1887 to the Airline Deregulation Act of 1978. Binder constructed the following MVRM system of return equations with one equation for each firm i in the industry to measure excess returns during the periods of specific announcements.

$$R_{1t} = \alpha_{10} + \alpha_{11}D_{0t} + \alpha_{12}DJAN_t + \beta_{10}R_{mt} + \beta_{11}R_{mt}D_{0t} + \Sigma_a\gamma_{1a}D_{at} + u_{1t}$$
$$R_{2t} = \alpha_{20} + \alpha_{21}D_{0t} + \alpha_{22}DJAN_t + \beta_{20}R_{mt} + \beta_{21}R_{mt}D_{0t} + \Sigma_a\gamma_{2a}D_{at} + u_{2t} \qquad (6.11)$$
$$\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots$$
$$R_{Nt} = \alpha_{N0} + \alpha_{N1}D_{0t} + \alpha_{N2}DJAN_t + \beta_{N0}R_{mt} + \beta_{N1}R_{mt}D_{0t} + \Sigma_a\gamma_{Na}D_{at} + u_{Nt}$$

where R_{it} = the return on the security of firm i in period t;

R_{mt} = the return on the market portfolio in period t;

D_{0t} = a dummy variable which equals 1 for every observation between the first announcement period and the last observation in the sample inclusive and 0 otherwise;

$DJAN_t$ = a dummy variable which equals 1 only during January and 0 otherwise;

D_{at} = a dummy variable which equals 1 during *a*th announcement period and 0 otherwise;

α,β,γ = regression parameters;

u_{it} = error term.

In the above system, if the announcements are partly or completely anticipated, the new information will be capitalised before the announcement periods. Thus, an alternative approach is to measure the effect of regulatory change over the entire period presumed to contain new information, i.e., over the full period. The model system is

$$R'_{1t} = \alpha'_{10} + \alpha'_{11}D_{0t} + \alpha'_{12}DJAN_t + \beta'_{10}R_{mt} + \beta'_{11}R_{mt}D_{0t} + \delta_{1}D_{Et} + u'_{1t}$$

$$R'_{2t} = \alpha'_{20} + \alpha'_{21}D_{0t} + \alpha'_{22}DJAN_t + \beta'_{20}R_{mt} + \beta'_{21}R_{mt}D_{0t} + \delta_{2}D_{Et} + u'_{2t} \qquad (6.12)$$

....

$$R'_{Nt} = \alpha'_{N0} + \alpha'_{N1}D_{0t} + \alpha'_{N2}DJAN_t + \beta'_{N0}R_{mt} + \beta'_{N1}R_{mt}D_{0t} + \delta_{N}D_{Et} + u'_{Nt}$$

where D_{Et}, D'_{0t} = dummy variables which equal 1 for three month before the first announcement through the last announcement.

The above model systems assume that disturbances are independent and identically distributed within each equation but allow the disturbance variance to differ across equations. It is also assumed that across firms the contemporaneous covariances of the disturbances can be non-zero, but that the non-contemporaneous covariances are zero.

The testing hypotheses include: (i) a joint hypothesis that all excess returns equal zero; (ii) a joint hypothesis that all excess returns for announcement period *a* equal zero; (iii) average excess return during announcement *a* equals zero; (iv) all event-period average excess returns equal zero; (v) the average of the event-period average excess returns equals zero. The results show that formal regulatory announcements are generally anticipated in cases where it is unclear when expectations change. Binder (1985-b) noted several implications of these results. First, stock returns will not be very useful in studying the effects of regulation when dates that market expectations change are not known exactly. Second, these results shed new light on some previous studies that used stock returns data. For example, Aharony and Swary (1981) examined the BHC Act of 1970 and found no significant revaluation of stock prices. However, the above results indicate that finding no impact on stock prices does not warrant a conclusion that a regulation was ineffective.

Malatesta (1986) derives a JGLS estimation and related test statistic applicable in the typical event study context utilising simulation techniques. The study generalises the method utilised by Binder (1985-a, 1985-b) and by Schipper *et al* (1983, 1985). Assuming the following regression model is well-specified,

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i \delta_{it} + \varepsilon_{it} \tag{6.13}$$

$$E(\varepsilon_{it}) = 0, \quad t = 1,\ldots,T, \quad i = 1,\ldots,J$$

where R_{it} = the rate of return of the firm i at time t;

R_{mt} = the rate of return to the market portfolio proxy at time t;

δ_{it} = a dummy variable taking the value 1 if t is an event period for firm i and 0 otherwise.

Testing the hypothesis that AR is zero provides no evidence that JGLS is superior to the other simpler or less sophisticated estimators. In other words, the JGLS, market model and OLS performance measurement techniques appear to provide essentially equivalent point estimates. However, these simulation results do not bear directly on the validity of inferences made by Binder (1985-a, 1985-b) or Schipper *et al* (1983, 1985). In spite of the above results, Malatesta (1986) notes that the potential benefit of utilising JGLS in an event study is theoretically greater when disturbance terms are more highly correlated across equations.

Smith, Bradley and Jarrell (1986) examined the firm-specific effects of oil price regulation on common stock returns earned by investors in 37 petroleum firms listed on the NYSE. They estimated the following system using SURE.

$$r_{it} = \alpha_i + \beta_i r_{mt} + E_t\{(1 + \Theta Lev_{it})(\delta_0 + \Sigma^{k}{}_{k=1}\delta_{k} X_{k,it}\} + \varepsilon_{it} \tag{6.14}$$

where r_{it} = the rate of return of security i at time t;

r_{mt} = the rate of return to the market portfolio proxy at time t;

α_i,β_i = regression parameters;

E_t = a dummy variable that signifies the event period;

Θ = leverage parameter taking the value 0 for the case in which the proportionate change in the value of debt equals that for the value of equity and 1 for the case where the value of debt is unaffected;

Lev_{it} = financial leverage for firm i at time t;

δ_k = parameter for k variables measuring firm operating characteristics during the period $X_{k,it}$;

ε_{it} = error term.

Smith *et al* (1986) examine how OPEC pricing and oil price regulation should have affected the market values of common stock in petroleum firms. They test the hypothesis that the effects should depend on the relative importance of five firm characteristics: foreign and U.S. oil production, foreign and U.S. refining, and access to price-controlled crude oil under early U.S. oil price regulation. The empirical results indicate that U.S. oil production and refiner access to price-controlled crude oil were sources of capital gains and that U.S. and foreign refining were sources of capital losses.

Smirlock and Kaufold (1987) examine the effect on bank valuation of the Mexican debt moratorium in August 1982. The Mexican default resulted in the passage of regulations requiring public disclosure by banks of foreign loan exposure. This regulatory response to the international debt crisis has been predicated largely on the assumption that, without mandatory disclosure laws, investors could not distinguish among banks with different levels of foreign lending exposure. Therefore, Smirlock *et al* (1987) examine empirically whether investors were able to distinguish among banks with differing degrees of lending exposure to Mexico. Their sample consists of 23 exposed banks and 37 non-exposed banks to Mexico default. Smirlock *et al* (1987) test for a stock price response in the context of the following linear system of 23 equations estimated over the 121-day sample period.

$$
\begin{aligned}
R_{1t} &= \alpha_1 + \beta_1 R_{mt} + \gamma_1 D_t + \varepsilon_{1t} \\
R_{2t} &= \alpha_2 + \beta_2 R_{mt} + \gamma_2 D_t + \varepsilon_{2t} \qquad (6.15) \\
&\cdots\cdots\cdots\cdots\cdots\cdots \\
R_{nt} &= \alpha_n + \beta_n R_{mt} + \gamma_n D_t + \varepsilon_{nt}
\end{aligned}
$$

where R_{it} = the return on the stock of bank i on day t;

R_{mt} = the return on the NYSE index on day t;

D_t = a dummy variable equal to 1 on the event day and 0 otherwise;

α_i, β_i = regression parameters. β_i is a systematic risk measure;

γ_i = parameter to measure the ARs of bank i due to the Mexican default;

ε_{it} = error term.

To examine the magnitude and significance of the price response of exposed banks, the following null hypotheses were tested;

(i) the event parameter γ_i equals zero for each bank i ($\gamma_1 = \gamma_2 = ... = \gamma_{23} = 0$) ;

(ii) the event parameters γ_i are equal across all banks in the sample ($\gamma_1 = \gamma_2 = ... = \gamma_{23}$)

In addition to the above system equation, Smirlock *et al* (1987) estimate another system of equations (which is essentially identical) in order to examine whether the observed differences in response are proportional to exposure. In this system, $\gamma_i D_t$ was replaced by $\lambda_i D_t EXP_i$, where $\lambda_i = \gamma_i / EXP_i$ and EXP_i = the Mexican loan to equity ratio of bank i (i.e., λ_i measures the price response of bank i per unit of exposure). Estimating this system equation, they test the hypothesis that the event parameters λ_i are equal across all banks in the sample ($\lambda_1 = \lambda_2 = ... = \lambda_{23}$). The empirical results suggest that, even in the absence of public disclosure regulations, the market (i.e., investors) could assess the degree of foreign loan exposure and that the regulatory view that disclosure rules were needed to provide investors with exposure information may not have been valid.

Allen and Wilhelm (1988) examine the impact of the 1980 Depository Institutions Deregulation and Monetary Control Act (DIDMCA) in the USA on market value and risk of three different types of depository institutions. It is argued that by changing the competitive relationship among these institutions, DIDMCA affected their profitability in a predictable and differential manner, and may have affected the industry's overall profitability. Therefore, Allen *et al* (1988) partition the banking industry into three groups of banks: members of the Federal Reserve System (FRS), non-member banks (non-FRS) and savings and loans (S & L). They investigate Stigler's (1971) hypothesis that the regulatory process transfers wealth from one economic group to another based on the following system of equations.

$$R_{pw} = \alpha_p + \alpha'_p D_s + \beta_p R_{mw} + \beta'_p D_s R_{mw} + \Sigma^{n}_{k=1} D_{Ik} \gamma_k + \varepsilon_{pw} \qquad (6.16)$$

where R_{pw} = the rate of return on portfolio p over week w for p=1, 2, 3;

R_{mw} = the rate of return on the CRSP equally weighted index of all common stocks in the NYSE and ASE over week w;

α_p = intercept before the intervention;

α'_p = shift in the regression intercept due to the intervention;

β_p = systematic risk coefficient of portfolio p before the intervention;

β'_p = shift in the systematic risk coefficient due to the intervention;

D_s = a shift dummy variable taking value 0 before intervention and 1 otherwise;

D_{Ik} = a information dummy variable k taking value 1 if information week k and 0 otherwise;

γ_k = coefficient on information dummy variable k;

n = number of weeks in which information concerning the event in question is released to the market;

ε_{pw} = stochastic error term for portfolio p.

They test the null hypothesis that DIDMCA had no influence upon the profitability for each depository group. The results indicate that DIDMCA had a significant impact on the competitive structure of the depository institutions industry. In particular, FRS banks appeared to have profited at the expense of other parties in the industry.

Eysell and Arshadi (1990) examined the wealth effects of the risk-based capital adequacy requirements as reviewed in Chapter 5. The sample includes 27 banking firms with book asset levels ranging from \$3.5 billion to \$155 billion at year-end 1987. The empirical model of their system of equations is

$$r_{jt} = a_j + b_j r_{mt} + c_j D_t + e_{it} \qquad (6.17)$$

$$t = 1,..., 311, \qquad j = 1,..., 27.$$

where r_{jt}, r_{mt} = the daily returns on the shares of firm j and the market portfolio, respectively;

a_j, b_j = regression coefficients estimated over a 300-day estimation period ending

100 days prior to the date of the first announcement;

D_t = a dummy variable taking the value of 0 during the estimation period and 1 in the announcement period;

c_j = regression coefficient to measure the daily excess return;

e_{it} = error term.

The testing null hypothesis is that at the time of announcement of the regulatory change, there are no significant differences between the excess returns on the shares of banks that meet the risk-based capital requirement and those that do not. The alternative hypothesis is that the market values of the equities of those whose capital levels are deficient at the time of the announced regulatory change are most likely to be affected by the new requirements. The results suggest that the equity values of a sample of large, publicly traded banks decrease at the time of the announcement. Further, those banks with capital levels which are deficient relative to the mandated levels suffer the largest relative losses.

Table 6.1 summarises the above review of empirical literature relevant to this research. All this empirical studies show that the use of SURE may provide an appropriate solution to the problem of 'event clustering' which is one serious problem involved in the traditional standard event methodology.

6.4 ECONOMETRIC MODEL SPECIFICATION

Our purpose in this chapter is to examine the impact of the new capital adequacy requirements on bank stock prices. As shown in the review of empirical studies, stock price data can be utilised to examine the impact of various regulatory changes on shareholders' wealth. To measure security price performance, the following dummy variable regression model will be run within a SURE framework. This model is numerically identical to a single factor market model in estimating ARs or CARs as discussed earlier. The market model gives the relationship between the rate of return on the security (or portfolio) and the

<Table 6.1> Measuring the Impact of Regulations (Events) with Stock Market Data Within a SURE Framework

Author	Year	Source	Comments
Gibbons	1980	Univ. of Chicago (Ph.D. dissertation)	- A MVRM methodology within SURE framework was first proposed in the event study.
	1982	JFE	- Further discussion of the above approach.
Schipper & Thompson	1983	JAR	- Examine the impact of merger-related regulations on the shareholders of acquiring firms.
	1985	JAR	- Reexamine and discuss the exact distributions of test statistics.
Binder	1985-a	JAR	- Discussion of the MVRM technique in the event studies and comparison of test statistics.
	1985-b	JAR	- Analysis of the effects of 20 major regulatory changes from 1887 to 1978.
Malatesta	1986	JFQA	- An attempt to generalise the MVRM to the case of non-contemporaneous events utilising simulation technique.
Smith, Bradley & Jarrell	1986	RJE	- Examine the firm-specific effects of oil price regulation.
Smirlock & Kaufold	1987	JOB	- Examine the effects of mandatory disclosure rules and the reaction of bank stock prices to the Mexican debt crisis.
Allen & Wilhelm	1988	JMCB	- Examine the impact of the 1980 DIDMCA on the market value and risk of deposit institutions.
Eysell & Arshadi	1990	JOBF	- Examine the wealth effect of the risk-based capital adequacy requirements on 27 large banks.

Notes: 1) JFE represents Journal of Financial Economics.
2) JAR represents Journal of Accounting Research.
3) RJE represents Rand Journal of Economics.
4) JFQA represents Journal of Financial and Quantitative Analysis.
5) JOB represents Journal of Business.
6) JMCB represents Journal of Money, Credit, and Banking.
7) JOBF represents Journal of Banking and Finance.

rate of return on the market portfolio proxy. Furthermore, this provides a method for separating the effects of general market conditions from firm or industry specific events. The model to measure ARs is the same as Equation 6.8. However, the functional form which is log-linear (see Section 6.6.2) differs from Equation 6.8.

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{n=T+1}^{T+N} \gamma_{jn} D_{nt} + \varepsilon_{jt} \tag{6.18}$$

$$t = 1,\ldots T, T+1,\ldots T+N$$

where r_{jt} = the daily rate of return on the stocks of bank j in natural logarithm;

r_{mt} = the daily rate of return on the KOSPI as a market portfolio proxy in natural logarithm;

α_j, β_j = regression parameters. β_j is a systematic risk measure;

γ_{jn} = regression coefficient to measure the AR of bank j (j=1,...,J) in period n (n=T+1,...,T+N);

D_t = a dummy variable taking the value of 1 when t = n (n=T+1,...,T+N) and 0 otherwise;

ε_{jt} = stochastic disturbance term.

The above equation can be written compactly (in matrix form) as

$$Y_j = X_j\beta_j + \varepsilon_j \tag{6.19}$$

i.e.,

$$\begin{bmatrix} r_{j1} \\ \vdots \\ r_{jT} \\ r_{jT+1} \\ r_{jT+2} \\ r_{jT+3} \\ \vdots \\ r_{jT+N} \end{bmatrix} = \begin{bmatrix} 1 & r_{m1} & 0\,0\,0 \ldots 0 \\ \vdots & \cdots & \vdots \\ 1 & r_{mT} & 0\,0\,0 \ldots 0 \\ 1 & r_{mT+1} & 1\,0\,0 \ldots 0 \\ 1 & r_{mT+2} & 0\,1\,0 \ldots 0 \\ 1 & r_{mT+3} & 0\,0\,1 \ldots 0 \\ \vdots & \cdots & \vdots \\ 1 & r_{mT+N} & 0\,0\,0 \ldots 1 \end{bmatrix} \begin{bmatrix} \alpha_j \\ \beta_j \\ \gamma_{jT+1} \\ \gamma_{jT+2} \\ \gamma_{jT+3} \\ \vdots \\ \vdots \\ \gamma_{jT+N} \end{bmatrix} + \begin{bmatrix} \varepsilon_{j1} \\ \vdots \\ \varepsilon_{jT} \\ \varepsilon_{jT+1} \\ \varepsilon_{jT+2} \\ \vdots \\ \vdots \\ \varepsilon_{jT+N} \end{bmatrix} \tag{6.20}$$

where the definitions of Y_j, X_j, β_j, and ε_j in Equation 6.19 are obvious from Equation 6.20.

If the announcements of new capital adequacy standards are partly or completely anticipated, the new information will be capitalised before the announcement periods. Therefore, an alternative approach is to measure the impact of capital adequacy regulation change over the full event period, and to test Hypothesis 1 as specified in Section 6.2. If Hypothesis 1 is accepted, the model simplifies to:

$$r_{jt} = \alpha_j + \beta_j r_{mt} + A_j D_t + \varepsilon_{jt} \tag{6.21}$$

where A_j = constant AR of bank j, identical in all periods from t=T+1,..,T+N;

D_t = a dummy variable taking the value 1 for t = T+1,...,T+N and 0 otherwise.

This model can be rewritten in matrix form as

$$\begin{bmatrix} r_{j1} \\ \vdots \\ r_{jT} \\ r_{jT+1} \\ r_{jT+2} \\ r_{jT+3} \\ \vdots \\ r_{jT+N} \end{bmatrix} = \begin{bmatrix} 1 & r_{m1} & 0 \\ \vdots & \cdots & \vdots \\ 1 & r_{mT} & 0 \\ 1 & r_{mT+1} & 1 \\ 1 & r_{mT+2} & 1 \\ 1 & r_{mT+3} & 1 \\ \vdots & \cdots & \vdots \\ 1 & r_{mT+N} & 1 \end{bmatrix} \begin{bmatrix} \alpha_j \\ \beta_j \\ A_j \end{bmatrix} + \begin{bmatrix} \varepsilon_{j1} \\ \vdots \\ \varepsilon_{jT} \\ \varepsilon_{jT+1} \\ \varepsilon_{jT+2} \\ \vdots \\ \vdots \\ \varepsilon_{jT+N} \end{bmatrix} \tag{6.22}$$

The model to measure CARs is

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{n=T+1}^{T+N} \delta_{jn} CD_{nt} + \varepsilon_{jt} \tag{6.23}$$

where δ_{jn}, CD_{nt} are as defined in Equation 6.9.

Equation 6.23 can be rewritten in matrix form as

$$\begin{bmatrix} r_{j1} \\ \vdots \\ r_{jT} \\ r_{jT+1} \\ r_{jT+2} \\ r_{jT+3} \\ r_{jT+4} \\ \vdots \\ r_{jT+N} \end{bmatrix} = \begin{bmatrix} 1 & r_{m1} & 0 & 0 & 0 & \cdots & 0 \\ \vdots & & \cdots & & & & \vdots \\ 1 & r_{mT} & 0 & 0 & 0 & \cdots & 0 \\ 1 & r_{mT+1} & 1 & 0 & 0 & \cdots & 0 \\ 1 & r_{mT+2} & -1 & 1 & 0 & \cdots & 0 \\ 1 & r_{mT+3} & 0 & -1 & 1 & \cdots & 0 \\ 1 & r_{mT+4} & 0 & 0 & -1 & \cdots & 0 \\ \vdots & & \cdots & & & & \vdots \\ 1 & r_{mT+N} & 0 & 0 & 0 & \cdots & 1 \end{bmatrix} \begin{bmatrix} \alpha_j \\ \beta_j \\ \delta_{jT+1} \\ \delta_{jT+2} \\ \delta_{jT+3} \\ \vdots \\ \vdots \\ \vdots \\ \delta_{jT+N} \end{bmatrix} + \begin{bmatrix} \varepsilon_{j1} \\ \vdots \\ \varepsilon_{jT} \\ \varepsilon_{jT+1} \\ \varepsilon_{jT+2} \\ \vdots \\ \vdots \\ \varepsilon_{jT+N} \end{bmatrix} \tag{6.24}$$

The above models will be estimated using OLS and SURE. These estimation procedures are discussed in the following section. For the CAR approach when the restriction $\gamma_{jT+1} = \gamma_{jT+2} = \ldots = \gamma_{jT+N}$ is imposed (i.e., when Hypothesis 1 is accepted), the CAR at period n (n=T+1,...,T+N) is simply calculated as (n-T)A_j, where A_j is as defined in Equation 6.21, so there is no need to estimate a separate model.

6.5 ESTIMATION PROCEDURES

6.5.1 OLS Estimation Procedure

A common type of theoretical proposition in economics states that changes in one variable can be explained by reference to changes in several other variables. Such a relationship is described by a multiple linear regression model in matrix form.

$$\underset{(T \times 1)}{\begin{bmatrix} Y_{j1} \\ \vdots \\ \vdots \\ Y_{jT} \end{bmatrix}} = \underset{(T \times k_j)}{\begin{bmatrix} 1 & X_{j21} \cdots\cdots X_{jkj1} \\ \vdots & \cdots\cdots\cdots\cdots \vdots \\ \vdots & \vdots \\ \vdots & \cdots\cdots\cdots\cdots \vdots \\ 1 & X_{j2T} \cdots\cdots X_{jkjT} \end{bmatrix}} \underset{(k_j \times 1)}{\begin{bmatrix} \beta_{j1} \\ \vdots \\ \vdots \\ \beta_{jkj} \end{bmatrix}} + \underset{(T \times 1)}{\begin{bmatrix} \varepsilon_{j1} \\ \vdots \\ \vdots \\ \varepsilon_{jT} \end{bmatrix}} \qquad (6.25)$$

where T = number of observation;

X_{jit} = *i*'th independent variable in equation j at time t (i=1,...,k_j, j=1,...,J, t=1,...,T).

Note that for i=1, X_{jit}=1 for all j, t;

Y_{jt} = dependent variable in equation j at time t;

ε_{jt} = error term in equation j at time t.

The dimensions of each term in Equation 6.25 are shown beneath in parentheses. Equation 6.25 can be compactly rewritten as

$$Y_j = X_j\beta_j + \varepsilon_j \qquad (6.26)$$

If the corresponding estimated model is $Y_j = X_j\beta_j + e_j$, the OLS estimation procedure selects β_j so as to minimise e'_je_j, the sum of squared estimated residuals. It can be shown that the expression for β_j which achieves this is $\beta_j = (X_j'X_j)^{-1}X'_jY_j$. A number of desirable properties of β_j follow if the following assumptions are satisfied (Greene, 1990; Gujarati, 1988; Kmenta, 1971):

(i) the correct functional form of the relationship between X_j and Y_j is linear, i.e., the relationship is correctly specified in the equation $Y_j = X_j\beta_j + \varepsilon_j$;

(ii) zero mean of the disturbance: $E(\varepsilon_j) = 0$ which implies that $E(Y_j) = X\beta_j$;

(iii) homoscedasticity and uncorrelatedness across observations: $E(\varepsilon_j\varepsilon'_j) = \sigma^2_j I_T$

where I_T = (T x T) identity matrix;

(iv) normality: $\varepsilon_j \sim N(0, \sigma^2_j I_T)$;

(v) no exact linear relationships exists among the independent variables;

(vi) the number of observations exceeds the number of coefficients to be estimated.

Under assumptions (i)-(iii) and (v)-(vi), according to the Gauss-Markov Theorem, $\hat{\beta}_j$ is the best linear unbiased estimator of β_j. A linear unbiased estimator is said to be Best Linear Unbiased if among all estimators which are linear functions of Y_j, and which are unbiased (i.e., whose expectation equals the true value of the parameter being estimated), the estimator has smallest variance (i.e., is most efficient, or best). If assumption (iv) is also valid, $\hat{\beta}_j$ can be interpreted as the maximum likelihood estimator of β_j, in which case it is asymptotically efficient, i.e., no other estimator (including non-linear and biased estimators) has a smaller variance. Assumption (iv) is also necessary for the validity of the standard hypothesis testing procedures for inference concerning the true values of the parameters of model.

As a first step, the above OLS procedure will be applied for each bank in order to estimate ARs and CARs, and to test Hypothesis 1 and 4 as specified in Section 6.2. Since announcements of regulatory changes affect all banking firms in the sample simultaneously, a portfolio approach is also used. By analysing portfolio returns and associated ARs and CARs, the cross-sectional dependence of the component security returns can be incorporated into the analysis, facilitating joint tests of significance. However, a portfolio approach has limitations. As Stigler (1971) noted, regulation is a process of wealth transfer among the various parties affected by regulations. Thus, the impact of capital regulation is likely to differ among individual banks. However, a portfolio approach cannot explicitly incorporate this fact into each equation and does not allow the individual ARs (or CARs) to differ across banking firms. To overcome the statistical problems (i.e., contemporaneous correlation across banks) involved in using OLS for estimation and drawbacks of a portfolio approach, SURE will also be employed. The next section discusses the SURE procedure.

6.5.2 SURE Procedure

The assumptions of the classical linear regression model were discussed in Section 6.5.1. However, as Kmenta (1971) noted, there is one further assumption, which is made only implicitly, namely, that there exists no other regression model with a disturbance which would be correlated with ε_j in Equation 6.25. This assumption becomes relevant when we discuss Zellner's (1962) Seemingly Unrelated Regression Estimation, or SURE procedure below.

Let us consider a set of regression equations where each member of the set is an equation of the form $Y_j = X_j\beta_j + \varepsilon_j$ and where there may be correlation between the disturbances in different equations. Such a specification is likely to be reasonable when estimating a number of related economic functions such as demand equations for a number of commodities, investment functions for a number of firms, or the market model to estimate ARs for a number of securities (Greene, 1990; Judge *et al*, 1985 & 1988). For these cases the disturbances for different functions, at a given point in time, are likely reflect some common unmeasurable or omitted factors, and so one would expect them to exhibit some correlation. This correlation between different disturbances at a given point in time is known as contemporaneous correlation (Greene, 1990; Griffiths *et al*, 1985; Theil, 1971). It is distinct from 'autocorrelation', which refers to correlation over time for the disturbances in a single equation. When contemporaneous correlation exists, it may be more efficient to estimate all equations jointly, rather than to estimate each one separately using OLS. In particular, regulatory event studies such as this one represent the extreme case of event-date clustering because all of the affected banks have identical (i.e., contemporaneous) event periods. Furthermore, in a sample characterised by industry homogeneity, contemporaneous correlation among residuals across the equations will be severe. As a result, failure to make such an adjustment results in a systematic underestimation of the standard deviations of ARs (Brown & Warner, 1985), and calculated t-values tend to be overstated, resulting in greater likelihood of Type I errors. In this situation, the appropriate joint estimation technique is SURE.

Suppose we are concerned with the problem of estimating the coefficients of the following J regression equations (using matrix notation).

$$Y_j = X_j\beta_j + \varepsilon_j \qquad j = 1, 2, \ldots, J \tag{6.27}$$

A convenient way to write these equations as a system is

$$\underset{(JT \times 1)}{\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ \vdots \\ Y_J \end{bmatrix}} = \underset{(JT \times K)}{\begin{bmatrix} X_1 & 0 & \cdots & 0 \\ & X_2 & & 0 \\ & & \cdot & \\ & & \cdot & \\ 0 & 0 & \cdots & X_J \end{bmatrix}} \underset{(K \times 1)}{\begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \vdots \\ \beta_J \end{bmatrix}} + \underset{(JT \times 1)}{\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \vdots \\ \varepsilon_J \end{bmatrix}} \tag{6.28}$$

or, alternatively,

$$Y = X\beta + \varepsilon \tag{6.29}$$

where the definitions of Y, X, β and ε are obvious from Equation 6.28 and where their dimensions are (JT x 1), (JT x K), (K x 1) and (JT x 1) with $K = \Sigma^{J}_{j=1} K_J$, respectively. Given that ε_{Jt} is the error for the *j*th equation in the *t*th time period, the assumption of contemporaneous disturbance correlation, but no correlation over time, implies that $E[\varepsilon_{is}\ \varepsilon_{jt}] = \sigma_{ij}$ if t=s, but 0 otherwise. Therefore, $E[\varepsilon_i \varepsilon'_j] = \sigma_{ij} I_T$, and the covariance matrix for the complete error vector can be written as

$$E[\varepsilon\, \varepsilon'] = V = \Sigma \otimes I_T \tag{6.30}$$

where

$$\underset{(J \times J)}{\Sigma} = \begin{bmatrix} \sigma_{11} & \sigma_{12} \cdots\cdots & \sigma_{1J} \\ \sigma_{12} & \sigma_{22} \cdots\cdots & \sigma_{2J} \\ \vdots & \vdots & \vdots \\ \sigma_{1J} & \sigma_{2J} \cdots\cdots & \sigma_{JJ} \end{bmatrix} \tag{6.31}$$

$\otimes$ = Kronecker product

Defining the ij'th element of Σ^{-1} by σ^{ij}, we can write:

$$\underset{(J \times J)}{\Sigma^{-1}} = \begin{bmatrix} \sigma^{11} & \sigma^{12} \ldots\ldots & \sigma^{1J} \\ \sigma^{12} & \sigma^{22} \ldots\ldots & \sigma^{2J} \\ \vdots & \vdots & \vdots \\ \sigma^{1J} & \sigma^{2J} \ldots\ldots & \sigma^{JJ} \end{bmatrix} \qquad (6.32)$$

The expression for the generalised least squares (GLS) estimator of β is

$$\beta = [X'(\Sigma^{-1} \otimes I_T)X]^{-1}X'(\Sigma^{-1} \otimes I_T)Y$$

$$= [X'V^{-1}X]^{-1}X'V^{-1}Y \text{ where } V^{-1} = \Sigma^{-1} \otimes I_T$$

$$= \begin{bmatrix} \sigma^{11}X'_1X_1 & \sigma^{12}X'_1X_2 & \ldots\ldots\ldots\ldots & \sigma^{1J}X'_1X_J \\ \sigma^{12}X'_2X_1 & \sigma^{22}X'_2X_2 & \ldots\ldots\ldots\ldots & \sigma^{2J}X'_2X_J \\ \vdots & \vdots & & \vdots \\ \sigma^{1J}X'_JX_1 & \sigma^{2J}X'_JX_2 & \ldots\ldots\ldots\ldots & \sigma^{JJ}X'_JX_J \end{bmatrix}^{-1} \begin{bmatrix} \Sigma^J_{j=1}\sigma^{1j}X'_1Y_j \\ \Sigma^J_{j=1}\sigma^{2j}X'_2Y_j \\ \vdots \\ \Sigma^J_{j=1}\sigma^{Jj}X'_JY_j \end{bmatrix} \qquad (6.33)$$

β as defined in Equation 6.33 is the BLUE for β. It has lower variance than the OLS estimator for β because it takes into account the contemporaneous correlation between the disturbance in different equations. The name 'seemingly unrelated regression estimation' reflects the fact that the equations are linked only by their disturbances.

The above discussion of SURE assumes that Σ is known. However, in most applications Σ is unknown, and so the estimator β cannot be calculated directly from Equation 6.33 (Greene, 1990; Judge *et al*, 1985). Hence, feasible or estimated GLS (FGLS or EGLS) estimators have been devised. The estimator in this study is obtained in two steps. Firstly, single equation OLS is used one equation at a time to compute β_i, and the residuals e_j for j=1,..J. These can be used, in turn, to compute

$$\hat{\sigma}_{ij} = \frac{\Sigma^T_{t=1} e_{it}e_{jt}}{T} = \frac{e'_ie_j}{T} \qquad (6.34)$$

GLS is then computed using this estimator of Σ. The estimated asymptotic covariance matrix is the estimate of the inverse matrix in Equation 6.33. Having calculated the GLS estimators the first time, a new set of residuals e_j (j=1,..,J) can be obtained, and $\hat{\sigma}_{ij}$ can be re-calculated and GLS re-run (see Greene, 1990 & 1991). The procedure can continue until the estimated coefficients β converge to some pre-specified degree.

In order for SURE to be possible, the matrix Σ must be non-singular so that Σ^{-1} can be computed. A potential difficulty exists with a system in which the same explanatory variables are used in all equations ($X_i = X_j$ for all i and j), and in which there is a high degree of collinearity between the dependent variables. In the extreme case in which $Y_i = Y_j$ for some i and j (i.e., equations i and j are identical), $e_i = e_j$, which means $\sigma_{ik} = \sigma_{jk}$ for k=1,...,J, i.e., Σ is singular and Σ^{-1} does not exist (Greene, 1993; Judge *et al*, 1985; Theil, 1971, p.281). Even in the less extreme case in which there is a close, but not exact linear relationship between two or more of the dependent variables, estimation becomes difficult and procedures used in econometric packages are liable to break down. Theil (1971, p.281) suggests that if the singular covariance matrix is due to linear dependency among equations, as an alternative to attempting to estimate the whole system, the dependent equations may be deleted from the system. In this case, for the subsystem obtained after the redundant equations, the condensed covariance matrix will be nonsingular and the regular procedure is applicable (Lee, Judge and Zellner, 1977, Section A.6). In addition, when restrictions are imposed upon the parameters in order to test hypotheses, the elements in Σ become drastically inflated, as do the correlations across equations (Greene, 1993; Judge *et al*, 1985). If the correlations across equations consequently become high, estimation becomes impossible.

It is interesting to ask how much efficiency is gained by using GLS instead of OLS. Dwivedi and Srivatava (1978) have analysed some special cases in detail:

(i)if the equations are actually unrelated, that is $\sigma_{ij} = 0$, there is no payoff to GLS. GLS estimation will be identical to OLS estimation;

(ii)if the equations have identical explanatory variables, that is $X_j = X_i$, the OLS and GLS estimators of β are numerically identical. Therefore, unrestricted market model estimation by SURE is the same as equation by equation OLS as far as the coefficients are concerned. However, the standard errors of the coefficients will still differ, so SURE is still preferred for hypothesis testing (Wallace and Silver, 1988). Furthermore, if linear constraints are imposed for hypothesis testing, the OLS and SURE estimations are no longer identical (Greene,1991);

(iii)if the explanatory variables in one block of equations are a subset of those in another, GLS brings no efficiency gain in estimation of the equations with the smaller number of explanatory variables.

(iv)in general, the SURE is preferred for hypothesis testing, since heteroscedasticity across equations and contemporaneous dependence of the disturbances are explicitly incorporated into the hypothesis tests (Binder, 1985-a).

6.6 EVENT DATES, DATA SOURCES AND DESCRIPTIVE ANALYSIS

6.6.1 Event Dates

As discussed in Chapters 3 and 5, the OBS of the BOK raised the level of capital adequacy ratios from 6% and 7% to 8% and 9% for NCBs and RBs, respectively, on December 4, 1990 and introduced the new risk-based capital adequacy system following the Basle system on July 16, 1992. Figure 6.2 summarises the events and estimation periods. One of the main difficulties with measuring the impact of regulatory changes on security prices is identifying when the market first anticipates the effects of the changes on future profitability (Schwert, 1981). In an efficient market, any regulatory change including new regulation or different enforcement of existing regulations, which affects future cash flows will cause a change in stock prices as soon as the regulatory change is anticipated by the market. Brown *et al* (1980) simulate the effects of imprecise dating of the change in expectations and find that it greatly decreases the power of event studies. Assuming that

<Figure 6.2> Outline of Events and Analysing Periods

[Event 1] The OBS raised the capital adequacy ratios from 6~7%-->8~9% on December 4, 1990.

```
                Pre-event period                         Event Period
               (262 trading days)                      (16 trading days)
|-----------------------------------------------|---------------------|---------------------|
1990.1.3                                    1990.11.21              12.4               1990.12.10
```

[Event 2] The OBS announced the introduction of new risk-adjusted standards on July 16, 1992.

```
                Pre-event Period                         Event Period
               (149 trading days)                      (16 trading days)
|-----------------------------------------------|---------------------|---------------------|
1992.1.4                                    1992.7.3                7.16               1992.7.23
```

the announcement occurs during an eleven-month period and causes a 5% AR, they reject the null hypothesis of no effect in a one-tailed test two to three times less often when the date is imprecisely fixed than when the announcement date is known. Because of the imprecise timing of new information, it is not certain that significant effects on stock returns can be found even for the most important regulation changes.

For the first event in our cases, it is difficult to fix the announcement date accurately because the OBS did not announce officially a change in capital adequacy standards. The Superintendent of Banks signed the new capital standard on December 4, 1990 and dispatched details to each commercial bank on the same day, but the information was not released to the press. Taking into account the fact that it was not announced formally, we fixed the announcement date as the date when the Superintendent of Banks signed. On the other hand, the announcement date for the second event is accurate because the OBS announced the introduction of the new risk-based capital adequacy system on July 16, 1992. As discussed in Chapter 5 (see Section 5.2.2), the new RAR system states that a uniform ratio of 7.25% by year-end 1993 and onwards (transition period), and 8% by year-end 1995 and onwards will be imposed for all domestic commercial banks and is effective from the announcement date (i.e., from July 16, 1992).

6.6.2 Data Sources and Descriptive Analysis of Data

The stock price data utilised for this empirical study have been taken from the KSE; these data have been provided informally to the researcher by the KSE. The sample contains 17 banks (7 NCBs and 10 RBs) out of 20 banks listed on the KSE. Three banks are excluded: KLTCB, which is a long-term credit bank, and Boram Bank and Hana Bank which are commercial banks, but for which insufficient observations were available to use them for our study. There were 23 commercial banks at the end of 1990. Banks which are not listed on the KSE include: KEB, which was privatised in 1989 and three local-based NCBs (Daedong, Dongnam and Donghwa banks).

For each sample bank, daily returns are calculated for the entire period including the event window. As discussed earlier, the event period should be included in the estimation period to estimate ARs (or CARs) in the periods surrounding regulatory changes. The samples for our study contain 278 daily returns (262 for the pre-event period and 16 for the event window) and 165 daily returns (149 for the pre-event period and 16 for the event window) for the first event and the second event, respectively.

Table 6.2 provides summary statistics for our samples. Since in the pre-test of our models, the functional form was found to be log-linear rather than linear, logarithmic transformations were applied to all the raw data, and the summary statistics refer to the transformed data. The mean values show that during the period of analysis, investors in the stocks of Korean banks realised losses. These findings reflect the fact that (as discussed in Chapter 2) capital markets in Korea have been bearish since the end of 1989. The standard deviation of returns for each bank does not diverge significantly among banks. However, the standard deviation for RBs is slightly higher than that for NCBs; this implies that stock returns among RBs are more widely dispersed than those among NCBs.

<Table 6.2> Summary Statistics for the Samples

Variable	Mean	Std.	Skew.	Kurt.	Minimum	Maximum	Cases
[EVENT 1							
Chohung	-0.000491	0.021667	0.649	3.678	-0.06230	0.05662	278
Commer	-0.000515	0.022384	0.586	3.543	-0.06899	0.05662	278
First	-0.000605	0.022710	0.404	3.858	-0.08760	0.05716	278
Hanil	-0.000775	0.022674	0.390	3.655	-0.08474	0.05827	278
Seoul	-0.000515	0.022416	0.631	3.557	-0.06899	0.05716	278
Shinhan	-0.000366	0.022134	0.338	3.280	-0.05884	0.05827	278
KorAm	-0.000418	0.021883	0.312	3.238	-0.05609	0.05609	278
Cbuk	-0.000618	0.023414	0.335	3.076	-0.06124	0.05716	278
CCB	-0.000555	0.022862	0.361	3.106	-0.05557	0.05557	278
Cheju	-0.000771	0.021920	0.320	3.274	-0.05264	0.05162	278
Daegu	-0.000714	0.023139	0.454	3.010	-0.05827	0.05827	278
Jbuk	-0.000812	0.022904	0.378	3.011	-0.05433	0.05609	278
Kangwon	-0.00071	0.022567	0.344	2.958	-0.05481	0.05162	278
Kwangju	-0.000835	0.024865	0.133	3.901	-0.10650	0.06496	278
KGB	-0.000763	0.023486	0.383	3.031	-0.05662	0.05662	278
KNB	-0.000567	0.022769	0.369	3.130	-0.05716	0.05716	278
Pusan	-0.000758	0.023466	0.326	3.029	-0.05827	0.05827	278
NCBs	-0.000454	0.018756	0.650	4.146	-0.06585	0.05367	278
RBs	-0.000651	0.020437	0.448	3.391	-0.05577	0.05325	278
CBs	-0.000561	0.019281	0.634	3.514	-0.04670	0.04968	278
KOSPI	-0.00076	0.018169	1.052	10.828	-0.08664	0.11720	278
[EVENT 2							
Chohung	-0.00177	0.020121	0.548	3.498	-0.05456	0.05358	165
Commer	-0.00183	0.020119	0.523	3.526	-0.05407	0.05311	165
First	-0.00137	0.020562	0.343	3.492	-0.05884	0.05456	165
Hanil	-0.00133	0.021197	0.513	3.160	-0.04840	0.05771	165
Seoul	-0.00177	0.020505	0.465	3.697	-0.05407	0.05609	165
Shinhan	-0.00092	0.019818	0.532	2.891	-0.03974	0.05033	165
KorAm	-0.00118	0.020041	0.427	2.901	-0.04735	0.04939	165
Cbuk	-0.00193	0.022097	0.367	3.128	-0.06002	0.05716	165
CCB	-0.00166	0.023321	0.422	3.414	-0.05609	0.05771	165
Cheju	0.00008	0.023318	0.394	2.319	-0.04521	0.05129	165
Daegu	-0.00145	0.022056	0.567	3.427	-0.05264	0.05609	165
Jbuk	-0.00193	0.023411	0.469	3.354	-0.05942	0.05827	165
Kangwon	-0.00177	0.024194	0.386	3.111	-0.05358	0.05827	165
Kwangju	-0.00185	0.022970	0.358	3.042	-0.06124	0.05771	165
KGB	-0.00153	0.022540	0.502	2.947	-0.05358	0.05506	165
KNB	-0.00125	0.022524	0.471	3.525	-0.05506	0.05506	165
Pusan	-0.00130	0.023430	0.586	3.169	-0.05358	0.05506	165
NCBs	-0.00141	0.018554	0.523	3.373	-0.04400	0.05071	165
RBs	-0.00141	0.020745	0.585	3.288	-0.04513	0.05230	165
CBs	-0.00141	0.019437	0.565	3.358	-0.04346	0.04937	165
KOSPI	-0.00112	0.013148	0.492	3.146	-0.03056	0.04093	165

Note: Mean, maximum and minimum are in logs.

In addition to the means and standard deviations, we also report estimated skewness and kurtosis coefficients in order to investigate further the distribution of sample data. The property of skewness can be of considerable interest in the characterisation of a distribution of observations: it is known that for a normally distributed variable, the population skewness is 0. However, since there are any number of symmetric distributions, a further characteristic is required to distinguish the normal distribution. Kurtosis provides a measure of the weight in the tails of a probability density function; it is known that for a normally distributed variable, the population kurtosis is 3.

The normal distribution plays an important part in statistics and many practical procedures rely for their validity, or for particular optimality properties, on an assumption that sample data are from a normal distribution (Newbold, 1988). However, there is strong evidence against normality for daily stock returns (Fama, 1976). The daily stock return for an individual security exhibits substantial departures from normality which are not observed with monthly data. The evidence generally suggests that distributions of daily returns are fat-tailed relative to a normal distribution (Fama, 1976, p.21; Brown *et al*, 1985). Table 6.2 indicates that daily stock returns of Korean banks are not normally distributed. Skewness for our sample data is positive, which implies that distributions are skewed to the right. However, one study using simulation techniques shows that the non-normality of daily stock returns has no obvious impact on event study methodology (Brown *et al*, 1985).

The results in Table 6.2 do not provide any information about the relationships between different bank stocks; however, since the prices of bank stocks are likely to move together, it is worthwhile to examine the inter-relationships between two or more bank stocks. The correlation coefficient is a useful tool as a descriptive measure of the strength of linear associations between bank stocks. The correlation coefficient must lie between -1 and 1, and the larger in absolute value the correlation, the stronger the linear association between bank stocks. Therefore, high correlation coefficients would indicate that when we investigate the relationships between random variables in an econometric model, the estimation procedure should consider the inter-correlations with other equations (as SURE does).

Examination of the correlation coefficients between the dependent variables in a system of equations may also give an indication as to whether a collinearity problem of the kind discussed in Section 6.5.2 is likely to arise.

Table 6.3 shows the correlation coefficient matrix between the returns on bank stocks. Some returns are highly correlated with others. For event 1, the returns for Seoul are highly correlated with those for Commercial, First, Cbuk, CCB and Cheju banks. The returns for KNB are highly correlated with those for Cbuk, CCB and Cheju banks. For event 2, the returns for Seoul are highly correlated with those for Chohung, Commercial, First, Cbuk and Kwangju banks. The returns for Kwangju are almost perfectly correlated with those for Cbuk. In particular, the strength of inter-correlations between the returns on bank stocks for event 2 is higher than that for event 1. The relatively high pairwise correlation coefficients between the returns on these stocks suggest that if the returns on too many of these stocks are used as dependent variables in a system of equations, estimation difficulties may be experienced (see Section 6.5.2).

6.7 CAPITAL ADEQUACY REQUIREMENTS AND WEALTH EFFECTS

6.7.1 OLS Estimation and Hypothesis Tests

6.7.1.1 Diagnostic Tests

As discussed in Section 6.5.1, the classical linear regression model is based on a number of statistical assumptions concerning the properties of the data. With these assumptions, we saw that the OLS estimators of the regression coefficients are BLUE (Gujarati, 1988), and that it is possible to test hypotheses about true population regression coefficients. Therefore, before discussing estimation results and presenting the results of hypothesis tests, it is important to diagnose whether or not our regression models satisfy the classical assump-

<Table 6.3>

Correlation Coefficient Matrix between Returns for Bank Stocks

[EVENT 1]

	Chohung	Commer	First	Hanil	Seoul	Shinhan	KorAm	Cbuk	CCB	Cheju	Daegu	Jbuk	Kangwon	Kwangju	KGB	KNB	Pusan
Chohung	1.00000																
Commer	0.86400	1.00000															
First	0.89298	0.93184	1.00000														
Hanil	0.43675	0.37322	0.36934	1.00000													
Seoul	0.89122	0.93765	0.95599	0.34798	1.00000												
Shinhan	0.77263	0.78640	0.83229	0.24195	0.83794	1.00000											
KorAm	0.65364	0.51613	0.57400	0.57849	0.55747	0.53638	1.00000										
Cbuk	0.79693	0.86340	0.86461	0.24737	0.88361	0.79773	0.48203	1.00000									
CCB	0.81260	0.84038	0.86261	0.26918	0.87505	0.82063	0.55805	0.91041	1.00000								
Cheju	0.80238	0.81092	0.84219	0.28706	0.84887	0.77785	0.54952	0.85667	0.87173	1.00000							
Daegu	0.80624	0.86104	0.87612	0.26918	0.89067	0.81277	0.51673	0.95328	0.92655	0.87475	1.00000						
Jbuk	0.66947	0.61435	0.63087	0.55069	0.63180	0.58082	0.75976	0.66839	0.66314	0.65872	0.67519	1.00000					
Kangwon	0.63971	0.56262	0.59459	0.51141	0.58663	0.54513	0.74288	0.60502	0.63350	0.63521	0.61836	0.89905	1.00000				
Kwangju	0.68211	0.63685	0.65830	0.56466	0.65184	0.58163	0.73230	0.62263	0.63359	0.61454	0.60584	0.88269	0.82480	1.00000			
KGB	0.77679	0.71690	0.73381	0.41587	0.72936	0.67561	0.63037	0.78276	0.79765	0.76109	0.80731	0.81157	0.78351	0.75555	1.00000		
KNB	0.78978	0.85874	0.85969	0.28874	0.87386	0.78475	0.50197	0.95181	0.91858	0.85801	0.95528	0.68935	0.63554	0.63431	0.80467	1.00000	
Pusan	0.72860	0.78534	0.79001	0.18875	0.80748	0.71670	0.41671	0.83896	0.82000	0.78916	0.85132	0.56271	0.54997	0.52332	0.68723	0.82732	1.00000

[EVENT 2]

	Chohung	Commer	First	Hanil	Seoul	Shinhan	KorAm	Cbuk	CCB	Cheju	Daegu	Jbuk	Kangwon	Kwangju	KGB	KNB	Pusan
Chohung	1.00000																
Commer	0.93295	1.00000															
First	0.92497	0.91479	1.00000														
Hanil	0.90204	0.88264	0.89944	1.00000													
Seoul	0.94789	0.94700	0.92173	0.90645	1.00000												
Shinhan	0.69544	0.66498	0.71606	0.73287	0.65715	1.00000											
KorAm	0.68039	0.69047	0.70393	0.68671	0.67141	0.77254	1.00000										
Cbuk	0.83063	0.85900	0.84080	0.80249	0.84889	0.68519	0.67692	1.00000									
CCB	0.77467	0.78013	0.77443	0.76097	0.79109	0.69283	0.66291	0.86372	1.00000								
Cheju	0.51021	0.51451	0.48841	0.56323	0.51025	0.67169	0.60631	0.49657	0.49949	1.00000							
Daegu	0.82389	0.83575	0.82968	0.81703	0.82789	0.72552	0.70403	0.89229	0.88761	0.57028	1.00000						
Jbuk	0.79890	0.79851	0.78264	0.76171	0.79512	0.64151	0.64946	0.87338	0.87742	0.46318	0.89931	1.00000					
Kangwon	0.79964	0.78706	0.80039	0.76985	0.80749	0.64075	0.66808	0.82953	0.80025	0.46376	0.86268	0.82613	1.00000				
Kwangju	0.84788	0.87718	0.85535	0.82264	0.87537	0.67066	0.67302	0.96437	0.86851	0.51168	0.89539	0.87461	0.84018	1.00000			
KGB	0.76787	0.77204	0.76674	0.81943	0.77277	0.77358	0.73696	0.81239	0.90481	0.61682	0.87253	0.84405	0.78445	0.81378	1.00000		
KNB	0.81809	0.81203	0.81978	0.81213	0.81471	0.71381	0.69380	0.88873	0.85731	0.54668	0.93208	0.87943	0.82105	0.89911	0.87021	1.00000	
Pusan	0.78123	0.79803	0.79253	0.80304	0.80091	0.75937	0.73097	0.85430	0.87249	0.55630	0.91124	0.86432	0.81767	0.85628	0.88861	0.88574	1.00000

tions required for OLS estimation. In this section, we focus on five tests of assumptions: no autocorrelation, linearity (i.e., functional form), no heteroscedasticity, normality, and no interdependence of residuals across regression models (i.e., no contemporaneous correlation). Tests of the first four of these assumptions were carried out by Microfit - an interactive econometric software package; contemporaneous correlation across residuals was examined using Quattro Pro - a spreadsheet package. Equation 6.18 was estimated separately, using OLS, for each of the 17 banks, and for each of the three portfolios, and tests for autocorrelation, linearity, heteroscedasticity, and normality were carried out on each of these equations, individually. The results of these tests are presented in the current sub-section, prior to discussion of the estimation results themselves in sub-section 6.7.1.2.

(i) *Test for No Autocorrelation*

Autocorrelation occurs when the disturbances are correlated with one another. When autocorrelation among residuals occurs, the OLS estimators are still linear-unbiased as well as consistent, but they are no longer efficient (i.e., they do not have minimum variance). In other words, the residual variance in the presence of autocorrelation is likely to underestimate the true variance. As a result, we are likely to overestimate R^2, and the usual t- and F-tests of significance are no longer valid (Gujarati, 1988). To establish confidence intervals and to test hypotheses, therefore, one should utilise GLS rather than OLS even though the OLS estimators are unbiased and consistent. Autocorrelation among residuals can be detected using the Durbin-Watson (D.W) statistic. The D.W statistic is:

$$d = \frac{\Sigma^n_{t=2} (e_t - e_{t-1})^2}{\Sigma^n_{t=1} e_t^2} \approx 2(1 - \rho) \qquad (6.35)$$

where $\rho = \Sigma\, e_t e_{t-1}/\Sigma e_t^2$ = estimate of the first-order autocorrelation coefficient.

Since $-1 \leq \rho \leq 1$, we must have $0 \leq d \leq 4$. Critical values for the Durbin-Watson test and decision rules are shown graphically in Figure 6.3. Table 6. 4 shows that the D.W statistics for most banks for event 1 fall into the zone of indecision. Only for Jeonbuk Bank can the null hypothesis of no autocorrelation be clearly accepted, although for the NCBs portfolio,

<Table 6.4> Diagnostic Tests for OLS Regression Models

	EVENT 1				EVENT 2			
	D.W[1)]	RESET[2)]	HET[3)]	JB[4)]	D.W	RESET	HET	JB
Chohung	2.06	0.39	128.55*	1624.4*	1.89	0.37	0.07	10.59*
Commer	2.34	2.73	162.76*	1451.9*	1.83	0.01	0.03	43.50*
First	2.30	2.79	151.98*	2354.2*	1.84	0.35	0.03	10.26*
Hanil	1.93	3.25	7.81*	64.7*	1.88	0.00	0.01	77.44*
Seoul	2.37	2.60	177.89*	2756.7*	2.03	0.03	0.01	16.04*
Shinhan	2.37	2.05	157.13*	963.5*	2.11	0.09	1.05	63.03*
Koram	2.17	0.64	40.10*	131.9*	1.94	0.27	2.16	21.79*
Cbuk	2.34	3.68	150.50*	1857.7*	1.98	0.37	0.00	21.15*
CCB	2.28	4.70*	172.01*	2133.9*	2.25	0.09	0.13	1.45
Cheju	2.35	3.27	163.58*	1313.9*	1.80	0.00	0.65	31.32*
Daegu	2.31	4.42*	153.14*	2201.4*	1.89	0.00	0.21	4.56
Jbuk	2.02	0.30	39.76*	438.6*	2.07	0.00	1.12	12.79*
Kangwon	2.16	0.04	28.37*	227.8*	2.28	0.00	0.96	1.71
Kwangju	2.07	0.61	17.06*	456.1*	1.96	1.65	0.02	17.43*
KGB	2.11	0.16	55.84*	915.9*	1.93	0.09	0.49	15.47*
KNB	2.35	4.55*	164.86*	1996.6*	1.79	0.25	1.47	13.10*
Pusan	2.16	2.17	124.02*	464.7*	1.92	0.26	0.11	23.69*
NCBs	1.96	0.97	163.55*	2329.8*	1.88	0.00	0.00	33.20*
RBs	2.07	1.35	131.81*	2326.7*	1.98	0.12	0.60	6.05*
CBs	2.06	1.31	161.32*	2705.5*	1.94	0.05	0.66	4.28

Notes: 1) D.W represents Durbin-Watson statistic to detect residual autocorrelation.
2) Ramsey's RESET test using the square of the fitted values.
3) LM statistic to measure heteroscedasticity based on the regression of squared residuals on squared fitted values.
4) JB represents Jarque-Bera's test of normality based on skewness and kurtosis of residuals.
5) '*' represents significant at the 0.05 level.

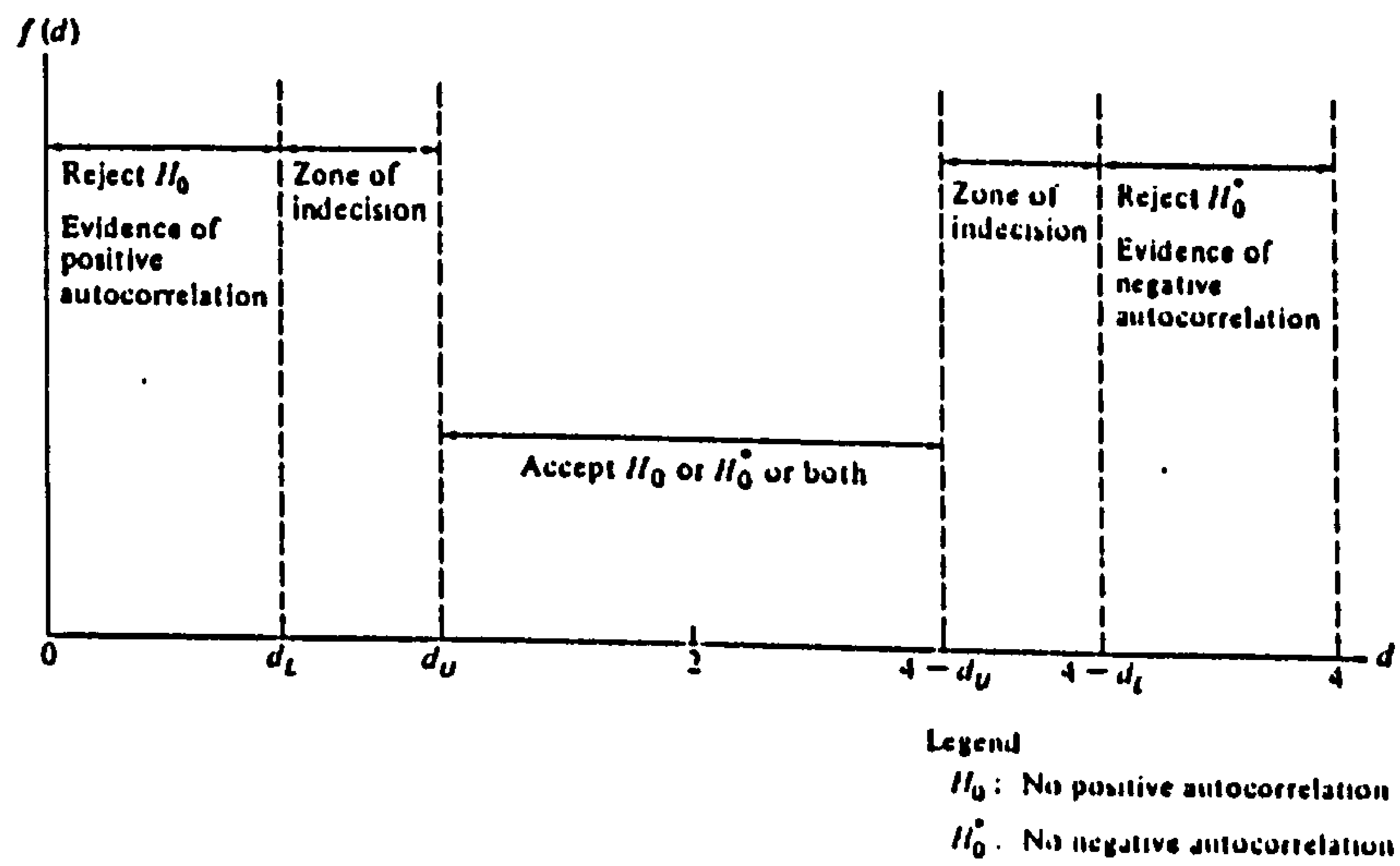
<Table 6.5> Critical Values for D.W Statistics

	D.W Statistic ($\alpha = 0.05$)			
	d_U	d_L	$4 - d_U$	$4 - d_L$
Event 1	1.955	1.588	2.045	2.412
Event 2	1.792[1)]	1.538[1)]	2.028	2.600

Note: 1) Calculated by interpolation.

we can marginally accept the null hypothesis of no autocorrelation. On the other hand, for event 2, the null hypothesis of no autocorrelation can be accepted for most banks; only in the case of 6 banks does the D.W statistic fall into the zone of indecision.

<Figure 6.3> Durbin-Watson d Statistic and Decision Rules



Source: Gujarati (1988), p.377, Figure 12.9

(ii) *Test for Linearity: Functional Form*

The classical linear regression model assumes that the relationship between the dependent and independent variables used in the model is linear. In this case, since logarithmic transformation have been applied to all our data, we are assuming a log-linear relationship between the original variables. The test of functional form is extremely important because by choosing the wrong functional form to describe the relationship between the variables of the model, the validity of any inferences drawn from the estimated regression will be highly questionable (Gujarati, 1988). The functional form assumption is tested by Ramsey's RESET test. The Lagrange multiplier (LM) statistic for the RESET test is computed by $LM = nR^2$ where R^2 comes from an auxiliary regression of the residuals from the OLS estimation on the explanatory variables and the squares of the fitted values, i.e.,

$$e_{jt} = \Sigma^{kj}_{i=1} \hat{\gamma} x_{jit} + \delta_j \hat{y}^2_{jt} + v_{jt} \tag{6.36}$$

The test statistic follows the Chi-square distribution with 1 degree of freedom under a null hypothesis that the functional form is correctly specified. As Table 6.4 shows, the null hypothesis is rejected at the 5% level for three banks for event 1 and accepted for the rest, and is accepted for all banks for event 2.

(iii) *Test for No Heteroscedasticity*

Heteroscedasticity occurs when the residuals do not have the same variance; heteroscedasticity among the residuals affects the standard deviation of the estimators. Therefore, the OLS estimators are still unbiased but not efficient. As a result, the usual t- and F-test procedures for hypothesis testing are invalid. Heteroscedasticity can be detected by running the following auxiliary regression:

$$e^2_{jt} = \gamma_0 + \delta_j \hat{y}^2_{jt} + v_{jt} \tag{6.37}$$

The test statistic is $LM = nR^2$ from the auxiliary regression, and this follows the Chi-square distribution with 1 degree of freedom under a null hypothesis that the residuals are homoscedastic. Table 6.4 shows that the regression results of all banks for event 1 are plagued by the presence of heteroscedasticity. This almost certainly reflects the fact that the stock market during the 1990 was extremely unstable (see Chapter 2). However, for event 2, the homoscedasticity assumption is accepted for all banks.

(iv) *Test for Normality*

The Normality assumption is not essential if our objective is estimation only (Gujarati, 1988), since the OLS estimators are BLUE regardless of whether the residuals are normally distributed or not. However, in the absence of normality, they cannot be interpreted as maximum likelihood estimators, and therefore, cannot be regarded as asymptotically efficient (see Section 6.5.1). Furthermore, if the residuals are not normally distributed, then the usual test procedures (t- and F-tests) are only valid asymptotically, that is, in large samples (Gujarati, 1988; Theil, 1978). The Normality assumption can be tested using

Jarque-Bera's (JB) test procedure. JB show that under the null hypothesis that the residuals follows normal distribution, the LM test statistic

$$LM = \frac{n}{6}\rho^2_1 + \frac{n}{24}(\rho_2 - 3)^2 \qquad (6.38)$$

where ρ_1 = estimated skewness coefficient;

ρ_2 = estimated kurtosis coefficient

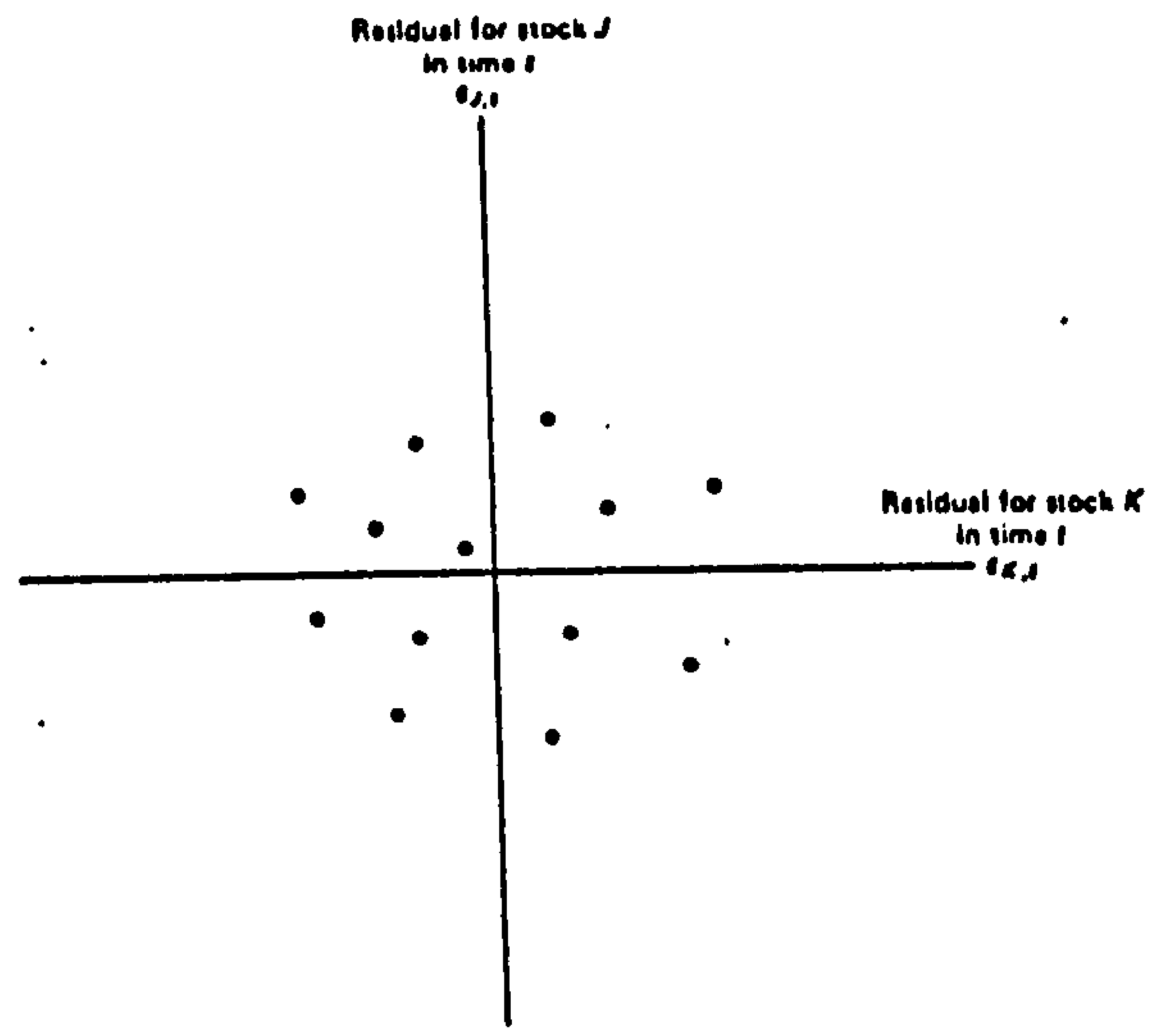
follows the Chi-square distribution with 2 degrees of freedom. Table 6.4 shows that the residuals from the OLS estimation are not normally distributed for all banks for event 1, and for all but three banks for event 2. Since our sample size is large, however, we can still use t- and F-tests to test hypotheses concerning the coefficients of the model.

(v) *Test for Interdependence across the Residuals*

As discussed in Section 6.5.2, the classical linear regression model implicitly assumes that there exists no other regression model with residuals which are correlated with the residuals of the regression model in question. However, in reality, the performances of firms such as banks are interconnected through either customer/supplier or competitive relationships. Furthermore, the imposition of new capital standards as an industry event which has a generalised impact on the banking industry may cause a problem of contemporaneous residual correlation in a model of the type presently under consideration.

The extent of correlation among the residuals across the regression models may be investigated informally by two methods: plotting the residuals, and calculating correlation coefficients for the residuals (see Haugen, 1990; Theil, 1971). If the assumption that the residuals of different models (in our case, bank stocks) are uncorrelated with one another is valid, the scatterplots of the residuals of any two bank stocks should not show any systematic pattern, as is the case in Figure 6.4 (Haugen, 1990). A non-systematic pattern of scatterplots of the residuals would also be expressed by low correlation coefficients for the residuals between pairs of bank stocks.

<Figure 6.4> Relationship between Residuals on Stocks J and K



Source: R. Haugen, 1990, p.156, Figure 6.2

The correlation coefficient between the residuals of any two bank stocks must fall within the range -1 to +1. To detect the extent to which the residuals in our sample are correlated, we can calculate the correlation coefficient matrix of regression residuals. Table 6.6 shows the correlation coefficients of the residuals between individual banks for each event. Table 6.6 indicates that the residuals between bank stocks are highly correlated in many cases. The extent of contemporaneous correlation differs between NCBs and RBs, and between events 1 and 2. Most pairs of residuals are positively correlated, the only exception being those for Cheju, First and Jbuk banks for event 2 which are negatively correlated. Figure 6.5 shows graphical representations of the contemporaneous correlation across the residuals for selected cases. These figures clearly indicate that the residuals of bank stocks are positively correlated with each other.

(vi)*Summary*

The diagnostic tests for our regression models indicate that the classical assumptions involved in the OLS estimation procedure are violated. Since the D.W statistics for most banks for event 1 fell into the zone of indecision, doubt is cast on the null hypothesis of no autocorrelation. The linearity assumption in the case of 3 banks for event 1 is also violated.

<Table 6.6>

Correlation Coefficient Matrix for Regression Residuals of Each Event

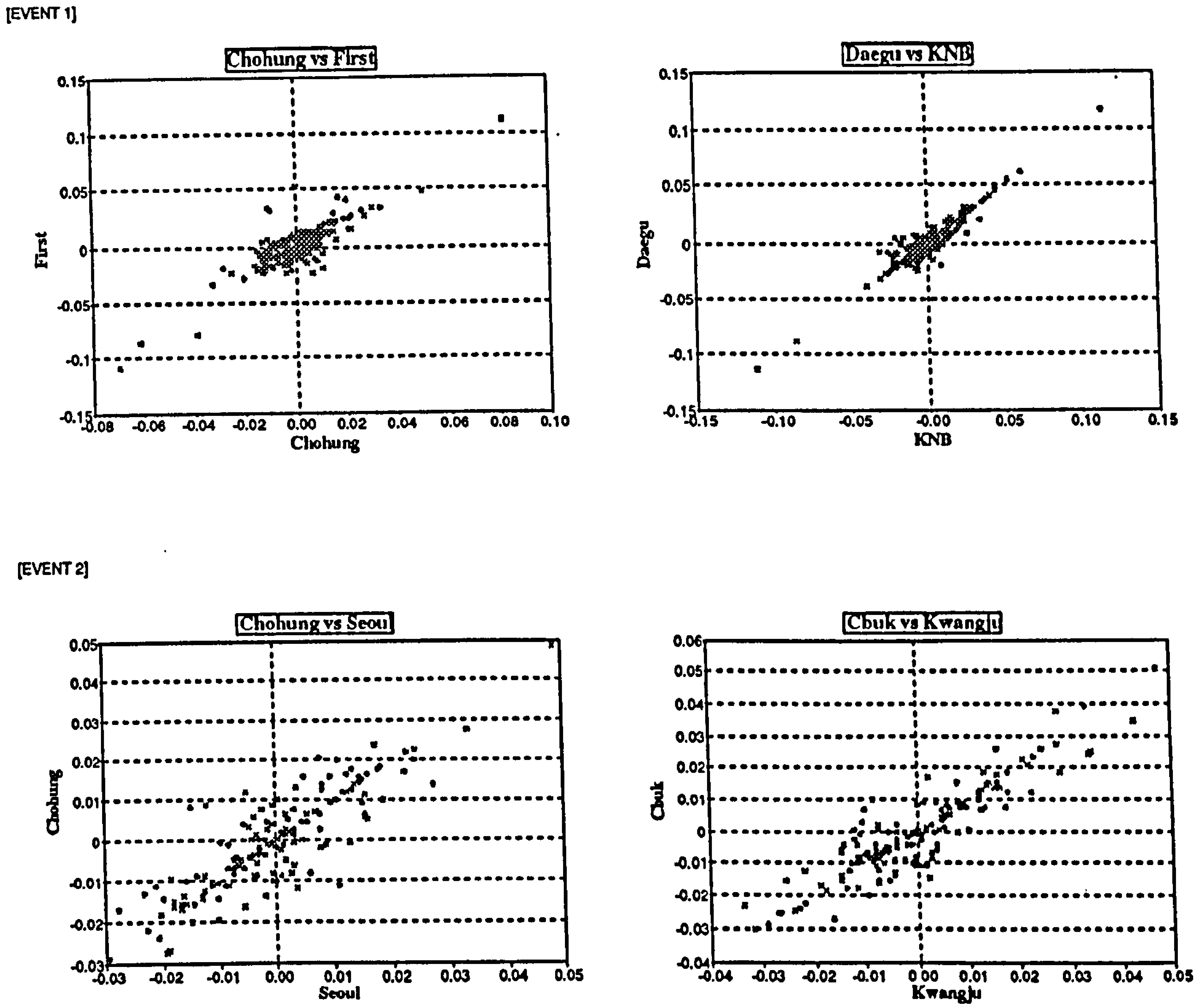
[EVENT 1]

	Chohung	Commer	First	Hanil	Seoul	Shinhan	Koram	Cbuk	CCB	Cheju	Daegu	Jbuk	Kangwon	Kwangju	KGB	KNB
Commer	0.796															
First	0.829	0.888														
Hanil	0.294	0.227	0.210													
Seoul	0.842	0.899	0.927	0.186												
Shinhan	0.631	0.671	0.740	0.055	0.753											
Koram	0.338	0.228	0.297	0.481	0.283	0.283										
Cbuk	0.656	0.787	0.783	0.053	0.818	0.688	0.173									
CCB	0.673	0.745	0.775	0.084	0.800	0.725	0.294	0.854								
Cheju	0.635	0.697	0.736	0.091	0.754	0.670	0.261	0.778	0.800							
Daegu	0.672	0.783	0.802	0.096	0.830	0.717	0.239	0.928	0.881	0.807						
Jbuk	0.412	0.416	0.423	0.435	0.437	0.382	0.615	0.515	0.504	0.478	0.553					
Kangwon	0.381	0.346	0.380	0.388	0.378	0.339	0.604	0.425	0.468	0.457	0.470	0.837				
Kwangju	0.520	0.486	0.507	0.459	0.505	0.414	0.597	0.468	0.485	0.441	0.466	0.815	0.728			
KGB	0.512	0.513	0.521	0.277	0.527	0.460	0.372	0.623	0.643	0.579	0.664	0.741	0.704	0.670		
KNB	0.644	0.779	0.777	0.110	0.803	0.670	0.211	0.926	0.869	0.784	0.936	0.549	0.470	0.484	0.668	
Pusan	0.601	0.687	0.692	0.014	0.720	0.592	0.140	0.764	0.733	0.699	0.782	0.397	0.390	0.362	0.514	0.747

[EVENT 2]

	Chohung	Commer	First	Hanil	Seoul	Shinhan	Koram	Cbuk	CCB	Cheju	Daegu	Jbuk	Kangwon	Kwangju	KGB	KNB
Commer	0.811															
First	0.783	0.753														
Hanil	0.728	0.674	0.719													
Seoul	0.856	0.859	0.769	0.739												
Shinhan	0.253	0.169	0.308	0.366	0.158											
Koram	0.185	0.210	0.231	0.233	0.175	0.495										
Cbuk	0.532	0.613	0.546	0.466	0.576	0.253	0.212									
CCB	0.430	0.431	0.419	0.404	0.463	0.308	0.230	0.662								
Cheju	0.027	0.020	-0.039	0.152	0.014	0.401	0.285	0.016	0.052							
Daegu	0.509	0.525	0.495	0.498	0.507	0.360	0.272	0.709	0.733	0.166						
Jbuk	0.501	0.491	0.449	0.420	0.491	0.209	0.203	0.697	0.720	-0.002	0.764					
Kangwon	0.495	0.461	0.490	0.440	0.530	0.195	0.232	0.599	0.569	0.002	0.681	0.614				
Kwangju	0.572	0.655	0.579	0.514	0.644	0.200	0.185	0.904	0.667	0.029	0.715	0.695	0.621			
KGB	0.387	0.402	0.378	0.543	0.406	0.482	0.375	0.528	0.546	0.292	0.692	0.641	0.494	0.521		
KNB	0.495	0.471	0.477	0.491	0.473	0.335	0.260	0.704	0.661	0.115	0.818	0.719	0.577	0.726	0.682	
Pusan	0.392	0.433	0.408	0.471	0.447	0.446	0.347	0.608	0.695	0.155	0.763	0.674	0.562	0.608	0.724	0.700

<Figure 6.5> Correlation between Regression Residuals



Furthermore, the regression results for event 1 suffer from the presence of heteroscedasticity. The residuals are not normally distributed. There are also strong indications of the existence of contemporaneous correlation across the residuals. All of the above results imply that the validity of statistical inferences based on the OLS estimation results will be severely limited. However, subject to these reservations, in the next sub-section we present the OLS estimation results.

6.7.1.2 The OLS Estimation Results

Table 6.7 reports the results of estimating Equation 6.18 for the two portfolios (NCBs and RBs) and for the portfolio of all CBs for the two events. The adjusted R^2 values for event 1 range from 44.49% for RBs to 49.22% for NCBs and corresponding values for event 2 range from 68.46% for RBs to 73.55% for CBs. Although the goodness-of-fit for event 1 is not particularly so high, that for event 2 indicates fairly strong goodness-of-fit. Most of this explained variability can be attributed to the highly significant market index variables.

Table 6.7 also shows the daily portfolio ARs over the 16 days of each event period for each of the two events. For event 1, there are 5 occurrences of negative ARs for CBs, 6 for NCBs and 4 for RBs. NCBs have negative ARs on the two days preceding the announcement date, while RBs have positive ARs. For event 2, there are 7 occurrences of negative ARs for each of the three portfolios. NCBs and RBs both have negative ARs on the day preceding the announcement date. Both banking groups have negative ARs between 2 and 4 days (inclusive) after the announcement of new RAR scheme. However, none of these ARs for CBs (NCBs or RBs) are statistically significant at the 0.05 level.

<Table 6.7> Daily ARs for Portfolios for Each Event Period

	EVENT 1			EVENT 2		
	CBs	NCBs	RBs	CBs	NCBs	RBs
α	-0.0001	0.0000	-0.0002	-0.0000	-0.0001	0.0000
(t-ratio)	(-0.152)	(0.006)	(-0.255)	(0.028)	(-0.096)	(0.080)
β	0.7553*	0.7394*	0.7664*	1.3129*	1.2466*	1.3592*
(t-ratio)	(16.362)	(16.544)	(15.052)	(20.709)	(20.385)	(18.395)
-10	0.0073	0.0110	0.0047	-0.0036	0.0008	-0.0067
(t-ratio)	(0.531)	(0.826)	(0.312)	(-0.360)	(0.081)	(-0.572)
-9	-0.0024	-0.0012	-0.0033	0.0059	0.0044	0.0070
(t-ratio)	(-0.180)	(-0.093)	(-0.219)	(0.589)	(0.454)	(0.597)
-8	-0.0034	-0.0046	-0.0026	0.0014	-0.0024	0.0042
(t-ratio)	(-0.249)	(-0.346)	(-0.171)	(0.145)	(-0.254)	(0.360)
-7	0.0035	0.0052	0.0024	0.0000	-0.0027	0.0019
(t-ratio)	(0.260)	(0.393)	(0.160)	(0.000)	(-0.276)	(0.161)
-6	0.0063	0.0075	0.0055	0.0085	0.0078	0.0091
(t-ratio)	(0.461)	(0.564)	(0.365)	(0.852)	(0.809)	(0.775)
-5	0.0058	0.0084	0.0040	-0.0016	-0.0017	-0.0016
(t-ratio)	(0.422)	(0.631)	(0.264)	(-0.167)	(-0.176)	(-0.141)
-4	0.0016	0.0018	0.0015	0.0016	0.0010	0.0021
(t-ratio)	(0.119)	(0.139)	(0.099)	(0.167)	(0.104)	(0.184)
-3	0.0078	0.0054	0.0094	0.0091	0.0075	0.0101
(t-ratio)	(0.565)	(0.406)	(0.622)	(0.903)	(0.780)	(0.866)
-2	0.0054	-0.0007	0.0097	0.0035	0.0057	0.0021
(t-ratio)	(0.392)	(-0.060)	(0.641)	(0.351)	(0.588)	(0.173)
-1	-0.0020	-0.0072	0.0015	-0.0033	-0.0008	-0.0050
(t-ratio)	(-0.149)	(-0.537)	(0.101)	(-0.325)	(-0.089)	(-0.421)
0	0.0080	0.0022	0.0120	0.0053	0.0024	0.0073
(t-ratio)	(0.582)	(0.171)	(0.791)	(0.530)	(0.255)	(0.626)
1	0.0124	0.0062	0.0167	0.0078	0.0079	0.0078
(t-ratio)	(0.896)	(0.463)	(1.096)	(0.782)	(0.823)	(0.665)
2	0.0047	0.0043	0.0050	-0.0008	-0.0003	-0.0011
(t-ratio)	(0.342)	(0.324)	(0.328)	(-0.078)	(-0.031)	(-0.095)
3	0.0004	-0.0013	0.0017	-0.0079	-0.0062	-0.0092
(t-ratio)	(0.031)	(-0.103)	(0.112)	(-0.793)	(-0.642)	(-0.784)
4	-0.0049	0.0012	-0.0092	-0.0174	-0.0148	-0.0192
(t-ratio)	(-0.355)	(0.094)	(-0.606)	(-1.709)	(-1.511)	(-1.616)
5	-0.0099	-0.0089	-0.0106	-0.0008	0.0010	-0.0022
(t-ratio)	(-0.721)	(-0.666)	(-0.701)	(-0.087)	(0.109)	(-0.188)
$\bar{R}^2$	48.74	49.22	44.49	73.55	72.98	68.46
F	16.49*	16.79*	14.06*	27.82*	27.07*	21.94*
D.W	2.06	1.96	2.07	1.94	1.88	1.98
N	278	278	278	165	165	165

Notes: 1)'*' represents significant at the 0.05 level.
2)Parameters are in logs.

Table 6.8 shows the daily ARs for each individual NCB during each event period obtained by estimating Equation 6.18 for each bank using OLS. Most of the NCBs begin to report negative ARs one or two days before, and on the announcement date itself for each event period. As noted in the above portfolio analysis, most of the NCBs show consecutively negative ARs from two days after the announcement of new RAR scheme (i.e., event 2). However, none of these negative ARs are statistically significant.

Table 6.9 provides OLS estimates of daily ARs for individual RBs during each event period (again, obtained by estimating Equation 6.18 for each bank). For event 1, three banks, Jeonbuk Bank, Kangwon Bank and Kwangju Bank, have significantly positive ARs on the announcement date, and one bank, Daegu Bank, has a significantly positive AR one day after the announcement date. On the other hand, others record ARs which are negative but insignificant. Do these results suggest that four banks among the RBs are significantly stronger than the others? It is difficult to judge whether these four banks have potential competitive advantages. However, two factors may support the view that they do not. One is that three of these banks showed negative ARs one day preceding the announcement date, while others showed positive ARs. If there is no bad news relating to these three banks' profitability, the stock prices for these banks may be relatively depressed in comparison with for the others because banks' stock prices are highly correlated with one another. Therefore, investors' demand will be concentrated on these lower-priced stocks and will tend to boost these three banks' stock prices. Another is that as discussed in Chapters 3 (Section 3.8.2) and 5 (Section 5.2.2), the capital adequacy ratios of all RBs except Pusan Bank are well above the new capital standard. For event 2, although they are not significant, RBs show negative ARs one day preceding the announcement of the new RAR scheme, as do NCBs. Furthermore, as in the case of the NCBs, RBs also have consecutively negative ARs from two days after the announcement. These results may need to be investigated further. As discussed earlier in this chapter, event 2 was officially announced. However, ordinary investors may not recognise the impact of the new RAR

<Table 6.8> Daily ARs for NCBs for Each Event Period

	Chohung	Commer	First	Hanil	Seoul	Shinhan	Koram
[EVENT 1]							
a	0.0001	-0.0001	-0.0001	-0.0005	-0.0001	-0.0001	0.0001
b	0.9619 *	0.7417 *	0.7949 *	0.4494 *	0.7615 *	0.7101 *	0.7545 *
-10	0.0051	0.0164	0.0156	0.0033	0.0162	0.0148	0.0061
-9	0.0079	-0.0001	-0.0001	-0.0077	-0.0001	-0.0001	-0.0080
-8	-0.0070	-0.0071	-0.0069	0.0094	-0.0071	0.0011	-0.0144
-7	0.0058	0.0066	0.0065	0.0076	0.0065	-0.0016	0.0057
-6	-0.0013	0.0011	0.0005	0.0281	0.0008	0.0007	0.0229
-5	0.0150	0.0192	0.0180	-0.0234	0.0188	0.0098	0.0011
-4	-0.0063	-0.0083	-0.0076	0.0210	-0.0081	0.0148	0.0076
-3	0.0017	0.0034	0.0109	0.0132	0.0112	-0.0119	0.0096
-2	0.0000	0.0118	0.0028	-0.0068	0.0034	0.0031	-0.0198
-1	-0.0045	-0.0093	-0.0099	-0.0129	-0.0017	-0.0016	-0.0097
0	-0.0043	-0.0067	-0.0059	-0.0215	-0.0063	-0.0060	0.0236
1	0.0022	0.0134	0.0125	-0.0057	0.0052	0.0193	-0.0034
2	0.0011	0.0011	0.0012	0.0239	0.0011	-0.0134	0.0151
3	0.0057	0.0021	0.0010	-0.0151	0.0017	0.0088	-0.0138
4	-0.0038	-0.0027	-0.0028	-0.0011	-0.0028	0.0185	0.0040
5	-0.0022	-0.0015	-0.0016	-0.0234	-0.0015	-0.0015	-0.0303
R-Bar-Sqr	64.08	34.30	38.46	9.60	35.93	31.87	37.10
F	30.07 *	9.50 *	11.18 *	2.73 *	10.13 *	8.62 *	10.61 *
D.W	2.06	2.34	2.30	1.93	2.37	2.37	2.17
N	278	278	278	278	278	278	278
[EVENT 2]							
a	-0.0004	-0.0005	0.0000	0.0001	-0.0003	0.0002	0.0000
b	1.2517 *	1.2803 *	1.3261 *	1.3000 *	1.2813 *	1.1047 *	1.1824 *
-10	0.0045	0.0047	-0.0066	-0.0062	-0.0128	0.0107	0.0111
-9	0.0019	0.0117	0.0126	0.0020	0.0139	-0.0029	-0.0084
-8	-0.0034	-0.0068	-0.0002	-0.0067	-0.0010	0.0005	0.0008
-7	-0.0067	0.0042	-0.0012	-0.0055	-0.0090	-0.0005	0.0002
-6	0.0090	-0.0012	0.0105	0.0103	0.0118	0.0103	0.0042
-5	-0.0003	0.0058	-0.0020	0.0032	0.0008	-0.0019	-0.0173
-4	0.0036	0.0039	-0.0003	-0.0035	0.0001	-0.0064	-0.0173
-3	0.0062	0.0104	0.0062	0.0117	0.0115	0.0067	0.0098
-2	0.0123	0.0020	0.0083	0.0070	0.0127	-0.0001	0.0001
-1	-0.0045	-0.0014	0.0046	-0.0027	-0.0038	-0.0118	-0.0018
0	0.0042	0.0106	0.0009	0.0019	0.0043	-0.0026	0.0137
1	0.0077	0.0082	0.0062	0.0139	0.0092	0.0046	-0.0019
2	0.0000	0.0001	-0.0014	0.0006	-0.0024	0.0004	0.0059
3	-0.0046	-0.0073	-0.0078	-0.0102	-0.0074	0.0015	0.0007
4	-0.0228	-0.0222	-0.0270	-0.0203	-0.0187	0.0085	-0.0073
5	0.0000	-0.0018	0.0120	-0.0035	-0.0007	-0.0076	-0.0012
R-Bar-Sqr	62.25	63.67	64.93	59.52	62.85	51.07	54.18
F	16.90 *	17.91 *	18.86 *	15.18 *	17.32 *	11.07 *	12.40 *
D.W	1.89	1.83	1.84	1.88	2.03	2.12	1.94
N	165	165	165	165	165	165	165

Note: 1) "*" significant at the 0.05 level.
2) Variables are in logs.

<Table 6.9> Daily ARs for RBs for Each Event Period

	CBUK	CCB	CHEJU	DAEGU	JBUK	KANGWON	KWANGJU	KGB	KNB	PUSAN
[EVENT 1]										
a	-0.0002	-0.0001	-0.0001	-0.0004	-0.0003	-0.0001	-0.0003	-0.0002	-0.0002	-0.0005
b	0.7726 *	0.7689 *	0.7688 *	0.7571 *	0.7840 *	0.7430 *	0.7709 *	0.8773 *	0.7488 *	0.6687 *
-10	0.0121	0.0116	0.0025	0.0191	-0.0090	-0.0088	-0.0088	0.0034	0.0121	0.0133
-9	0.0000	-0.0001	-0.0001	0.0002	-0.0068	-0.0130	-0.0068	0.0068	-0.0068	-0.0065
-8	-0.0055	-0.0054	0.0013	-0.0121	0.0085	-0.0052	0.0086	-0.0119	0.0014	-0.0053
-7	-0.0086	-0.0016	0.0040	-0.0013	0.0054	-0.0016	0.0055	0.0049	0.0053	0.0128
-6	-0.0002	-0.0004	-0.0016	-0.0001	0.0200	0.0188	0.0204	-0.0015	0.0066	-0.0060
-5	0.0141	0.0199	-0.0022	0.0273	-0.0205	-0.0261	-0.0272	0.0177	0.0136	0.0223
-4	0.0014	-0.0051	-0.0265	-0.0117	0.0219	0.0143	0.0220	-0.0037	0.0013	0 0007
-3	0.0089	0.0019	0.0298	0.0156	0.0152	0.0017	0.0089	0.0077	-0.0045	0.0095
-2	0.0077	0.0073	-0.0068	0.0076	0.0134	0.0256	0.0142	0.0053	0.0143	0.0092
-1	0.0167	0.0162	-0.0039	0.0164	-0.0290	-0.0217	-0.0225	0.0081	0.0164	0.0176
0	-0.0033	-0.0032	-0.0131	-0.0159	0.0546 *	0.0520 *	0.0614 *	-0.0016	-0.0033	-0.0104
1	0.0345	0.0274	0.0177	0.0405 *	-0.0168	-0.0222	-0.0103	0.0316	0.0337	0.0292
2	-0.0049	-0.0049	0.0068	-0.0109	0.0262	0.0251	0.0263	-0.0107	0.0013	-0.0047
3	0.0112	0.0169	-0.0027	0.0174	-0.0138	-0.0192	-0.0197	0.0087	0.0049	0.0130
4	-0.0026	-0.0149	-0.0138	-0.0085	-0.0087	-0.0086	-0.0087	-0.0030	-0.0146	-0.0081
5	-0.0138	-0.0076	-0.0015	-0 0012	-0.0263	-0.0135	-0 0264	-0 0076	-0 0013	-0 0070
R-Bar-Sqr	35.09	36.72	39.37	36.86	38.24	34.97	30.59	45.51	34 85	25.55
F	9.81 *	10.45 *	11.58 *	10.51 *	11.09 *	9.76 *	8.18 *	14.60 *	9.71 *	6.59 *
D.W	2.34	2.28	2.35	2.31	2.02	2.16	2.07	2.11	2.35	2.16
N	278	278	278	278	278	278	278	278	278	278
[EVENT 2]										
a	-0.0005	-0.0001	0.0013	0.0000	-0.0003	-0.0004	-0.0003	0.0001	0.0002	0.0002
b	1.3591 *	1.3629 *	1.0841 *	1.3980 *	1.3612 *	1.4207 *	1.4331 *	1.3346 *	1.3914 *	1.4534 *
-10	-0.0114	-0.0150	-0.0101	-0.0144	-0.0056	0.0146	-0.0092	0.0043	-0.0146	-0.0049
-9	0.0081	0.0105	0.0055	0.0153	0.0034	-0.0030	0.0126	-0.0037	0.0150	0.0065
-8	0.0070	0.0050	0.0118	0.0009	0.0066	0.0014	0.0069	0.0008	0.0006	0.0007
-7	0.0039	0.0091	-0.0004	0.0092	0.0040	0.0000	0.0042	-0.0100	-0.0006	-0.0003
-6	0.0151	0.0024	-0.0023	0.0034	0.0011	0.0139	0.0183	0.0124	0.0129	0.0139
-5	-0.0049	-0.0071	0.0158	-0.0021	-0.0017	0.0081	-0.0075	-0.0117	-0.0024	-0.0024
-4	0.0005	0.0063	-0.0112	0.0017	0.0062	0.0024	0.0009	0.0013	0.0015	0.0119
-3	0.0096	0.0184	0.0004	0.0188	0.0098	0.0095	0.0092	0.0080	0.0085	0.0094
-2	0.0056	0.0023	0.0000	0.0001	-0.0015	0.0003	0.0046	0.0014	0.0085	-0.0016
-1	-0.0054	-0.0065	-0.0062	-0.0046	-0.0043	-0.0039	-0.0038	-0.0058	-0.0046	-0.0034
0	0.0050	0.0069	0.0040	0.0070	0.0116	0.0075	0.0109	0.0068	0.0067	0.0070
1	0.0176	0.0109	-0.0082	0.0163	0.0062	-0.0012	0.0078	0.0056	0.0060	0.0168
2	-0.0020	-0.0146	0.0059	0.0009	-0.0100	0.0014	-0.0045	0.0008	0.0105	0.0007
3	-0.0019	0.0034	-0.0218	-0.0180	-0.0081	-0.0055	-0.0053	-0.0072	-0.0181	-0.0089
4	-0.0240	-0.0166	0.0203	-0.0282 *	-0.0233	-0.0221	-0.0227	-0.0168	-0.0284	-0.0300
5	-0.0028	-0.0216	-0.0176	0.0100	-0.0026	0.0207	-0.0079	-0.0005	-0.0001	0.0007
R Bar-Sqr	59.50	54.88	34.87	62.10	51.50	52.83	61.33	54.80	60.06	58 85
F	15.17 *	12.73 *	6.16 *	16.80 *	11.24 *	11.80 *	16.30 *	12.69 *	15.50 *	14.79 *
D.W	1.98	2.23	1.80	1.89	2.07	2.28	1.96	1.93	1.79	1.92
N	165	165	165	165	165	165	165	165	165	165

Notes: 1) "*" significant at the 0.05 level.
2) Variables are in logs.

scheme on bank profitability. In the day following the announcement of the new RAR scheme, securities analysts' opinions that the scheme would lower bank profitability were expressed in newspaper articles. This is one possible explanation of why banks show consecutively negative ARs for several days from two days after the announcement of the new RAR scheme onwards. Daegu Bank shows a significant negative AR 4 days after the announcement.

Table 6.10 shows the estimated CARs for the portfolios for each event period obtained from OLS estimation of equation 6.23 for each portfolio. The CARs in Table 6.10 are cumulated by two schemes. First, the CARs in the upper panel of Table 6.10 are cumulated from day (-10) to day 5. Therefore, the CAR at each date represents CAR from day (-10) to that date. For example, 3.81% for CBs on day 0 for event 1 is a CAR from day (-10) to the announcement date. 4.08% for CBs on day 5 for event 1 is a CAR from day (-10) to day 5: that is, CAR over the entire event period. Second, the CARs in the lower panel of Table 6.10 are cumulated from the announcement date to day 5. Therefore, these CARs are designed to measure the impact only from the announcement date onwards. For instance, 1.07% for CBs on day (0+5) for event 1 is a CAR from the announcement date to day 5.

Table 6.10 shows that investors gained positive CARs during the entire event period. However, most of these positive CARs were gained during the pre-announcement date period. In particular, there were negative CARs after the announcement date for event 2. As discussed in the earlier analysis, the CARs during the post-announcement date period for event 2 begin to decline from day (0+2) and show negative CARs on day (0+4) and day (0+5). However, none of these CARs are statistically significant at the 0.05 level. This implies that the new capital adequacy standards do not significantly influence shareholders' wealth as a whole.

Table 6.11 and 6.12 show the CARs for individual NCBs and RBs for each event period, estimated by applying OLS to Equation 6.23 and cumulated in the same manner as for the portfolios. Two banks, Jeonbuk Bank and Kwangju Bank, show significant positive CARs on day (0+2) for event 1 in Table 6.12. Most of the NCBs and RBs show negative CARs

<Table 6.10> CARs for Portfolios for Each Event Period

	EVENT 1			EVENT 2		
	CBs	NCBs	RBs	CBs	NCBs	RBs
-10	0.0073	0.0110	0.0047	-0.0036	0.0008	-0.0067
(t-ratio)	(0.531)	(0.826)	(0.312)	(-0.360)	(0.081)	(-0.572)
- 9	0.0048	0.0098	0.0014	0.0023	0.0052	0.0003
(t-ratio)	(0.248)	(0.518)	(0.066)	(0.163)	(0.377)	(0.020)
- 8	0.0014	0.0052	-0.0011	0.0038	0.0027	0.0045
(t-ratio)	(0.059)	(0.223)	(-0.044)	(0.216)	(0.162)	(0.222)
- 7	0.0050	0.0104	0.0012	0.0038	0.0007	0.0064
(t-ratio)	(0.180)	(0.388)	(0.041)	(0.186)	(0.004)	(0.271)
- 6	0.0114	0.0180	0.0068	0.0123	0.0079	0.0155
(t-ratio)	(0.366)	(0.597)	(0.199)	(0.541)	(0.360)	(0.582)
- 5	0.0172	0.0264	0.0108	0.0107	0.0062	0.0139
(t-ratio)	(0.504)	(0.798)	(0.288)	(0.426)	(0.258)	(0.474)
- 4	0.0188	0.0283	0.0123	0.0124	0.0072	0.0160
(t-ratio)	(0.510)	(0.790)	(0.303)	(0.454)	(0.276)	(0.505)
- 3	0.0267	0.0337	0.0218	0.0214	0.0148	0.0261
(t-ratio)	(0.673)	(0.879)	(0.500)	(0.733)	(0.525)	(0.768)
- 2	0.0321	0.0329	0.0316	0.0250	0.0206	0.0282
(t-ratio)	(0.761)	(0.807)	(0.680)	(0.809)	(0.691)	(0.783)
- 1	0.0300	0.0257	0.0332	0.0217	0.0197	0.0232
(t-ratio)	(0.674)	(0.597)	(0.675)	(0.662)	(0.623)	(0.608)
0	0.0381	0.0280	0.0452	0.0271	0.0222	0.0306
(t-ratio)	(0.814)	(0.619)	(0.877)	(0.783)	(0.666)	(0.759)
1	0.0505	0.0342	0.0620	0.0349	0.0302	0.0384
(t-ratio)	(1.031)	(0.722)	(1.146)	(0.963)	(0.863)	(0.908)
2	0.0552	0.0386	0.0670	0.0341	0.0298	0.0373
(t-ratio)	(1.081)	(0.780)	(1.189)	(0.902)	(0.819)	(0.845)
3	0.0556	0.0372	0.0687	0.0261	0.0237	0.0281
(t-ratio)	(1.047)	(0.723)	(1.171)	(0.666)	(0.624)	(0.613)
4	0.0507	0.0385	0.0595	0.0087	0.0088	0.0089
(t-ratio)	(0.920)	(0.721)	(0.978)	(0.215)	(0.224)	(0.187)
5	0.0408	0.0295	0.0488	0.0079	0.0099	0.0067
(t-ratio)	(0.715)	(0.535)	(0.775)	(0.186)	(0.242)	(0.135)
0+1	0.0204	0.0085	0.0288	0.0132	0.0104	0.0151
(t-ratio)	(1.044)	(0.448)	(1.333)	(0.924)	(0.759)	(0.909)
0+2	0.0251	0.0128	0.0338	0.0124	0.0102	0.0140
(t-ratio)	(1.047)	(0.552)	(1.275)	(0.707)	(0.601)	(0.686)
0+3	0.0256	0.0114	0.0355	0.0044	0.0039	0.0048
(t-ratio)	(0.920)	(0.425)	(1.158)	(0.217)	(0.200)	(0.203)
0+4	0.0207	0.0127	0.0263	-0.0130	-0.0109	-0.0144
(t-ratio)	(0.664)	(0.422)	(0.765)	(-0.571)	(-0.497)	(-0.542)
0+5	0.0107	0.0038	0.0156	-0.0139	-0.0099	-0.0166
(t-ratio)	(0.314)	(0.115)	(0.414)	(-0.556)	(-0.410)	(-0.570)

Note: Parameters are in logs.

<Table 6.11> CARs for NCBs for Each Event Period

	Chohung	Commer	First	Hanil	Seoul	Shinhan	Koram
[EVENT 1]							
-10	0.0051	0.0164	0.0156	0.0033	0.0162	0.0148	0.0061
-9	0.0131	0.0163	0.0155	-0.0044	0.0161	0.0146	-0.0018
-8	0.0060	0.0092	0.0086	0.0050	0.0090	0.0158	-0.0164
-7	0.0119	0.0159	0.0151	0.0126	0.0156	0.0141	-0.0105
-6	0.0106	0.0170	0.0157	0.0408	0.0164	0.0148	0.0123
-5	0.0256	0.0363	0.0337	0.0174	0.0353	0.0247	0.0135
-4	0.0192	0.0279	0.0261	0.0384	0.0271	0.0395	0.0211
-3	0.0209	0.0313	0.0371	0.0517	0.0384	0.0275	0.0308
-2	0.0209	0.0431	0.0399	0.0449	0.0419	0.0307	0.0109
-1	0.0164	0.0338	0.0299	0.0319	0.0401	0.0290	0.0012
0	0.0121	0.0271	0.0240	0.0532	0.0337	0.0230	0.0248
1	0.0144	0.0406	0.0366	0.0478	0.0390	0.0423	0.0214
2	0.0156	0.0417	0.0379	0.0718	0.0401	0.0288	0.0365
3	0.0213	0.0439	0.0389	0.0566	0.0419	0.0376	0.0227
4	0.0175	0.0411	0.0361	0.0555	0.0390	0.0562	0.0267
5	0.0152	0.0396	0.0345	0.0320	0.0375	0.0547	-0.0036
0+1	-0.0020	0.0067	0.0067	0.0158	-0.0011	0.0133	0.0201
0+2	-0.0008	0.0079	0.0079	0.0398	-0.0001	-0.0001	0.0353
0+3	0.0048	0.0100	0.0090	0.0246	0.0017	0.0086	0.0215
0+4	0.0010	0.0073	0.0061	0.0235	-0.0010	0.0271	0.0255
0+5	-0.0012	0.0058	0.0045	0.0001	-0.0026	0.0256	-0.0048
[EVENT 2]							
-10	0.0045	0.0047	-0.0066	-0.0062	-0.0128	0.0107	0.0111
-9	0.0064	0.0164	0.0060	-0.0042	0.0011	0.0078	0.0026
-8	0.0030	0.0096	0.0058	-0.0109	0.0001	0.0083	0.0034
-7	-0.0036	0.0139	0.0045	-0.0165	-0.0089	0.0078	0.0037
-6	0.0053	0.0127	0.0151	-0.0061	0.0029	0.0181	0.0080
-5	0.0050	0.0185	0.0130	-0.0028	0.0037	0.0162	-0.0093
-4	0.0086	0.0225	0.0127	-0.0064	0.0039	0.0097	0.0005
-3	0.0149	0.0329	0.0190	0.0053	0.0154	0.0165	0.0006
-2	0.0272	0.0350	0.0273	0.0124	0.0281	0.0163	-0.0011
-1	0.0227	0.0335	0.0320	0.0096	0.0243	0.0045	0.0125
0	0.0270	0.0441	0.0329	0.0116	0.0287	0.0018	0.0106
1	0.0347	0.0524	0.0392	0.0255	0.0380	0.0065	0.0165
2	0.0347	0.0525	0.0377	0.0262	0.0355	0.0070	0.0173
3	0.0301	0.0451	0.0299	0.0160	0.0280	0.0085	0.0099
4	0.0072	0.0228	0.0028	-0.0043	0.0092	0.0170	0.0086
5	0.0073	0.0210	0.0149	-0.0078	0.0085	0.0094	0.0178
0+1	0.0119	0.0188	0.0071	0.0159	0.0136	0.0019	0.0040
0+2	0.0120	0.0189	0.0057	0.0165	0.0112	0.0024	0.0047
0+3	0.0073	0.0116	-0.0020	0.0063	0.0037	0.0040	-0.0025
0+4	-0.0154	-0.0106	-0.0291	-0.0140	-0.0150	0.0125	-0.0038
0+5	-0.0154	-0.0125	-0.0170	-0.0175	-0.0158	0.0048	0.0053

Note: Variables are in logs

<Table 6.12> CARs for RBs for Each Event Period

	Cbuk	CCB	Cheju	Daegu	Jbuk	Kangwon	Kwangju	KGB	KNB	Pusan
[EVENT 1]										
-10	0.0121	0.0116	0.0025	0.0191	-0.0090	-0.0088	-0.0088	0.0034	0.0121	0.0133
-9	0.0122	0.0116	0.0025	0.0193	-0.0159	-0.0218	-0.0157	0.0102	0.0053	0.0068
-8	0.0067	0.0061	0.0039	0.0071	-0.0073	-0.0270	-0.0071	-0.0016	0.0068	0.0014
-7	-0.0019	0.0045	0.0080	0.0057	-0.0019	-0.0287	-0.0015	0.0033	0.0122	0.0142
-6	-0.0021	0.0040	0.0063	0.0057	0.0180	-0.0099	0.0188	0.0018	0.0188	0.0082
-5	0.0120	0.0240	0.0040	0.0330	-0.0024	-0.0360	-0.0083	0.0195	0.0325	0.0306
-4	0.0133	0.0188	-0.0224	0.0212	0.0194	-0.0217	0.0136	0.0157	0.0339	0.0314
-3	0.0223	0.0207	0.0073	0.0368	0.0346	-0.0200	0.0225	0.0235	0.0293	0.0409
-2	0.0301	0.0280	0.0005	0.0445	0.0481	0.0056	0.0368	0.0288	0.0436	0.0501
-1	0.0469	0.0442	-0.0033	0.0610	0.0190	-0.0160	0.0142	0.0370	0.0600	0.0678
0	0.0435	0.0410	-0.0165	0.0450	0.0737	0.0359	0.0756	0.0353	0.0567	0.0574
1	0.0781	0.0684	0.0011	0.0855	0.0568	0.0136	0.0653	0.0670	0.0905	0.0866
2	0.0731	0.0635	0.0079	0.0746	0.0831	0.0388	0.0916	0.0563	0.0918	0.0818
3	0.0844	0.0805	0.0052	0.0921	0.0692	0.0195	0.0718	0.0650	0.0968	0.0949
4	0.0817	0.0655	-0.0085	0.0836	0.0605	0.0109	0.0631	0.0620	0.0821	0.0868
5	0.0679	0.0570	-0.0100	0.0824	0.0341	-0.0026	0.0366	0.0544	0.0807	0.0797
0+1	0.0311	0.0242	0.0045	0.0245	0.0378	0.0297	0.0510	0.0300	0.0304	0.0187
0+2	0.0262	0.0192	0.0113	0.0136	0.0640 *	0.0549	0.0773 *	0.0193	0.0317	0.0139
0+3	0.0374	0.0362	0.0086	0.0311	0.0502	0.0356	0.0576	0.0280	0.0367	0.0270
0+4	0.0348	0.0213	-0.0051	0.0226	0.0414	0.0269	0.0488	0.0250	0.0220	0.0189
0+5	0.0210	0.0136	-0.0068	0.0213	0.0150	0.0134	0.0224	0.0173	0.0207	0.0118
[EVENT 2]										
-10	-0.0114	-0.0150	-0.0101	-0.0144	-0.0056	0.0146	-0.0092	0.0043	-0.0146	-0.0049
-9	-0.0032	-0.0044	-0.0048	0.0008	-0.0021	0.0115	0.0033	0.0005	0.0004	0.0016
-8	0.0038	0.0005	0.0072	0.0018	0.0044	0.0130	0.0102	0.0014	0.0011	0.0024
-7	0.0077	0.0097	0.0068	0.0111	0.0085	0.0130	0.0145	-0.0086	0.0004	0.0021
-6	0.0228	0.0121	0.0044	0.0146	0.0096	0.0270	0.0329	0.0038	0.0134	0.0160
-5	0.0178	0.0050	0.0203	0.0124	0.0078	0.0352	0.0253	-0.0079	0.0109	0.0135
-4	0.0184	0.0114	0.0091	0.0141	0.0141	0.0377	0.0262	-0.0065	0.0125	0.0255
-3	0.0280	0.0299	0.0095	0.0330	0.0239	0.0472	0.0355	0.0015	0.0210	0.0349
-2	0.0336	0.0322	0.0095	0.0331	0.0223	0.0475	0.0400	0.0029	0.0306	0.0333
-1	0.0281	0.0257	0.0032	0.0284	0.0180	0.0435	0.0362	-0.0029	0.0259	0.0298
0	0.0332	0.0326	0.0073	0.0355	0.0297	0.0511	0.0472	0.0037	0.0326	0.0369
1	0.0508	0.0436	-0.0008	0.0518	0.0360	0.0499	0.0551	0.0094	0.0387	0.0537
2	0.0488	0.0289	0.0050	0.0528	0.0259	0.0513	0.0505	0.0102	0.0493	0.0544
3	0.0468	0.0323	-0.0168	0.0348	0.0178	0.0457	0.0452	0.0029	0.0311	0.0455
4	0.0228	0.0156	0.0035	0.0658	-0.0055	0.0235	0.0225	-0.0138	0.0027	0.0154
5	0.0199	-0.0059	-0.0141	0.0166	-0.0081	0.0443	0.0145	-0.0144	0.0025	0.0162
0+1	0.0226	0.0178	-0.0041	0.0233	0.0179	0.0063	0.0188	0.0123	0.0127	0.0239
0+2	0.0206	0.0032	0.0017	0.0243	0.0078	0.0077	0.0143	0.0131	0.0233	0.0243
0+3	0.0186	0.0066	-0.0201	0.0063	-0.0002	0.0022	0.0090	0.0587	0.0051	0.0156
0+4	-0.0053	-0.0100	0.0002	-0.0219	-0.0235	-0.0199	-0.0137	-0.0109	-0.0232	-0.0143
0+5	-0.0082	-0.0317	-0.0174	-0.0118	-0.0262	0.0007	-0.0217	-0.0115	-0.0234	-0.0136

Notes: 1) "*" significant at the 0.05 level.
2) Variables are in logs.

as a whole over the post-announcement date period for event 2. As in the portfolio analysis, however, the CARs are insignificant during the entire event window for each event.

In brief, for both events negative ARs are reported one and/or two days preceding the announcement date, and for event 2, consecutively negative ARs are reported from two days after the announcement of the new RAR scheme onwards, which implies that new capital adequacy standards may negatively influence bank profitability. However, most of the estimated ARs and CARs are statistically insignificant. This suggests that the imposition of new capital adequacy requirements does not impact on shareholders' wealth. However, as noted in Section 6.7.1.1, several statistical problems exist in these estimated models. Therefore, the findings are only suggestive of the true wealth effects at best.

6.7.1.3 Hypothesis Tests

6.7.1.3.1 Test Statistic

Our hypothesis testing methodology is to formulate a 'restricted' statistical model, which contains the hypothesis as a restriction imposed upon its parameters. Then hypothesis tests are carried out by using a Wald test to compare two models:

(i) the restricted model, as described above; and

(ii) an unrestricted model, in which the parameters are permitted to take whatever values are required to minimise the sum of squared residuals.

The tests work on the principle that if the restricted and unrestricted models are similar (i.e., when we estimate the unrestricted model, the null hypothesis comes close to being true of the unrestricted model's parameters) then the null hypothesis can be accepted. If on the other hand two models are widely different (i.e., imposing the restrictions makes a big difference to the model, so the restrictions are not close to being true on the unrestricted model), then the null hypothesis must be rejected.

Wald's test statistic to test the set of linear restrictions is of the form H_0: $R_j\beta_j = \Gamma_j$,

where R_j = a M_j x k_j matrix of constants

β_j = a k_j x 1 vector of regression coefficients for equation j (as before)

Γ_j = a M_j x 1 vector of constants

is

$$\lambda_w = \frac{\tilde{e}'_j\tilde{e}_j - e'_je_j}{\hat{\sigma}_{jj}} \tag{6.39}$$

where $\tilde{e}_j$ = the residual sum of squares from the restricted estimation;

e_j = the residual sum of squares from the unrestricted estimation.

This test statistic follows the Chi-squared distribution with (M_j) degrees of freedom (Judge *et al*, 1985). As explained in Section 6.2, two of the four hypotheses (i.e., Hypotheses 1 and 4) can be tested for individual equations; therefore, only these two hypotheses are considered in this section.

6.7.1.3.2 Hypothesis 1: For each bank, the AR is the same on all days during the event period (H_0: $\gamma_{jn} = A_j$)

Hypothesis 1 is tested in order to examine whether or not investors earned constant ARs on each day during each of the event periods. Table 6.13 shows that H_0 can be accepted at the 0.05 level for all banks. The results indicate that for each bank, there was no significant variation in the AR between different days within the 16 day event window. Since Hypothesis 1 is accepted, we can estimate and utilise a restricted version of the model for our subsequent system analysis, which, as discussed in Section 6.2, will considerably reduce the computational costs.

<Table 6.13> Test Results for Hypothesis 1

	Event 1		Event 2	
	Wald Statistic	P-value	Wald Statistic	P-value
Chohung	3.1169	0.9995	6.5061	0.9699
Commer	3.5955	0.9988	7.2165	0.9514
First	3.3929	0.9991	9.1271	0.8708
Hanil	8.9583	0.8797	6.3208	0.9738
Seoul	2.8345	0.9997	8.8972	0.8828
Shinhan	4.5645	0.9952	3.1956	0.9994
Koram	11.4322	0.7214	5.1529	0.9908
Cbuk	5.9886	0.7994	7.7905	0.9319
CCB	6.1977	0.9762	8.4027	0.9066
Cheju	8.3078	0.9109	5.6069	0.9856
Daegu	11.5584	0.7121	12.6633	0.6283
Jbuk	23.4765	0.0745	4.1991	0.9970
Kangwon	21.3968	0.1246	5.2604	0.9897
Kwangju	19.2703	0.2017	7.7666	0.9328
KGB	5.9375	0.9808	3.9838	0.9978
KNB	5.7098	0.9842	10.2503	0.8037
Pusan	5.6097	0.9856	7.6188	0.9382
NCBs	2.6764	0.9998	5.3544	0.9887
RBs	3.4026	0.9991	6.4468	0.9712
CBs	2.7172	0.9998	6.6519	0.9666

Note: The Wald statistic follows the Chi-squared distribution with 15 degrees of freedom.

6.7.1.3.3 Hypothesis 4: For all banks, the AR is zero on all days during the event window

$(H_0: \gamma_{jn} = A_j = 0)$

Having accepted Hypothesis 1, a further possibility is to test whether the AR is zero on all days for all banks during the event period. As reported earlier, four banks out of RBs had significant ARs for event 1 based on the t-statistic. Since the t-statistic is to test a hypothesis about any individual partial regression coefficient, however, it cannot be employed for the joint hypothesis test. Fomby *et al* (1984, p.37) noted that "... testing a series of single (individual) hypotheses is not equivalent to testing those same hypotheses jointly". Therefore, the test of the joint hypothesis will not necessarily show that four banks had ARs which were significantly different from zero for event 1. If Hypothesis 4 is accepted, we may conclude that the new capital adequacy requirements do not have any impact on shareholders' wealth. Although in principle, Hypothesis 4 can also be tested using a Wald test, a simpler method is to estimate Equation 6.21 and draw inferences using t-ratio on the estimated parameter, A_j. Table 6.14 shows that none of test statistics for this test are statistically significant at the 0.05 level, so Hypothesis 4 is also accepted.

To complement the above tests for Hypothesis 4, we also tested the same hypothesis using as an unrestricted model the version in which the equality of ARs restriction is not imposed (i.e., Equation 6.18). In this case, the null hypothesis for bank j is H_0: $\gamma_{jn} = 0$ for n=T+1,..,T+N. Test results are reported in Table 6.15. The Wald test statistics are all insignificant at the 0.05 level, which confirms the findings that the new capital adequacy requirements did not have an impact on bank shareholders' wealth.

As noted earlier (see Section 6.2), since there are significant computational costs involved in estimating Equation 6.18 using SURE, all further hypotheses will be tested using Equation 6.21, the restricted version of Equation 6.18 which was accepted in Section 6.7.1.3.2.

6.7.2 SURE Estimation Results and Significance Tests

6.7.2.1 Practical Problems Involved in SURE Procedure and Test Statistic

As discussed earlier (see Section 6.6.2 and 6.7.1.1), the returns and estimated residuals for sample banks' stocks are highly correlated with one another. Although the SURE procedure allows the residual correlations across banks, Tables 6.3 and 6.6 suggest that some banks' data are sufficiently similar that if too many of them are included in the same system, it may become possible to find a linear combination of the estimated residuals which comes close to summing to zero, making Σ^{-1} difficult or impossible to calculate, which implies that SURE cannot be implemented (see Section 6.5.2). Preliminary attempts

<Table 6.14> Test Results for Hypothesis 4: Using Equation 6.21 (H_0:$A_j = 0$)

	Event 1			Event 2		
	α	β	A_j	α	β	A_j
Chohung	0.0002	0.9669*	0.0009	-0.0004	1.2311*	0.0004
(t-ratio)	(0.250)	(25.932)	(0.280)	(-0.430)	(17.199)	(0.128)
Commer	-0.0001	0.7509*	0.0024	-0.0006	1.2429*	0.0012
(t-ratio)	(-0.072)	(12.735)	(0.526)	(-0.570)	(17.662)	(0.392)
First	-0.0001	0.8023*	0.0021	-0.0001	1.2773*	0.0008
(t-ratio)	(-0.104)	(13.862)	(0.467)	(-0.009)	(17.964)	(0.258)
Hanil	-0.0005	0.4339*	0.0021	0.0002	1.2703*	-0.0006
(t-ratio)	(-0.427)	(6.133)	(0.383)	(0.147)	(16.277)	(-0.164)
Seoul	-0.0001	0.7694*	0.0023	-0.0004	1.2549*	0.0005
(t-ratio)	(-0.053)	(13.214)	(0.505)	(-0.401)	(17.208)	(0.144)
Shinhan	-0.0000	0.7149*	0.0034	0.0003	1.1206*	0.0006
(t-ratio)	(-0.013)	(12.018)	(0.731)	(0.254)	(14.114)	(0.178)
Koram	0.0002	0.7463*	-0.0002	0.0000	1.1568*	0.0011
(t-ratio)	(0.153)	(13.038)	(-0.038)	(0.015)	(14.793)	(0.305)
Cbuk	-0.0002	0.7846*	0.0042	-0.0006	1.3222*	0.0012
(t-ratio)	(-0.224)	(12.749)	(0.868)	(-0.495)	(16.173)	(0.318)
CCB	-0.0001	0.7825*	0.0035	-0.0001	1.3415*	-0.0004
(t-ratio)	(-0.143)	(13.174)	(0.763)	(-0.090)	(14.699)	(-0.106)
Cheju	-0.0001	0.7759*	-0.0007	0.0014	1.1120*	-0.0008
(t-ratio)	(-0.132)	(13.864)	(-0.156)	(0.939)	(10.235)	(-0.169)
Daegu	-0.0004	0.7779*	0.0050	-0.0000	1.3336*	0.0008
(t-ratio)	(-0.360)	(12.826)	(1.060)	(-0.031)	(16.632)	(0.247)
Jbuk	-0.0003	0.7616*	0.0023	-0.0004	1.3231*	-0.0006
(t-ratio)	(-0.319)	(12.554)	(0.484)	(-0.297)	(14.122)	(-0.146)
Kangwon	-0.0002	0.7237*	-0.0000	-0.0005	1.3817*	0.0027
(t-ratio)	(-0.135)	(11.842)	(-0.007)	(-0.363)	(14.418)	(0.630)
Kwangju	-0.0004	0.7466*	0.0025	-0.0004	1.3932*	0.0008
(t-ratio)	(-0.313)	(10.773)	(0.455)	(-0.315)	(16.778)	(0.220)
KGB	-0.0003	0.8879*	0.0033	0.0000	1.3086*	-0.0010
(t-ratio)	(-0.261)	(15.688)	(0.755)	(0.030)	(15.039)	(-0.251)
KNB	-0.0003	0.7593*	0.0049	0.0003	1.3458*	0.0000
(t-ratio)	(-0.244)	(12.662)	(1.066)	(0.221)	(16.131)	(0.012)
Pusan	-0.0005	0.6826*	0.0049	0.0002	1.3951*	0.0009
(t-ratio)	(-0.420)	(10.333)	(0.951)	(0.150)	(15.972)	(0.225)
NCBs	0.0001	0.7409*	0.0018	-0.0001	1.2220*	0.0006
(t-ratio)	(0.009)	(17.088)	(0.545)	(-0.127)	(21.968)	(0.225)
RBs	-0.0002	0.7686*	0.0030	0.0000	1.3251*	0.0003
(t-ratio)	(-0.258)	(15.537)	(0.788)	(0.050)	(19.646)	(0.111)
CBs	-0.0001	0.7572*	0.0025	-0.0000	1.2827*	0.0004
(t-ratio)	(-0.152)	(16.906)	(0.728)	(-0.005)	(22.150)	(0.162)

Notes: 1) Parameters are in logs.

2) '*' represents significant at the 0.05 level.

<Table 6.15> Test Results for Hypothesis 4: Using Equation 6.18 (H_0: $\gamma_{jn} = 0$)

	Event 1		Event 2	
	Wald Statistic	P-value	Wald Statistic	P-value
Chohung	3.1919	0.9997	6.5218	0.9814
Commer	3.8609	0.9991	7.3626	0.9656
First	3.6019	0.9994	9.1912	0.9053
Hanil	9.1018	0.9092	6.3462	0.9839
Seoul	3.0783	0.9998	8.9173	0.9168
Shinhan	5.0786	0.9953	3.2251	0.9997
Koram	11.4336	0.7819	5.2401	0.9944
Cbuk	6.7181	0.9783	7.8873	0.9522
CCB	6.7612	0.9776	8.4134	0.9356
Cheju	8.3315	0.9384	5.6338	0.9916
Daegu	12.6688	0.6968	12.7236	0.6929
Jbuk	23.7188	0.0958	4.2189	0.9985
Kangwon	21.3969	0.1638	5.6338	0.9916
Kwangju	19.4809	0.2445	7.8237	0.9542
KGB	6.4889	0.9819	4.0427	0.9988
KNB	6.8079	0.9768	10.2504	0.8532
Pusan	6.4831	0.9820	7.6670	0.9582
NCBs	2.9598	0.9998	5.4021	0.9934
RBs	3.9978	0.9989	6.4585	0.9823
CBs	3.2233	0.9997	6.6769	0.9790

Note:The Wald statistic follows the Chi-squared distribution with 16 degrees of freedom.

to estimate ARs for all banks as a single system using SURE showed that this problem was present.

To overcome this problem, the number of equations included in each estimation was adjusted downward. Initially, three banks were dropped from the system of equations based on Tables 6.3 and 6.6 for each event, but on finding this was insufficient, further banks were also omitted. Table 6.16 shows the banks ultimately included in the systems of equations estimated for each event. In addition, we also estimated two sub-systems of equations (i.e., NCBs and RBs) so that the banks omitted from the full system could be incorporated into the analysis. However, the results provided by estimation of these sub-systems only gives limited information concerning the impact of new capital adequacy regulations on bank shareholders' wealth, because when a system of equations is divided into two sub-systems, groupwise heteroscedasticity and contemporaneous correlation across sub-systems are not fully taken into account.

<Table 6.16> Banks Included in a System of Equations for Each Event

All Sample	Event 1		Event 2	
Banks	Initial Model	Final Model	Initial Model	Final Model
Chohung	Chohung	Chohung	Chohung	Chohung
Commercial	Commercial	Commercial	Commercial	Commercial
First	First	First	First	First
Hanil	Hanil	Hanil	Hanil	Hanil
Seoul	-	-	-	-
Shinhan	Shinhan	Shinhan	Shinhan	Shinhan
Koram	Koram	Koram	Koram	Koram
Cbuk	Cbuk	Cbuk	Cbuk	Cbuk
CCB	CCB	CCB	CCB	CCB
Cheju	Cheju	Cheju	Cheju	-
Daegu	-	-	-	-
Jbuk	Jbuk	-	Jbuk	Jbuk
Kangwon	Kangwon	-	Kangwon	-
Kwangju	Kwangju	-	-	-
KGB	KGB	-	KGB	-
KNB	-	-	KNB	-
Pusan	Pusan	Pusan	Pusan	Pusan
Total (17)	(14)	(10)	(14)	(10)

Note: '-' represents that banks were dropped in the models.

Meanwhile, as reported in Section 6.7.1.1, some doubts were cast on the assumption of no autocorrelation in our models. SURE can be extended to allow for autocorrelation (Greene, 1993; Judge *et al*, 1985). Therefore, our systems of equations are estimated with first-order autoregressive disturbances (AR1). To do this, the following steps are implemented:

(i)estimate each equation (i.e., $Y_j = X_j\beta_j + \varepsilon_j$ where $j=1,...,J$) in the system by OLS and using the results, obtain an estimator of the first-order autocorrelation coefficient for the disturbances, $\rho_j = \Sigma e_{jt}e_{jt-1}/\Sigma e^2_{jt}$;

(ii)for that equation, transform the data by the Prais-Winsten (1954) transformation to remove the autocorrelation, i.e., for t=1, $y^*_{jt} = y_{jt}(1 - \rho^2_j)^{1/2}$, $x^*_{jit} = x_{jit}(1 - \rho^2_j)^{1/2}$, and for t=2,...,T, $y^*_{jt} = y_{jt} - \rho_j y_{jt-1}$ and $x^*_{jit} = x_{jit} - \rho_j x_{jit-1}$;

(iii)using the transformed data, apply the SURE procedure as described above.

As discussed in Section 6.7.1.3, hypothesis tests can be conveniently formulated as constraints on the values of parameters . For testing a set of M linear restrictions of the form $R\beta = \Gamma$

where R = an M x K matrix of constants;

β = a K x 1 vector of regression coefficients as before and which may include cross-equation restrictions;

Γ = an M x 1 vector of constants,

a generalised version of our earlier Wald statistic is employed. The Wald's test statistic (Judge *et al*, 1985, p.474) is

$$\lambda_w = \tilde{e}'(\hat{\Sigma}^{-1} \otimes I)\tilde{e} - e'(\hat{\Sigma}^{-1} \otimes I)e$$

$$= J\,tr(S_o \hat{\Sigma}^{-1}) - JT \qquad (6.40)$$

where $e = y - X\hat{\beta}$ and $\hat{\beta}$ is obtained by estimating the unrestricted model using SURE, using $\hat{\Sigma}$ as an estimator of Σ where $\hat{\Sigma}$ is based on the residuals of the unrestricted model;

$\tilde{e} = y - X\tilde{\beta}$ and $\tilde{\beta}$ is obtained by estimating the restricted model using SURE, again using $\hat{\Sigma}$ as an estimator of Σ (from the unrestricted model);

$\hat{\Sigma}$ = an (J x J) matrix whose i'jth element $\hat{\sigma}_{ij} = e'_i e_j/T$ as before;

S= an (J x J) matrix whose i'jth element $S_{ij} = \tilde{e}'_i \tilde{e}_j/T$ where $\tilde{e}_j$ comes from eas defined above;

tr( ) = trace, equal to the sum of the main diagonal elements of the matrix.

The Wald statistic follows a Chi-squared distribution with M degrees of freedom under H_0: $R\beta = \Gamma$.

6.7.2.2 SURE Estimation Results

Table 6.17 shows the SURE estimation results for the two portfolios. Since the results reported in Table 6.17 were estimated by applying correction for first order residual autocorrelation within a SURE, the estimated coefficients are different from those for OLS. However, in general, the results show a quite similar pattern to those obtained previously using OLS. As with the OLS estimations, for event 1, NCBs show negative ARs two days preceding the announcement date. For event 2, both NCBs and RBs show negative ARs on the day preceding the announcement and from two days after the announcement date onwards. However, none of the estimated ARs are statistically significant at the 0.05 level.

Table 6.18 shows the SURE estimation results of Equation 6.21, by treating all NCBs and all RBs as separate systems and applying SURE to each of these systems separately, for each event. Since the SURE estimation results for banks included within a full system are identical to those within two separate systems, they are not reported. Although some banks' event parameters are negative, none of them are statistically significant for either for event 1 or event 2.

In brief, the SURE estimation results show that none of the estimated ARs are significant and imply that the null hypothesis of no impact of the new capital adequacy requirements on shareholders' wealth is likely to be accepted. In the next sub-section, various joint hypotheses will be tested formally in order to examine whether or not the new capital regulations affect bank profitability and shareholders' wealth. The systems of equations estimated are identical to those reported in the above and are, therefore, not reported in the following sub-section.

<Table 6.17> Regression Estimates for Portfolios from Systems: Equation 6.18

	Event 1		Event 2	
	NCBs	RBs	NCBs	RBs
α	-0.0000	-0.0003	-0.0001	0.0001
(t-ratio)	(-0.024)	(-0.289)	(-0.077)	(0.083)
β	0.7446*	0.7865*	1.2549*	1.3615*
(t-ratio)	(17.261)	(16.063)	(22.062)	(19.571)
-10	0.0110	0.0048	0.0001	-0.0068
(t-ratio)	(0.849)	(0.323)	(0.013)	(-0.612)
- 9	-0.0012	-0.0033	0.0045	0.0071
(t-ratio)	(-0.094)	(-0.226)	(0.491)	(0.635)
- 8	-0.0046	-0.0026	-0.0025	0.0042
(t-ratio)	(-0.354)	(-0.173)	(-0.270)	(0.381)
- 7	0.0053	0.0024	-0.0026	0.0019
(t-ratio)	(0.407)	(0.163)	(-0.283)	(0.172)
- 6	0.0075	0.0054	0.0080	0.0091
(t-ratio)	(0.581)	(0.363)	(0.871)	(0.824)
- 5	0.0084	0.0037	-0.0017	-0.0017
(t-ratio)	(0.646)	(0.250)	(-0.189)	(-0.150)
- 4	0.0019	0.0017	0.0011	0.0022
(t-ratio)	(0.150)	(0.117)	(0.116)	(0.196)
- 3	0.0054	0.0094	0.0077	0.0102
(t-ratio)	(0.418)	(0.635)	(0.837)	(0.919)
- 2	-0.0008	0.0095	0.0055	0.0020
(t-ratio)	(-0.066)	(0.642)	(0.597)	(0.177)
- 1	-0.0072	0.0013	-0.0007	-0.0049
(t-ratio)	(-0.558)	(0.088)	(-0.074)	(-0.442)
0	0.0024	0.0123	0.0025	0.0073
(t-ratio)	(0.184)	(0.836)	(0.273)	(0.664)
1	0.0062	0.0164	0.0081	0.0078
(t-ratio)	(0.475)	(1.115)	(0.881)	(0.706)
2	0.0044	0.0050	-0.0003	-0.0011
(t-ratio)	(0.337)	(0.343)	(-0.033)	(-0.101)
3	-0.0016	0.0014	-0.0064	-0.0092
(t-ratio)	(-0.112)	(0.092)	(-0.693)	(-0.834)
4	0.0013	-0.0093	-0.0151	-0.0192
(t-ratio)	(0.098)	(-0.631)	(-1.627)	(-1.718)
5	-0.0089	-0.0107	0.0012	-0.0022
(t-ratio)	(-0.687)	(-0.727)	(0.126)	(-0.197)

Notes:1)'*' significant at the 0.05 level.
2)Parameters are in logs.

<Table 6.18> Regression Estimates for Two Sub-Banking Groups from Systems: Equation 6.21

	Event 1			Event 2		
	α	β	A_j	α	β	A_j
[NCBs]						
Chohung	0.0003	1.0089*	0.0005	-0.0005	1.2307*	0.0008
(t-ratio)	(0.346)	(24.815)	(0.153)	(-0.449)	(17.907)	(0.242)
Commercial	0.0001	0.8485*	0.0015	-0.0006	1.2435*	0.0017
(t-ratio)	(0.060)	(15.517)	(0.399)	(-0.571)	(18.596)	(0.499)
First	0.0000	0.8915*	0.0013	-0.0000	1.2736*	0.0012
(t-ratio)	(0.018)	(16.540)	(0.348)	(-0.040)	(18.608)	(0.352)
Hanil	-0.0006	0.4344*	0.0019	0.0001	1.2743*	-0.0003
(t-ratio)	(-0.414)	(6.191)	(0.347)	(0.119)	(16.948)	(-0.073)
Seoul	0.0001	0.8702*	0.0014	-0.0005	1.2432*	0.0009
(t-ratio)	(0.091)	(16.316)	(0.373)	(-0.475)	(17.512)	(0.293)
Shinhan	0.0001	0.7916*	0.0026	0.0003	1.1082*	0.0007
(t-ratio)	(0.102)	(14.256)	(0.693)	(0.257)	(14.035)	(0.216)
Koram	0.0002	0.7885*	-0.0003	0.0000	1.1516*	0.0011
(t-ratio)	(0.218)	(14.054)	(-0.079)	(0.007)	(14.943)	(0.321)
[RBs]						
Cbuk	-0.0002	0.8692*	0.0036	-0.0005	1.3306*	0.0009
(t-ratio)	(-0.179)	(15.039)	(0.893)	(-0.466)	(16.859)	(0.239)
CCB	-0.0001	0.8564*	0.0029	-0.0001	1.3261*	-0.0004
(t-ratio)	(-0.073)	(15.175)	(0.752)	(-0.107)	(15.001)	(-0.118)
Cheju	-0.0001	0.8360*	-0.0012	-0.0014	1.1315*	-0.0010
(t-ratio)	(-0.084)	(15.863)	(-0.322)	(0.900)	(10.711)	(-0.187)
Daegu	-0.0003	0.8606*	0.0043	0.0000	1.3472*	0.0005
(t-ratio)	(-0.341)	(15.163)	(1.103)	(0.013)	(17.610)	(0.150)
Jbuk	-0.0003	0.7920*	0.0021	-0.0003	1.3305*	-0.0009
(t-ratio)	(-0.303)	(13.363)	(0.463)	(-0.280)	(14.663)	(-0.232)
Kangwon	-0.0001	0.7664*	-0.0002	-0.0005	1.3792*	0.0023
(t-ratio)	(-0.108)	(12.991)	(-0.051)	(-0.399)	(14.800)	(0.619)
Kwangju	-0.0003	0.7827*	0.0023	-0.0003	1.4033*	0.0005
(t-ratio)	(-0.283)	(11.575)	(0.448)	(-0.277)	(17.571)	(0.130)
KGB	-0.0002	0.9184*	0.0030	0.0001	1.3201*	-0.0013
(t-ratio)	(-0.244)	(16.681)	(0.741)	(0.062)	(15.656)	(-0.322)
KNB	-0.0002	0.8413*	0.0044	0.0003	1.3635*	-0.0003
(t-ratio)	(-0.203)	(14.965)	(1.121)	(0.248)	(17.331)	(-0.081)
Pusan	-0.0005	0.7361*	0.0044	0.0002	1.4057*	0.0005
(t-ratio)	(-0.412)	(11.492)	(0.943)	(0.180)	(16.776)	(0.139)

Notes: 1)'*' significant at the 0.05 level.
2)Parameters are in logs.

6.7.2.3 Hypothesis Tests

6.7.2.3.1 Hypothesis 2: The sum of all the ARs earned by all banks on all days within the event period is zero (H_0: $\Sigma^J_{j=1}A_j = 0$)

A test of the sum of event parameters across portfolios or banks is in the spirit of traditional event studies where analysis is performed on the cross-sectional sum or average residual from an unconditional return-generating process. The sum of the parameters reflects the total, sample-wide influence of the regulatory changes. In this case, the sum is constrained to be zero under the null hypothesis that new capital adequacy regulations do not have an impact on bank profitability and shareholders' wealth.

Test of hypothesis 2 can be implemented by two ways. First, as discussed earlier, this hypothesis may be tested with equally weighted portfolios (Thompson, 1985). Second, each bank can be included individually in a system of equations and the null hypothesis can be tested across the entire system.

The null hypothesis is tested by imposing restrictions on the parameters estimated in Table 6.17, a full system, and Table 6.18, respectively. Corresponding results are reported as Portfolios, Full System and Two Sub-systems in Table 6.19. Wald test statistics to test the null hypothesis show high probability values and acceptance of the null hypothesis. This means that the new capital adequacy regulations do not have an effect on bank profitability and shareholders' wealth, at least recognised by investors, at the level of the whole banking industry.

6.7.2.3.2 Hypothesis 3: The AR is the same (but not necessarily zero) for all banks in all periods for each event (H_0: $\gamma_{jn} = A_j = A$)

This hypothesis is to test mainly whether the impact of new capital adequacy requirements varies between banking groups or banks. Hypothesis 3 is more likely to be rejected

<Table 6.19> Test Results for Hypothesis 2

	Event 1		Event 2	
	Wald Stat.	P-value	Wald Stat.	P-value
Portfolios	0.5323	0.4656	0.0311	0.8600
Full System	0.3784	0.5385	0.0394	0.8426
Two Sub-systems				
0 NCBs	0.1880	0.6646	0.1198	0.7292
0 RBs	0.5649	0.4523	0.0008	0.9775

Note: Wald test statistics for hypothesis 2 have an asymptotic Chi-squared distribution with 1 degree of freedom.

than Hypothesis 2, especially if the regulatory changes influenced some banks positively and others negatively, cancelling each other in total; or if the regulatory changes had positive influences in some periods and negative influences in others, cancelling each other in total. In other words, even if the sum of the event parameters is zero, some of the individual parameters could be non-zero if there are redistributional effects across banks or over time. For example, one might predict that some banks gain a competitive advantage because of new capital adequacy regulations. Under these situations, one might reject the hypothesis that all of the individual ARs are equal. Under the null hypothesis that two banking groups or banks are equally affected, this hypothesis may be tested by imposing restrictions of equal event parameters over the event window.

Test results are reported in Table 6.20. The Wald's test statistics for portfolios indicate that the null hypothesis is accepted and there are no differences between the ARs of the NCBs and RBs for each event. This implies that the new capital adequacy regulations affect two banking groups equally and that there is no redistribution of wealth between the two banking groups. The results for the full system also shows that the null hypothesis is accepted and suggests that all banks are equally affected by the new capital adequacy requirements. The test result for the two sub-systems also supports the above findings. Therefore, we may conclude that the new capital adequacy requirements affect all banks equally. This implies that investors did not perceive the differences between banks and that therefore there was no differential impact of the new capital regulations on bank profitability. Naturally, in view of our earlier acceptance of Hypothesis 4 based on the single equation estimation results, the acceptance of Hypothesis 3 in the systems estimations is not surprising; ARs are equal across banks because ARs are close to zero for all the individual banks.

<Table 6.20> Test Results for Hypothesis 3

	Event 1		Event 2	
	Wald Stat.	P-value	Wald Stat.	P-value
Portfolios	0.2758[1)]	0.5995	0.0083[1)]	0.9273
Full System	5.0714[2)]	0.8280	0.9989[2)]	0.9994
Two Sub-systems				
0 NCBs	0.9700[3)]	0.9867	0.5321[3)]	0.9974
0 RBs	6.3056[4)]	0.7089	1.5090[4)]	0.9971

Note : 1)An asymptotic Chi-squared distribution with 1 degree of freedom.
2), 4)An asymptotic Chi-squared distribution with 9 degrees of freedom.
3)An asymptotic Chi-squared distribution with 6 degrees of freedom.

6.7.2.3.3 Hypothesis 4: For all banks, the AR is zero on all days during the event period (H_0: $A_j = 0$)

Finally in this section, we also use the SURE in order to test Hypothesis 4. This time with the restriction imposed across the entire system of equations, rather than on each equation individually as in Section 6.7.1.3.3. Test results are reported in Table 6.21. The Wald statistics are highly insignificant and, therefore, the null hypothesis is accepted. This implies that the new capital adequacy requirements do not affect bank profitability and, therefore, shareholders' wealth.

<Table 6.21> Test Results for Hypothesis 4

	Event 1		Event 2	
	Wald Stat.	P-value	Wald Stat.	P-value
Portfolios	0.7130[1)]	0.7001	0.0477[1)]	0.9765
Full System	5.1144[2)]	0.8834	1.0862[2)]	0.9998
Two Sub-systems				
0 NCBs	1.0878[3)]	0.9932	0.7567[3)]	0.9979
0 RBs	6.3143[2)]	0.7882	1.5284[2)]	0.9988

Notes: 1)An asymptotic Chi-squared distribution with 2 degrees of freedom.
2)An asymptotic Chi-squared distribution with 10 degrees of freedom.
3)An asymptotic Chi-squared distribution with 7 degrees of freedom.

6.8 CONCLUSION

This chapter has examined the impact of new capital adequacy requirement on bank shareholders' wealth. For this purpose, the event study methodology was utilised. In particular, we followed the dummy variable approach instead of the standard event study methodology because of the convenience in estimating event parameters and obtaining correct standard errors of event parameters. Descriptive analysis confirmed Fama's findings (1976) on the distribution of daily stock returns: the daily stock returns of Korean banks are not normally distributed.

The likely impact of the new capital regulations was examined in two ways. As a first step, OLS is applied to estimate a set of single equation models. Although a small number of banks showed statistically significant ARs, the reported results for event 1 in particular are not entirely reliable because a serious heteroscedasticity problem was detected during estimation. Nevertheless, the results indicate strongly that the new capital standards did not have an impact on bank shareholders' wealth. However, the validity of the OLS estimation results is also called into question by the fact that significant contemporaneous correlation was detected between the residuals across equations. To generate more efficient estimators than those produced by OLS which take account of this problem, the equations were reestimated as a system using SURE. Our SURE estimators are more efficient than our OLS estimators because heteroscedasticity across equations, potential autocorrelation and contemporaneous correlation problems are addressed in the estimation procedure. However, the SURE estimation results also suggest that the new capital adequacy requirements did not have an influence on bank shareholders' wealth. In addition, a test for equality of parameters between banking groups indicates that no intra-industry differences exist.

However, some caution needs to be made in interpreting these results. One is that the residuals of our models are not normally distributed. Although there is empirical evidence that non-normality has no obvious impact on event study methodology (Brown *et al*,1985), robustness of our inference may be lower than that of normality case. In this case, alternative, distribution-free test procedures may be more appropriate (see Theil, 1971, Section 12.3; Corrado, 1989); however, these have not been investigated in the present analysis. Another is that although the SURE procedure adapted allows for variation in the residual variance across equations, it does not do so within each equation. Therefore, the SURE estimation results for event 1, for which a serious heteroscedasticity problem was detected, may not be entirely reliable.

It may be argued that because of the simultaneous impact of the structural deregulation and supervisory re-regulation, the measurement of the net impact of the new capital adequacy requirements is impossible or, at least, difficult. However, this is not the case for this study because the time horizon under consideration is very short (i.e., only 16 days) and a careful review of event widow reveals that there were no new information flows to the market relating to deregulation.

It is worth noting that failure to detect any impact of the new capital regulations does not imply that capital adequacy requirements are not effective in Korea. As discussed in Chapter 2, the Korean stock market has become bearish since the end of 1989. One policy of the Korean government to boost the stock market was to restrict new equity issues of big firms like banks in an attempt to restore equality between the demand and the supply of stocks. Therefore, the OBS regulated banks' new equity issues. In addition, most banks satisfied the new capital standards for event 1. As for event 2, all banks had much higher capital ratios than the new RAR (see Chapter 3 and Chapter 5). These are all possible explanations as to why we fail to detect any impact of the new capital adequacy requirements on bank shareholders' wealth.

CHAPTER 7

CAPITAL ADEQUACY REQUIREMENTS AND BANK RISK: RISK EFFECTS

7.1 INTRODUCTION

The aim of this chapter is to examine the impact of new capital adequacy requirements on the risk of commercial banks, which is one of the main concerns of bank supervisors. As discussed in Chapters 3 and 5, the most important objective of banking supervision in general and capital adequacy requirements in particular are to help ensure the safety and soundness of banks and thereby help enhance depositor (small depositors at least) protection, and to help maintain the overall stability of the banking system (i.e., reduce systemic risk potential). Bank supervision, of course, does not necessarily aim at preventing all bank failures, nor even reducing the number of actual failures, but at enhancing the stability of the whole system which can be threatened by the negative contagion effect of an individual bank failure. In this context, the analysis of examining the impact of new capital regulations on the risk of commercial banks focuses on the banking system as a whole: in short, a portfolio approach is utilised.

This chapter complements Chapter 6, which analysed the impact of new capital adequacy requirements on bank shareholders' wealth. As we emphasised in Chapter 4, making the correct risk-return trade-offs are fundamental in banking. Therefore, the changes in bank profitability should be largely associated with changes in bank risk. In Chapter 6, we failed to find any significant wealth effects, and this leads to a possible inference that the risk profile of Korean banks did not change. However, if no wealth effects are found but concurrent risk effects are identified, then this implies that the Korean banks do not operate on the efficient frontier. Chapter 6 did not address this fundamental issue involving bank capital adequacy requirements. Thus, this chapter aims at examining whether or not the market-perceived risk of banks changed after the announcements of the new capital adequacy regulations.

For this purpose, we utilise a methodology similar to that employed by Aharony *et al* (1980) and Smirlock (1984). The analysis examines the risk characteristics of bank stocks before and after the announcements of new capital adequacy requirements. By examining changes in bank risk at the time of regulatory changes, we are able to assess directly the effect of new capital adequacy regulations on the risk of banks. In other words, we can directly assess whether the effects of capital adequacy requirements are consistent with the supervisor's intention or whether they are perverse.

The remainder of this chapter is organised in the following manner. Section 2 states our main questions and constructs testable hypotheses in order to examine whether new capital standards affect the risk of banks. Section 3 discusses risk measures for this study. Section 4 reviews the empirical literature which provides the basis for our econometric models and methodology. Section 5 discusses the risk-partition, and specifies the econometric models to assess the impact of new capital adequacy requirements on the risk of banks. Section 6 provides descriptive analysis of the dataset in order to examine the properties of our sample data. Section 7 reports the results of the estimation and of hypothesis tests, and Section 8 summarises the findings and presents our conclusions.

7.2 TESTING OBJECTIVES AND HYPOTHESES

As reviewed in Chapter 5 (see Section 5.4.3), Lackman (1986), from an analysis of bank portfolio composition, concluded:

(i)the imposition of the capital/deposits ratio causes a shift of bank portfolios from 'safe' assets toward 'risky' assets. Although it will always reduce the variance of ROE, it will also reduce the expected return and may, therefore, increase the probability of failures;

(ii)the capital/risky assets ratio causes a shift in the portfolio holdings of banks toward less risky assets and will tend to reduce the variance of ROE;

(iii)RAR causes a shift of bank portfolios from risky to safer assets reducing the risk (variance) of ROE, thereby reducing the probability of bank failure.

Our analysis does not examine bank portfolio composition, but investigates rates of return on bank stocks which reflect investors' future expectations. However, we may test Lackman's (1986) hypothesis using stock price data and replacing ROE by rates of return on bank stocks. Since the new capital regulations are the change in the capital/total assets ratio for event 1 and the introduction of RAR for event 2, our capital standards do not exactly match Lackman's capital adequacy ratio scheme. However, if the portion of deposits to total assets increases, then the ratio of capital to deposit is close to that of capital to total assets. Despite this difference, therefore, we can test whether or not Lackman's hypothesis is valid in Korea.

The analyses will endeavour to answer the following questions.

(i)What is the impact of the new capital standards on the risk of banking firms?

(ii)Are the effects of new capital regulations consistent with the supervisor's intention or are they perverse?

To answer the above questions, we may test the null hypothesis that the risk of banks is the same before and after the impositions of the new capital adequacy requirements. In order to do so, we need to formulate four testable sub-hypotheses as below. Suppose the expression defining returns on the 3 portfolios (ie., p=1 for CBs; p=2 for NCBs; and p=3 for RBs) during the pre-announcement period (A), t=1,...,T and the post-announcement period (B), t=T+N+1,...,M are as follows:

$$r_{pt} = \alpha^A{}_p + \beta^A{}_p r_{mt} + \varepsilon_{pt};\ Var(r_{pt}) = \Sigma^A{}_{pp};\ Var(\varepsilon_{pt}) = \sigma^A{}_{pp} \qquad (7.1)$$

$$\text{for } t=1,\dots,T, \text{ for } p=1,2,3$$

and

$$r_{pt} = \alpha^B{}_p + \beta^B{}_p r_{mt} + \varepsilon_{pt};\ Var(r_{pt}) = \Sigma^B{}_{pp};\ Var(\varepsilon_{pt}) = \sigma^B{}_{pp} \qquad (7.2)$$

$$\text{for } t=T+N+1,\dots,M \text{ for } p=1,2,3$$

where r_{pt} = the natural logarithm of the daily rate of return on the portfolio p(=1,2,3);

r_{mt} = the natural logarithm of the daily rate of return on the KOSPI as a market portfolio proxy;

$\alpha^A{}_p$, $\alpha^B{}_p$, $\beta^A{}_p$, $\beta^B{}_p$ are regression parameters;

ε_{pt} = stochastic disturbance term.

Let $\quad \mathrm{Var}(r_{mt}) = \Sigma^A{}_{mm}$ for t=1,...,T and $\Sigma^B{}_{mm}$ for t=T+N+1,...,M $\qquad$ (7.3)

(i) *Hypothesis 1*

Firstly, we test the null hypothesis that the variances of returns for each portfolio are the same before and after the announcement of the new capital adequacy requirements for each event.

$$H_0: \Sigma^A{}_{pp} = \Sigma^B{}_{pp} = \Sigma_{pp} \qquad (7.4)$$

(ii) *Hypothesis 2*

Secondly, to examine whether the variance of market portfolio was changed over time, the null hypothesis that the variance of the return on the market portfolio was the same before and after the announcement of the new capital standards for each event is tested.

$$H_0: \Sigma^A{}_{mm} = \Sigma^B{}_{mm} = \Sigma_{mm} \qquad (7.5)$$

(iii) *Hypothesis 3*

The changes in capital regulations are likely to affect the market sensitivity coefficient which captures systematic risk of the banking industry. Therefore, we also test for shifts in the market sensitivity of each portfolio. The null hypothesis is that the market sensitivity coefficient, β_p, for each portfolio is the same during the pre- and post-announcement periods.

$$H_0: \beta^A{}_p = \beta^B{}_p = \beta_p \qquad (7.6)$$

(iv) *Hypothesis 4*

Having tested for changes in the components of systematic risk, we also examine whether there were changes in unsystematic risk. The null hypothesis is that the variances of the residuals are the same before and after the announcements of the new capital adequacy requirements.

$$H_0: \sigma^A_{pp} = \sigma^B_{pp} = \sigma_{pp} \qquad (7.7)$$

7.3 RISK MEASURES

As discussed in Chapter 4, risk can be measured by the variance (or standard deviation) of returns around the expected returns. In contrast to the accounting measure of risk discussed in Chapter 4, risk in this chapter is measured by the variance of stock returns, as a proxy for the bankruptcy risk. This is a conventional measure of risk in event studies. As such, changes in the variance of stock returns can be utilised in order to measure changes in the risk of bank failure.

The variance of rates of return on stocks measures the risk of equity (σ^2_E), and, therefore, does not entirely capture bankruptcy risk as measured by the variance of returns to the firm (σ^2_V), which is composed of the variance of return on debt (σ^2_D) as well as equity (σ^2_E). Smirlock (1984) argues that there are several reasons why we need to concentrate on the variance of returns on equity:

(i)unless σ^2_D varies inversely with σ^2_E, increases in σ^2_E will unambiguously increase bankruptcy risk. Evidence (see Aharony *et al*, 1980; Warner, 1977) suggests σ^2_E and σ^2_D are positively related to bankruptcy risk;

(ii)the lower the debt/capital ratio (where capital equals debt plus equity), the more important is σ^2_E relative to σ^2_D in calculating σ^2_V. Since bank leverage is regulated by supervisory authorities and such regulation is assumed to be effective, σ^2_E is a more significant determinant of σ^2_V than is σ^2_D;

(iii)the market for bank debt is thin and quoted returns may not accurately reflect actual returns.

Smirlock's (1984) arguments are also closely related to the difficulty of valuing banks. As discussed in Chapter 5 (see Section 5.2.3.1), Copeland *et al* (1990) recommend the equity approach for valuing banks, not the entity approach. Even with a due consideration of the difficulty of valuing banks, data availability and the observed relationship between the risk components, therefore, there are good grounds for assuming that changes in the variance of stock returns may be an appropriate (even if imperfect) proxy for changes in the risk of bank failure (see Section 7.4).

7.4 LITERATURE SURVEY: THE FOUNDATION FOR MODEL SPECIFICATION

Most of event studies are focussed on wealth effects; studies specifically on the risk effects of new events are few. To the researcher's knowledge, there are only two event studies on the risk effect of capital adequacy requirements: those of Swary (1980), and Aharony and Swary (1981). Other studies have focussed on the effects of deposit rate ceiling changes (including DIDMCA in the USA), changes in monetary policy, and analysis of corporate bankruptcy, rather than capital adequacy requirements. Therefore, we review previous studies on the risk effects of new events in order to provide the basis of our analysis. This review is not exhaustive, but a selective one which is targeted specifically the purposes of this study.

With the enactment of the 1970 Amendment to the BHC Act in the USA, each BHC intending to acquire a non-bank firm has to apply to the FRB for approval. Swary (1980) analysed the effects of non-bank acquisitions of BHCs as well as the effects of FRB's decision on the riskiness of BHCs. The sample consisted of 74 applications proposed by 58 BHCs during the period 1970-1977. Swary (1980) utilised the variability of the returns on stocks as the measure of risk. The estimated variance of returns according to the market model was partitioned:

$$\mathrm{Var}(R_j) = \beta^2_j\ \mathrm{Var}(R_m) + \mathrm{Var}(\varepsilon_j) \qquad (7.8)$$

where $\mathrm{Var}(R_j)$ = variance of returns on security j;

$\mathrm{Var}(R_m)$ = variance of the market portfolio;

$\mathrm{Var}(\varepsilon_j)$ = variance of disturbance term of security j.

To test the changes in risk, the estimated variances of the return on each stock were compared before and after the announcement of the FRB's decision. An F-test was utilised to test the significance of these differences. In addition, in order to test the changes in systematic risk, the following model was run:

$$R_j = \alpha_j + \alpha'_j D + \beta_j R_m + \beta'_j D R_m + \varepsilon_j \qquad (7.9)$$

where R_j = rate of return of security j over week t, j=1,..,N;

R_m = rate of return on the CRSP value weighted index of all common stocks in the NYSE over week t;

$\beta_j = \mathrm{Cov}(R_j R_m)/\mathrm{Var}(R_m)$;

$\alpha_j = E(R_j) - \beta_j E(R_m)$;

D = a dummy variable taking values zero in the first 60-week period and unity in the second 60-week period.

ε_j = disturbance term of security j in week w.

The t-statistic on the coefficient, β'_j, was used to test for risk shifts. The results revealed that, on average, the sample of denied acquisitions experienced a significantly larger increase in total risk than had the approved applications group. In addition, the change in the average total risk in the approved group was caused by shifts in the market-wide factors and not by shifts in the average of the firm-specific component.

Aharony, Jones, and Swary (1980) analysed the risk and return characteristics of corporate bankruptcy using weekly capital market data. Their sample consisted of a group of 45 bankrupt firms during the 1970-1978 period and a group of 65 control firms. One or two control firms were matched to each bankrupt company. The risk measure employed was the variability of rates of return, and shifts in the variance of stock returns are used to measure changes in the risk of corporate failure. The following market model was estimated:

$$R_{jw} = \alpha_{jw} + \beta_{jw} R_{jmw} + e_{jw} \qquad (7.10)$$

where w = w, w-1, ..., w-103, and w = bankruptcy week.

The variance of the rates of return on the *j*th stock is composed of three different risk elements as in Equation 7.8. The direction and significance in the total variance of returns are of interest. To examine whether any shift in the total risk is caused by firm-specific effects or is merely due to changes in market-wide factors, Aharony *et al* (1980) examined each of the components of the total variance of returns by employing cross-sectional and time-series analyses. The null hypothesis of the cross-sectional analysis is that the mean of the total risk (Var (R)) for the two groups (i.e., bankrupt and control) are equal at any given point in time relative to the event week. The result indicates that the sample mean of the total variance for the bankrupt group is significantly larger than that for the control group for every week measured prior to the bankruptcy week. Time-series analysis reveals that the sample mean of total variance increased significantly over the period between 226 weeks before bankruptcy and 120 weeks before bankruptcy, while there was no significant shift over time in any of the risk measures for the control group. The important component of risk that differentiates the two groups is unsystematic risk. Systematic risk is not a useful indicator of firm deterioration over time. Thus, in assessing any information concerning corporate bankruptcy that may be contained in stock market data, Aharony *et al* (1980) concluded that the measure of risk employed is very important.

Aharony, and Swary (1981) examined the effects of the 1970 Amendment to the BHC Act in the USA on the profitability and risk of BHCs using stock market data. The 1970 amendment brought one-bank holding companies (OBHCs) under the control of the Federal Reserve System and permitted multi-bank holding companies (MBHCs) to engage in selected non-bank activities. The amendment constrained the non-bank activities of

OBHCs and allowed MBHCs to expand permissible non-bank activities. The sample included three portfolios of banks with different regulatory status:

(i)33 OBHCs which were unregulated before the 1970 amendment and were brought under regulation by the 1970 act;

(ii)25 MBHCs all of which were subject to the BHC Act prior to December, 1970;

(iii)15 independent banks which serve as a control group.

The null hypothesis to be tested for each bank group was that the 1970 amendment had no influence on their risk and profitability. As a risk measure, the total variance of returns was utilised and the significance of changes in risk was tested using an F-statistic. The total variance of each group bank was partitioned as in Equation 7.8. To examine whether a shift in total risk is caused by group-specific effects or is due to changes in market-wide factors, Aharony *et al* (1981) examined shifts in systematic-risk (β_i) and in the variance of market portfolio [Var(R_m)]. To test for shifts in β_i, the same regression model as in Equation 7.9 was run. The results showed that no significant differences in profitability and no change in the relative risk of any bank group as a result of the enactment of the 1970 amendment was observed. The null hypothesis that the non-bank expansion provisions of the 1970 amendment had no influence on BHCs' risk and profitability was accepted. The findings imply that the BHCs' expansion into non-bank activities occurred during periods of instability in the banking industry as a whole. Furthermore, these risk shifts were found to coincide with shifts in the variance of returns of the market portfolio.

Smirlock (1984) examined the effects of four deposit rate ceiling changes, which occurred during the period 1970-1978, on the solvency risk of commercial banks using stock market data. The sample consists of 17 banks for the 1970 event and 29 banks for the three post-1970 events listed on the NYSE and ASE. Assuming that security returns follow a multivariate normal distribution, Smirlock (1984) estimated the same market model as in Equation 7.10, and the variance of the rates of return on the *j*th stock was partitioned as in Equation 7.8. To test for changes in risk, Smirlock (1984) estimated Equation 7.10 using pre- and post-event period observations and compared the risk characteristics from each regression. The event period was deleted from the estimation period. The empirical results showed that deposit rate ceilings did not affect bank risk and that the removal of these ceilings would not decrease the soundness of the banking system.

Aharony, Saunders, and Swary (1986) investigated the effects of the FRB's October 6th, 1979 change in monetary policy regime on the profitability and risk of large commercial banks as perceived by investors in the capital market. The basic methodology utilised was the 'event study' using the market model. The study examined whether the change in monetary policy regime altered the riskiness of commercial banks over the longer term. The sample consisted of 73 banks, divided into three sub-groups according to size of total assets as at December 31, 1979. Using the weekly rate of return, Aharnoy *et al* (1986) ran the following regression model.

$$R_{jw} = \alpha_j + \beta_{mj} R_{mw} + \beta_{Ij} R_{Iw} + e_{jw} \qquad (7.11)$$

where R_{jw} = rate of return on security j over week w;

R_{mw} = rate of return on the CRSP value weighted index of all common stocks on the New York and American Stock Exchange over week w;

R_{Iw} = the unexpected change in the interest rate on constant maturity 'bonds' over week w orthogonalised with respect to R_{mw} [where $E(R_{Iw})=0$] and estimated as the difference between actual and predicted, where the predicted values were obtained from an ARIMA time series model estimated from past values of the series;

e_{jw} = disturbance term of security j in week w;

$\alpha_j = E(R_{jw}) - \beta_{mj} E(R_{mw}) - \beta_{Ij} E(R_{Iw})$.

The variability of total return (i.e., total risk) on bank stocks was partitioned as below.

$$Var(R_{jw}) = \beta^2_{mj} Var(R_{mw}) + \beta^2_{Ij} Var(R_{Iw}) + Var(e_{jw}) \qquad (7.12)$$

The results indicate that all components of $Var(R_j)$ increased in the period following October 1979. However, the relative importance of these components changed. The most significant change was in the unexpected interest variance component. The results were consistent with a negative relationship between bank returns and unexpected interest-rate changes as well as between returns and rate variability.

Aharony, Saunders, and Swary (1988) analysed the effects of the 1980 DIDMCA in the USA on bank shareholders' returns and risk. The sample included 83 commercial banks and 31 savings & loans (S&Ls). These sample banks were combined into equally weighted portfolios: the 12 money centre banks, the 71 regional banks and all 83 banks, and the 31 S&Ls. To examine the long-term risk changes, Aharony *et al* (1988) estimated the following model.

$$R_{pw} = \alpha_p + \beta_{mp} R_{mw} + \beta'_{mp} D R_{mw} + \beta_{Ip} R_{Iw} + \beta'_{Ip} D R_{Iw} + \hat{e}_{pw} \qquad (7.13)$$

where R_{pw}, R_{mw}, α_p, β_{mp}, β_{Ip}, $\hat{e}_{pw}$ defined as in Equation 7.11 in terms of portfolios;

D = a dummy variable taking values 0 before the event and 1 after the event.

The total risk was also partitioned as same manner in Equation 7.8. The results indicate that the total risk of both the money centre banks and the regional banks increased, while that for S&Ls decreased. Interestingly, while the unexpected interest-sensitivity parameters of thrifts and banks were lower in the post-DIDMCA period, this was offset by an increase in the absolute size of the unexpected interest-rate risk itself.

Table 7.1 summarises the empirical studies reviewed in this section.

7.5 MODEL SPECIFICATION AND ESTIMATION PROCEDURES

To examine the risk effects of the new capital adequacy requirements on the risk level of banking industry, three equally weighted portfolios are constructed as in Chapter 6. Equations 7.1 and 7.2 are estimated in order to obtain coefficient estimates which reflect the systematic risk before and after the announcements of the new capital adequacy requirements.

From Equations 7.1 and 7.2, the total risk can be decomposed into three elements as follows:

$$\Sigma^A_{pp} = (\beta^A_p)^2 \Sigma^A_{mm} + \sigma^A_{pp} \quad \text{and} \quad \Sigma^B_{pp} = (\beta^B_p)^2 \Sigma^B_{mm} + \sigma^B_{pp} \qquad (7.14)$$

<Table 7.1> Measuring the Effects of Events on the Risk of Banks Using Stock Data

Author	Year	Source	Comments
Swary	1980	UMI	-Analysed the effects of non-bank acquisitions of BHCs as well as the effects of FRB's decision on the riskiness of BHCs.
Aharony, Jones and Swary	1980	JOF[1)]	-Compared the characteristics of risk/return measures for bankrupt firms with those of a non-bankrupt firms. -Both total variance and the firm-specific variance behave quite differently between two groups.
Aharony and Swary	1981	JOF	-Examined the effects of the 1970 amendment to the BHC Act on the profitability and risk of BHCs.
Smirlock	1984	JME[2)]	-Evaluated the likelihood effects of the four deposit rate ceiling changes which were occurred during the period 1970-1978, on the solvency risk of large commercial banks.
Aharony, Saunders and Swary	1986	JME	-Investigated the effects of the FRB's change in monetary policy regime on the profitability and risk of large commercial banks.
Aharony, Saunders and Swary	1988	JOBF[3)]	-Evaluated the effects of the 1980 DIDMCA on bank shareholders' risk and return.

Notes: 1)JOF represents Journal of Finance.
2)JME represents Journal of Monetary Economics.
3)JOBF represents Journal of Banking and Finance.

where all terms are defined previously.

The terms $(\beta^A_p)^2\Sigma^A_{mm}$ and $(\beta^B_p)^2\Sigma^B_{mm}$ in Equation 7.14 represent variations caused by market-wide factors, whereas σ^A_{pp} and σ^B_{pp} are due to variables specific to portfolio p. To examine the changes in risk, the estimated variance of returns of each portfolio for each event is compared during observation periods A (before) and B (after the announcements) and Hypotheses 1 to 4 are tested. To test for changes in systematic risk over time, the following regression model is estimated for each portfolio:

$$r_{pt} = \alpha^A_p + \alpha'_p D_{1t} + \beta^A_p r_{mt} + \beta'_p D_{2t} + \varepsilon_{pt} \qquad (7.15)$$

where r_{pt}, r_{mt}, α_p, β_p and ε_{pt} are the same as in Equation 7.1 and 7.2;

$\alpha'_p = (\alpha^B_p - \alpha^A_p)$;

$\beta'_p = (\beta^B_p - \beta^A_p)$;

D_{1t} = a dummy variable taking values 0 (for t=1,...,T) and 1 (for t=T+N+1,...,M);

D_{2t} = a dummy variable taking values 0 (for t=1,...,T) and r_{mt} (for t=T+N+1,...,M).

The t-statistic for the estimated coefficient, β'_p, on D_{2t} can be utilised to test whether any change in systematic risk (measured by the difference between β^B_p and β^A_p) is statistically significant. A significant and negative t-statistic indicates a decrease in β_p and a significant and positive t-statistic indicates an increase in β_p after the announcements of the new capital adequacy requirements.

The estimation procedures which are used are the same as in Chapter 6. Initially, OLS will be used to estimate Equations 7.1 and 7.2 for the three portfolios separately. Since there are indicators of contemporaneous correlation between the estimated residuals for NCBs and RBs (see Chapter 6), the models for NCBs and RBs will then be reestimated using SURE. If evidence of residual autocorrelation is also found in the OLS estimation, appropriate corrections will be incorporated into the SURE estimation , as in Chapter 6.

7.6 DESCRIPTIVE ANALYSIS OF THE DATA

7.6.1 Periods of Analysis

To examine the impact of the new capital regulations on the risk of banking firms, we examine the daily rates of return on the three portfolios during the periods January 3, 1990 - November 30, 1991 (545 observations) for event 1 and January 3, 1992 - October 31, 1992 (230 observations) for event 2. These periods are divided into pre-event (262 observations for event 1; 149 observations for event 2) and post-event (283 observations for event 1; 81 observations for event 2) periods for each event. Table 7.2 shows the periods of analysis and the number of observations for each event. The event periods are excluded from the periods of analysis. As in the conventional event study methodology, that is, 16 trading days are omitted for each event (see Figure 6.2 in Chapter 6).

<Table 7.2> Outline of Analysis Periods

	Pre-Period	Post-Period
[Event 1]		
Period	Jan. 3, 1990 - Nov. 21,1990	Dec. 11, 1990 - Nov. 30, 1991
0 Trading days	262	283
[Event 2]		
Period	Jan. 3, 1992 - July 3,1992	July 24, 1992 - Oct. 31, 1992
0 Trading days	149	81

7.6.2 Descriptive Analysis of the Data

The source of data used for this chapter is the same as in Chapter 6. Table 7.3 shows a number of descriptive statistics. Since the main objective in this chapter is comparative analysis of the data for the pre- and post-announcement periods, Table 7.3 is set out to allow suitable comparisons. Table 7.3 shows a number of interesting results. For event 1, the values of the means, minima and maxima show that the extent of investors' losses was smaller during the post-announcement period. The standard deviation suggests that the extent of dispersion of rates of return on each portfolio was also smaller during the post-announcement period. We will test later whether or not this risk reduction is significant. However, as before, the skewness and kurtosis coefficients indicate that the data are non-normal.

For event 2, the mean values show that investors realised gains during the post-announcement period. However, the standard deviation for each portfolio indicates that the rates of return on each portfolio during the post-announcement period were more widely dispersed than those for the pre-announcement period. This implies that the risk was relatively greater during the post-announcement period. We will test the significance of this increase in risk later. Although the skewness coefficients were smaller during the post-announcement period, the distribution of the samples is still far from normality.

<Table 7.3> Descriptive Statistics for r_{mt} and r_{pt} (p=1,2,3)

Variable	Mean	Std. Dev.	Skew.	Kurt.	Minimum	Maximum	Cases
[Event 1]							
KOSPI							
0 Pre	-0.00116	0.01851	1.104	10.747	-0.08664	0.11720	262
0 Post	-0.00042	0.01313	0.527	6.123	-0.04328	0.05919	283
CBs							
0 Pre	-0.00100	0.01963	0.685	3.512	-0.04670	0.04968	262
0 Post	-0.00037	0.01607	0.527	4.117	-0.04777	0.04653	283
NCBs							
0 Pre	-0.00085	0.01911	0.696	4.120	-0.06585	0.05367	262
0 Post	-0.00017	0.01549	0.604	4.774	-0.04939	0.05155	283
RBs							
0 Pre	-0.00113	0.02079	0.498	3.379	-0.05577	0.05325	262
0 Post	-0.00053	0.01704	0.468	3.565	-0.04959	0.04625	283
[EVENT 2]							
KOSPI							
0 Pre	-0.00088	0.01296	0.443	3.195	-0.03056	0.04093	149
0 Post	0.00212	0.01849	0.391	2.810	-0.03585	0.04363	81
CBs							
0 Pre	-0.00114	0.01972	0.535	3.268	-0.04346	0.04937	149
0 Post	0.00159	0.02231	0.406	2.709	-0.04385	0.04729	81
NCBs							
0 Pre	-0.00118	0.01880	0.473	3.287	-0.04400	0.05071	149
0 Post	0.00178	0.02163	0.382	2.829	-0.04420	0.04689	81
RBs							
0 Pre	-0.00113	0.02110	0.566	3.192	-0.04513	0.05230	149
0 Post	0.00145	0.02338	0.366	2.614	-0.04732	0.04951	81

Notes: 1) 'Pre' and 'Post' represent the Pre- and Post-announcement periods, respectively.
2) Mean, Minimum and Maximum are in logs.

7.7 CAPITAL ADEQUACY REQUIREMENTS AND RISK EFFECTS

7.7.1 The Estimation Results

Table 7.4 shows the OLS estimation results. For event 1, the estimation results for the three portfolios are plagued by the existence of heteroscedasticity during both the pre- and post-announcement periods. The normality assumption is also violated at the 5% signifiance level. On the other hand, no evidence of residual autocorrelation is found, and the linearity assumption is accepted. For event 2, most of the classical assumptions are accepted. The normality assumption is violated for CBs and NCBs during the pre-announcement period, but accepted in all cases during the post-announcement period. The D.W. statistics for CBs and RBs fall into the zone of indecision during the post-announcement period.

<Table 7.4> The OLS Estimation Results for Each Event

	Pre-period			Post-period		
	CBs	NCBs	RBs	CBs	NCBs	RBs
[Event 1]						
α	-0.0001	0.0000	-0.0002	0.0001	0.0002	-0.0001
(t-statistic)	(-0.152)	(0.006)	(-0.255)	(0.110)	(0.471)	(-0.136)
β	0.7553*	0.7394*	0.7664*	1.0169*	0.9752*	1.0460*
(t-statistic)	(16.362)	(16.544)	(15.052)	(25.055)	(24.649)	(22.825)
R^2(Adj.)	50.54	51.09	46.36	68.97	68.26	64.84
F Statistic	267.70*	273.70*	226.56*	627.74*	607.57*	520.99*
D.W.	2.06	1.97	2.08	2.07	1.98	2.06
<Diag. Stat.>						
LM	0.26	0.26	0.42	0.35	0.04	0.34
RESET	1.24	0.92	1.28	0.00	0.14	0.05
HET	152.73*	154.75*	125.20*	7.98*	8.30*	6.17*
JB	2211.2*	1900.0*	1897.8*	159.1*	220.7*	80.0*
[Event 2]						
α	0.0000	-0.0001	0.0001	-0.0007	-0.0004	-0.0009
(t-statistic)	(0.028)	(-0.096)	(0.080)	(-0.664)	(-0.406)	(-0.756)
β	1.3129*	1.2466*	1.3592*	1.0905*	1.0476*	1.1207*
(t-statistic)	(20.709)	(20.385)	(18.395)	(18.722)	(17.881)	(17.006)
R^2(Adj.)	74.30	73.69	69.51	81.37	79.93	78.27
F Statistic	428.86*	415.54*	338.38*	350.49*	319.73*	289.20*
D.W.	1.93	1.87	1.98	1.65	1.86	1.61
<Diag. Stat.>						
LM	0.15	0.54	0.01	1.90	0.18	2.50
RESET	0.05	0.98	0.11	0.66	0.28	0.79
HET	0.69	0.00	0.62	2.40	2.52	1.39
JB	2.19*	19.41*	3.52	0.41	0.83	4.22

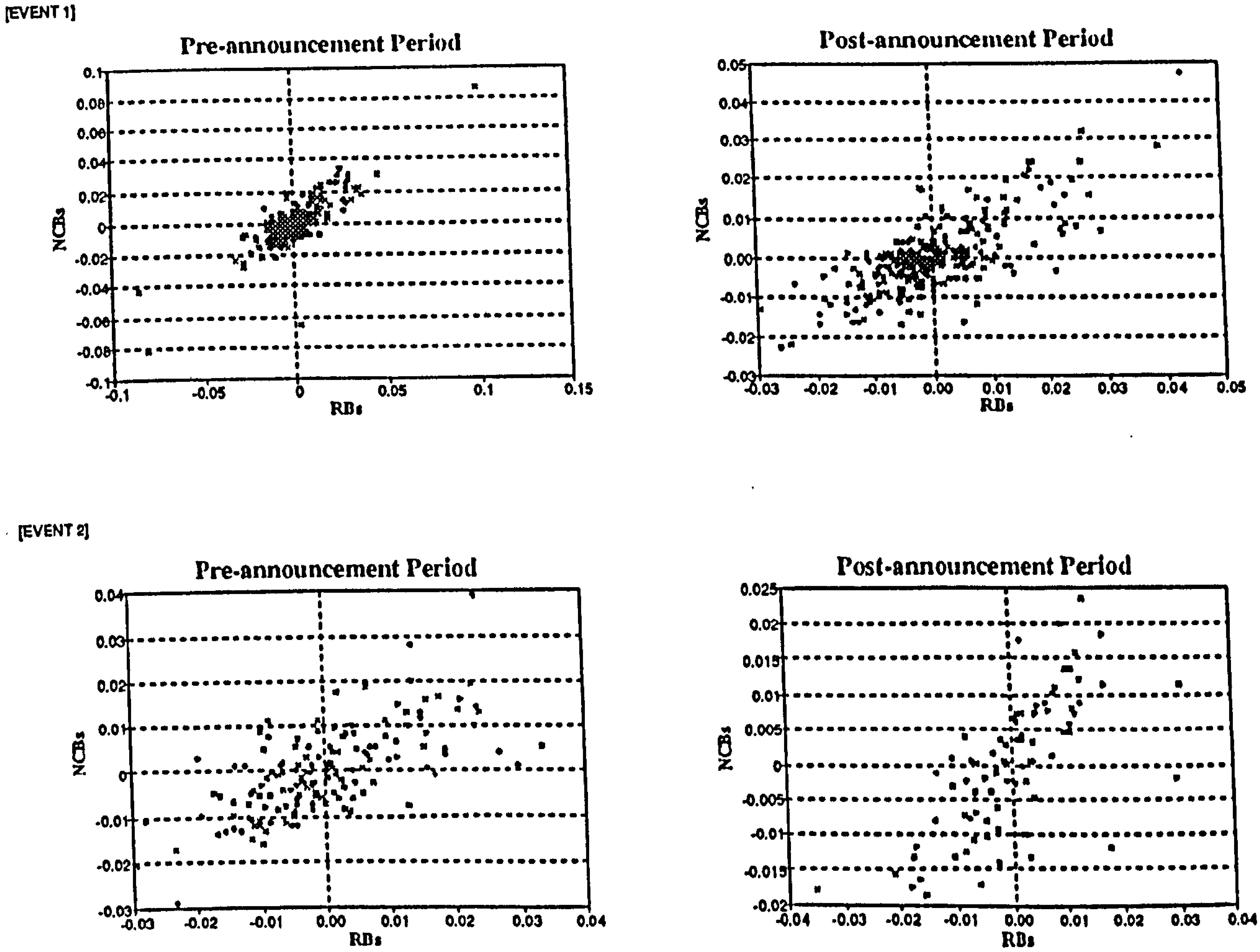
Notes: 1) '*' represents significant at the 0.05 level.
2)LM represents Lagrange Multiplier test of residual serial correlation.
3)RESET, HET and JB are the same as defined in Section 6.7.1.1.
4)Diag. Stat. represents Diagnostic Statistics.

<Table 7.5> Critical Values for D.W. Statistics

	D.W. Statistics ($\alpha = 0.05$)			
	d_U	d_L	$4 - d_U$	$4 - d_L$
[Event 1]				
Pre-period[1)]	1.758	1.778	2.242	2.222
Post-period[1)]	1.758	1.778	2.242	2.222
[Event 2]				
Pre-period[2)]	1.687	1.720	2.313	2.280
Post-period[3)]	1.618	1.667	2.382	2.333

Notes: 1)Values are for 200 observations.
2), 3)Calculated by interpolation.

<Figure 7.1> Correlation between the Residuals of Two Portfolios (NCBs & RBs)



However, LM tests for the residual autocorrelation suggest that no problematic autocorrelation is present. The linearity and homoscedasticity assumptions are accepted in all cases. As before, visual inspection of the cross-equation residual correlation coefficients suggested that contemporaneous correlation exists between NCBs and RBs (see Figure 7.1). Therefore, re-estimation is needed to correct the above statistical problems.

To do this, SURE is applied for NCBs and RBs in order to correct the contemporaneous correlation problems between two portfolios. Although the re-estimation provides more reliable standard errors and, therefore, t-statistics than the OLS estimation, the parameters estimated are unchanged. The re-estimation results are reported in Table 7.6. The reported t-statistics in Table 7.6 are slightly different from those shown in Table 7.4.

<Table 7.6> The SURE Estimation Results for Each Event

	Pre-period		Post-period	
	NCBs	RBs	NCBs	RBs
[Event 1]				
a	0.0000	-0.0002	0.0002	-0.0001
(t-statistic)	(0.006)	(-0.256)	(0.472)	(-0.136)
b	0.7394*	0.7664*	0.9752*	1.0460*
(t-statistic)	(16.607)	(15.110)	(24.736)	(22.906)
[Event 2]				
a	-0.0001	0.0001	-0.0004	-0.0009
(t-statistic)	(-0.096)	(0.080)	(-0.411)	(-0.766)
b	1.2466*	1.3592*	1.0476*	1.1207*
(t-statistic)	(20.523)	(18.520)	(18.106)	(17.220)

Note: '*' represents significant at the 0.05 level.

Table 7.7 summarises the estimated risk components for each portfolio for each event. For event 1, the variances of the rates of return were lower after the announcement of the new capital adequacy requirements. The variances of firm-specific factors were also smaller during the post-announcement period. However, the systematic risk coefficients (β^i_p) were increased. In contrast to event 1, for event 2 the variances of the rates of return were increased after the announcement of the new capital adequacy requirements for all three portfolios. However, the measures of systematic risk were decreased after the announcement of the new RAR. The above results reveal contrasting patterns between the two events. Based on the above analysis, we will formally test whether or not the risk of the banking industry was changed after the announcement of the new capital adequacy requirements in the following section.

<Table 7.7> Estimated Risk Components for Each Event

	Σ^{i}_{pp}	β^{i}_{p}	Σ^{i}_{mm}	σ^{i}_{pp}
[EVENT 1]				
CBs				
i=A	0.000385	0.7553	0.000343	0.000191
i=B	0.000258	1.0169	0.000172	0.000080
NCBs				
i=A	0.000365	0.7394	0.000343	0.000177
i=B	0.000240	0.9752	0.000172	0.000076
RBs				
i=A	0.000432	0.7664	0.000343	0.000230
i=B	0.000290	1.0460	0.000172	0.000101
[EVENT 2]				
CBS				
i=A	0.000389	1.3129	0.000168	0.000099
i=B	0.000498	1.0905	0.000342	0.000093
NCBs				
i=A	0.000353	1.2466	0.000168	0.000092
i=B	0.000468	1.0476	0.000342	0.000092
RBs				
i=A	0.000445	1.3592	0.000168	0.000134
i=B	0.000547	1.1207	0.000342	0.000116

Notes: 1) σ^{i}_{pp} for CBs was calculated using standard errors from the OLS.
2) σ^{i}_{pp} for NCBs and RBs were calculated using standard errors from the SURE.

7.7.2 Hypothesis Tests

7.7.2.1 Test Statistics

Our hypothesis tests are carried out by using the F-test for the equality of two variances.

To test $H_0: \Sigma^A_{pp} = \Sigma^B_{pp} = \Sigma_{pp}$, we calculate the F-statistic:

$$F = \frac{\Sigma^A_{pp}}{\Sigma^B_{pp}} \qquad (7.16)$$

where $\Sigma^A_{pp} = \Sigma^{n_A}_{t=1} (r_{pt} - \bar{r}^A_p)^2/(n_A - 1)$ and $\bar{r}^A_p = \Sigma^{n_A}_{t=1} (r_{pt}/n_A)$;

$\Sigma^B_{pp} = \Sigma^{n_B}_{t=1} (r_{pt} - \bar{r}^B_p)^2/(n_B - 1)$ and $\bar{r}^B_p = \Sigma^{n_B}_{t=1} (r_{pt}/n_B)$.

Under H_0, F-statistic has an F-distribution with degrees of freedom $(n_A - 1)$ and $(n_B - 1)$.

7.6.2.2 Test of Hypothesis 1 ($H_0: \Sigma^A_{pp} = \Sigma^B_{pp} = \Sigma_{pp}$): Changes in the Variance of Portfolio Returns

We begin by comparing the variance of overall returns on the three portfolios (i.e., CBs, NCBs and RBs) between the pre- and post-announcement periods for each event. The test results are reported in Table 7.8.

As discussed earlier (see Section 7.5.2), for event 1, Table 7.8 shows that the variances of the rates of return on all three portfolios were smaller during the post-announcement period than during the pre-announcement period. The F-statistics indicate that changes in total risk are significant at the 0.05 level, which means that the level of total risk of banks was decreased after the announcement of the new capital standards. In contrast to event 1, for event 2 the variances of the rates of return for all three portfolios were higher during the post-announcement period. However, these changes were statistically insignificant. Therefore, for event 1, Hypothesis 1 is rejected, which implies that the level of risk for Korean banks was changed after the announcements of the new capital adequacy requirements. However, for event 2, Hypothesis 1 is accepted, which implies that the new capital regulations did not have an influence on the total risk of banks.

<Table 7.8> Test Results for Total Risk Shifts

	Cases	Mean[1] (r^i_p)	Variance (Σ^i_{pp})	F-statistic[2]
[Event 1]				
CBs				
i=A	262	-0.00100	0.000385	1.4922*
i=B	283	-0.00037	0.000258	
NCBs				
i=A	262	-0.00085	0.000365	1.5208*
i=B	283	-0.00017	0.000240	
RBs				
i=A	262	-0.00113	0.000432	1.4897*
i=B	283	-0.00053	0.000290	
[Event 2]				
CBs				
i=A	149	-0.00114	0.000389	1.2802
i=B	81	0.00159	0.000498	
NCBs				
i=A	149	-0.00118	0.000353	1.3258
i=B	81	0.00178	0.000468	
RBs				
i=A	149	-0.00113	0.000445	1.2292
i=B	81	0.00145	0.000547	

Note: 1)Mean represents the mean of rates of return.
2) In all cases, numerator has the larger variance and denominator has the smaller variance.
3) '*' represents significant at the 0.05 level. The critical value for event 1, $F^{0.05}_{(261,282)}$, is 1.14 and that for event 2, $F^{0.05}_{(80,148)}$, is 1.38.

7.7.2.3 Test of Hypothesis 2 (H_0: $\Sigma^A_{mm} = \Sigma^B_{mm} = \Sigma_{mm}$): Changes in the Variance of Market Returns

To examine whether changes in total risk for Korean banks were due to the announcement of the new capital requirements or due to changes in the variance of returns on the market portfolio, we tested for changes in risk on the market portfolio for each event. Test results are reported in Table 7.9. Table 7.9 shows that the variance of market portfolio changed significantly after both events. For event 1, the variance of KOSPI was significantly smaller during the post-announcement period than during the pre-announcement period, whereas for event 2 the variance of KOSPI was significantly higher during the post-announcement period. Therefore, we may conclude that at least part of the changes in total bank risk are due to changes in the level of risk for the market as a whole.

<Table 7.9> Test Results for Market Risk Shifts

	Cases	Mean[1](r^i_m)	Variance (Σ^i_{mm})	F-statistic[2]
[Event 1]				
KOSPI				
i=A	262	-0.00116	0.000343	1.9942*
i=B	283	-0.00042	0.000172	
[Event 2]				
KOSPI				
i=A	149	-0.00088	0.000168	2.0357*
i=B	81	0.00212	0.000342	

Note: 1)Mean represents the mean of rates of return.
2) In all cases, numerator has the larger variance and denominator has the smaller variance.
3) '*' represents significant at the 0.05 level. The critical value for event 1, $F^{0.05}_{(261,282)}$, is 1.14 and that for event 2, $F^{0.05}_{(80,148)}$, is 1.38.

7.7.2.4 Test of Hypothesis 3(H_0: $\beta^A_p = \beta^B_p = \beta_p$): Changes in Sensitivity to Market Returns

To examine changes in the sensitivity of portfolio returns to variations in market returns, Equation 7.15 was estimated for all three portfolios. The model was estimated using 545 trading days of data for event 1 and 230 trading days of data for event 2. As discussed in Section 7.4, the t-statistic on the coefficient, β'_p, can be utilised to test for shifts in market sensitivity. The tests are run using the OLS results for CBs and the SURE results for NCBs and RBs. The results are reported in Table 7.10.

For event 1, Table 7.10 shows that the systematic risk coefficients of all three portfolios increased and that the increases are highly significant. This implies that portfolio returns became more sensitive to a given change in market returns during the post-announcement period. In contrast, for event 2, the systematic risk coefficients for all three portfolios decreased and the reductions are all highly significant. This indicates that portfolio returns became less sensitive to a given change in market returns after the announcement of the RAR. Hypothesis 3 is therefore rejected. Portfolio returns became more (for event 1) or less (for event 2) sensitive to market returns after the announcement of the new capital adequacy requirements.

<Table 7.10> Test Results for Systematic Risk Shifts Using the OLS & SURE

	Event 1			Event 2		
	CBs	NCBs	RBs	CBs	NCBs	RBs
α_p	-0.0001	0.0000	-0.0002	0.0000	-0.0001	0.0001
(t-statistic)	(-0.181)	(0.008)	(-0.304)	(0.028)	(-0.096)	(0.082)
α'_p	0.0002	0.0002	0.0002	-0.0007	-0.0004	-0.0010
(t-statistic)	(0.190)	(0.249)	(0.145)	(-0.539)	(-0.274)	(-0.637)
β_p	0.7553*	0.7394*	0.7664*	1.3129*	1.2466*	1.3592*
(t-statistic)	(19.571)	(19.819)	(17.937)	(20.974)	(20.532)	(18.977)
β'_p	0.2616*	0.2358*	0.2796*	-0.2224*	-0.1990*	-0.2384*
(t-statistic)	(4.022)	(3.752)	(3.883)	(-2.571)	(-2.372)	(-2.409)
R^2(Adj.)[1]	58.21	(58.16)	(54.06)	77.18	(76.31)	(72.96)
F Statistic[1]	253.7	(253.1)	(214.4)	259.2	(246.9)	(207.0)
D.W.	2.06	1.97	2.07	1.84	1.88	1.87

Notes: 1) Numbers in parentheses were calculated using the OLS. This numbers only gave limited information because adjusted R^2 for individual equations are actually meaningless in the SURE (see Greene,1993).
2) '*' represents significant at the 0.05 level.

7.7.2.5 Test of Hypothesis 4(H_0: $\sigma^A_{pp} = \sigma^B_{pp} = \sigma_{pp}$): Changes in Unsystematic Risk

The third component of risk, σ_{pp}, is analysed in order to examine whether or not any risk changes are captured by this term. The test results are reported in Table 7.11. For event 1, Table 7.11 shows that unsystematic risk (i.e., the variance of residuals) for all three portfolios was significantly decreased after the announcement of the new capital adequacy requirements. Therefore, Hypothesis 4 is rejected, implying that the new capital adequacy regulations did change unsystematic risk of Korean banks. In contrast, for event 2, Table 7.11 shows that changes in unsystematic risk for all three portfolios were not significant, implying that the introduction of the new RAR did not affect the risk profile of the Korean banks.

<Table 7.11> Test Results for Unsystematic Risk Shifts

	Cases	Mean[1](ε^i_p)	Variance(σ^i_{pp})	F-statistic[2]
[Event 1]				
CBs				
i=A	262	-0.00000	0.000190	2.3750*
i=B	283	-0.00000	0.000080	
NCBs				
i=A	262	0.00000	0.000177	2.3289*
i=B	283	-0.00000	0.000076	
RBs				
i=A	262	-0.00000	0.000230	2.2772*
i=B	283	-0.00000	0.000101	
[Event 2]				
CBs				
i=A	149	-0.00000	0.000099	1.0645
i=B	81	0.00000	0.000093	
NCBs				
i=A	149	0.00000	0.000092	1.0000
i=B	81	-0.00000	0.000092	
RBs				
i=A	149	0.00000	0.000134	1.1552
i=B	81	-0.00000	0.000116	

Note: 1)Mean represents the mean of the residuals.
2) In all cases, numerator has the larger variance and denominator has the smaller variance.
3) '*' represents significant at the 0.05 level. The critical value for event 1, $F^{0.05}_{(260,281)}$, is 1.14 and that for event 2, $F^{0.05}_{(79,147)}$, is 1.38.

7.7.2.6 Synthesis: Shifts in Relative Importance of Risk Components

In the preceding analysis, we have found that offsetting movements between three components of total risk have taken place between the pre- and the post-announcement periods for both events. Table 7.12 based on Equation 7.14 shows the overall impact of these offsetting movements on total risk and identifies shifts in the relative importance of the three risk components.

For event 1, the reductions in total risk were mainly due to the reductions in Σ_{mm} and σ_{pp}. However, the significant increases in market sensitivity (β_p) partly offset these effects. The relative importance of the systematic and unsystematic components of risk was changed. The relative importance of systematic risk (which reflects the market-wide movements)

<Table 7.12> Shifts in Relative Importance of Risk Components for Each Event

	Σ^i_{pp}	=	$(\beta_p)^2 \Sigma^i_{mm}$	+	σ^i_{pp}
[Event 1]					
CBs					
i=A	0.000385	=	0.5704 x 0.000343	+	0.000190
(%)	(100.00%)	=	(50.65%)	+	(49.35%)
i=B	0.000258	=	1.0341 x 0.000172	+	0.000080
(%)	(100.00%)	=	(68.99%)	+	(31.01%)
NCBs					
i=A	0.000365	=	0.5467 x 0.000343	+	0.000177
(%)	(100.00%)	=	(51.51%)	+	(48.49%)
i=B	0.000240	=	0.9510 x 0.000172	+	0.000076
(%)	(100.00%)	=	(68.33%)	+	(31.67%)
RBs					
i=A	0.000432	=	0.5874 x 0.000343	+	0.000230
(%)	(100.00%)	=	(46.76%)	+	(53.24%)
i=B	0.000290	=	1.0941 x 0.000172	+	0.000101
(%)	(100.00%)	=	(64.83%)	+	(34.83%)
[Event 2]					
CBs					
i=A	0.000389	=	1.7237 x 0.000168	+	0.000099
(%)	(100.00%)	=	(74.55%)	+	(25.45%)
i=B	0.000498	=	1.1892 x 0.000342	+	0.000093
(%)	(100.00%)	=	(81.53%)	+	(18.67%)
NCBs					
i=A	0.000353	=	1.5540 x 0.000168	+	0.000092
(%)	(100.00%)	=	(73.94%)	+	(26.06%)
i=B	0.000468	=	1.0975 x 0.000342	+	0.000092
(%)	(100.00%)	=	(80.13%)	+	(19.66%)
RBs					
i=A	0.000445	=	1.8474 x 0.000168	+	0.000134
(%)	(100.00%)	=	(69.66%)	+	(30.11%)
i=B	0.000547	=	1.2560 x 0.000342	+	0.000116
(%)	(100.00%)	=	(78.61%)	+	(21.21%)

was higher, while that for unsystematic risk (which may reflect the effect of regulatory change) was lower after the announcement of the new capital adequacy requirements. In contrast, for event 2, the measures of total risk were, although insignificant, higher after than before the announcement of the new RAR. These increases mainly emanated from increases in Σ_{mm}. However, the significant reductions in market sensitivity (β_p) largely offset these effects, making the overall changes in total risk insignificant. Unsystematic risk, σ_{pp}, was almost unchanged in this case. However, the relative importance of the systematic and unsystematic components of total risk was obviously altered. Once again, the relative importance of systematic risk increased, whereas that of unsystematic risk was reduced. These findings may imply the new capital adequacy regulations led to reductions in the relative importance for unsystematic risk of banks after both events. However, since these effects were largely offset by changes in systematic risk, the level of total risk of Korean banks appears to be mainly influenced by the market-wide factors, rather than by the regulatory changes.

7.8 CONCLUSION

This chapter has examined the impact of the new capital adequacy requirements of risk of banks measured by the variability of rates of return on stocks. To this end, three portfolios were constructed and the OLS and SURE estimation procedures were applied to model the relationships between portfolio returns and market returns in each case. Total risk was measured by the variance of rates of return on each portfolio. This measure of total risk was further decomposed into three constituents following the standard risk-partition procedure. To test for possible changes in overall risk and within this decomposition, the estimated components for the pre- and post-announcement periods were compared.

The test results suggest that the new capital adequacy requirements did have an influence on bank risk as a whole (i.e., banking industry level). For event 1, market risk was significantly lower during the post-announcement period, but the sensitivity of portfolio returns to market returns was greatly increased, implying little net change in the market contribution to overall risk. Unsystematic risk was significantly lower during the post-announcement period, so total risk was reduced. For event 2, market risk was significantly higher during the post-announcement period. Since this increase in market risk was largely offset by the significant reduction in sensitivity of portfolio returns to market returns, and since there was little change in unsystematic risk, the change in total risk was insignificant. Finally, the level of bank risk appears to be affected primarily by market-wide factors, rather than by the regulatory changes. Although the results for event 1 provide some evidence in support of Lackman's hypothesis, we fail to find any evidence to support this hypothesis for event 2.

However, caution should be made in the interpretation of these conclusions. Our findings may be affected or distorted by the simultaneous impact of structural deregulation and supervisory re-regulation. As discussed earlier, since the early 1980s, the banking and financial markets have been structurally deregulated and at the same time, supervision or prudential regulation has been enhanced. The simultaneity of these two seemingly opposing policy make it difficult to measure the separate impact of each policy on banks. We tried to measure the likely changes in risk, comparing the variance of rates of return for pre-period to that for post-announcement period. However, a lot of new information or new events may influence, with enhancing or offsetting way, the stock prices for each period. For instance, the effects of structural deregulation may offset the effects of capital adequacy regulations and *vice versa*. This simultaneity of two seemingly opposing supervisory policies may make the researcher over- or underestimate the impact of the new capital adequacy regulations on bank risk. These two, perhaps, counteracting forces were both in operation during the period of this study. The effects may be difficult to disentangle.

In addition, as discussed in Chapter 6, the failure to detect any impact of the new capital adequacy regulations on bank risk, in particular, for event 2 does not necessarily lead to the conclusion that the new capital regulations were not effective in Korea. Since the RARs for all Korean banks were well above the new standards, capital market perceived that the new RAR would not lead banks towards more/excessive risk-taking in order to compensate for the likely reductions in profitability caused by the new capital adequacy requirements (see Chapter 5).

CHAPTER 8

CONCLUSIONS, POLICY IMPLICATIONS AND LIMITATIONS

8.1 INTRODUCTION

Despite the importance of bank capital adequacy in an era of wide-ranging structural deregulation and in an increasingly competitive financial environment, there appears to be little empirical research on capital adequacy in the Korean banking system. This gap in research and understanding has stimulated the researcher to conduct the preceding theoretical and empirical research on capital adequacy in the Korean banking system. This study has examined for the first time the impact of the new capital adequacy requirements on the risk-return profile of Korean banks.

This final chapter attempts to summarise the main findings and conclusions, the related policy implications, and limitations of this study. The remainder of this chapter is organised in the following manner. Section 2 summarises the main conclusions and overall assessment, and Section 3 provides some policy recommendations drawn by this research. Section 4 enumerates the main limitations involved in this thesis.

8.2 CONCLUSIONS

The primary aim of this study is to analyse the impact of the higher capital adequacy requirements and the imposition of the new RAR on the risk-return profile of Korean banks. Bank supervision is concerned fundamentally with bank safety, the stability of the financial system and depositor protection. However, bank safety and the stability of the banking and financial system depend crucially upon the public confidence that depositors and other creditors have in the banks and banking system. Since it is a generally accepted view that bank capital acts as a short-term buffer or cushion to absorb unexpected (and essentially unpredictable) losses arising from all of the risks which banks assume in their operations, bank capital serves as a critical element in generating public confidence in a bank's ability to handle uncertainty and as the ultimate defence against such losses.

In this context, capital adequacy regulations by the supervisory authorities have become an increasingly important policy tool to help curb the risk exposure that a bank can assume, thereby helping to preserve public confidence in a bank and the banking system as a whole. This role of capital adequacy regulations is particularly important in Korea. As discussed in Chapters 1 and 2, since the early 1980s various deregulation measures were implemented in the financial services industry in Korea. However, this financial deregulation carries with it the risk of instability in the short-term and, therefore, requires a reassessment of the existing balance between market forces and supervisory policies in order to incorporate the increasing role of the market into supervisory policies. Therefore, the impact of capital adequacy requirements on the banking industry was analysed in the context of the contemporary deregulatory environment.

First, the banking and financial system in Korea (Chapter 2) was analysed in order to identify its main, distinguishing characteristics and to establish the relative importance of banks and banking within the Korean financial and economic system. Financial deepening and modernisation have brought about a number of significant changes in the structure of the financial sector. Perhaps the most significant developments in Korea's financial system have been the rapid growth of credit extended by the NBFIs and direct financing through capital markets. The rapid growth of the NBFIs may be attributed to the relatively free regulatory environment in which they have been allowed to operate. Their competitive edge and managerial autonomy allowed these institutions to grow rapidly by encroaching on the market share of the DMBs. Since the mid-1980s, however, the interest rate advantage has declined, and this, together with the financial reform toward universal banking, has enabled the DMBs to regain their competitiveness.

Second, to provide a basic framework to evaluate the impact of supervision policy on banks, the present supervisory system in Korea (Chapter 3) was analysed. The analysis was centred on examining the reasons why bank supervision is desirable and the forms and style it may take. In this context, we examined all the different kinds of regulations pertaining to a bank. The reason why we examined these regulations and regulatory regimes was that the supervisory framework is a part of the broader regulatory framework to which banks are subject, and which may sometimes conflict with or complement supervisory targets and instruments. Although theories such as the public interest theory, the capture theory, and the new economic theory seek to explain the rationale of bank supervision, they explain only some aspects of regulation, and there is no generally accepted explanation as yet. However, protecting the public against financial disruption and curbing the contagion effect and systemic instability emanating from the existence of specific market failures, such as information asymmetries and negative externalities, appear to be the strongest economic rationales for bank supervision. The rationale for bank supervision in Korea is basically the same, and the broader objectives are to 'contribute to the national economic progress through ensuring the soundness of banking operations, protecting depositors and maintaining the credit system'. Under this rationale and objectives, the forms, style, and instruments of supervision and the present supervisory system in Korea have been analysed. From this analysis, the task of the OBS is to achieve a proper balance between supervisory policy and market discipline in order to help achieve the benefits sought by the recent, extensive structural deregulation.

Having analysed the market in which banks operate and the respective regulatory constraints, and bearing in mind that bank supervision operates on the performance (return) and condition (risk) of banks, the performance and condition of Korean banks (Chapter 4) based on accounting data were analysed in order to provide a preliminary financial picture of Korean banks. Some specific, relevant observations were made. As for return measures, the ROE of the Korean banks reached a peak in 1984, and since 1984 has gradually decreased with some fluctuation. Second, RBs achieved significantly higher performance in terms of ROA, PM, AU and NIM than NCBs. Third, the EM of the Korean banks has drastically decreased over time. Fourth, NCBs are more effective in overhead control than RBs, but the overall costs of NCBs are slightly higher than those of RBs. Finally, RBs have more ability to cover their interest expenses than NCBs.

Regarding risk measures, analysing the variance of ROE as an overall risk measure revealed that ROE has fluctuated widely, but the magnitude of variance has gradually decreased. It was also shown that capital ratios rose sharply in recent years, which implies that the Korean banks became safer in terms of their capital cushion against unexpected losses. Examining supplemental risk measures revealed that RBs have the same ability to meet short-term liquidity needs as NCBs, while the traditional loan/deposit ratio indicates that RBs take less risk than NCBs. Furthermore, RBs have a more stable funding base than NCBs. A second characteristic noted in the area of interest-rate risk was that the Korean banks have a positive funds gap (6 month gap). Third, analysing credit risk revealed that the Korean banks allocated more funds for loan loss provisions when they made more profits than when they relatively earned less.

The above performance (return) and condition (risk) analysis confirmed the fundamental trade-off between return and risk in Korean banking. In addition, the ROE decomposition analysis was conducted in order to explore the determinants or sources of ROE and to identify high performance banks. Some characteristics of high performance US banks identified by Ford and Olson (1978) were found in the Korean banks.

To evaluate the impact of capital adequacy requirements on the Korean bank's risk-return profile, a theoretical framework (Chapter 5) was provided. The emphasis was examining the nature of capital adequacy regulations, the micro-finance foundations of capital adequacy, the impact of capital adequacy regulations on a bank's capital structure and portfolio composition, and the role of the market in evaluating the impact on banks of capital adequacy regulations. The review of theoretical and empirical studies revealed that the impact of capital adequacy regulation on banks' capital and risk-level decisions were somewhat contradictory and model-specific. However, recent empirical studies indicate that regulation of bank capital affects banks' risk-return profiles.

Based on the earlier analysis, Chapters 6 and 7 evaluated the likely impact of the new capital adequacy regulations on banks' risk and return using stock market data. An event study methodology was developed to identify the wealth gains and losses in the vicinity of the announcements of the new capital adequacy regulations and to examine changes in risk. Descriptive analysis confirmed Fama's findings (1976) on the distribution of daily stock returns: that is, the daily stock returns of Korean banks are not normally distributed.

The impact of the new capital regulations on shareholders' wealth was examined in two ways. As a first step, the OLS was applied to estimate a set of single equation models. Although some serious statistical problems were detected during estimation, the results indicated strongly that the new capital standards did not have an impact on bank shareholders' wealth. The SURE estimation results, which are more efficient than those produced by using the OLS, also suggested that the new capital adequacy requirements did not have an influence on bank shareholders' wealth. In addition, no intra-industry effects were found.

To examine the impact of the new capital adequacy requirements on bank risk, three portfolios were constructed and the OLS and SURE estimations were applied to these portfolios in order to obtain the parameters. To test the possible shifts in risk, the estimated risks were compared pre- and post-announcement periods. The test results suggested that the new capital adequacy requirements did have an influence on bank risk for event 1. However, the level of bank risk appears to be affected primarily by market-wide factors, rather than by the regulatory changes. Although the results for event 1 provided some evidence in support of Lackman's (1986) hypothesis, we failed to find any evidence to support this hypothesis for event 2.

In conclusion, the empirical results indicate that the imposition of the new capital adequacy requirements did not have an influence on bank shareholders' wealth, whereas they did have some partial influence on banks' risk, at least perceived by investors in Korea. However, failure to detect any impact of the new capital regulations does not necessarily lead to the conclusion that capital adequacy requirements were not effective in Korea. As discussed in Chapter 2, the Korean stock market became bearish since the end of 1989. One policy of the Korean government to boost the stock market was to restrict new equity issues of big firms including banks in an attempt to restore equilibrium between the demand and the supply of stocks. Therefore, the OBS regulated banks' new equity issues. In addition, most banks satisfied the new capital standards for event 1. As for event 2, all banks had much higher capital ratios than required under the new RAR (see Chapter 5) standards. Since the RAR for Korean banks were well above the new standards, investors perceived that the new RAR would not lead the Korean banks towards more/excessive risk-taking in order to compensate the likely decreases in profitability due to the imposition of the new capital adequacy requirements (see Chapter 5).

8.3 POLICY IMPLICATIONS

The earlier analyses and conclusions suggest some possible policy implications. They are as follows.

(i) *Re-establishment of risk monitoring system.*

Financial deregulation to enhance efficiency has been implemented since the early 1980s. Furthermore, the speed and scope of this structural deregulation are expected to be faster and wider in the 1990s. All of these developments in financial markets imply that government involvement in economic matters gradually decreased and the market has increasingly played a more important role in the decision-making of financial institutions. In other words, market forces have increasingly affected the risk-return trade-off of financial institutions, and, therefore, cannot be ignored.

As discussed earlier, however, the structural deregulation carries with it the risk of instability in the short run since competition between banks (including domestic and foreign banks) may become more intensified and unpredictable than that in the previous, more tightly regulated market. In other words, deregulation is likely to intensify the competition between banks, in particular during the early stages (i.e., 'learning period') of adjustment of banking portfolios; and, in turn, these increased competitive pressures may lead the financial system towards temporary 'overshooting behaviour' (see Gardener in Norton, 1991; and Llewellyn, 1986) as these portfolio adjustments take place. During this 'learning period,' banks are likely to expand their investment opportunities and, therefore, the efficient frontier of banks will be shifted outward (Sinkey, 1992). Banks may face two situations. One is that the opportunity to expand into new activities may serve to reduce risk through diversification and, at the same time, to increase expected returns without more/excessive risk-taking. Another is a case that banks expand their investment opportunities into almost (or totally) unknown fields in order to increase market power and, therefore, may be forced to take excessive risks and face severe competition with other financial firms which already operate in this area. This is the case that the risk of the banks and the banking system overall increases, at least temporarily, in the process of financial deregulation.

Under a deregulatory environment, therefore, market risks, like interest-rate risk and foreign exchange rate risk, appear to increase. In particular, foreign exchange risk has already been experienced by some Korean banks, due to highly volatile exchange rates. The Korean banks, which have not accumulated enough managerial experience and the sophisticated techniques to handle the increased market risks compared with the large banks of the developed countries, may face more uncertainty and higher riskiness in the process of rapid and wide-ranging financial deregulation during the 1990s.

In the face of this possible rapid 'build up' of such associated risks in the system as banks react to the new environment, more stringent capital adequacy requirements are one possible policy response. In this context, the imposition of higher capital ratios and the introduction of the RAR (i.e., the Basle system) in Korea appear to be soundly based from a stability perspective. As discussed in Chapter 5, however, the new RAR fundamentally considers only relative credit risk. As the banks face a wider range of risks (e.g., liquidity risk, interest-rate risk, foreign exchange rate risk, settlement risk, operating risk and regulatory risk, etc..), the Korean capital adequacy requirements should be correspondingly extended in their risk coverage. Besides extending the range of commercial banking risk coverage, more sophisticated schemes for investment banking capital adequacy will need to be considered. In addition, to complement the RAR and to help instil more market discipline, it is time to examine the introduction of deposit insurance for banks. Greater experience with a RAR system is a necessary complement (a kind of proxy for risk-related deposit insurance premia) to deposit insurance and/or the basis for a later development into the use of risk-related deposit insurance premia. These specific considerations, however, lie outside the terms of reference of this thesis.

In this context, the OBS should reexamine and reassess the present supervisory monitoring system and reestablish it to be appropriate for the new more vulnerable, competitive financial environment. As discussed in Chapter 3, however, since the primary responsibility for the safety and soundness of banks lies with the management of each bank, not with bank supervisors, the directors and management of each bank must be able to take corrective measures in response to market signals and to establish adequate internal risk control systems in each bank (i.e., risk management). In this context, the role of bank supervisors is to make sure that adequate systems for detecting signs of weakness are in place in the banks subject to their jurisdiction and to stand ready to promote and require early corrective measures based on the new monitoring system. In summary, more sophisticated risk monitoring associated with improved (and continually improving) capital adequacy schemes must be seen *inter alia* as a way of instilling greater risk awareness and risk management sophistication in bank management. With the growing internationalisation of banking, the Korean authorities need to keep abreast and in line with wider international developments in capital adequacy, like the (1988) Basle agreement.

(ii) *Enhancement of the role of the market*

Relating to the above discussions, financial deregulation requires a more sensitive monitoring system to cope with the more vulnerable and risky environment and the wider portfolios assumed by many banks. One way to increase the sensitivity of the supervisory monitoring process is to enhance the role of the market. As long as the market has full information and is competitive, this information will be incorporated into stock prices. In this context, although there are vigorous debates between bankers, investors, regulators and academics on how much information needs to be disclosed, it is necessary to disclose more information in order to enhance the role of the market as a regulator. In particular, the loan-loss reserves, non-performing assets and off-balance sheet positions should be disclosed in more detail. Insofar as the financial environment becomes more risky and vulnerable (induced by structural deregulation), the timing of corrective actions is more important. Utilising more stock market data may substantially increase the sensitivity of the supervisory monitoring process. How to use stock market data in order to evaluate the effects of supervisory policy on banks was demonstrated in Chapters 6 and 7.

Bank supervisors should always take the role of the market into account within their supervisory policies. As Gardener (1986) noted, prudential bank regulation and supervision will ultimately be subject to the market forces. Therefore, supervision has to recognise and develop alongside these market forces. This is necessary in order to ensure that supervision remains effective, that possibly risky avoidance innovations do not become a problem, and that the benefits of competition are secured. In the new deregulatory environment, therefore, the role of supervisors is to achieve a proper balance between a tight and a flexible supervisory style in order not to 'undo' the economic benefits sought by the financial deregulation. Striking this balance will never be easy, but improved risk monitoring and awareness can only help to achieve a more effective policy balance.

(iii)*Implications on structural deregulation and supervisory re-regulation*

The recent waves of financial deregulation around the world have also greatly affected Korea. As discussed earlier, since the early 1980s the banking and financial markets have been structurally deregulated and, at the same time, supervisory re-regulation has been enhanced. Interest-rates, restrictions on business activities, and entry barriers (see Chapters 3 and 4) were greatly liberalised and lowered, while capital adequacy requirements were contemporaneously strengthened. These two seemingly opposing policies were simultaneously operating in the Korean banking market during the period of this study. Our main concern has been in examining the impact of the new capital adequacy requirements on bank shareholders' risk and return. However, the simultaneity of these two broad policy areas make it difficult to measure empirically the separate impact of each policy on bank shareholders' risk.

As Fry (1988) pointed out, there has been virtually no theoretical discussions of the simultaneous impact that arises when controls in some areas (e.g., interest-rate ceilings, restrictions on business activities and on branching) are deregulated, whereas controls in other areas (e.g., capital adequacy) are strengthened (i.e., re-regulated). This study has not attempted to separate the effects of these seemingly opposing regulatory policies, because our finance models adopted in order to examine the impact of the new capital adequacy requirements on banks' risk profile did not allow it. Also, banking theory has not been developed to handle this simultaneity problem. This implies that some econometric models need to be developed in later research in order to incorporate the simultaneous effects of structural deregulation and supervisory re-regulation, and bank supervisors should always consider the simultaneous impact of these two regulatory policies within their policy-making process under a deregulatory environment. There is an obvious aggregation problem here in that big, simultaneous (risk/return) effects of both structural deregulation and supervisory re-regulation may be 'netted out'. At this time and within our research, an event study is at least an attempt to focus empirically on specific events.

8.4 LIMITATIONS

Although the limitations of the analysis undertaken in this research have been discussed throughout this thesis, the main limitations need to be placed in order as a summary.

(i) *Some doubts on the market efficiency*

The capital market is 'efficient' in the sense that stock prices continuously 'reflect' all available information, implies that stock prices are a useful alternative source of data that bank supervisors can use for measuring changes in bank risk and return. However, as discussed in Chapter 5, the degree of usefulness of stock data in order to evaluate the effects of the new capital adequacy regulations depends on whether the capital market is efficient. As analysed earlier, empirical evidence tended to support the weak-form efficiency of Korean markets, whereas there appeared to exist some doubts on semistrong-form efficiency. Our empirical results - in particular, for event 1 - cast some doubts on the semistrong-form efficiency, since the same econometric model showed too much different explanatory power, R^2, for event 1 and for event 2. This efficiency problem may lead to potential model specification bias as below.

(ii) *Potential model specification bias*

Our models for event 1 did not explain much of the behaviour of rates of return on bank stocks. This implies that there are some omitted variables which may explain the behaviour of rates of return. Since there is no general agreement on factors which may influence the changes in stock prices, we were reluctant to use the multi-factor model such as the APT. Our models were based on the single factor model that only market wide-factors affect the changes in stock prices. The empirical results for event 1 imply that there are some other factors which may be incorporated into the models. Perhaps, factor analysis may be used in later research to help select variables and to specify better models.

(iii) *Simultaneous impact of structural deregulation and supervisory re-regulation*

As discussed earlier (see Section 8.3(iii)), the simultaneity of structural deregulation and supervisory re-regulation, seemingly opposing policies, makes it difficult to measure empirically the separate impact of each policy on banks. This practical difficulty in measuring the effects of capital adequacy requirements arises in measuring the risk effect of the new capital adequacy requirements in this research. We tried to measure the likely changes in risk, comparing the variance of rates of return for pre-period to that for post-announcement period. However, a lot of new information or new events may influence, with enhancing or in an offsetting way, the stock prices for each period. For instance, the effects of structural deregulation may offset the effects of capital adequacy regulations and *vice versa*. This simultaneity of two seemingly opposing supervisory policies may lead the researcher to over- or underestimate the impact of the new capital adequacy regulations on bank risk.

(iv) *Some statistical problems involved in the estimation procedures*

Some caution (usual in any statistical investigation) needs to be exercised on our conclusions. One is that the residuals of our models are not normally distributed. Since the observations of our sample are large enough, however, the estimated results are asymptotically valid. Another is that although the SURE procedure adopted allows for variation in the residual variance across equations, it does not do so within each equation. Therefore, the SURE results for event 1, for which a serious heteroscedasticity problem was detected, may not be entirely reliable.

(v) *Data limitations*

Balance-sheet data used in Chapter 4 included only the banking account of each bank. The trust account was not included, because it was not available to the researcher. Therefore, the results of the performance and condition analysis for Korean banks were distorted by the data limitations.

Finally, conclusions made in this study may not be applied to other financial services firms such as investment and finance companies, merchant banking corporations, mutual savings institutions and insurance companies, because they operate under different regulatory constraints. The need to 'converge' all of these supervisory regimes may imply the inherent desirability of a 'functional' (supervision directed towards activities) rather than 'institutional' (supervision directed towards institutions) approach towards developing modern supervision. But that is another story, which lies outside the specific scope of this thesis.

APPENDIX A:TABLES

<Table A.1> Principal Accounts of the Korea Development Bank
(At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & checks	314.7(1.3)	Deposits in KW	846.0(3.6)
Due from banks	41.5(0.2)	Deposits in foreign currency	5,182.8(22.2)
Due from banks in foreign currency	82.6(0.4)	Borrowings from	3,517.1(15.1)
		.government	1,821.6(7.8)
Securities	2,544.2(10.9)	.foreign loan funds	430.5(1.8)
Loans & discounts	12,737.9(54.6)	.NIF	861.5(3.7)
		.others	403.5(1.7)
Fixed assets	110.0(0.5)	Industrial finance debentures issued	4,611.5(19.8)
Other assets	7,509.6(32.2)		
		Other liabilities	7,808.1(33.5)
		Paid-in capital	1,241.9(5.3)
		Surplus	133.1(0.6)
Total	23,340.5(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.44

<Table A.2> Principal Accounts of the ExIm Bank
(At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	109.8(4.0)	Borrowings	307.2(11.3)
		Borrowings from foreign currency	950.2(34.9)
Securities	142.6(5.2)		
Loans	2,367.1(86.9)	ExIm finance debentures issued	380.9(14.0)
.loans in foreign currency	1,986.0(72.9)		
		Promissory notes sold	18.6(0.7)
Fixed assets	21.5(0.8)		
Other assets	82.4(3.0)	Other liabilities	372.5(13.7)
		Surplus	153.1(5.6)
Total	2,723.4(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.45

<Table A.3> Principal Accounts of the Korea Long Term Credit Bank (At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	269.5(4.2)	Deposits	927.8(14.4)
		.deposits in foreign currency	628.0(9.7)
Securities	1,249.0(19.0)	Borrowings from domestic market	599.9(9.3)
Loans & discounts	2,368.1(36.7)		
Loans in foriegn currency	922.1(14.3)	Borrowings in foreign currency	316.8(4.9)
		Debentures issued	2,098.6(32.5)
Fixed assets	55.8(0.8)	Other liabilities	502.1(7.8)
Other assets	136.1(2.1)	Acceptances & guarantees	1,454.2(22.5)
Customers' liabilities on acceptances & guarantees	1,454.2(22.5)	Paid-in capital	172.0(2.7)
		Surplus	383.3(5.9)
Total	6,454.8(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.46

<Table A.4> Principal Accounts of the Banks' Trust Business (At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Securities	40,514.3(70.0)	Money in trust	29,174.6(50.4)
Loans	11,282.2(19.5)	Securities investment trust	25,248.9(43.6)
Loans to banking accounts	853.6(1.5)	Other liabilities	2,612.0(4.5)
Other assets	5,250.7(9.1)	Surplus	865.5(1.5)
Total	57,900.9(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.51

<Table A.5> Principal Accounts of Mutual Savings & Finance Companies
(At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	837.3(7.3)	Deposits	8,502.6(74.1)
Securities	283.8(2.5)	Borrowings from public	437.7(3.8)
Loans & discounts	9,581.4(83.5)	Other liabilities	1,352.2(11.8)
Fixed assets	547.9(4.8)	Capital accounts	1,178.9(10.3)
Others	221.1(1.9)		
Total	11,471.5(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.50

<Table A.6> Principal Accounts of Mutual Credits
(At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	830.3(6.0)	Deposits	13,823.5(99.9)
Securities	2,359.3(17.0)	Others	15.0(0.1)
Loans	10,373.8(75.0)		
Other assets	275.1(2.0)		
Total	13,838.5(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.49

<Table A.7> Principal Accounts of Credit Unions
(At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	591.5(16.4)	Deposits	2,657.7(73.9)
		Borrowings	106.6(3.0)
Loans	2,686.5(74.7)	Other liabilites	105.7(2.9)
Investment assets	98.2(2.7)	Shares	593.1(16.5)
Other assets	221.0(6.1)	Surplus	134.0(3.7)
Total	3,597.1(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.50

<Table A.8> Principal Accounts of the Postal Savings
(At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash	361.8(10.5)	Deposits	1,365.1(39.6)
Due from banks	1,412.7(41.0)	RP	1,458.6(42.3)
Securities	1,590.6(46.2)	Others	621.9(18.0)
Others	80.5(2.3)		
Total	3,445.6(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.52

<Table A.9> Principal Accounts of Investment & Finance Companies (At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	696.9(3.8)	Paper issued	1,544.3(8.4)
		CMA	7,031.0(38.1)
Securities	2,440.1(13.2)	Borrowings	1,255.3(6.8)
Loans & discounts	10,527.5(57.1)	Other liabilities	6,676.2(36.2)
.Bills discounted	8,861.2(48.0)	Paid-in capital	803.2(4.4)
.Trade bills discounted	695.1(3.8)	Surplus	1,136.9(6.2)
.others	971.2(5.3)		
Fixed assets	221.4(1.2)		
Other assets	4,561.0(24.7)		
Total	18,446.8(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.47

<Table A.10> Principal Accounts of Merchant Banking Companies (At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	143.7(2.8)	Deposits	1,209.0(23.2)
		Borrowings	2,131.9(40.9)
Securities	1,449.3(27.8)	Debentures issued	686.1(13.2)
Loans & discounts	998.1(19.2)		
Fixed assets	4.0(0.1)	Other liabilities	529.0(10.2)
Other assets	2,614.1(50.2)	Capital accounts	653.2(12.5)
Total	5,209.3(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.48

<Table A.11> Principal Accounts of Life Insurance Companies
(At the end of December 1990)

Unit: billion won

Assets	Amount	Liabilities & Net Worth	Amount
Cash & due from banks	2,303.8(8.1)	Policy reserves	27,165.8(95.5)
		Other liabilities	598.9(2.1)
Securities	7,414.3(26.1)	Paid-in capital	416.6(1.5)
Loans & discounts	15,204.0(53.4)	Surplus	271.3(9.9)
Fixed assets	2,209.6(7.8)		
Other assets	1,328.3(4.7)		
Total	28,460.0(100.0)		

Note: Figures in parentheses represent percentage of total
Source: The BOK, Monthly Bulletin, March 1991, p.52

APPENDIX B: SUPPLEMENTAL PERFORMANCE AND CONDITION MEASURES

1 SUPPLEMENTAL PERFORMANCE AND CONDITION MEASUREMENTS

Regarding perfomance measures, six supplemental measures are analysed. They include: profit margin (PM), asset utilisation (AU), net interest margin (NIM), net burden, operating efficiency and debt service coverage. As for risk measures, three supplemental risk measures are analysed. They include: liquidity risk, interest rate risk and credit risk.

2 RETURN MEASURES

2.1 Profit Margin

Table B.1 shows the PM of the Korean banks, which reflects the percentage of each Korean Won of revenue remaining after all costs and expenses are paid. In other words, PM is the ratio of net income after tax to total operating revenues. A bank with a relatively high cost structure has a lower PM than a more efficient bank. Bank managers can improve both ROE and ROA by improving PM, other things equal (i.e., AU and EM). According to Sinkey (1992), a bank can improve its PM by:

(1) spread management;

(2) control of loan quality;

(3) control of overhead;

(4) generation of fee and service charge income; and

(5) tax avoidance (as opposed to tax evasion which is illegal).

Table B.1 and Figure B.1 show the long-term trends of PM: the average PMs are 5.83% for all commercial banks, 4.33% for NCBs and 7.03% for RBs during the period 1982-1991. This implies that RBs are more profitable than NCBs. Although some fluctuation occurred

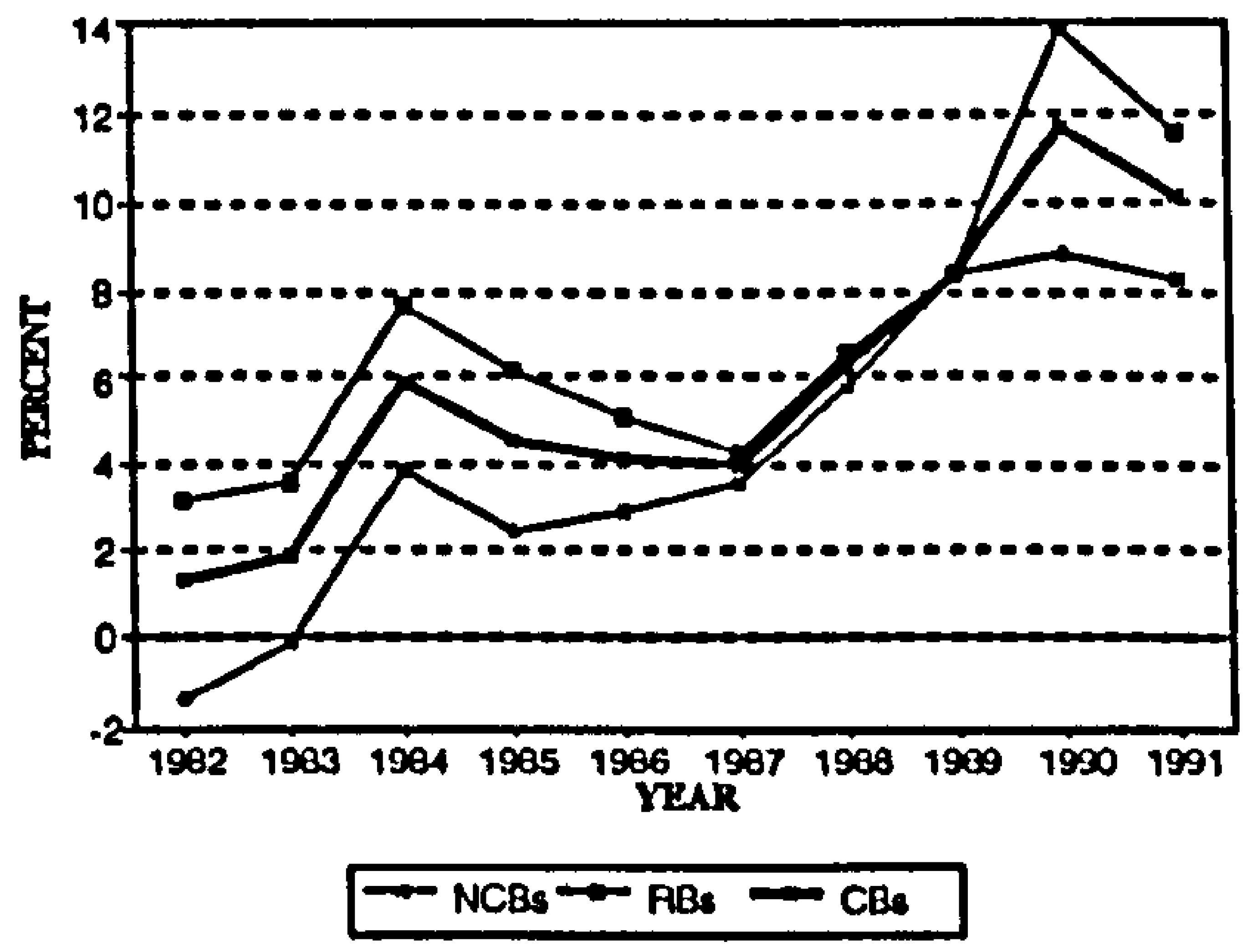
<Table B.1> Profit Margin

Unit:Times

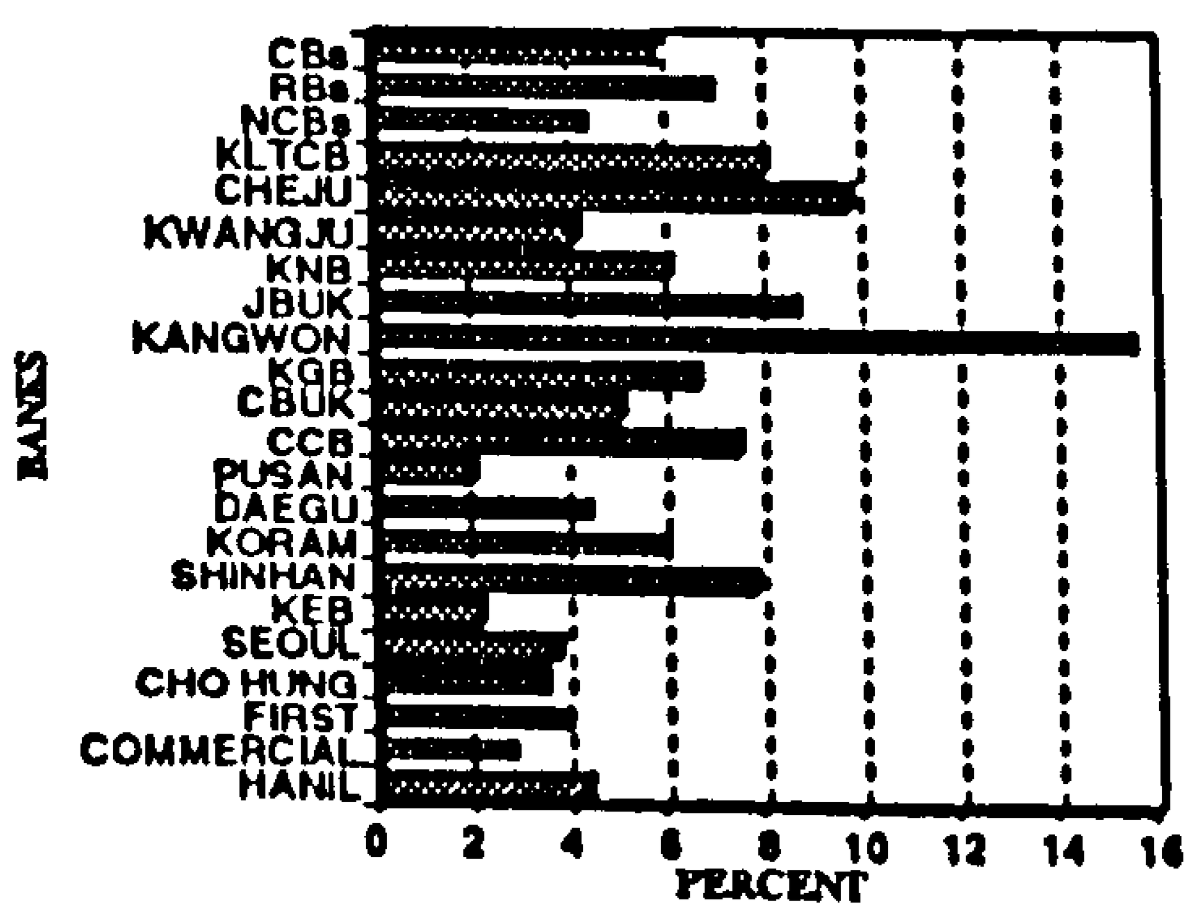
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	2.54	1.54	3.10	1.37	1.56	2.34	6.01	8.91	8.50	8.18	4.40
COMMER	2.12	1.24	2.94	1.34	1.17	1.07	2.54	4.93	6.07	4.85	2.83
FIRST	1.42	1.35	4.00	1.37	1.61	2.05	4.72	8.05	8.05	7.56	4.02
CHO HUN	1.54	1.35	1.67	1.49	1.48	1.48	3.74	8.74	7.60	6.81	3.59
SEOUL	1.72	1.63	3.02	1.74	2.03	2.00	5.49	8.28	6.28	5.74	3.79
KEB	2.14	0.86	1.44	1.40	2.16	2.45	3.34	2.95	2.65	2.65	2.20
SHINHAN	-21.11	6.01	7.50	6.36	7.90	10.42	12.26	15.27	17.42	16.39	7.84
KORAM	**	-14.79	6.20	4.32	4.82	5.96	8.26	10.23	14.82	13.71	5.95
DAEGU	0.99	0.57	3.43	2.12	2.07	2.04	4.92	6.71	10.84	9.61	4.33
PUSAN	1.98	1.86	2.62	0.88	0.94	0.68	0.74	1.94	5.38	4.43	2.14
CCB	3.02	2.26	10.20	4.20	5.83	5.15	6.29	13.98	15.12	9.82	7.59
CBUK	0.50	1.68	1.60	2.09	1.78	1.50	6.62	8.54	15.98	11.18	5.15
KGB	1.29	1.88	7.48	4.27	5.41	3.68	6.03	12.79	13.50	10.18	6.65
KANGWO	12.11	13.81	19.01	17.20	13.71	8.60	15.34	22.33	19.32	14.40	15.58
JBUK	0.82	1.29	3.57	3.22	1.72	3.36	12.41	21.45	23.02	16.53	8.74
KNB	1.82	2.74	7.73	3.70	3.62	2.69	5.21	9.59	13.30	10.46	6.09
KWANGJ	6.55	5.35	10.30	8.71	3.68	2.73	5.09	-19.81	11.91	7.75	4.22
CHEJU	2.46	3.14	10.77	15.27	12.41	12.41	4.02	6.43	11.01	20.55	9.85
KLTCB	8.91	7.01	7.41	6.59	5.91	5.72	8.25	10.03	11.46	9.57	8.09
NCBs	-1.38	-0.10	3.73	2.42	2.84	3.47	5.79	8.42	8.92	8.24	4.33
RBs	3.16	3.46	7.67	6.17	5.12	4.28	6.67	8.39	13.94	11.49	7.03
CBs	1.22	1.88	5.92	4.50	4.11	3.92	6.28	8.41	11.71	10.04	5.83

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.1> Profit Margin



<Figure B.2> Profit Margin by Banks (10 Year Average)



during the period as a whole, PM has gradually increased. The average PM of all commercial banks rose from 1.22% in 1982 to 5.92% in 1984. Since 1984, PM gradually dropped to 3.92% in 1987. However, PM sharply renewed its upward path in 1988, and reached 10.04% in 1991. PMs for NCBs and RBs have risen from -1.38% and 3.16% in 1982 to 8.24% and 11.49%, respectively. However, these average figures were distorted by the large negative PMs of Shinhan Bank in 1982, KorAm Bank in 1983 and Kwangju Bank in 1989. Table B.1 and Figure B.2 illustrate that Kangwon Bank shows the highest PM (15.58%) for the whole period followed by 9.85% for Cheju Bank and 8.74% for JBUK. KorAm Bank had a relatively high PM (5.95%) out of the NCBs; the lowest is 2.14% for Pusan Bank followed by 2.20% for KEB. Five NCBs have relatively low PMs. In 1991, Cheju Bank is ranked at the top PM (20.55%) followed by 16.53% of Jeonbuk Bank and 16.39% of Shinhan Bank. KorAm Bank also shows high PM (13.71%). KLTCB has a relatively high PM during the entire period and in 1991.

In brief, as a whole, RBs achieved higher PM than NCBs during the entire period. PMs of NCBs and RBs had converged until 1989, but they have diverged since 1989.

2.2 Asset Utilisation

Table B.2 shows the productivity of the Korean banks. Productivity measures focus on the firm's ability to generate revenues compared to the asset base on which revenues can be earned. The most common measure, called asset turnover in industrial firms and asset utilisation (AU) in financial institutions, compares total operating revenues to total assets. Therefore, AU measures revenue per Korean Won of total assets. To improve both ROE and ROA, bank managers may focus on AU. If PM and EM remain unchanged, then better AU will mean higher ROE and ROA. One way to improve AU is through portfolio management. In particular, a shift from lower-yielding assets to higher-yielding assets is required. However, since a risk-return trade-off inevitably exists, as AU increases, a bank's risk exposure may also increase.

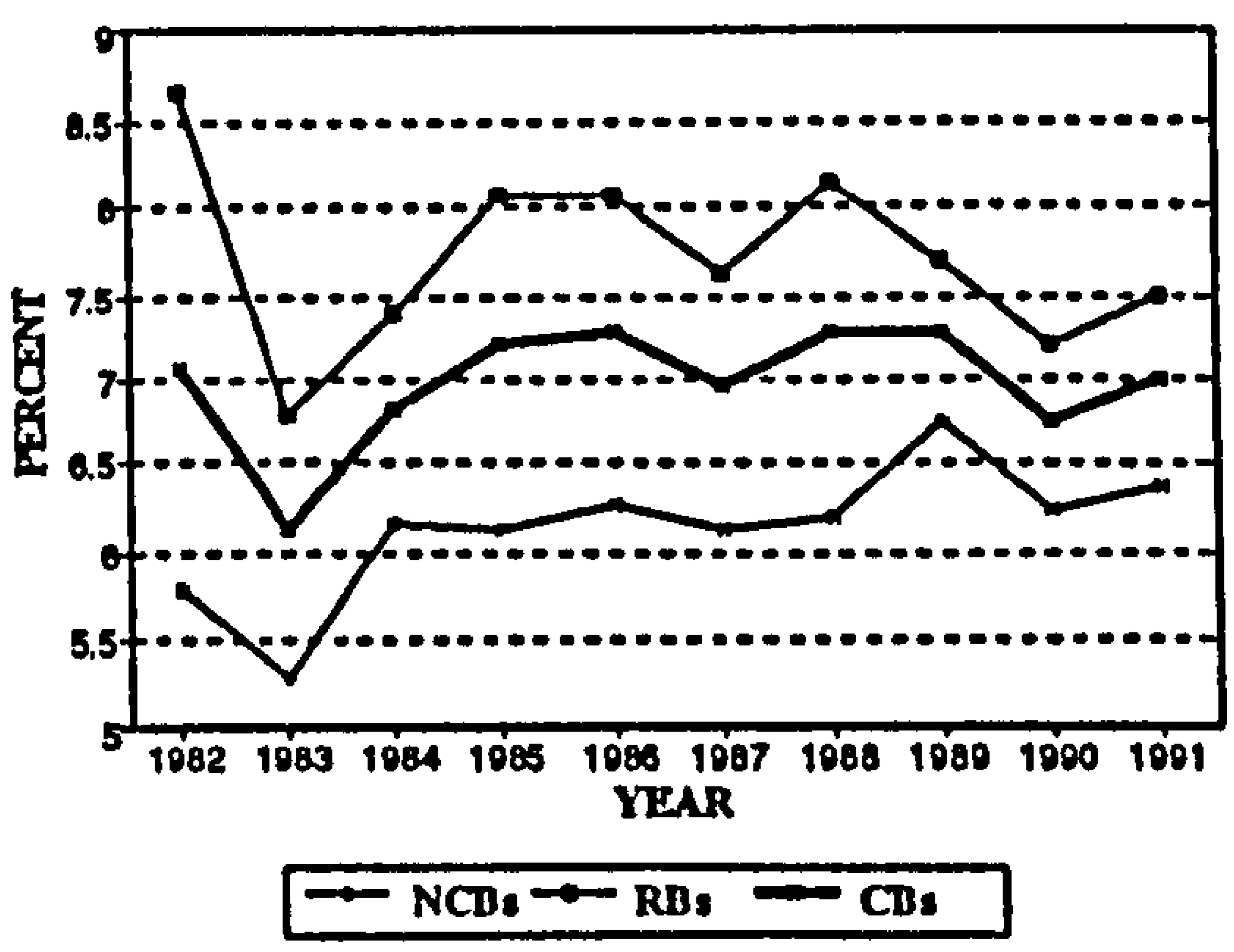
<Table B.2> Asset Utilisation

Unit: %

BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	6.28	6.34	6.39	6.48	6.67	6.31	6.41	6.94	6.55	6.53	6.49
COMMER	6.03	5.50	6.19	6.30	6.44	6.24	6.01	6.62	6.38	6.78	6.25
FIRST	6.69	6.01	6.53	6.65	6.96	6.47	6.34	7.12	6.27	6.67	6.57
CHO HUN	6.18	5.81	5.76	5.82	5.99	5.85	5.74	6.53	6.22	6.75	6.06
SEOUL	6.64	5.87	6.42	6.23	6.78	5.99	5.94	6.57	6.15	6.65	6.32
KEB	6.58	5.77	6.57	6.30	6.12	6.00	6.69	7.77	6.66	6.30	6.48
SHINHAN	1.96	3.99	5.26	5.39	5.27	6.24	6.35	6.38	6.97	6.85	5.46
KORAM	**	3.04	6.09	5.78	5.87	5.86	6.16	6.15	4.57	4.29	5.31
DAEGU	7.91	6.64	6.89	7.17	6.84	7.21	7.63	7.37	7.15	7.46	7.23
PUSAN	8.67	7.27	7.67	8.04	8.49	8.06	8.63	7.92	7.72	8.77	8.13
CCB	9.59	6.58	7.29	8.64	8.65	7.81	8.44	7.26	6.77	7.16	7.82
CBUK	9.91	5.79	6.77	7.26	7.82	7.50	8.17	9.07	7.00	6.82	7.61
KGB	10.25	7.14	8.50	8.72	8.82	8.29	8.57	7.89	7.57	8.07	8.38
KANGWO	10.88	8.85	9.36	10.82	8.87	7.43	8.17	7.62	6.50	6.33	8.48
JBUK	7.19	6.24	5.54	6.56	6.64	7.07	7.25	6.89	7.18	6.89	6.74
KNB	8.76	7.27	7.90	9.08	8.20	7.26	8.51	7.32	6.77	7.24	7.83
KWANGJ	5.53	4.98	6.24	6.44	7.13	6.37	8.17	6.71	6.67	7.31	6.55
CHEJU	8.04	7.05	7.48	7.88	9.15	9.15	7.89	8.85	8.51	8.76	8.27
KLTCB	14.11	12.24	11.37	10.67	11.10	10.18	9.57	8.29	7.48	7.49	10.25
NCBs	5.76	5.29	6.15	6.12	6.26	6.12	6.20	6.76	6.22	6.35	6.12
RBs	8.67	6.78	7.37	8.06	8.06	7.61	8.14	7.69	7.18	7.48	7.71
CBs	7.06	6.12	6.82	7.20	7.26	6.95	7.28	7.28	6.76	6.98	7.00

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.3> Trends of Asset Utilisation



<Figure B.4> Asset Utilisation by Banks (10 Year Average)

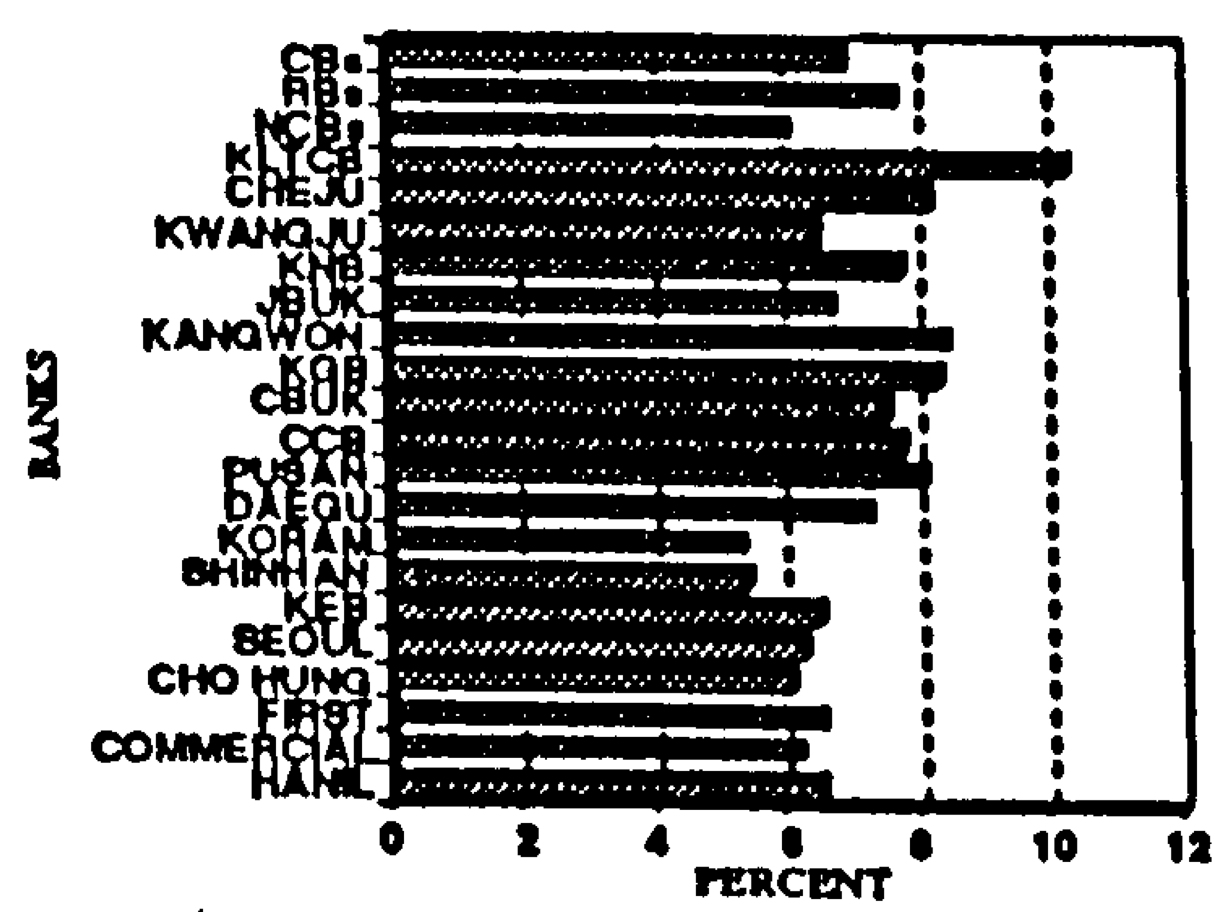


Table B.2 and Figure B.3 illustrate that although some fluctuation occurred during the period 1982-1991, the level of AU has been maintained at around 7.00%. During the period 1982-1991, the average AUs are 7.00% for all commercial banks, 6.12% for NCBs and 7.71% for RBs. Therefore, the productivity of RBs is a little bit higher than that of NCBs. Table B.2 and Figure B.4 show that Kangwon Bank has the highest AU (8.48%) followed by KGB (8.38%). However, this figure is not so superior to those of other banks. Although its AU has gradually decreased, KLTCB outperformed all commercial banks for the period as a whole. In 1991, Pusan Bank shows the highest productivity (8.77%) followed by the 8.76% of Cheju Bank. With the exception of KorAm Bank (4.29%), AUs of NCBs range from 6.3% for KEB to 6.85% of Shinhan Bank, while those of RBs range from 6.33% for Kangwon Bank to 8.77% for Pusan Bank. Therefore, we may conclude that productivities of all sample banks are not so different between them and have not improved significantly over time.

2.3 NET INTEREST MARGIN

Table B.3 and Figures B.5 and B.6 show the NIM of the Korean banks. NIM, as the focal variable of asset-liability management (ALM), can be computed by dividing net interest income by earning assets (defined as total assets minus cash and total fixed assets). In practice, NIM is calculated by the ratio of interest income to earning assets minus the ratio of interest expenses to earning assets. NIM is a comprehensive measure of management's ability to control the spread between interest revenues and interest costs and is also a measure of interest-rate risk sensitivity. Since the larger banks operate in loan and deposit markets substantially more competitive than local ones in which regional banks compete, large banks tend to have lower NIMs. This phenomenon is reflected by a big difference in NIMs between NCBs and RBs in Table B.3 and Figures B.5 and B.6.

During the period 1982-1991, NIM has been changed with an upward cycle. Figure B.5 illustrates that NIM increased from 1.52% in 1982 to 2.94% in 1985. After 1985, NIM

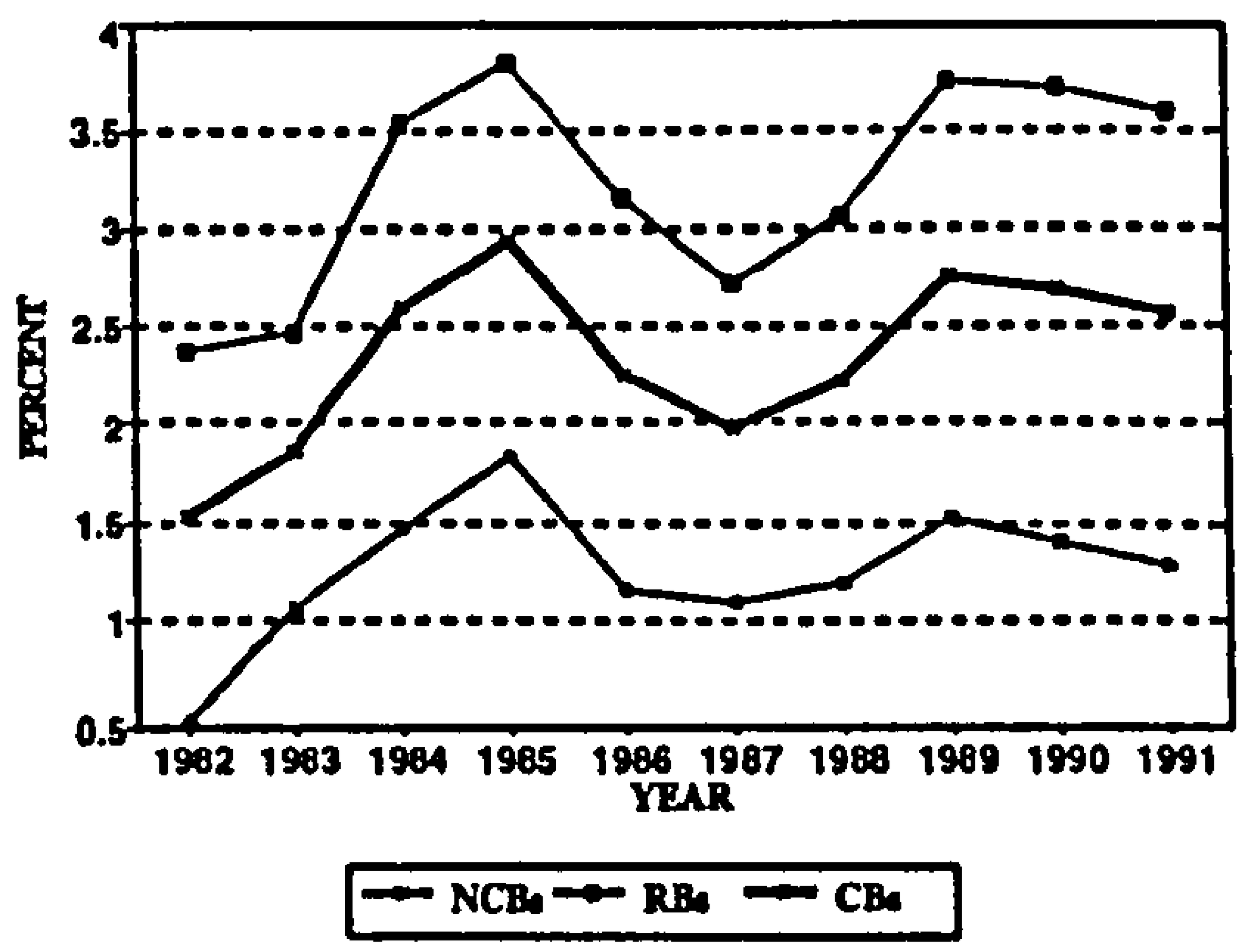
<Table B.3> Net Interest Margin

Unit : %

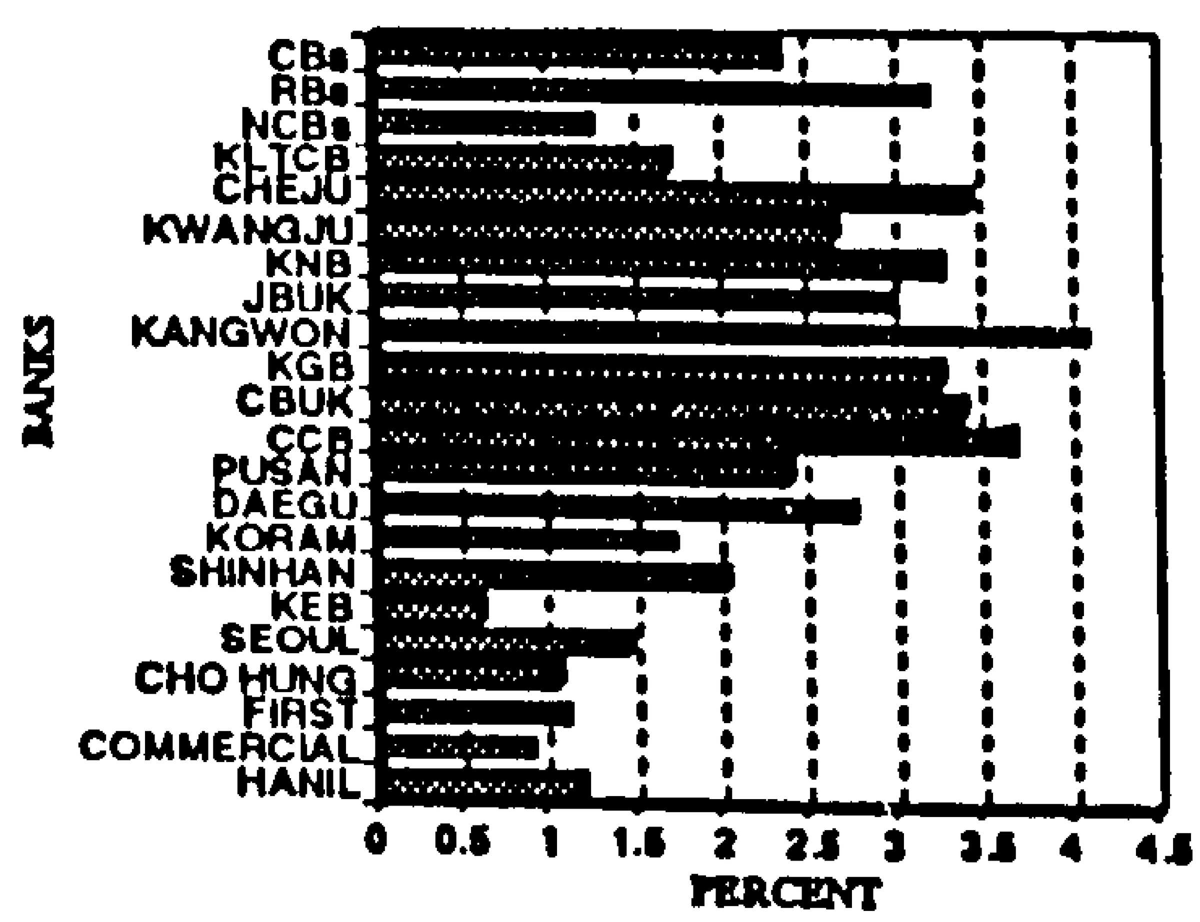
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	0.24	0.84	1.03	0.98	0.84	1.36	1.59	1.87	1.69	1.33	1.18
COMMER	0.31	0.65	1.21	1.35	0.57	0.62	1.08	1.45	1.24	0.82	0.93
FIRST	-0.42	1.15	1.59	1.55	1.31	1.14	0.84	1.39	1.37	1.30	1.12
CHO HUN	0.97	1.35	1.16	1.25	0.95	0.78	0.94	1.13	1.12	1.18	1.08
SEOUL	0.78	1.13	1.92	1.97	1.83	1.37	1.30	1.43	1.43	1.44	1.46
KEB	0.60	0.70	0.84	0.69	0.65	0.67	0.77	0.76	0.21	0.45	0.63
SHINHAN	1.09	1.32	1.76	5.34	1.15	1.49	1.22	2.07	2.57	2.26	2.03
KORAM	**	1.37	2.15	1.57	2.02	1.30	1.85	2.19	1.65	1.37	1.72
DAEGU	1.82	1.25	2.75	2.74	2.95	2.65	2.91	3.65	3.60	3.49	2.78
PUSAN	2.02	2.23	3.07	2.79	2.14	2.10	2.01	2.33	2.26	3.19	2.41
CCB	2.53	2.38	4.12	4.45	3.99	3.54	3.88	4.16	4.15	3.98	3.72
CBUK	2.48	2.01	2.98	3.54	3.10	2.65	4.41	5.16	3.96	3.65	3.39
KGB	2.26	2.60	3.76	4.12	3.25	2.72	3.10	3.97	3.75	3.46	3.30
KANGWO	3.86	4.37	5.45	6.79	4.60	2.78	2.83	3.60	3.79	3.02	4.11
JBUK	1.87	2.29	2.80	2.77	2.43	2.44	2.61	3.93	4.63	4.17	3.00
KNB	2.44	2.91	3.96	4.62	2.95	2.56	2.95	3.64	3.68	3.41	3.31
KWANGJ	1.70	2.03	2.93	2.86	2.40	2.05	2.96	3.11	3.43	3.27	2.67
CHEJU	2.73	2.79	3.44	3.63	3.59	3.60	2.91	3.77	3.68	4.22	3.44
KLTCB	2.15	1.83	1.92	1.84	1.93	1.73	1.73	1.67	1.43	1.01	1.72
NCBs	0.51	1.06	1.46	1.84	1.17	1.09	1.20	1.54	1.41	1.27	1.27
RBs	2.37	2.49	3.53	3.83	3.14	2.71	3.06	3.73	3.69	3.59	3.21
CBs	1.52	1.85	2.61	2.94	2.26	1.99	2.23	2.76	2.68	2.56	2.35

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.5> Trends of Net Interest Margin



<Figure B.6> Net Interest Margin by Banks (10 Year Average)



decreased for two consecutive years and touched the bottom (1.99%) in 1987. Since 1987, NIM has risen and fallen. This movements of NIM reflected corresponding interest rate movements. Interest rates were cut during the 1981-1982 period which reduced the NIMs of commercial banks until 1983. As commercial banks adjusted their portfolios to new interest rates and the band of loan rates increased from 10.0%-10.5% on April 1, 1984 to 10.0%-11.5% on November 5, 1984, NIM increased again and reached the top point in 1985. However, as average deposit rates increased due mainly to introducing new high interest rate deposit accounts on April 19, 1985 (such as preferential savings and household preferential instalment savings), NIM decreased again since 1985. The reason why NIM increased during the period 1988-1989 is that loan rates increased a little due to interest rate liberalisation at the end of 1988 and at the same time, the band of loan rates also increased from 11.0%-13.0% in 1988 to 10.0%-12.5% in 1989. The reason why NIM decreased since 1990 is that as market interest rates rose due to interest rate liberalisation and the activities of the real sector deteriorated, the BOK guided commercial banks to reduce loan rates. The average NIMs are 2.35% for all commercial banks, 1.27% for NCBs and 3.21% for RBs. RBs are about 2% point higher than NCBs. This implies that NCBs pay the similar interest rate on deposits to RBs. On the other hand, NCBs impose lower loan rates than RBs. This inference can be validated by Tables B.4 and B.5.

Tables B.4-B.5 and Figures B.7-B.10 are supplementary for Table B.3 and Figure B.5. Table B.4 shows the ratio of interest income to earning assets (IIEA) and Figures B.7-B.8 illustrate the long-term trends and average ratio of each banks for 10 years. Table B.5 shows the ratio of interest expenses to earning assets (IEEA) and Figures B.9-B.10 illustrate the long-term trends and average ratio of each banks. As shown in Table B.4 and Figures B.7-B.8, during the period 1982-1991, the average ratio (5.94%) of IIEA for NCBs is substantially lower than RBs (8.07%). On the other hand, as shown in Table B.5 and Figures B.9-B.10, the average ratio (4.67%) of IEEA of NCBs is almost the same as that of RBs (4.86%). Furthermore, this interest expense ratio of NCBs is higher than RBs since 1989. This implies that since 1989, competition between NCBs has intensified. This

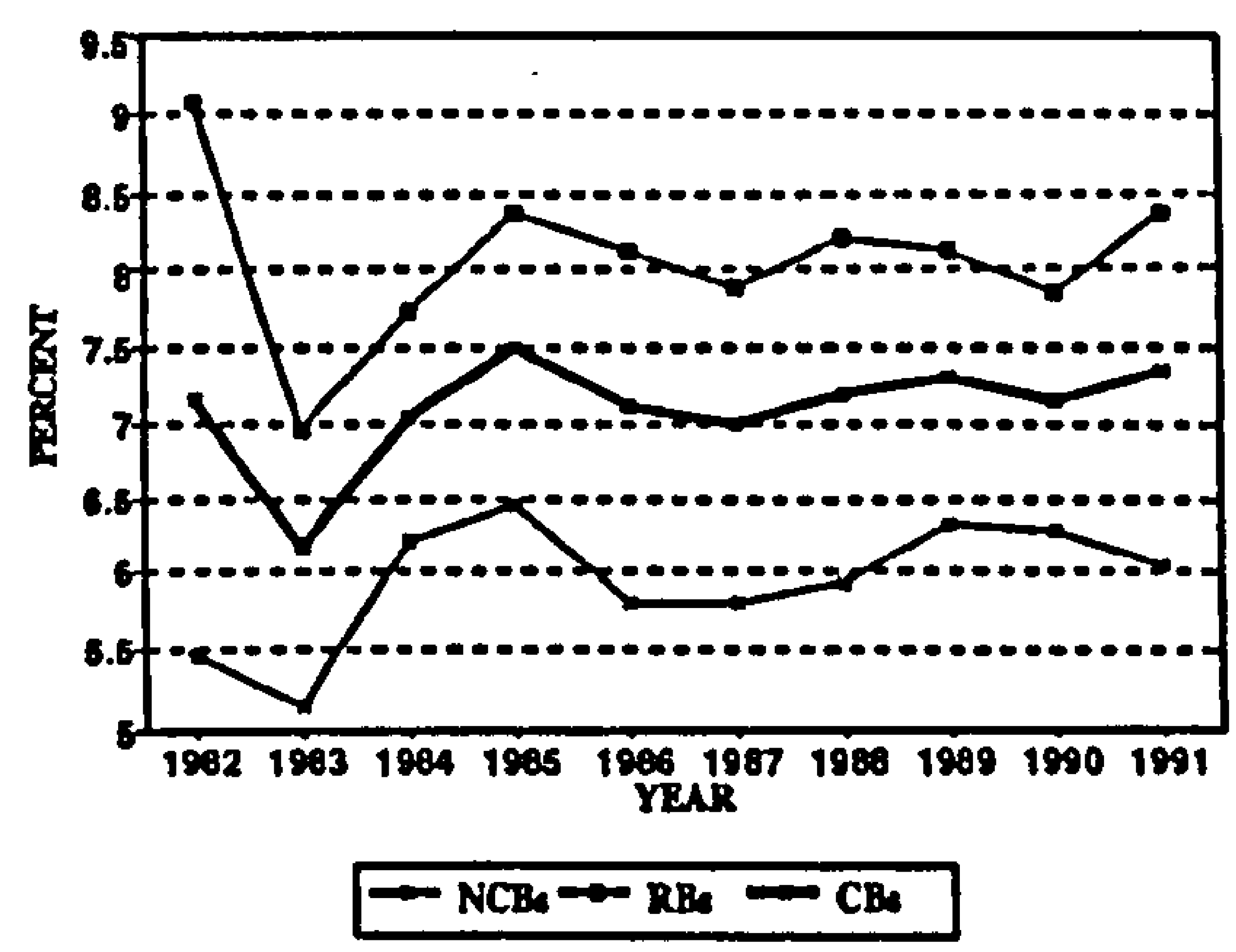
<Table B.4> The Ratios of Interest Income to Earning Assets

Unit: %

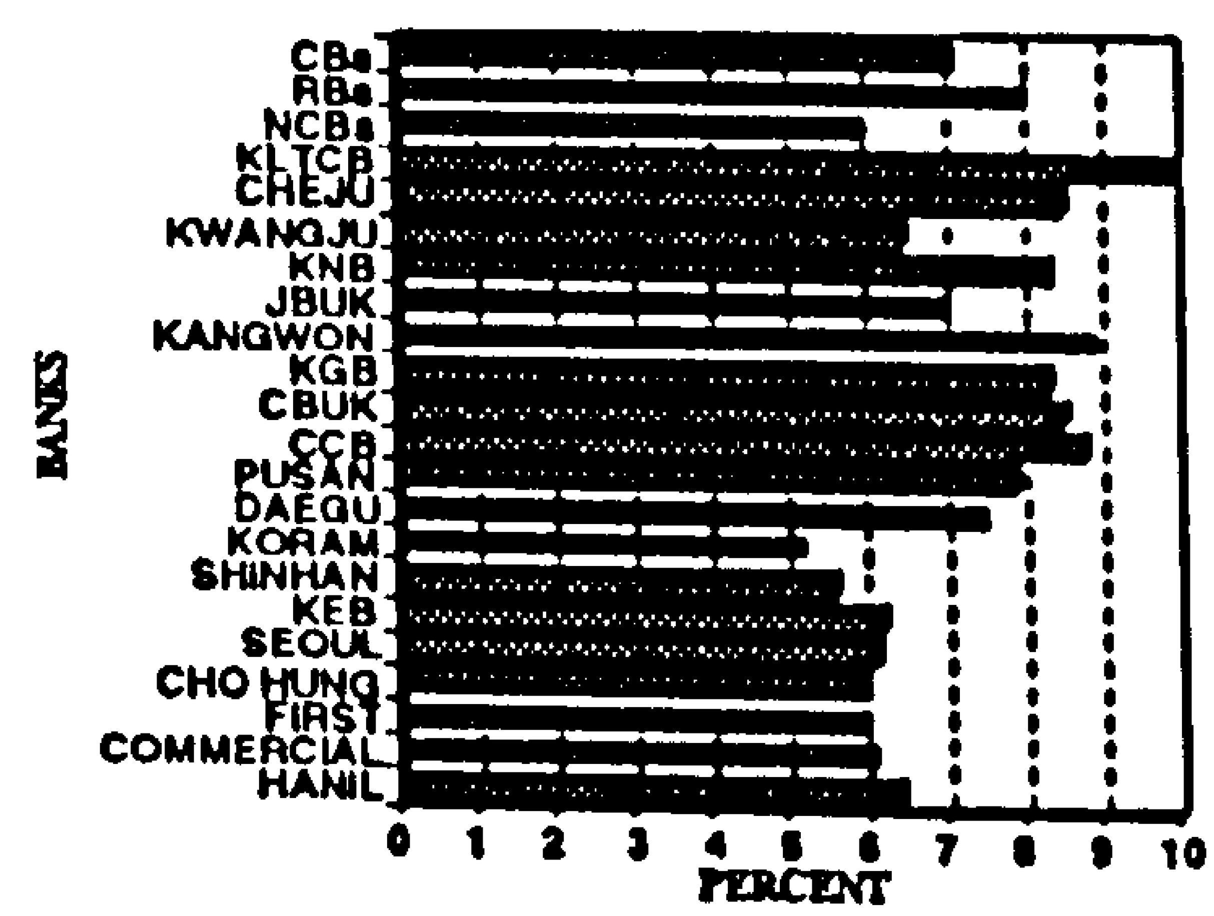
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	5.94	6.13	6.24	5.67	6.21	6.46	6.92	6.98	7.30	6.72	6.46
COMMER	5.51	5.17	6.08	6.15	5.84	5.83	6.26	6.57	6.61	6.23	6.02
FIRST	5.27	5.94	6.30	6.47	6.35	5.93	5.43	6.07	5.77	5.82	5.93
CHO HUN	6.48	5.93	5.91	5.87	5.77	5.76	5.70	5.92	6.18	6.36	5.99
SEOUL	6.11	5.33	6.62	6.36	6.48	5.77	5.86	5.91	6.34	6.45	6.12
KEB	6.60	5.72	6.73	6.25	5.88	5.63	6.15	7.07	6.20	5.82	6.20
SHINHAN	2.19	4.17	5.46	8.99	4.64	5.77	5.20	6.08	7.15	6.77	5.64
KORAM	**	2.79	6.15	5.68	5.39	5.38	5.91	5.93	4.66	4.32	5.13
DAEGU	7.86	5.59	6.64	6.75	7.60	7.81	8.52	7.82	7.93	8.33	7.48
PUSAN	8.70	7.18	7.91	7.89	7.99	7.88	7.93	7.29	7.18	9.16	7.91
CCB	9.30	6.84	8.60	9.98	9.68	9.38	9.75	8.33	8.07	8.66	8.86
CBUK	10.81	6.19	7.10	8.13	8.54	8.27	9.70	10.36	8.16	8.75	8.60
KGB	9.80	6.97	8.29	8.90	8.52	8.02	8.40	8.33	8.13	8.43	8.38
KANGWO	11.86	9.87	9.59	11.68	9.33	7.69	7.15	7.36	7.48	7.24	8.93
JBUK	7.74	6.56	6.15	6.35	6.16	7.16	6.46	7.40	8.61	8.26	7.08
KNB	9.55	7.85	8.78	9.77	8.25	7.83	8.32	8.10	7.67	8.15	8.43
KWANGJ	5.12	4.96	6.22	6.13	6.29	6.22	7.50	7.02	7.22	8.32	6.50
CHEJU	10.05	7.64	8.03	8.17	8.85	8.85	8.24	9.25	8.25	8.24	8.56
KLTCB	13.72	12.38	11.44	10.62	10.77	10.05	9.20	7.81	7.12	6.80	9.99
NCBs	5.44	5.15	6.19	6.43	5.82	5.82	5.93	6.32	6.28	6.06	5.94
RBs	9.08	6.97	7.73	8.37	8.12	7.91	8.20	8.13	7.87	8.35	8.07
CBs	7.16	6.16	7.04	7.51	7.10	6.98	7.19	7.32	7.16	7.33	7.12

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.7> Trends of IIEA Ratio



<Figure B.8> IIEA Ratio by Banks (10 Year Average)



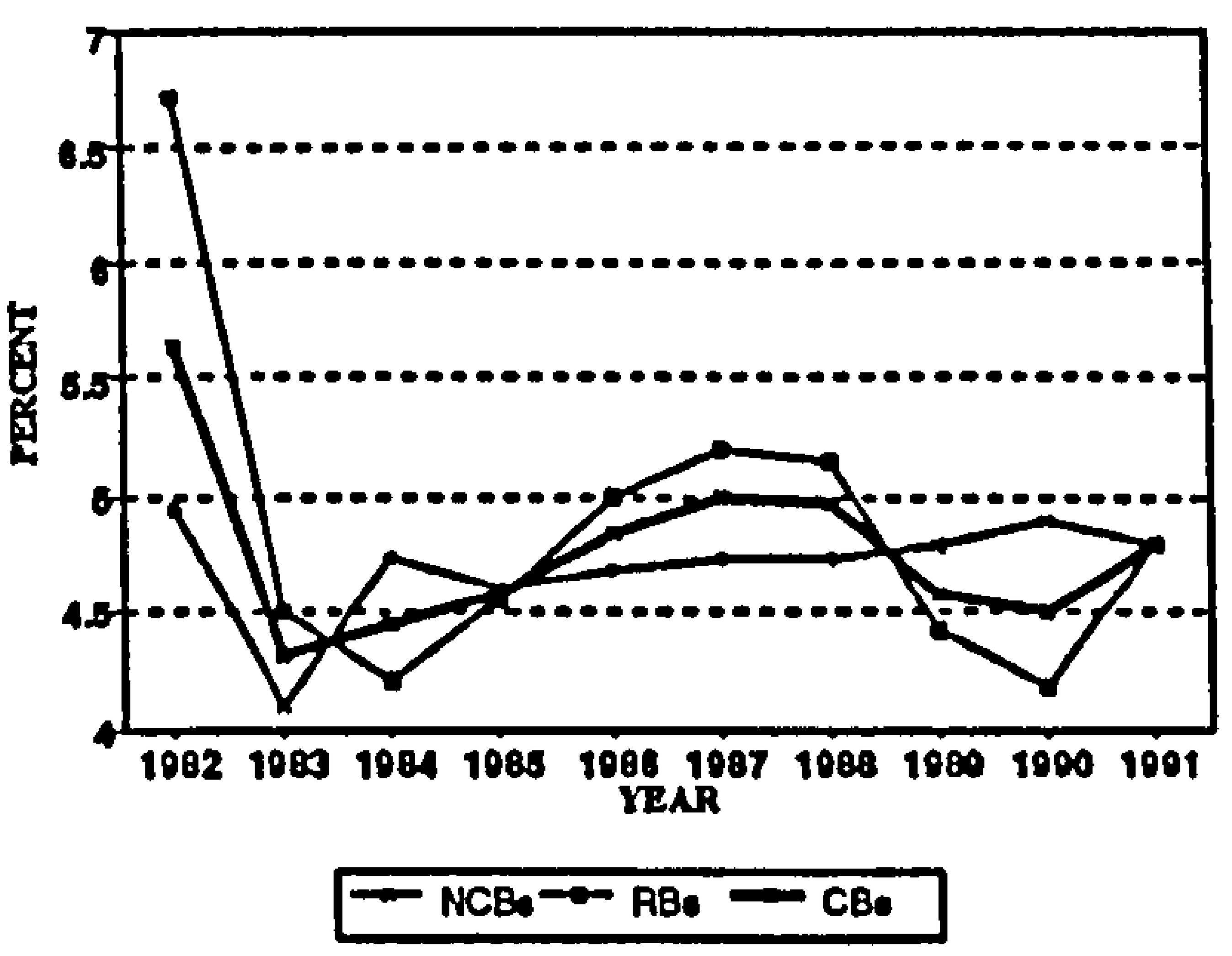
<Table B.5> The Ratio of Interest Expenses to Earning Assets

Unit: %

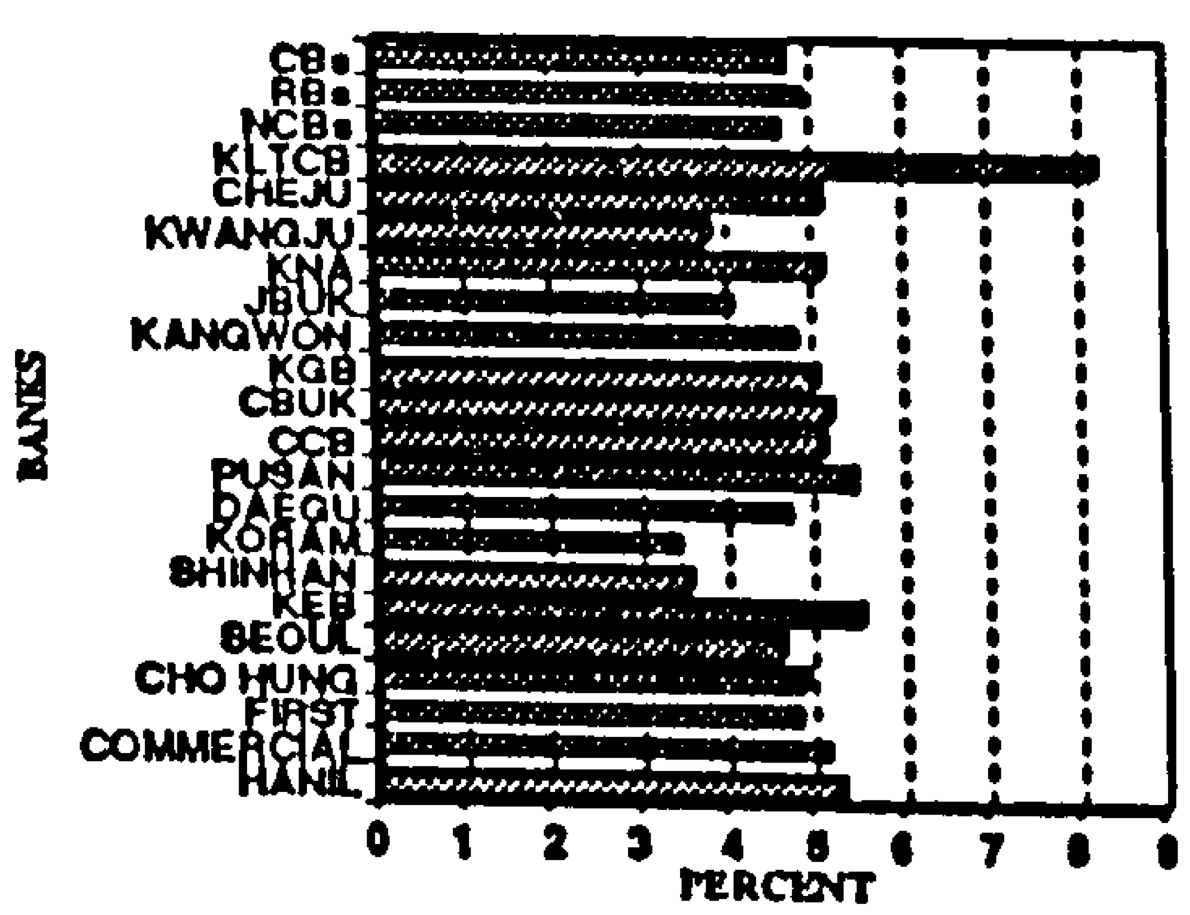
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	5.69	5.29	5.20	4.69	5.37	5.10	5.33	5.11	5.61	5.38	5.28
COMMER	5.20	4.52	4.87	4.80	5.26	5.21	5.18	5.12	5.37	5.40	5.09
FIRST	5.69	4.79	4.71	4.92	5.04	4.78	4.59	4.67	4.40	4.51	4.81
CHO HUN	5.51	4.58	4.75	4.62	4.81	4.98	4.76	4.79	5.06	5.18	4.91
SEOUL	5.33	4.20	4.70	4.40	4.65	4.39	4.56	4.48	4.92	5.00	4.66
KEB	6.00	5.02	5.90	5.57	5.23	4.96	5.37	6.30	5.99	5.37	5.57
SHINHAN	1.09	2.85	3.70	3.65	3.49	4.28	3.97	4.01	4.58	4.50	3.61
KORAM	**	1.43	4.00	4.11	3.37	4.07	4.05	3.75	3.00	2.95	3.42
DAEGU	6.04	4.33	3.89	4.00	4.64	5.16	5.60	4.18	4.34	4.84	4.70
PUSAN	6.68	4.95	4.84	5.10	5.85	5.78	5.92	4.96	4.92	5.97	5.50
CCB	6.77	4.46	4.49	5.53	5.69	5.84	5.88	4.17	3.91	4.69	5.14
CBUK	8.34	4.18	4.11	4.59	5.43	5.62	5.28	5.20	4.20	5.10	5.21
KGB	7.55	4.37	4.53	4.78	5.26	5.30	5.31	4.36	4.38	4.96	5.08
KANGWO	8.00	5.50	4.14	4.89	4.74	4.91	4.32	3.76	3.69	4.22	4.82
JBUK	5.87	4.27	3.34	3.57	3.73	4.72	3.85	3.46	3.98	4.09	4.09
KNA	7.11	4.94	4.82	5.15	5.30	5.27	5.37	4.46	3.98	4.74	5.12
KWANGJ	3.42	2.93	3.29	3.26	3.89	4.17	4.54	3.91	3.79	5.05	3.83
CHEJU	7.32	4.85	4.59	4.54	5.26	5.26	5.33	5.48	4.57	4.02	5.12
KLTCB	11.57	10.55	9.52	8.79	8.84	8.32	7.47	6.14	5.69	5.79	8.27
NCBs	4.93	4.08	4.73	4.59	4.65	4.72	4.73	4.78	4.87	4.79	4.67
RBs	6.71	4.48	4.20	4.54	4.98	5.20	5.14	4.40	4.17	4.77	4.86
CBs	5.64	4.30	4.44	4.57	4.84	4.99	4.96	4.57	4.48	4.78	4.77

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.9> Trends of IEEA Ratio



<Figure B.10> IEEA Ratio by Banks (10 Year Average)



may reflect the fact that (as discussed in Chapter 2 and earlier in this subsection) interest rates in Korea were substantially liberalised at the end of 1988.

During the period 1982-1991, Table B.3 and Figure B.6 show that Kangwon Bank has the highest NIM of 4.11% followed by the 3.72% of CCB. NIMs of RBs range from 2.41% of Pusan Bank to 4.11% of Kangwon Bank, while those of NCBs range from 0.63% for KEB which is the lowest to 2.03% of Shinhan Bank. Since 1989, Shinhan Bank has a higher NIM than other NCBs. In 1991, Cheju Bank is the highest NIM of 4.22% followed by the 4.17% of JBUK. NIMs of RBs range from 3.02% for Kangwon Bank to 4.22% of Cheju Bank, while those of NCBs range from 0.45% for KEB to 2.26% for Shinhan Bank. KLTCB has a higher NIM than NCBs during the period as a whole, but was lower in 1991.

In a nutshell, NIM of the Korean banks fluctuated with interest rate changes. RBs have a significantly higher NIM than NCBs during the entire period. The main reason is that RBs charged higher loan rates than NCBs and, accordingly, earned more interest income than NCBs. On the other hand, RBs paid the similar interest rates on deposits to NCBs. As a result, RBs' interest expenses are almost the same as NCBs'.

2.4 NET BURDEN

One way of maximising the profit of a bank is effectively to control overhead (or burden). Table B.6 and Figures B.11-B.12 show the net burden as a percentage of total earning assets. Net burden is the difference between non-interest expenses and non-interest income. This ratio measures the operating efficiency of a bank with the ratio shown in Table B.7. As discussed earlier in this section, effective control of overhead or burden is very important to performance of a bank. The lower the net burden ratio, the more a bank effectively controls overhead.

Table B.6 and Figures B.11-B.12 show that NCBs are more efficient than RBs and show almost the same pattern with NIM as shown in Table B.3 and Figure B.5. Net burden of NCBs and RBs rose remarkably from 0.43% and 1.96% in 1982 to 1.57% and 3.10% in

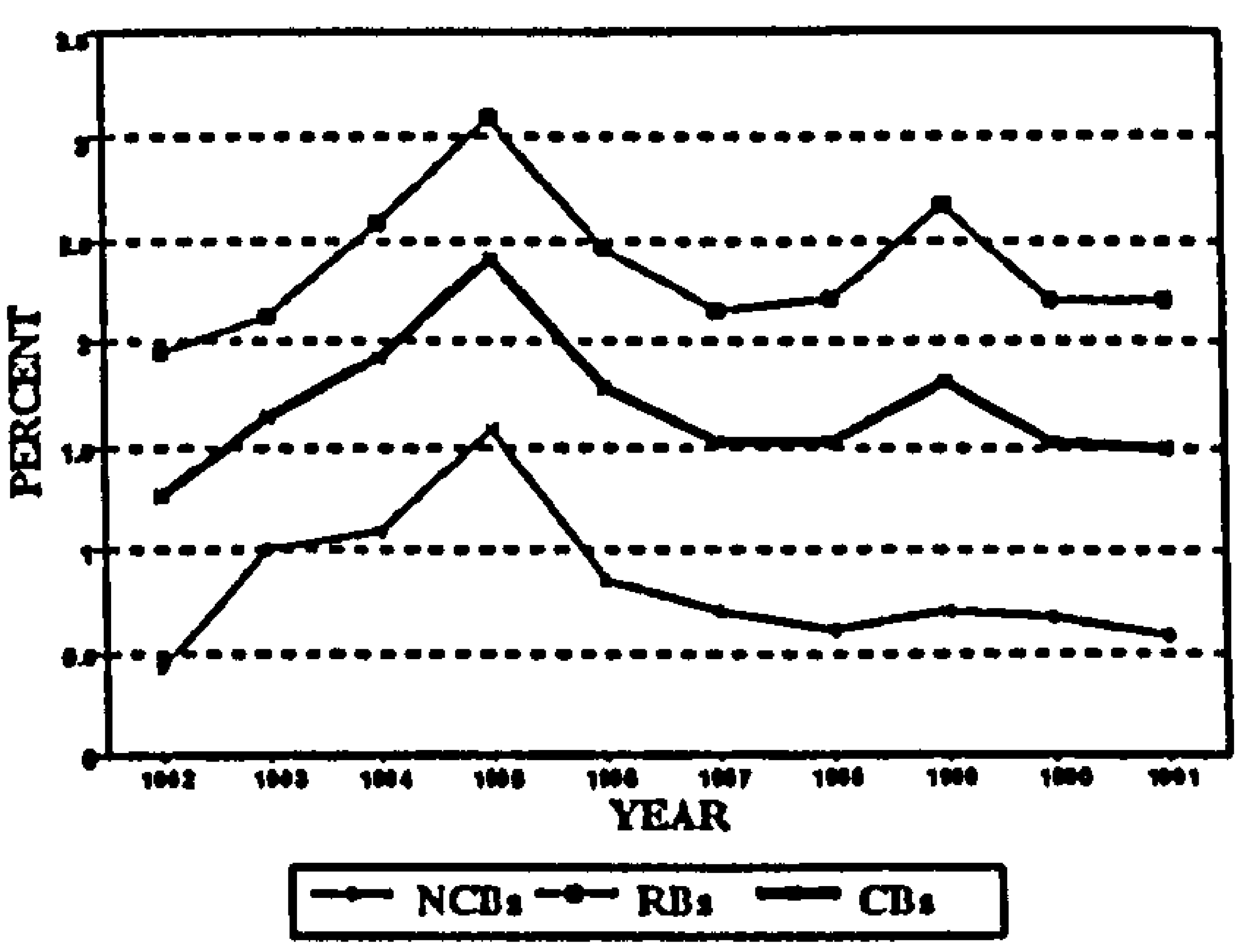
<Table B.6> Net Burden

Unit: %

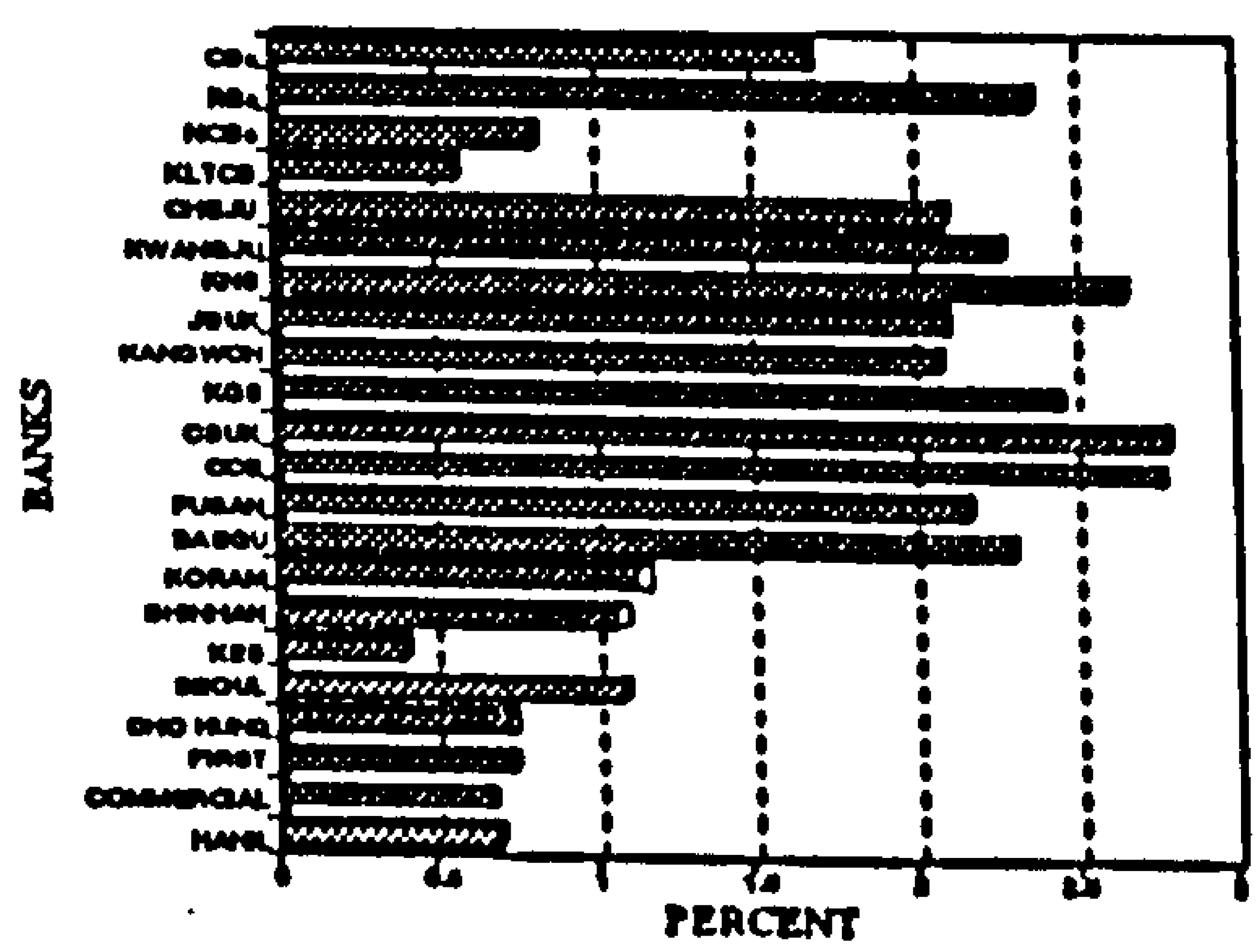
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	-0.02	0.67	0.72	0.87	0.68	1.07	0.89	0.88	0.84	0.46	0.71
COMMER	0.13	0.55	0.93	1.20	0.46	0.51	0.86	1.00	0.68	0.34	0.67
FIRST	-0.58	0.99	1.13	1.40	1.12	0.89	0.41	0.64	0.73	0.64	0.74
CHO HUN	0.83	1.24	1.02	1.12	0.80	0.61	0.61	0.30	0.35	0.50	0.74
SEOUL	0.62	1.00	1.60	1.80	1.60	1.14	0.81	0.65	0.84	0.85	1.09
KEB	0.39	0.62	0.66	0.52	0.44	0.40	0.44	0.34	0.03	0.26	0.41
SHINHAN	1.61	0.89	0.97	4.65	0.33	0.28	-0.02	0.58	0.82	0.74	1.08
KORAM	**	1.90	1.54	1.03	1.41	0.57	0.86	1.16	1.02	0.85	1.15
DAEGU	1.74	1.18	2.34	2.47	2.72	2.38	2.36	2.99	2.48	2.37	2.30
PUSAN	1.80	2.04	2.68	2.70	2.02	2.03	1.93	2.13	1.70	2.63	2.17
CCB	2.07	2.15	2.85	3.92	3.20	2.91	2.97	2.56	2.48	2.74	2.79
CBUK	2.41	1.89	2.82	3.24	2.90	2.43	3.58	4.00	2.28	2.41	2.80
KGB	2.03	2.40	2.79	3.60	2.46	2.18	2.37	2.49	2.17	2.11	2.46
KANGWO	1.92	2.63	2.93	4.25	2.98	1.78	0.50	0.68	1.82	1.50	2.10
JBUK	1.78	2.22	2.35	2.50	2.29	2.14	1.42	1.88	2.12	2.45	2.12
KNB	2.33	2.63	3.08	4.17	2.56	2.25	2.36	2.64	2.42	2.27	2.67
KWANGJ	1.18	1.66	2.07	2.14	2.09	1.81	2.40	4.74	2.47	2.32	2.29
CHEJU	2.37	2.47	2.01	1.97	1.71	1.73	2.39	2.82	2.10	1.55	2.11
KLTCB	0.51	0.62	0.80	0.78	1.02	0.69	0.49	0.47	0.44	0.11	0.59
NCBs	0.43	0.98	1.07	1.57	0.86	0.68	0.61	0.69	0.66	0.58	0.82
RBs	1.96	2.13	2.59	3.10	2.49	2.16	2.23	2.69	2.20	2.24	2.38
CBs	1.26	1.62	1.92	2.42	1.76	1.51	1.51	1.80	1.52	1.50	1.69

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.11> Trends of Net Burden



<Figure B.12> Net Burden by Banks (10 Year Average)



1985, respectively. However, net burden fell in 1986 and reached a low point in 1987 (1988 for NCBs). The average net burden ratio of NCBs is 0.82%, whereas that of RBs is 2.38%. This means that RBs do not effectively control overhead compared with NCBs. Net burden of RBs is almost three times higher than that of NCBs. The average ratio of CBUK is the highest (2.80%) followed by the 2.79% of CCB during the entire period. The ratios of RBs range from 2.10% for Kangwon Bank to 2.80% for CBUK, whereas those of NCBs range from 0.41% for KEB to 1.15% for KorAm Bank. In 1991, Table B.6 indicates that NCBs are also more efficient than RBs as long-term trends. Net burden of NCBs is 0.58%, while that of RBs is 2.24%. CCB is ranked at the top (2.74%), while KEB is the lowest (0.26%). KLTCB has a lower net burden than most commercial banks.

In brief, the trend of net burden shows similar pattern to that of NIM. NCBs are more efficient than RBs in terms of net burden. Net burden of RBs is almost three times higher than that of NCBs.

2.5 Operating Ratio

Table B.7 and Figures B.13-B.14 illustrate another operating efficiency measure. This operating ratio measures the level of total operating costs. The operating ratio is calculated as total operating expenses divided by total operating revenues. The higher the operating ratio, the less favourable for the banks. The greater the portion of revenues absorbed by costs, the less profit is available to pay dividends and reinvest in the bank. Examining the information in Table B.7 and Figures B.13-B.14 reveal that RBs' overall costs per Korean Won of revenues were slightly lower than the NCBs'. However, the difference between RBs and NCBs is not significant. The operating ratios of NCBs and RBs have drastically decreased from 101.7% and 98.1% in 1982 to 91.6% and 86.5% in 1991, respectively. However, average figures of NCBs in 1982 and 1983 were distorted by Shinhan Bank and KorAm Bank. Kangwon Bank recorded the lowest operating ratio of 80.6% followed by the 87.6% of Cheju Bank; the highest is the 97.6% of Pusan Bank. In 1991, Table B.7

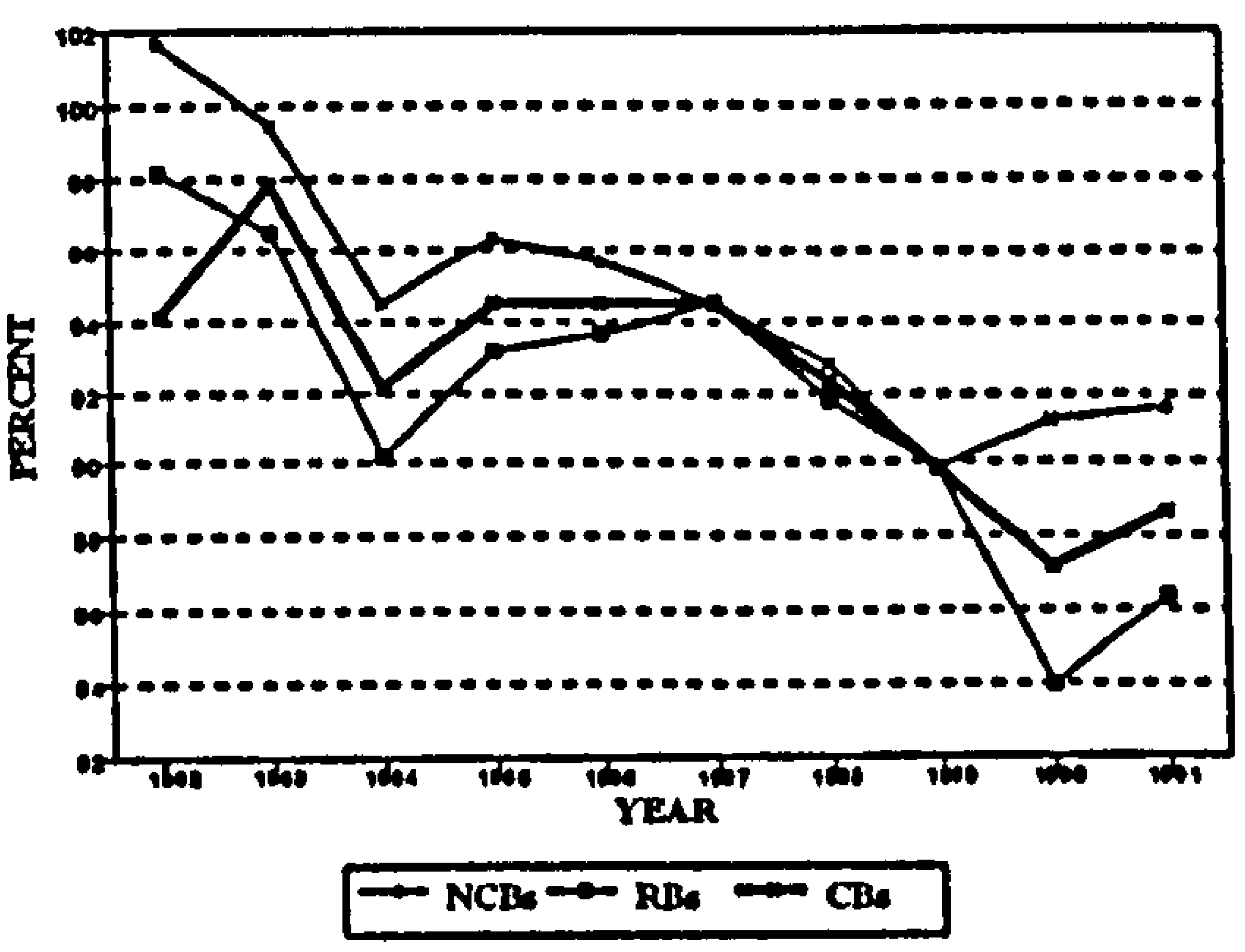
<Table B.7> Operating Efficiency

Unit: %

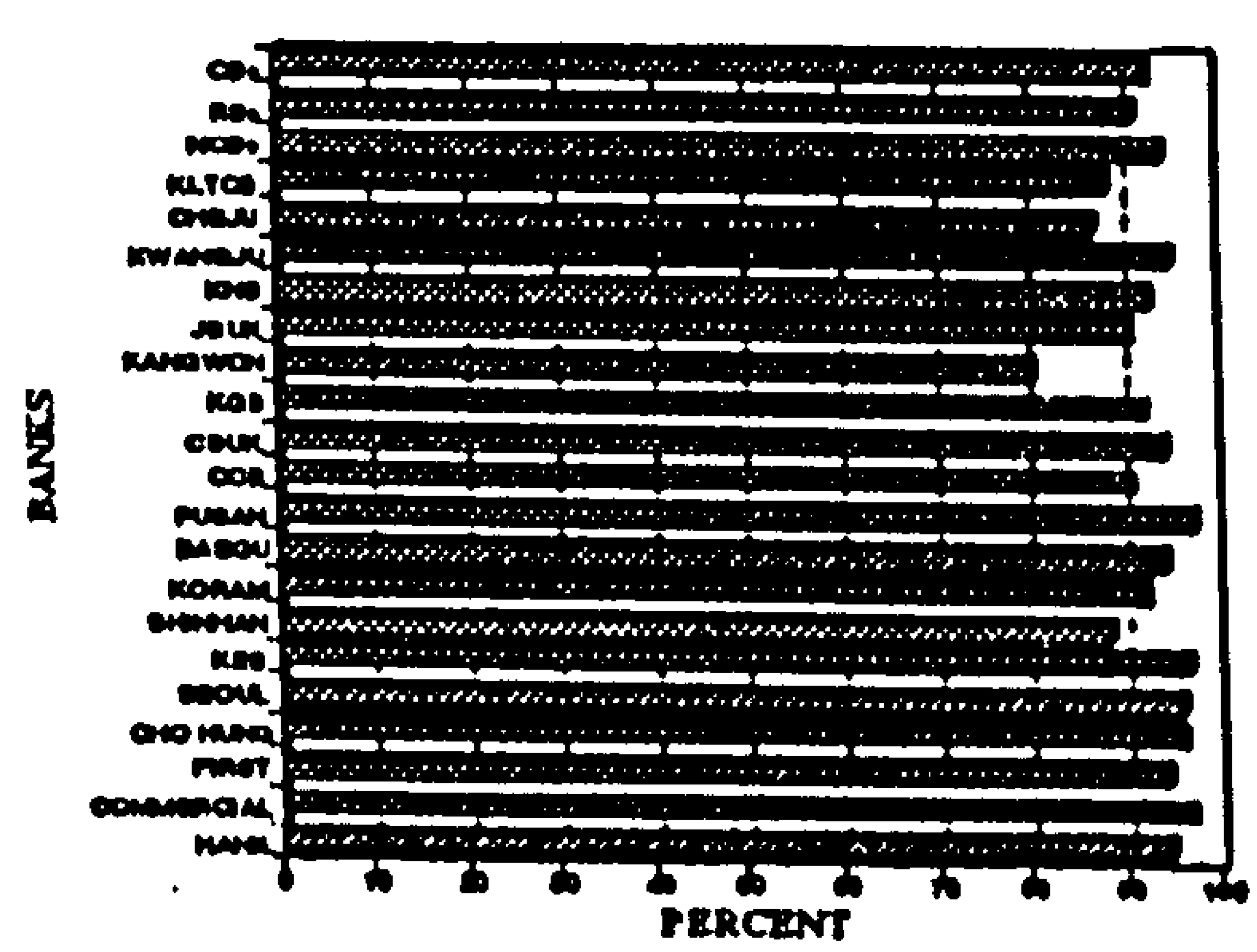
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	98.0	97.8	96.2	98.4	98.1	96.5	92.0	89.0	90.9	90.5	94.8
COMMER	97.2	98.3	96.5	97.8	98.0	98.4	98.1	95.0	94.2	94.1	96.8
FIRST	98.5	98.3	90.3	98.0	97.7	96.7	94.5	90.9	91.4	91.5	94.8
CHO HUN	98.4	98.4	98.8	98.4	98.1	98.2	96.0	91.4	93.5	93.6	96.5
SEOUL	102.4	98.8	96.0	98.1	96.9	96.7	94.2	91.0	93.7	93.4	96.1
KEB	97.1	98.5	97.6	97.8	96.8	96.0	96.1	95.3	98.3	98.2	97.2
SHINHAN	120.0	91.8	89.1	89.6	87.4	84.1	83.3	80.5	79.8	81.3	88.7
KORAM	**	114.7	91.6	92.5	91.3	89.1	87.4	85.9	88.7	90.0	92.3
DAEGU	103.4	101.1	94.5	95.3	96.0	96.0	94.3	92.6	87.9	88.2	94.9
PUSAN	97.9	98.0	95.6	98.8	99.2	99.3	99.3	98.9	94.1	95.0	97.6
CCB	96.0	98.1	87.3	95.6	92.5	94.0	92.0	82.8	81.7	87.2	90.7
CBUK	100.2	98.3	98.6	99.0	98.0	97.9	95.8	91.3	82.2	87.6	94.9
KGB	99.1	99.5	91.2	95.5	92.6	94.4	92.9	85.4	83.8	86.9	92.1
KANGWO	85.5	84.3	77.5	80.8	84.3	88.9	75.5	70.6	76.8	82.4	80.6
JBUK	106.9	98.9	93.6	96.4	97.8	96.4	85.6	76.3	75.1	81.8	90.9
KNB	100.6	96.8	91.0	95.8	96.2	96.8	94.2	89.2	84.6	87.6	93.3
KWANGJ	92.2	93.7	88.2	90.2	96.1	97.1	94.1	120.3	88.8	92.5	95.3
CHEJU	99.5	96.6	84.9	83.1	83.2	83.2	94.6	91.1	84.9	75.3	87.6
KLTCB	88.5	90.6	90.3	90.6	92.2	90.1	87.3	85.9	86.3	87.6	88.9
NCBs	101.7	99.6	94.5	96.3	95.5	94.5	92.7	89.9	91.3	91.6	94.6
RBs	98.1	96.5	90.2	93.0	93.6	94.4	91.8	89.8	84.0	86.5	91.8
CBs	94.1	97.9	92.1	94.5	94.5	94.4	92.2	89.9	87.2	88.7	93.1

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.13> Trends of Operating Efficiency



<Figure B.14> Operating Efficiency by Banks (10 Year Average)



shows that Cheju Bank has the lowest operating ratio of 75.3% followed by the 81.3% for Shinhan Bank and the 81.8% for Jeonbuk Bank. Cheju Bank has drastically dropped since 1989, whereas Kangwon Bank and JBUK have increased since 1989. The operating ratios of RBs range from 75.3% for Cheju Bank to 92.5% for Kwangju Bank. Corresponding figures of NCBs range from 81.3% for Shinhan Bank to 98.2% for KEB. KLTCB has superior to most of commercial banks during the period as a whole, and in 1991.

In sum, operating ratio as a measure of operating efficiency has drastically decreased. Examining these ratios reveals that NCBs are slightly higher than RBs. This implies that NCBs have a lower ability to pay dividends and reinvest in the bank than RBs.

2.6 Debt Service Coverage

Table B.8 and Figures B.15-B.16 show the ratio of total earnings before income tax to total interest expenses and its long-term trends. This measure, called the times interest earned ratio or debt service coverage, shows the number of times that the bank is covering its interest charges. To calculate this ratio, total earnings before income tax are defined as total operating revenues plus non-operating revenues. The higher the number of times, the more ability the bank has to cover its interest expenses.

Examining the information in Table B.8 and Figures B.15-B.16 reveal that RBs are slightly higher than NCBs and the ratio has increased, but some fluctuation occurred over time. During the period 1982-1991, the average times interest earned ratios are 1.82X for all commercial banks, 1.63X for NCBs and 1.97X for RBs. The ratio for NCBs has gradually increased from 1.50X in 1982 to 1.64X in 1991. The ratio for RBs was more widely fluctuated than that for NCBs. Debt service coverage of RBs sharply increased from 1.59X in 1982 to 2.12X in 1984 and after 1985, dropped for two consecutive years to 1.79X in 1987. However, it increased again and reached the highest point (2.21X) in 1989. Movement of this ratio shows the similar pattern with that of NIM. The highest ratio is marked by Kangwon Bank of 2.21X. JBUK and Kwangju Bank are ranked at the second (2.07X)

<Table B.8>

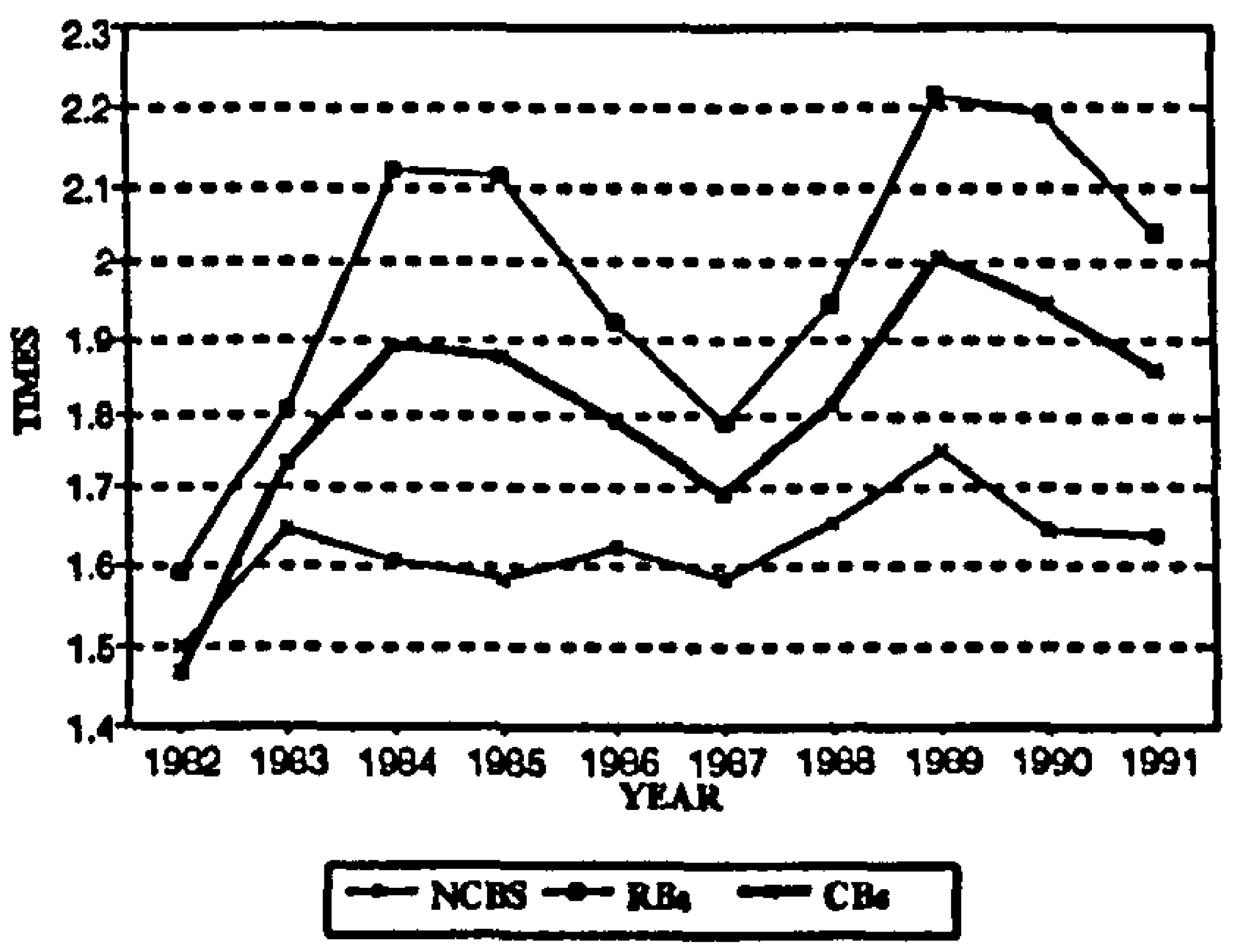
Debt Service Coverage

Unit : times

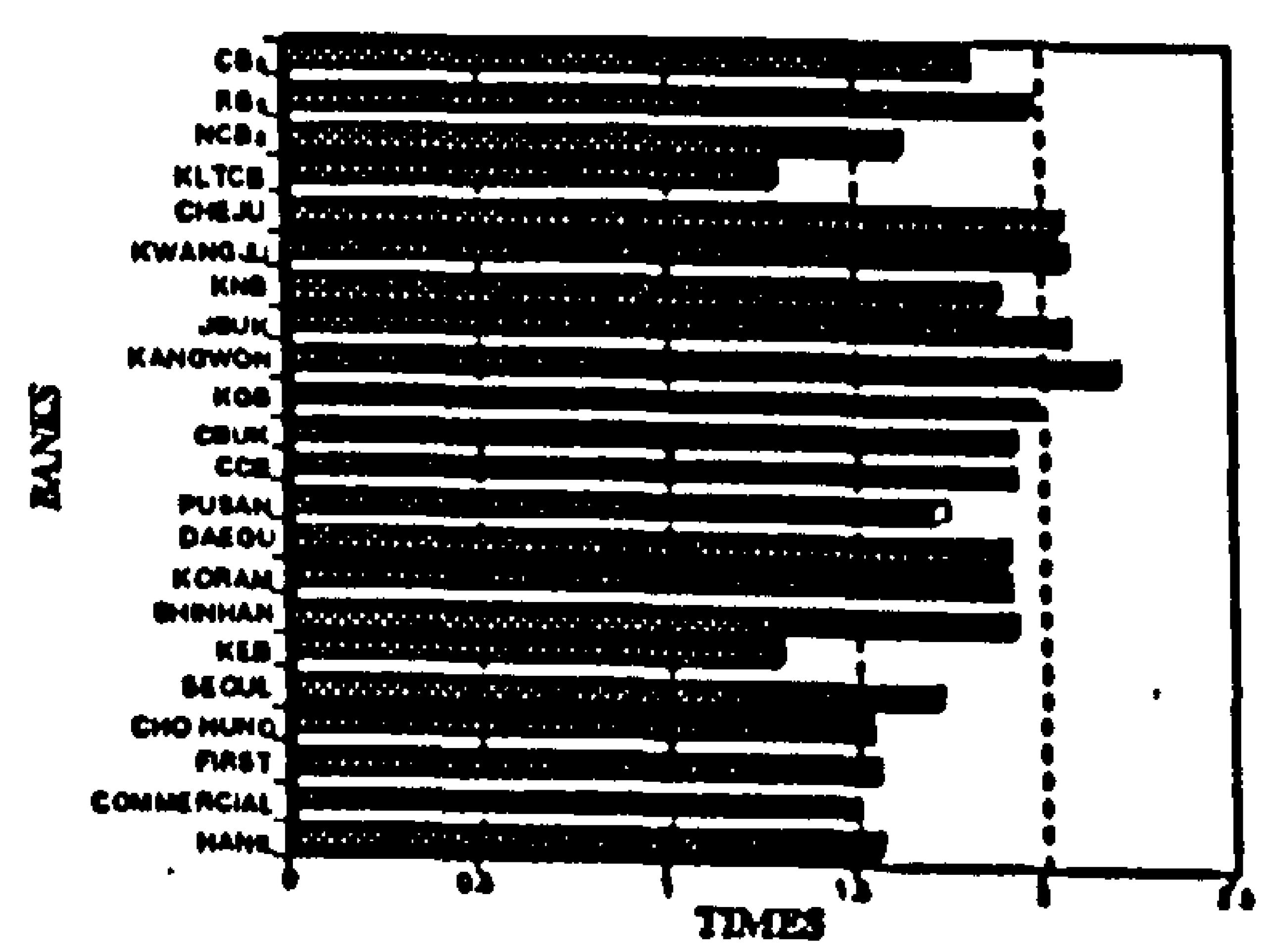
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	1.36	1.46	1.52	1.50	1.50	1.58	1.62	1.74	1.60	1.65	1.55
COMMER	1.37	1.44	1.58	1.58	1.45	1.48	1.50	1.58	1.53	1.52	1.50
FIRST	1.32	1.42	1.56	1.54	1.56	1.55	1.63	1.74	1.63	1.66	1.56
CHO HUN	1.32	1.47	1.46	1.49	1.48	1.51	1.60	1.76	1.69	1.66	1.54
SEOUL	1.57	1.65	1.70	1.73	1.75	1.73	1.80	1.91	1.72	1.71	1.73
KEB	1.19	1.24	1.24	1.24	1.28	1.35	1.40	1.40	1.31	1.38	1.30
SHINHAN	2.37	1.98	1.96	1.86	1.87	1.79	1.88	1.92	1.88	1.80	1.93
KORAM	**	2.51	1.85	1.75	2.08	1.68	1.81	1.93	1.86	1.76	1.91
DAEGU	1.56	1.81	2.09	2.14	1.87	1.70	1.76	2.12	2.04	1.93	1.90
PUSAN	1.46	1.68	1.87	1.79	1.70	1.66	1.66	1.88	1.85	1.76	1.73
CCB	1.64	1.76	2.07	1.92	1.81	1.71	1.82	2.21	2.28	2.05	1.93
CBUK	1.42	1.63	1.99	2.02	1.84	1.72	2.07	2.39	2.24	1.90	1.92
KGB	1.58	1.85	2.18	2.07	1.90	1.81	1.90	2.26	2.17	2.01	1.97
KANGWO	1.66	2.00	2.69	2.68	2.16	1.82	2.20	2.63	2.29	1.97	2.21
JBUK	1.68	1.80	2.08	2.10	1.99	1.76	2.17	2.48	2.43	2.24	2.07
KNB	1.49	1.74	1.98	2.07	1.81	1.72	1.87	2.10	2.13	1.93	1.88
KWANGJ	1.86	1.98	2.22	2.25	2.12	1.87	2.17	2.14	2.17	1.94	2.07
CHEJU	1.60	1.83	2.05	2.13	2.08	2.08	1.81	1.94	2.29	2.67	2.05
KLTCB	1.24	1.23	1.25	1.27	1.29	1.26	1.31	1.40	1.38	1.40	1.30
NCBs	1.50	1.65	1.61	1.58	1.62	1.58	1.65	1.75	1.65	1.64	1.63
RBs	1.59	1.81	2.12	2.12	1.93	1.79	1.94	2.21	2.19	2.04	1.97
CBs	1.47	1.74	1.89	1.88	1.79	1.70	1.82	2.01	1.95	1.86	1.82

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.15> Trends of Debt Service Coverage



<Figure B.16> Debt Service Coverage by Banks (10 Year Average)



followed by Cheju Bank of 2.05X. Shinhan Bank is the highest (1.93X) out of NCBs. KEB marked the lowest (1.30X). In 1991, Cheju Bank is the top (2.67X) followed by JBUK of 2.24X. Shinhan Bank is once again the highest (1.8X) out of NCBs. KLTCB has a very low ratio during the period as a whole and in 1991.

In sum, analysing the debt service coverage ratio reveals the RBs have more ability to cover their interest expenses than NCBs. However, the RB ratios fluctuated more widely over time than that of the NCBs.

2.3 RISK MEASURES

2.3.1 Liquidity Risk

A bank's liquidity risk is the risk that a bank may not have adequate cash or other liquid assets to meet demands for deposits withdrawals and/or requests (i.e., all legitimate requests) by good customers (Graddy and Spencer, 1990). Liquid assets, here, can be defined as ones that are easily converted into cash with little or no capital losses. By their nature, however, these assets reduce a bank's profitability: this reflects the trade-off between liquidity and profitability. Thus, a higher liquidity ratio for a bank would indicate a less-risky and corresponding less-profitable bank (Hempel and Simonson, 1991).

Banks need liquidity to meet their customers' liquidity requests. Since banks can prepare for expected deposit withdrawals and expected loans, it is the unexpected changes in these liquidity requests that produce liquidity risk as discussed earlier in Chapter 4. If these unexpected changes are adverse, but small, the bank should be able to meet its liquidity needs without costly financial distress. However, if the changes are large and the bank become vulnerable, a liquidity crisis could develop. These unexpected changes can be caused by factors either internal to the bank (such as poor liquidity planning and management) or external to it (such as unexpected economic or financial collapse). Therefore, banks must hold some liquid assets.

Liquidity management involves the estimation of the demand for funds by the customers and the provision of sufficient reserves to meet these needs. When liquidity needs are matched in an unplanned way (e.g., selling long-term investments or calling loans), a bank's shareholders' wealth is likely to be reduced. The inability of a bank to meet depositors' withdrawal requests can lead to severe regulatory action, culminating in liquidation and , thus, the complete destruction of shareholder wealth. Inadequate funding of the loan portfolio disrupts customer relationships and could permanently reduce a bank's market share.

Liquidity needs are determined by the time-series properties of the deposit and loan accounts, existing and planned. The temporal dimensions of these account can be divided into four categories (Graddy and Spencer, 1990):

(1) seasonal variations;

(2) cyclical movements;

(3) secular trends; and

(4) short-term irregular or random movement.

Seasonal variations in deposits and loans result from natural weather patterns and social conventions like New Year's day and the Full Moon Festival and tax system in Korea. These events produce deposits and loan flows that reoccur year after year in a relatively consistent manner. Loan demands and deposit growth are closely related to the business cycle. Loan demands tend to rise above the normal trend line in times of high business activity and to fall below expectations during slack periods. On the other hand, deposit growth is likely to be low on the upturn in the cycle and accelerate as business conditions worsen. Secular trends in loans and deposits extend over many years, resulting from such factors as population shifts, technological change, industrial restructuring, and changes in consumer behaviour. Large deposits accounts of wealthy individuals are prone to erratic fluctuations. Therefore, some protection must be provided against what might be termed irregular or unstable deposits and loans.

Bank liquidity may play five roles. First, liquidity serves to demonstrate to the market that the bank is 'safe' and , therefore, capable of repaying its borrowing; this function can be called the 'confidence' factor. Although the existence of deposit insurance and the lender of last resort can guarantee such confidence, however, the ultimate guarantor is a strong balance sheet and capable management as discussed in Chapter 3 (also see Sinkey, 1992). Second, liquidity enables the bank to meet its prior loan commitments; this function is an integral part of the customer relationship. Failure to provide these needs could permanently reduce a bank's market share. Third, liquidity enables the banks to avoid the 'fire sale (in Benston and Kaufman's (1986) terms)' of assets to generate funds. Fourth, liquidity restrains the size of the default-risk premium the bank must pay for funds. Finally, it avoids abuse of bank use of the Central Bank's discount window.

A bank's liquidity can be generated by three ways: stored liquidity in the balance sheet and purchased liquidity in the market and securitisation of loans. Traditionally, bank liquidity management is to store liquidity investments as a temporary source of funds until a more permanent adjustment can be made. Because of the squeeze on bank profit margins, the practice of storing liquidity has become less popular but it still exists. As an alternative to storing liquidity in balance-sheet items, a bank may attempt to generate liquidity by managing its liabilities. This approach is referred to as liability management (LM): Kane (1979) divided LM into LM-1 and LM-2. The idea behind LM is to purchase or acquire funds and use them profitably, especially to meet loan demands. LM (LM-2 in Kane's terms) focuses on a permanent expansion of a banks's asset base as opposed to the compositional change (LM-1 in Kane's terms) in assets that liquidity-reserve approach adopts. Meanwhile, securitisation is a recent innovation designed to acquire funds by pooling and repackaging loans into securities; the loan-backed securities generated are then sold to a diversified group of investors. It is important to note that securitisation once again shifts the focus of funds management to the asset side of bank's statement. Active LM emphasises balance sheet growth as the means of providing loan-liquidity. In contrast, the 'new' asset liquidity management approach (i.e., securitisation) view the growing loan demand of borrowers as being satisfied by selling loans (securitisation) and other assets.

Since liquidity can be either stored in a bank's balance sheet or purchased in the market, or both, we need at least two alternative measures of liquidity. Although CDs as a tool of purchased liquidity have been recently increased in Korea, however, their share in banking liabilities is not yet very high (see Chapter 2). Hence, the separation of CDs from other deposits is not so meaningful. Furthermore, CBs are not allowed to securitise their loans in Korea. In this context, four alternative measures of bank liquidity are chosen and analysed:

(1) (cash + deposits at the BOK and other banks)/total assets;

(2) loans/deposits;

(3) core deposits/total assets; and

(4) loans/total assets.

Tables B.9-B.12 show the liquidity ratios of the sample banks. First, Table B.9 and Figures B.17-B.18 illustrate the portion of total assets held in cash, deposits at the BOK and other banks. This ratio shows the ability of a bank to meet short-term liquidity needs. Deposits at the BOK and other banks are used to clear checks, but they can also be utilised for liquidity requests in urgent cases. Table B.9 and Figure B.17 show the liquidity ratios of RBs are not so different from those of NCBs and have been gradually increased. These ratios had increased and reached the highest point in 1987 (1988 for NCBs). However, since 1987, these ratios decreased. During the period 1982-1991, the average ratios of liquidity are 22.5% for all sample banks, 22.7% for NCBs, and 22.4% for RBs, respectively. The highest is 26.9% for Shinhan Bank followed by the 26.3% for Hanil Bank. Shinhan Bank maintained a high liquidity position until 1987. Since 1988, however, its liquidity ratio has sharply decreased. Out of NCBs, KEB has the lowest ratio (17.2%), followed by KorAm Bank (20.1%). Pusan Bank has the lowest ratio (17.4%), followed by Kwangju Bank (18.0). At the end of 1991, the average liquidity ratios are 24.0% for all commercial banks, 21.7% for NCBs, and 25.9% for RBs, respectively. The liquidity ratios of CCB and CBUK, two regional banks, well exceeded 30.0%. Shinhan Bank has the

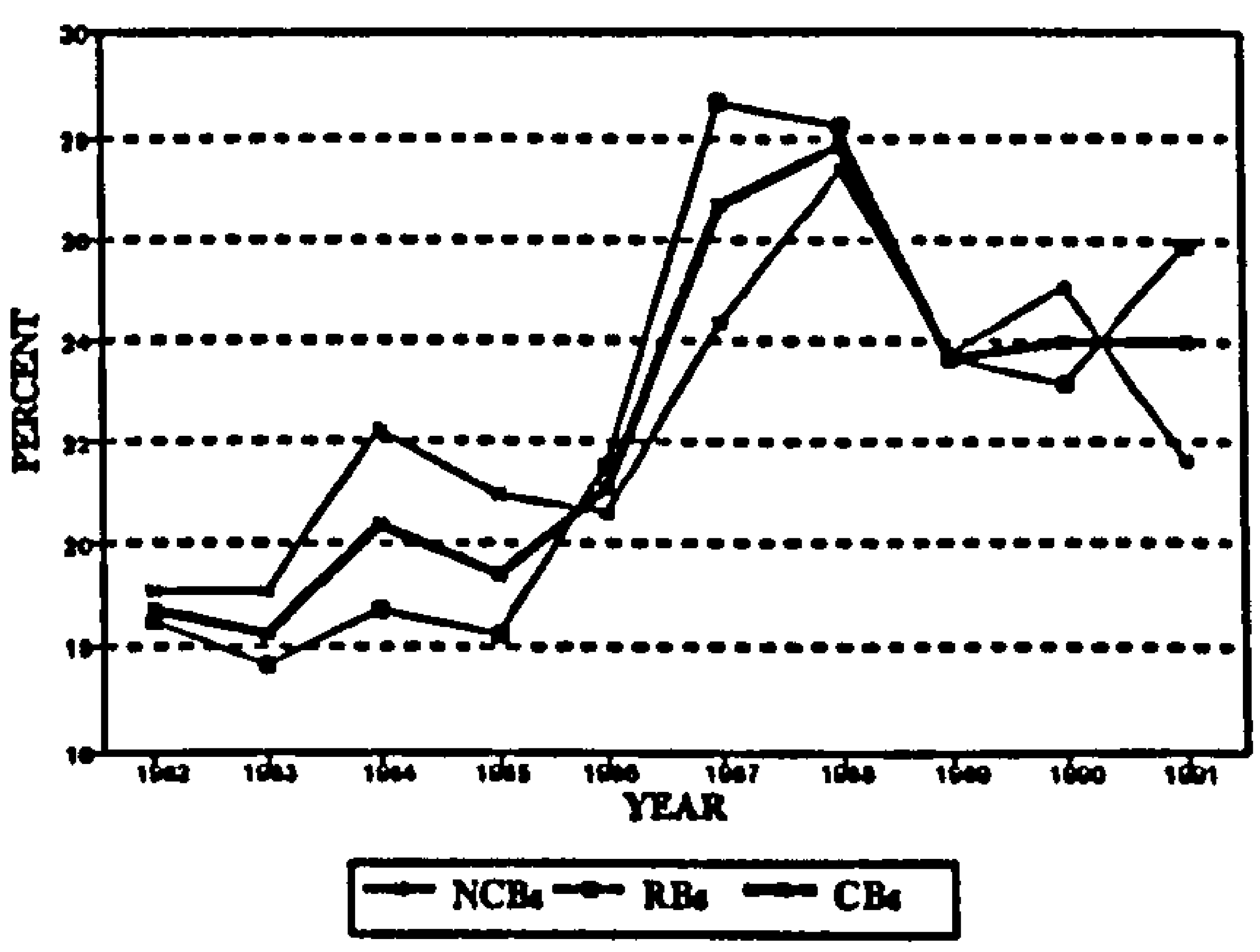
<Table B.9> Cash and Due from Banks to Total Assets

Unit: %

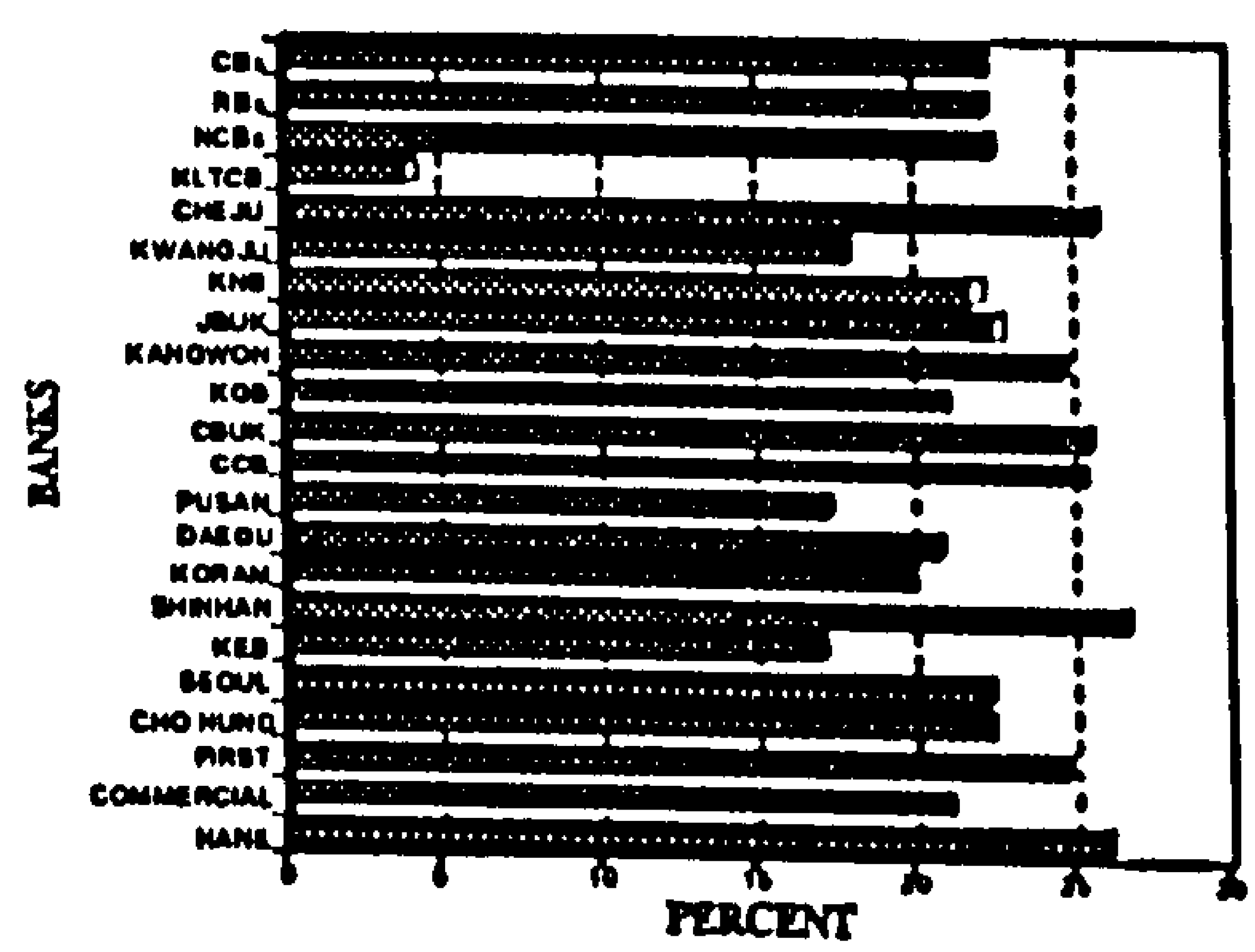
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	24.0	23.2	24.0	13.4	20.9	29.7	36.0	30.1	31.7	29.5	26.3
COMMER	17.2	16.9	20.7	20.8	17.1	23.1	26.4	23.5	24.9	19.9	21.1
FIRST	18.7	19.4	26.2	23.5	21.5	27.8	35.8	27.7	26.4	22.4	25.0
CHO HUN	20.4	15.4	20.4	17.6	18.5	25.6	31.0	25.4	27.2	21.8	22.3
SEOUL	19.5	13.5	20.0	19.4	16.0	26.0	33.1	25.4	27.2	25.0	22.5
KEB	16.1	7.9	13.0	24.3	23.6	16.1	13.5	18.1	20.4	18.9	17.2
SHINHAN	36.6	36.7	34.0	25.7	27.7	27.7	23.1	21.4	20.0	16.4	26.9
KORAM	**	18.9	19.4	22.5	19.1	19.2	20.8	18.1	23.1	19.6	20.1
DAEGU	16.4	13.0	15.3	17.3	25.1	29.0	29.6	18.7	21.3	22.8	20.9
PUSAN	12.2	13.7	15.5	17.5	17.2	23.1	21.1	17.0	18.6	18.3	17.4
CCB	14.2	17.7	23.6	21.9	24.5	33.8	33.1	26.1	27.6	32.6	25.5
CBUK	15.7	18.1	20.1	23.1	28.7	33.3	32.2	28.0	25.8	31.6	25.7
KGB	14.9	13.0	15.9	15.7	18.7	26.9	29.9	24.6	25.9	25.9	21.1
KANGWO	24.4	22.8	18.4	22.0	26.5	31.7	26.8	23.8	23.5	28.1	24.8
JBUK	20.9	20.7	21.7	13.1	13.7	27.4	33.0	24.0	24.4	28.6	22.8
KNB	18.0	18.3	19.9	17.9	19.4	30.7	21.3	25.7	23.5	26.3	22.1
KWANGJ	12.4	14.1	14.3	11.9	15.2	25.1	25.9	20.8	17.6	22.9	18.0
CHEJU	35.7	24.8	22.9	21.9	25.9	25.9	29.6	27.9	23.8	22.0	26.0
KLTCB	1.9	5.5	5.9	4.4	3.0	3.6	2 8	3.6	4 3	7.2	4 2
NCBs	19.1	19.0	22.2	20.9	20.6	24.4	27.5	23.7	25.1	21.7	22.7
RBs	18.5	17.6	18.8	18.2	21.5	28.7	28.3	23.7	23.2	25.9	22.4
CBs	18.7	18.2	20.3	19.4	21.1	26.8	27.9	23.7	24.1	24.0	22.5

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.17> Trends of Cash and Due from Banks to Total Assets



<Figure B.18> Cash and Due from Banks to Total Assets by Banks (10 Year Average)



lowest ratio (16.4%) followed by Pusan Bank at 18.3%. KLTCB, a development bank, shows the lowest ratio (7.2%), reflecting its business characteristics - long-term lending business: therefore, it is not necessary for KLTCB to maintain high short-term liquidity.

Table B.10 shows the loan/deposit ratios of sample banks and Figures B.19 and B.20 illustrate long-term trends and average ratios of individual banks for 10 years. The loan/deposit ratio is a traditional measure of bank liquidity, indicating the extent to which deposits are used to meet loan requests. The lower this ratio, the more stored liquidity a bank has, *ceteris paribus*. Loans include loans and discounts in Korean Won and foreign currency, advances for customers, call loans, local LC, and local Usance. Deposits include deposits in Korean Won and foreign currency, instalment savings deposits, and CDs. Therefore, Table B.10 is different from Table 3.11 calculated by the BOK in Chapter 3. Loans and deposits in Table 3.11 include only loans and discounts in Korean Won with some adjustments. During the period 1982-1991, the average ratios are 86.9% for all sample banks, 102.3% for NCBs, and 74.6% for RBs. Except Pusan Bank, most ratios of RBs are well below NCBs. Most of NCBs range from 80.0% for Shinhan Bank to 102.4% for Chohung Bank with the exception of KEB (144.5%) which was privatised at the end of 1989. These ratios reached their peak in 1986 (1985 for RBs) and, thereafter, sharply decreased until 1988. However, these ratios rose in 1989 and fell again in 1990. At the end of 1991, the ratios of NCBs are higher than those of RBs. The average ratios are 81.2% for all sample banks, 96.2% for NCBs, and 69.3% for RBs. Most of RBs with the exception of Pusan Bank (87.6%) and Kwangju Bank (80.4%) are well below 80%, while most NCBs, excluding Hanil Bank (73.1%), are above 83%. Therefore, we may conclude that as bank size increases, the relative volume of loans to deposits increases.

Table B.11 shows the ratio of core deposits to total assets and Figures B.20-B.22 illustrate long-term trends and the average ratio of each bank for 10 years. This ratio measures a bank's stable or core funds expected to remain in the bank, regardless of the economic environment. Therefore, core deposits tend to be collected in local markets, referred to as the bank's service area. To calculate the ratios in Table B.11, core deposits are defined as

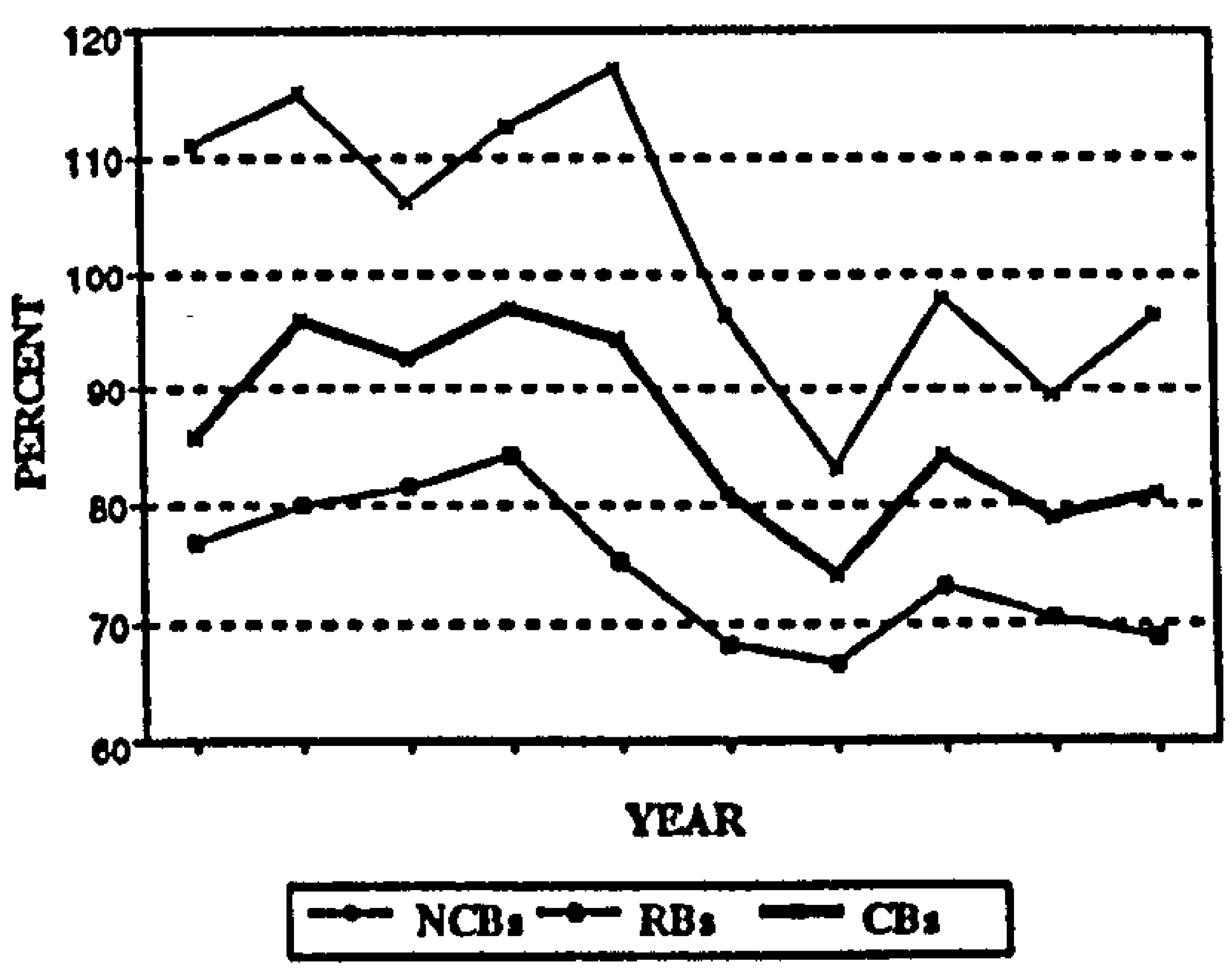
<Table B.10> Loans to Deposits Ratio

Unit: %

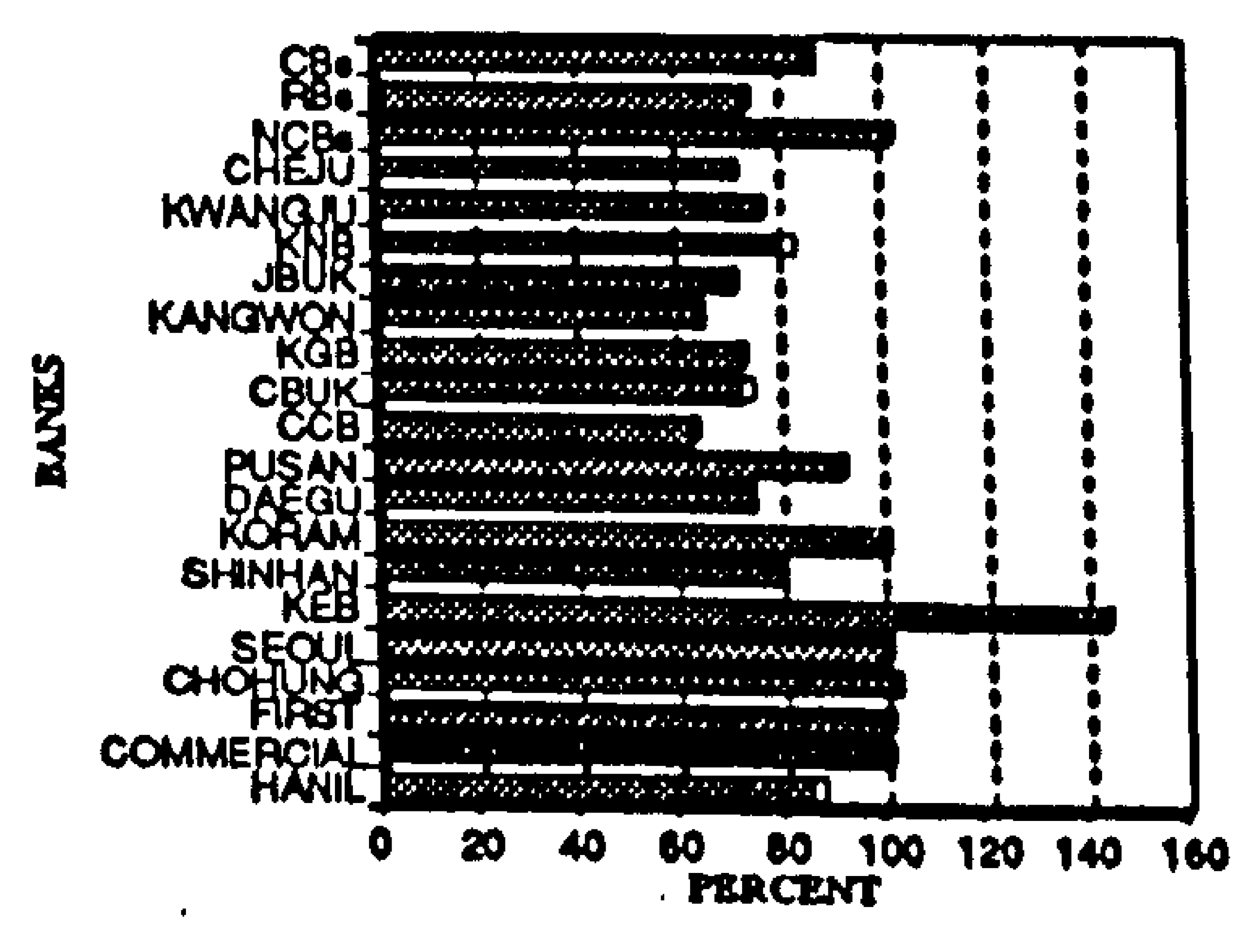
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	95.1	99.3	99.5	100.9	104.4	78.9	61.1	79.9	72.7	73.1	86.5
COMMER	95.1	98.1	98.2	111.4	128.5	104.1	90.9	105.1	89.9	96.9	101.8
FIRST	110.9	116.8	98.7	116.9	114.5	93.0	75.5	99.3	86.2	99.0	101.1
CHOHUN	112.9	121.6	104.4	110.3	114.2	97.9	80.6	96.6	87.7	98.2	102.4
SEOUL	108.5	123.2	111.4	121.6	113.7	89.7	73.3	98.1	86.0	86.7	101.2
KEB	186.8	176.2	155.2	178.6	177.7	133.2	103.5	106.5	111.7	115.6	144.5
SHINHAN	67.0	60.3	61.6	66.1	70.2	66.1	84.8	100.4	106.5	116.8	80.0
KORAM	**	124.8	118.3	94.4	113.1	107.2	95.3	97.3	72.9	83.2	100.7
DAEGU	83.2	80.2	80.8	85.9	63.5	60.9	58.9	79.7	75.9	77.0	74.6
PUSAN	104.8	107.8	105.7	101.4	89.2	78.9	80.8	87.2	80.8	87.6	92.4
CCB	71.9	70.8	72.4	69.9	64.4	51.1	54.7	60.1	60.2	53.5	62.9
CBUK	91.6	84.7	83.7	78.9	70.7	67.0	69.4	69.4	69.0	54.9	73.9
KGB	72.3	70.1	78.0	83.4	75.9	69.7	63.4	69.5	74.6	74.2	73.1
KANGWO	53.7	56.7	62.3	64.2	65.7	65.7	68.9	79.0	66.1	72.5	65.5
JBUK	69.5	75.2	73.1	83.9	84.7	65.7	66.2	70.3	69.9	60.7	71.9
KNB	82.9	82.8	85.6	94.5	89.3	86.0	75.9	80.4	75.0	70.3	82.3
KWANGJ	74.3	85.1	90.3	87.5	73.2	65.4	64.4	77.1	73.8	80.4	77.2
CHEJU	63.0	84.7	84.2	89.5	76.6	76.6	65.8	57.8	62.4	61.6	72.2
KLTCB	3821.8	3350.0	3025.1	3993.4	2662.7	1021.5	558.9	513.5	469.7	674 8	2009.1
NCBs	110.9	115.0	105.9	112.5	117.0	96.3	83.1	97.9	89.2	96.2	102.3
RBs	76.7	79.8	81.6	83.9	75.3	68.7	66.8	73.1	70.8	69.3	74.6
CBs	85.7	95.5	92.4	96.6	93.9	80.9	74.1	84.1	79.0	81.2	86.9

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.19> Trends of Loans to Deposits Ratio



<Figure B.20> Loans to Deposits Ratio by Banks (10 Year Average)



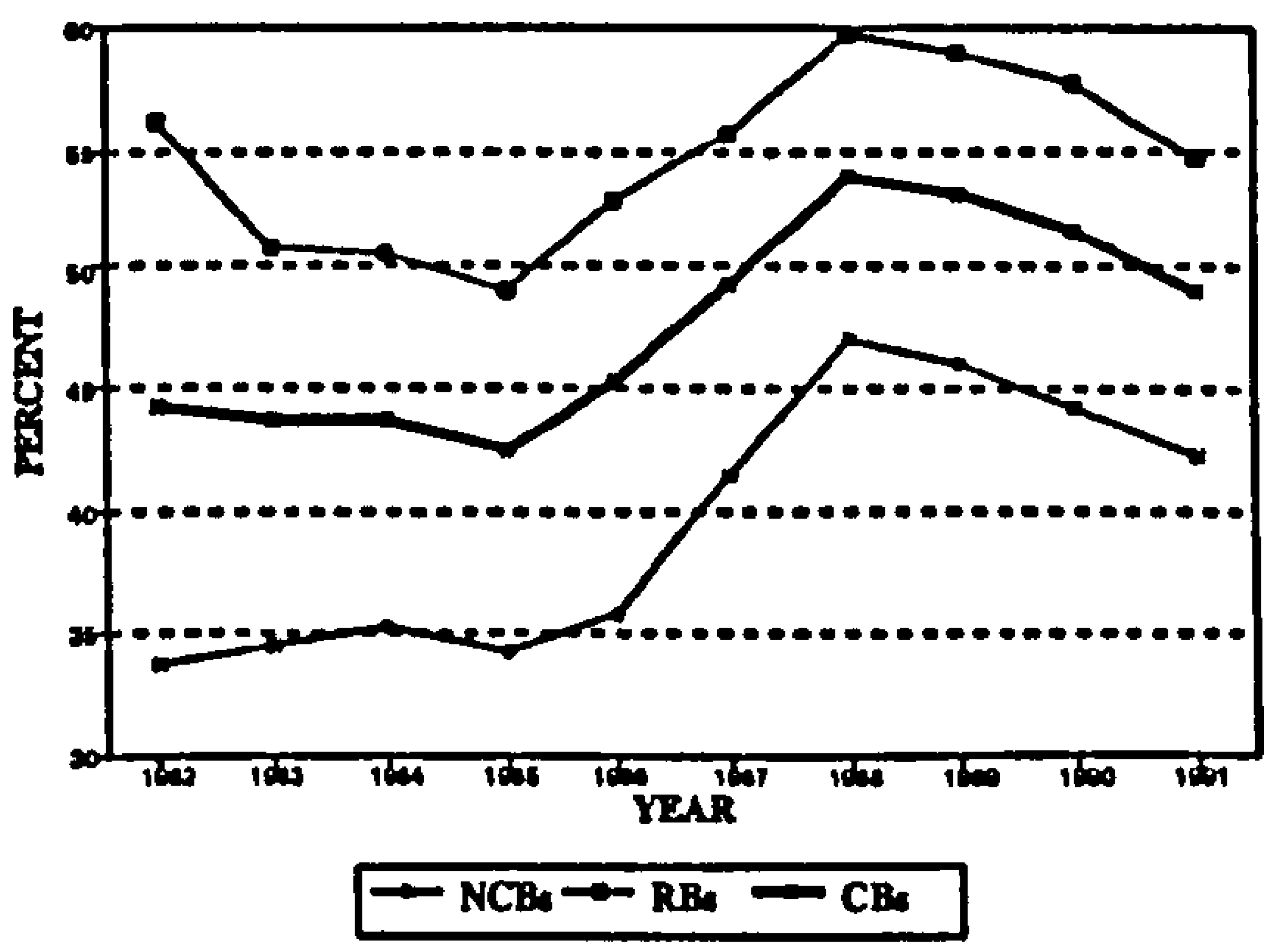
<Table B.11> Core Deposits to Total Assets Ratio

Unit: %

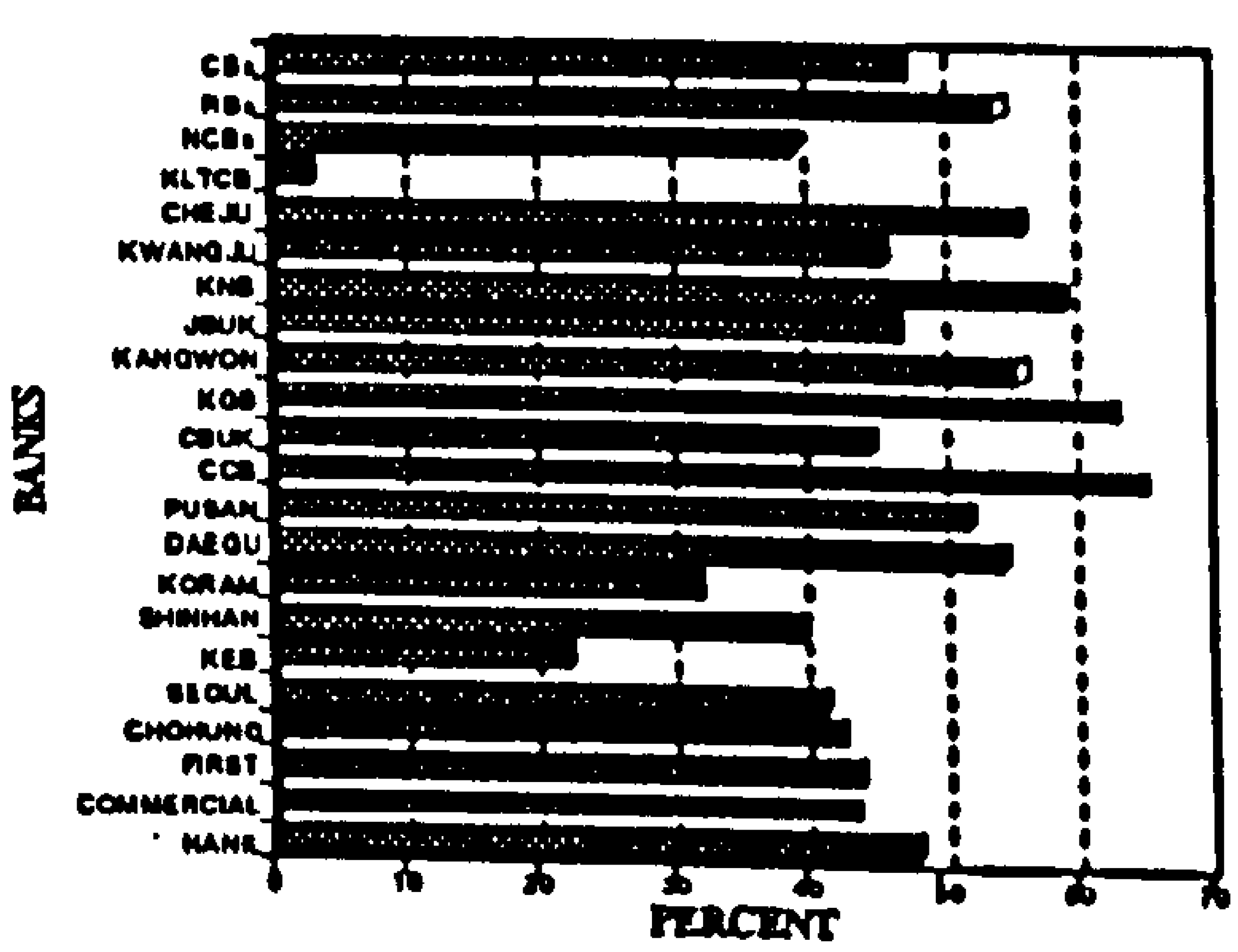
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	38.9	38.9	42.5	42.2	44.3	54.1	62.2	54.1	52.2	52.9	48.2
COMMER	35.7	37.3	38.0	37.1	39.6	46.5	52.3	48.8	51.2	49.0	43.5
FIRST	35.0	36.0	39.7	37.6	43.0	50.3	56.2	50.6	50.3	43.9	44.3
CHOHUN	34.6	32.9	36.9	37.6	40.5	45.8	52.2	50.7	49.3	47.4	42.8
SEOUL	34.9	33.9	36.0	34.3	38.2	44.7	51.6	48.6	47.7	48.1	41.8
KEB	9.7	10.1	11.2	11.2	13.1	23.0	30.3	41.6	38.2	37.2	22.5
SHINHAN	47.3	49.9	44.0	38.8	38.9	40.1	40.6	37.8	33.0	30.6	40.1
KORAM	**	38.4	34.2	35.0	29.0	26.9	30.4	36.2	32.3	28.8	32.4
DAEGU	48.4	48.9	47.1	47.1	57.5	59.2	66.4	59.7	59.8	56.9	55.1
PUSAN	46.0	45.0	47.2	48.5	55.8	56.3	58.2	57.0	56.0	54.1	52.4
CCB	62.1	61.0	63.2	64.4	63.1	69.9	70.4	66.3	66.5	65.9	65.3
CBUK	51.5	41.2	38.4	38.9	38.9	42.4	46.9	54.4	51.2	48.6	45.2
KGB	66.9	62.1	62.3	61.0	63.6	63.2	67.4	67.0	61.4	59.4	63.4
KANGWO	69.3	60.8	61.7	58.4	53.2	51.8	51.6	57.4	52.5	45.3	56.2
JBUK	58.0	49.6	45.7	41.0	41.0	51.4	49.3	45.0	46.3	45.1	47.2
KNB	55.7	54.4	56.4	55.0	59.3	58.5	69.7	62.3	62.7	60.5	59.5
KWANGJ	34.4	33.7	34.7	32.5	45.0	53.1	59.8	58.5	58.1	49.8	46.0
CHEJU	69.6	53.3	49.5	45.1	51.4	51.4	57.8	61.9	62.5	61.7	56.4
KLTCB	2.1	2.3	2.6	2.0	3.0	2.5	4.1	4.3	4.7	4.5	3.2
NCBs	33.7	34.7	35.3	34.2	35.8	41.4	47.0	46.0	44.3	42.2	39.4
RBs	56.2	51.0	50.6	49.2	52.9	55.7	59.7	58.9	57.7	54.7	54.7
CBs	44.3	43.7	43.8	42.5	45.3	49.4	54.1	53.2	51.7	49.2	47.9

NOTE: '**' denotes that KorAm Bank was not established in 1982

<Figure B.21> Trends of Core Deposits to Total Assets Ratio



<Figure B.22> Core Deposits to Total Assets by Banks (10 Year Average)



deposits in Korean Won and foreign currency plus instalment savings deposits. Regional-based banks should have high values for this ratio, whereas liquidity management banks or NCBs should have low values. During the period 1982-1991, as shown in Table B.11, RBs have a ratio of core deposits to total assets of 54.7%, whereas NCBs have a ratio of 39.4%. CCB has the highest ratio of 65.3%, while KEB has the lowest ratio of 22.5%. As theory suggests, the ratio of core deposits to total assets of RBs is much higher than that for the NCBs. At the end of 1991, the average ratios are 42.2% for NCBs and 54.7% for RBs, respectively. Ratios of RBs range from 45.1% for JBUK to 65.9% for CCB, while those of NCBs range from 28.8% for KorAm Bank to 52.9% for Hanil Bank. KLTCB shows a very low ratio, reflecting the fact that KLTCB raises its funds through bond issues.

Table B.12 shows the ratio of loans to total assets and Figures B.23 and B.24 illustrate long-term trends and the average ratio of each bank during the period 1982-1991. In the absence of secondary markets for securitisation of bank loans in Korea, bank loans are the least liquid assets. Accordingly, the ratio of loans to total assets is a measure of bank liquidity. A high ratio is indicative of a bank that is relatively illiquid, whereas a low ratio indicates a liquid bank with excess lending capacity. This ratio tends to vary directly with bank size. However, as shown in Table B.12 and Figures B.23 and B.24, the Korean banks show slightly different patterns. The average ratio of RBs which are smaller banks than NCBs is slightly higher than that of NCBs during the period 1982-1986. Since 1986, however, this ratio of RBs is almost the same level as that of NCBs. The average ratios are 41.4% for all sample banks, 40.0% for NCBs, and 42.4% for RBs, respectively. Pusan Bank shows the highest ratio of 50.9% followed by Kyungnam Bank at 50.3%, whereas KEB is the lowest ratio of 30.3%. In 1991, the ratios of NCBs slightly exceed those of RBs. The average ratios are 43.1% for all banks, 43.7% for NCBs, and 42.6% for RBs, respectively. However, it is difficult to conclude that big banks tend to have higher ratios than small banks in Korea. The ratios of RBs range from 32.2% for CBUK to 53.0% for Pusan Bank, while those of NCBs range from 27.7% for KorAm Bank to 49.4% for the Commercial Bank of Korea and Chohung Bank.

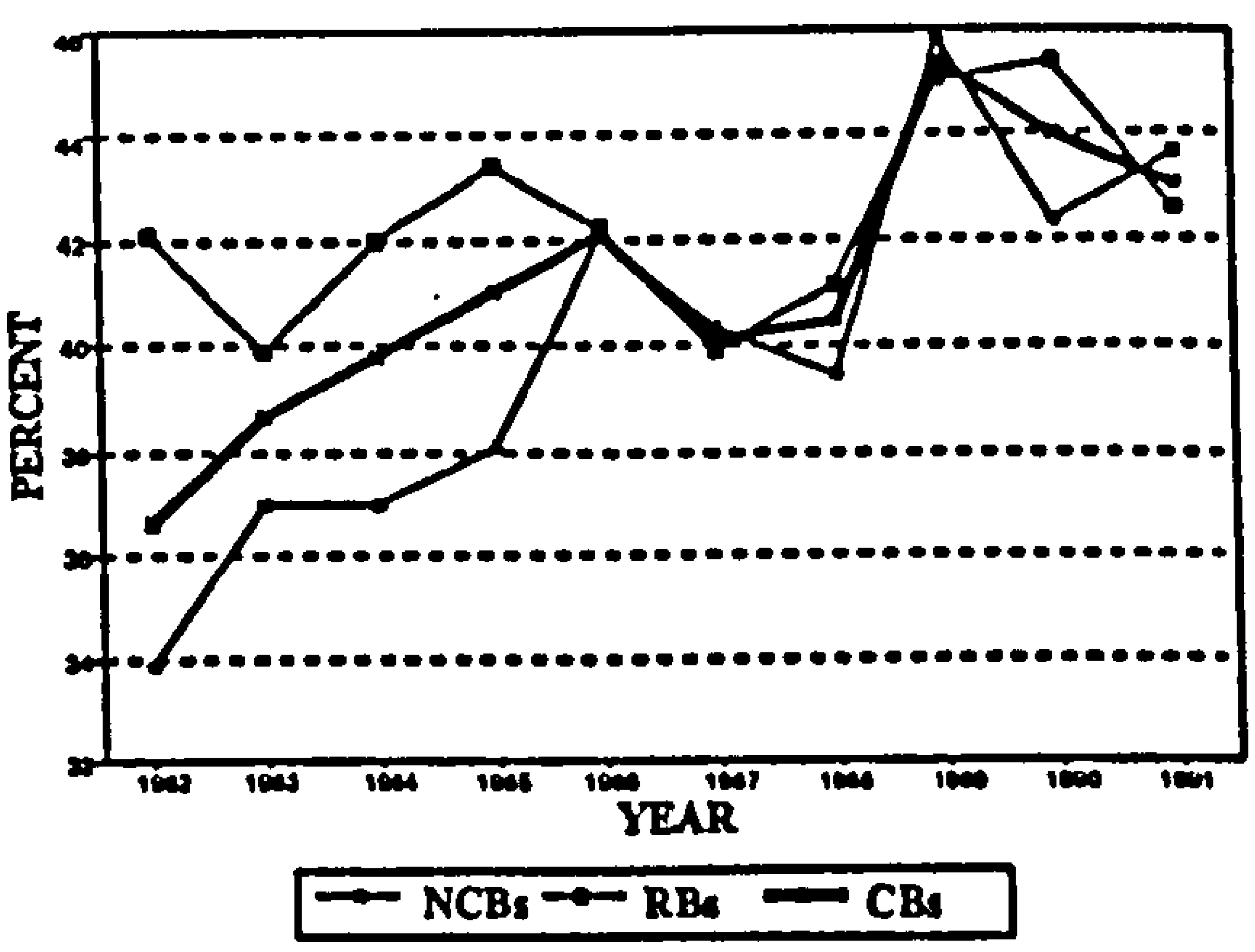
<Table B.12> Loans to Total Assets Ratio

Unit: %

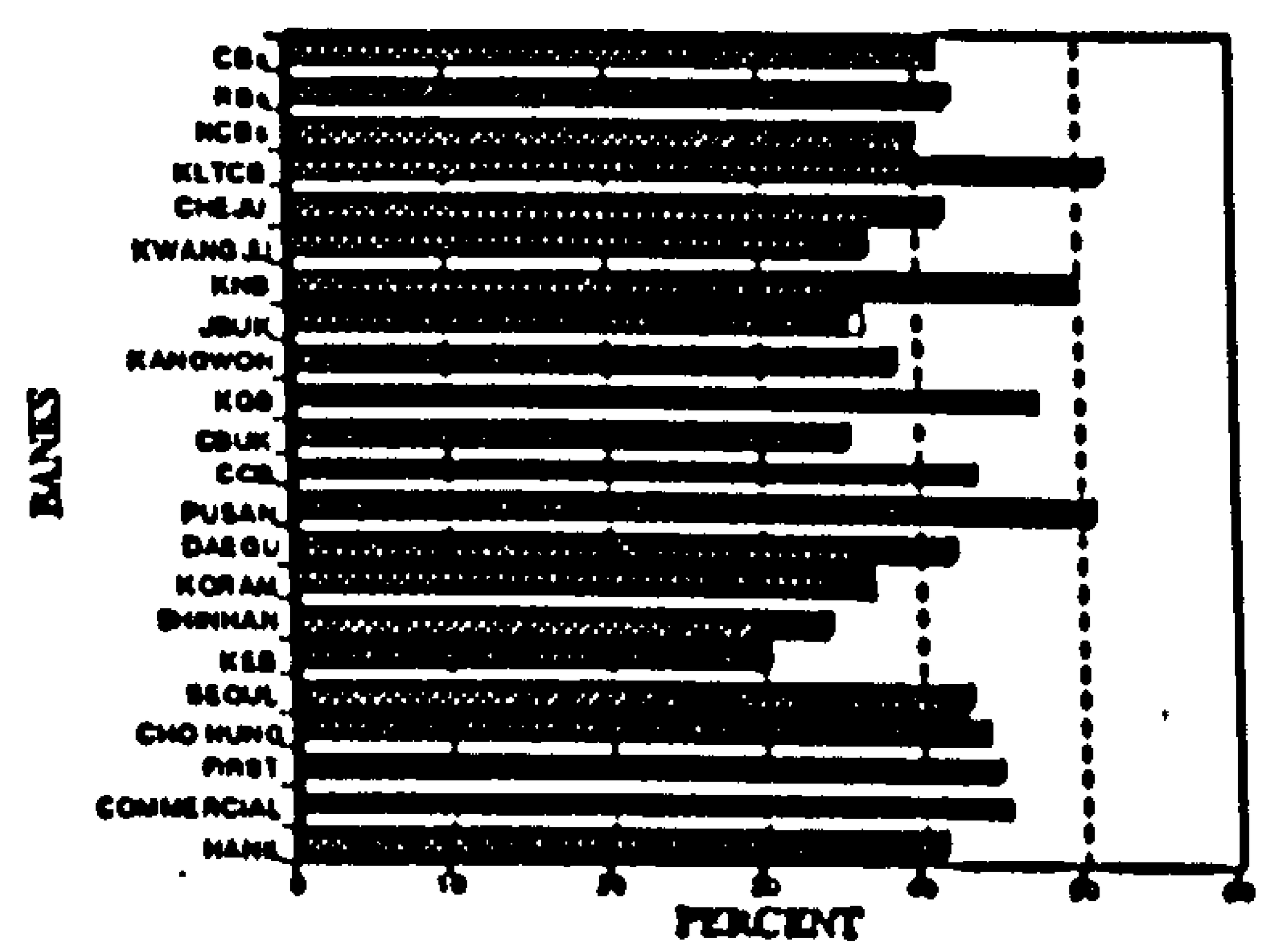
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	36.9	38.7	43.4	43.6	47.3	43.3	38.2	43.4	39.5	40.6	41.5
COMMER	33.9	36.6	38.6	42.5	52.4	49.5	48.1	52.0	48.2	49.4	45.1
FIRST	38.8	42.0	39.8	44.6	50.0	47.3	42.7	50.5	45.7	46.8	44.8
CHO HUN	39.1	40.0	39.6	42.5	47.4	45.6	42.3	49.2	45.3	49.4	44.0
SEOUL	37.9	41.7	41.7	43.8	46.0	41.7	39.0	48.5	44.3	46.3	43.1
KEB	18.1	17.7	18.3	21.3	25.1	33.0	33.6	45.2	44.6	45.7	30.3
SHINHAN	31.7	30.1	30.0	27.6	30.6	29.8	38.2	40.5	42.6	43.5	34.5
KORAM	**	47.9	44.0	38.2	38.2	33.3	34.0	38.3	29.3	27.7	36.8
DAEGU	40.3	39.2	39.0	42.0	38.1	37.3	39.7	48.7	49.2	47.2	42.1
PUSAN	48.2	48.5	51.3	51.9	52.5	47.8	49.8	53.7	52.6	53.0	50.9
CCB	44.7	43.2	48.6	49.8	46.6	38.8	41.0	41.5	43.9	38.8	43.7
CBUK	47.1	34.9	34.0	32.7	31.2	30.6	33.7	40.3	39.5	32.2	35.6
KGB	48.3	43.5	49.0	52.7	50.5	45.9	44.1	47.0	47.4	48.4	47.7
KANGWO	37.2	34.5	39.3	38.9	36.3	35.1	36.3	46.6	42.0	40.2	38.7
JBUK	40.3	37.4	34.4	37.6	36.4	35.3	34.1	34.7	39.2	33.1	36.3
KNB	46.2	45.0	49.2	53.5	54.8	51.3	53.4	51.1	51.6	46.6	50.3
KWANGJ	25.6	28.7	32.4	33.3	34.9	36.1	40.0	46.8	48.8	44.9	37.1
CHEJU	43.9	45.2	43.7	42.8	41.4	41.4	40.2	39.9	39.9	41.6	42.0
KLTCB	80.8	78.6	78.0	78.4	79.1	25.4	23.1	21.9	22.0	30.5	51.8
NCBs	33.8	36.8	36.9	38.0	42.1	40.4	39.5	45.9	42.4	43.7	40.0
RBs	42.2	40.0	42.1	43.5	42.3	40.0	41.2	45.0	45.4	42.6	42.4
CBs	36.6	38.6	39.8	41.1	42.2	40.2	40.5	45.4	44.1	43.1	41.4

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.23> Trends of Loans to Total Assets Ratio



<Figure B.24> Loans to Total Assets Ratio by Banks (10 Year Average)



Regarding liquidity risk of the Korean banks, four liquidity measures were examined. Through this analysis, we found the following. First, analysing the ratio of cash and due from banks to total assets reveals that NCBs maintained almost the same level of liquidity as RBs during the entire period. This implies that RBs have the same ability to meet short-term liquidity needs as NCBs. Second, the ratio of loans to deposits ratio for NCBs is much higher than that for the RBs. This indicates that as bank size increases, the relative volume of loans to deposits increases. Therefore, we can expect that the ratio of loans to deposits to vary directly with bank size. Third, examining the ratio of core deposits to total assets reveals that RBs raise more funds from the local market than do the NCBs. This implies that RBs have more stable funds expected to remain in the bank than NCBs, regardless of the changes of economic environment. Finally, the ratio of loans to total assets shows that during the period 1982-1986, the ratio of RBs was much higher than NCBs. However, since 1986, there is no difference between NCBs and RBs. Therefore, it is difficult to conclude that this ratio tends to vary directly with bank size in Korea.

2.3.2 Interest Rate Risk

Interest rate risk is the risk that fluctuating market interest rates will adversely affect both bank earnings and the value of bank assets, liabilities, and capital (Rose, 1991). Since banks hold portfolios of financial assets and liabilities, their net assets values are sensitive to unanticipated changes in interest rates. Since actual changes in interest rates are equal to anticipated changes plus unanticipated changes, anticipated changes should be incorporated into rational portfolio decisions. Accordingly, only unanticipated changes affect values of banks (Sinkey, 1992).

Adverse unanticipated changes in market interest rates can damage the bank's profitability by increasing its cost of funds and lowering its returns on earning assets or by reducing the value of its assets portfolio. The wide swings in interest rates in the 1970s and 1980s have drastically changed bank costs, returns on loans, and the value of bonds and other securities held. For many banks in the USA saddled with large amounts of fixed-rate loans and securities and short-term rate-flexible deposits, the results frequently have been disastrous, contributing to a significant acceleration in bank failures throughout much of the period. Bankers began to seek aggressively ways to insulate their assets-liability portfolios and their profits from the destructive effects of changing interest rates.

In today's environment of interest rate deregulation and volatility, interest rate risk has become a vital concern. Managing interest rate risk begins with measurement of a banks's exposure to interest rate risk. A bank's exposure to interest rate risk can be measured in two ways: measurement of funds gap or maturity gap and duration analysis (Gardner & Mills, 1988; Graddy & Spencer, 1990; Rose, 1991; Sinkey, 1992).

Measurement of gap begins with an analysis of the interest rate characteristics of the earning assets and liabilities on the existing balance sheet. That evaluation reveals relative interest rate sensitivities and, in turn, the extent of current exposure to risks arising from changing interest rates. Rate-sensitive assets (RSAs) and liabilities (RSLs) are defined as ones on which the interest rate can change with market conditions during the bank's interest rate planning period (usually 90 days is used). The definition of rate sensitivities varies from bank to bank depending upon the planning time horizon, which is heavily influenced by sources of funds.

Once RSAs and RSLs are identified, a bank's funds gap is measured by

$$\text{GAP} = \text{RSAs} - \text{RSLs} \qquad \text{(B.1)}$$

The funds gap calculated by equation B.1 is not financed with rate-sensitive or matched funds sources; consequently, these RSAs are financed with fixed-rate funds. Another way of comparing RSAs and RSLs is the gap ratio, defined as

$$\text{GAP Ratio} = \text{RSAs}/\text{RSLs} \qquad \text{(B.2)}$$

Like other ratios, the gap ratios permit comparison of the relative interest rate sensitivity of a bank to other banks or to the bank's previous positions, allowing for differences in bank size (Gardner & Mills, 1988).

A bank can be positioned in one of three gaps: positive gap, zero gap, and negative gap. Table B.13 shows three gaps in terms of funds gap and gap ratio. A zero gap or the gap ratio of 1 means the rate sensitivity of earning assets and liabilities is perfectly matched. Although the perfect match is unobtainable, many risk-averse managers using gap management strive to achieve as small a gap as possible. A positive gap means there are more RSAs than RSLs. If interest rates increase, banks with large positive gaps should find their asset returns increasing faster than their liability costs. A negative gap indicates that the amount of RSLs exceeds the volume of RSAs. If interest rates fall, liability costs for banks with large negative gaps should fall faster than asset yields. Therefore, net interest income increases.

<Table B.13> Three Gaps in Banks

	Funds Gap	Gap Ratio
Negative Gap	RSAs < RSLs	RSAs/RSLs < 1
Zero Gap	RSAs = RSLs	RSAs/RSLs = 1
Positive Gap	RSAs > RSLs	RSAs/RSLs > 1

An alternative way to measure a bank's exposure to interest rate risk is duration analysis. Funds gap can be a useful tool in analysing the impact of interest rate changes, but it does not fully consider the impact of changing interest rates on the value of current and future cash flows generated by the bank's assets and liabilities and, therefore, on the market value of the bank capital (Rose, 1991). To overcome this drawback of funds gap, duration analysis has been developed. Duration is a value- and time-weighted measure of maturity that considers the timing of all cash inflows from earning assets and all cash outflows associated with liabilities. It tells us the average maturity of a promised stream of future cash payment.

As measures of bank interest rate risk, we examined funds gap and duration analysis. The vital point of these two measures is to identify and classify the assets and liabilities in accordance with their maturity. The crucial problem for the researcher arises from this point. Unfortunately, information on maturity is not available to the researcher because assets and liabilities of individual banks were not classified according to their maturity. Therefore, it is not possible to measure the Korean banks' exposure to interest rate risk. However, we can enhance our understanding on the Korean banks' exposure to interest rate risk through analysing interest rate movements and investigating the work of other researchers.

Table B.14 and Figure B.25 show the trends of interest rates. Table B.14 includes three regulated interest rates: the rediscount rate on commercial bills of the BOK, interest rate on time deposits for 1 year or more and interest rate on loans of general funds up to 1 year for general enterprises and two market interest rates which are corporate bonds yields and public bonds yields. Deposits rate was raised from 8.0% to 10.0% in 1984 and at the same time, the band of lending rates was introduced (1.5% point). The base of lending rate was raised again from 10.0% to 11.0%, and the differential band of lending rate was also enlarged from 1.5% to 2.0% in 1988. However, as market rates rose in accordance with interest rate liberalisation at the end of 1988, the BOK reduced the base and differential

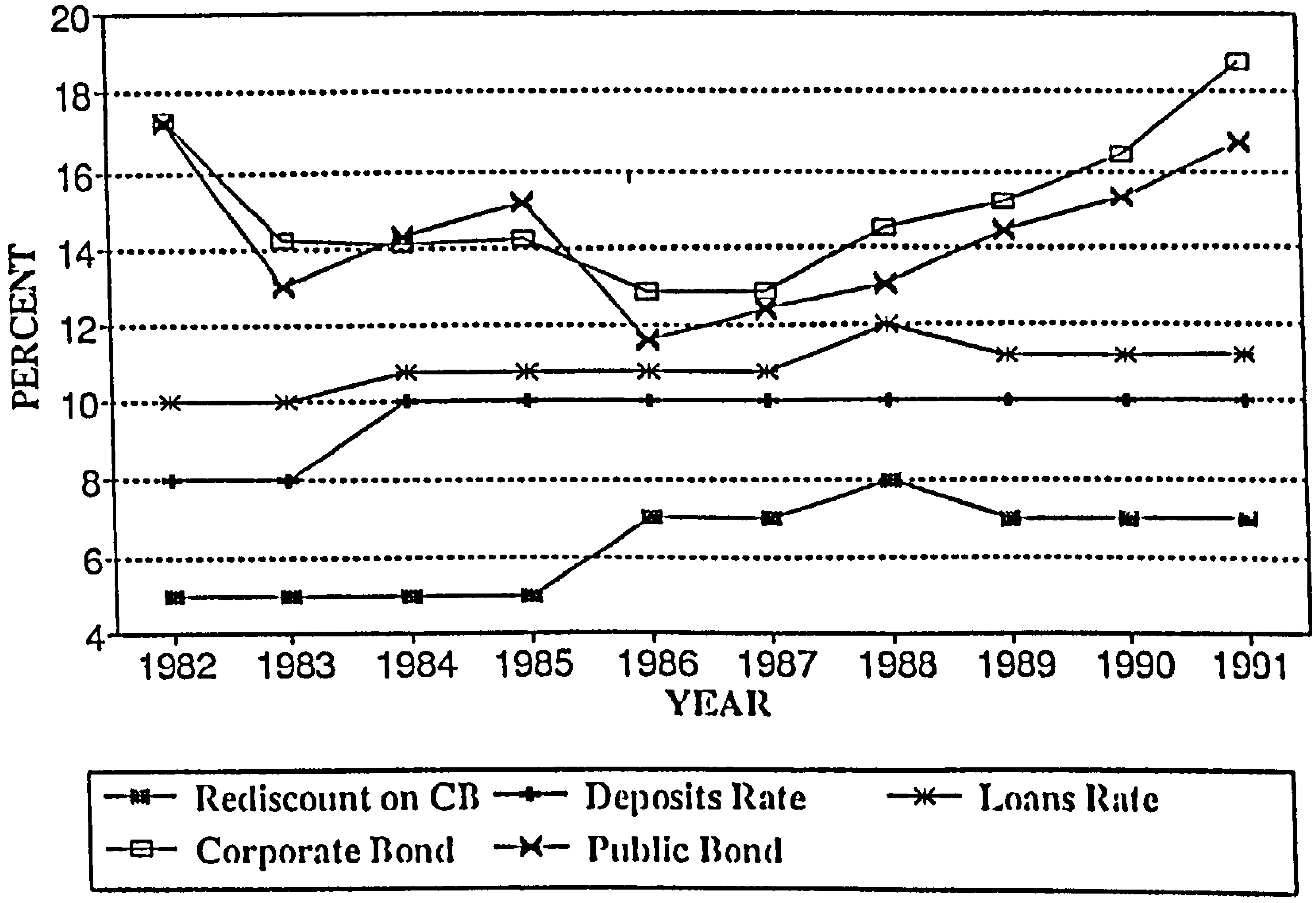
<Table B.14> Interest Rates Movements

Unit: %

Year	Rediscounts on CB	Deposits Rate	Loans Rate	Corporate Bonds Yields	Public Bonds Yields
1982	5.0	8.0	10.0	17.3	17.2
1983	5.0	8.0	10.0	14.2	13.0
1984	5.0	10.0	10.0-11.5	14.1	14.3
1985	5.0	10.0	10.0-11.5	14.2	15.2
1986	7.0	10.0	10.0-11.5	12.8	11.6
1987	7.0	10.0	10.0-11.5	12.8	12.4
1988	8.0	10.0	11.0-13.0	14.5	13.0
1989	7.0	10.0	10.0-12.5	15.2	14.4
1990	7.0	10.0	10.0-12.5	16.4	15.3
1991	7.0	10.0	10.0-12.5	18.8	16.7

Notes: 1)Yields on corporate bonds are the arithmetic average yields on guaranteed floating rate bonds.
2)Yields on public bonds are the arithmetic average yields on taxable National Housing Bonds.
Sources: 1)BOK, 'Monthly Bulletin', various issues.
2)KSE, 'Fact Book', 1992.

<Figure B.25> Trends of Interest Rates



band of lending rate on November, 1989. As shown in Table B.14 and Figure B.25, however, market rates rose continuously since 1988. These interest rate movements show clearly the causes of fluctuation in NIM discussed earlier in this chapter.

Regarding other research in this area, some recent research was carried out by economists[1] who held positions in the BOK. Kim and Park (1991) analysed 27 banks, including 7 nationwide commercial banks, 10 regional banks, and 10 foreign bank branches in Korea. The period of analysis covers the period 1983-1990 (8 years) for the Korean banks and the period 1986-1990 (5 years) for foreign bank branches. To measure the sample banks' exposure to interest rate risk, they utilised single-period funds gap and multi-period funds gap methods. Taking into account the maturity of assets and liabilities of individual banks, a 6 month gap for single-period funds gap was analysed and for multi-period funds gap, 6

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1. Kim and Park (1991.12), 'An Analysis of Commercial Banks' Exposure to Interest Rate Risk in Korea', Monthly Bulletin, The BOK, December 1991, pp.3-27.

month gap, 6 month to 1 year gap, 1-2 year gap, and more than 2 year gaps were examined. Calculating the 6 month gap, Kim and Park (1991) found that all the sample banks had positive gaps for the entire period of analysis. When the interest rates rise, therefore, net interest income of sample banks will increase, while when the interest rate falls, net interest income will decrease.

The reason why the funds gap of sample banks had a continuously positive gap is mainly due to the difference of timing in adapting new interest rates to deposits and loans. According to the current method, new interest rates for loans are adjusted from the effective date, while for deposits, especially time deposits and instalment savings deposits, contractual interest rates adapted when the accounts were opened continuously adapted to their maturity. Thus, for 6 month gap analysis, most loans are classified as RSAs because they can be adjusted within 1 month after a change of interest rates. On the other hand, only the amount of time deposits matured within 6 months after change of interest rates are classified as RSLs and the other time deposits with more than 6 month maturity are classified as non-RSLs. As a result, RSAs exceed RSLs (i.e., positive gap). In addition, since the share of short-term money market instruments such as CDs and RPs in banking liabilities was small until the mid-1980s, sources of fund of commercial banks depended mainly upon long-term time and savings deposits.

Table B.15 and B.16 summarise the results. Table B.15 shows that the funds gap is +10.5% for nationwide commercial banks (NCBs), +17.3% for regional banks (RBs), and +51.5% for foreign bank branches (FBs), respectively, at the end of 1990. It indicates that the gap of NCBs is the smallest, while that of FBs is the largest. The reason why gap of NCBs is small is that NCBs utilise more of their funds as institutional (or policy) loans, which is less sensitive to interest rate changes, than RBs. In addition, NCBs are less dependent upon RSLs (e.g., call money and sale of RPs) as source of funds than RBs. On the other hand, NCBs have larger RSAs (e.g., call loans and short-term securities) than RBs. Meanwhile, the reason why gap of FBs is larger than NCBs and RBs is that they have small amount of matched assets and matched liabilities because borrowings from the BOK are small. At the same time, their dependence on deposits as sources of funds is lower than NCBs and RBs, while they use most of their funds as RSAs such as loans and call loans. It also stems, in part, from the increase of 'Kap-Funds' in order to increase their capital. This results in the increase of non-RSAs of FBs.

Table B.15 and Figure B.26 also show trends of funds gap. It indicates that the funds gap of NCBs has gradually decreased, while those of RBs and FBs have increased. The funds gap of NCBs has decreased from +18.4% in 1983 to +10.5% in 1990. The main reason is that loans had slowly increased, compared with deposits, due mainly to the effects of domestic credit restriction in the period 1986-1989. However, as loans in order to boost the stock market in 1989 increased, the funds gap of NCBs also increased. On the other hand, the funds gap in 1990 decreased due to increasing the ceiling of CDs issues and acceptance of corporate bonds.

The funds gap of RBs has sharply increased from +10.1% in 1983 to +24.5% in 1989. The reason is that loans as uses of funds have continuously increased, while RSLs have decreased due mainly to the decrease of borrowings from the BOK and the increase of equity capital in the period 1988-1989. However, the funds gap of RBs reduced in 1990 due to the same reasons like NCBs.

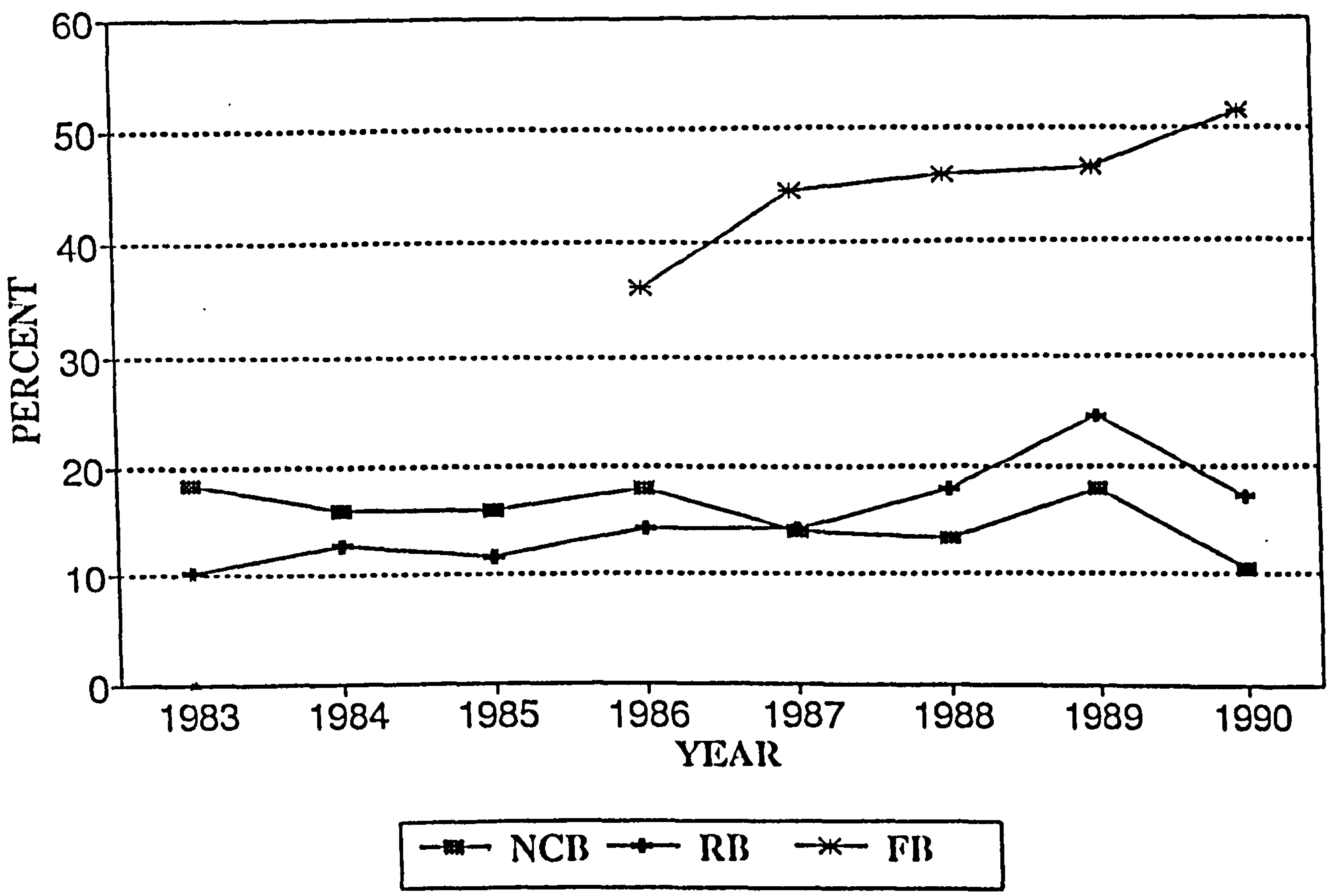
<Table B.15> Single-Period Funds Gap (6 Month Gap)

(Unit: % to total assets in Korean Won)

	1983	1984	1985	1986	1987	1988	1989	1990
NCBs	18.43	15.86	15.93	18.03	13.95	13.30	18.04	10.50
RBs	10.14	12.72	11.58	14.29	14.15	18.02	24.53	17.32
FBs	-	-	-	36.07	44.50	45.75	46.50	51.52

Source: Kim & Park (1991.12), reconstructed from Table 3, pp.20.

<Figure B.26> Trends of Single Period Funds Gap (6 Month Gap)



Source: Kim and Park (1991.12), p.15

As for FBs, funds gap has increased from +36.1% in 1986 to +51.5% in 1990. The reason is that, in the case of raising funds, the amount of swap with the BOK sharply decreased due to reducing the ceiling of amount and guaranteed yields and, in the case of uses of funds, FBs utilised their funds in call loans and purchasing CDs. As a result, RSAs increased.

Table B.16 shows the multi-period funds gap of sample banks. It shows that 6 month gaps of NCBs, RBs, and FBs are positive, while most of 6 month to 1 year gaps and 1-2 years gaps are negative. This structure of funds gap implies that when interest rate increases (decreases), net interest income of sample banks will increase (decrease) within 6 month after changes of interest rate, but thereafter, this effect will be gradually dissipated.

<Table B.16> Multi-Period Funds Gap

(Unit: % to total assets in Korean Won)

GAP\YEAR	1983	1984	1985	1986	1987	1988	1989	1990
<NCBs>								
6 month	18.43	15.86	15.93	18.03	13.95	13.30	18.04	10.50
6 month-1 year	-4.31	-3.97	-4.11	-3.82	-3.14	-3.15	-2.71	-2.05
1-2 year	-6.00	-5.48	-5.63	-6.11	-5.57	-5.04	-4.81	-4.99
More than 2 year	-8.12	-6.41	-6.19	-8.10	-5.24	-5.11	-10.52	-3.46
<RBs>								
6 month	10.14	12.72	11.58	14.29	14.15	18.02	24.53	17.32
6 month-1 year	-3.66	-3.08	-2.56	-2.81	-2.43	-3.07	-1.71	-1.61
1-2 year	-4.47	-5.24	-4.44	-3.64	-4.00	-2.99	-3.08	-2.97
More than 2 year	-2.01	-4.40	-4.58	-7.84	-7.72	-11.96	-19.74	-12.74
<FBs>								
6 month	-	-	-	36.07	44.50	45.75	46.50	51.52
6 month-1 year	-	-	-	-13.81	-12.80	-5.44	-7.62	-5.18
1-2 year	-	-	-	-0.11	1.07	0.85	2.91	0.58
More than 2 year	-	-	-	-22.15	-32.77	-41.16	-41.79	-46.92

Source: Kim & Park (1991.12), adopted from Table 3, p.20.

In sum, based on the 6 month gap analysis, Kim and Park (1991) found that all the sample banks in Korea had positive gap for the period 1983-1990. Therefore, when the interest rates rise, net interest income of sample banks will increase, while when the interest rate falls, net interest income will decrease. They conclude that the reason why the funds gap of sample banks had continuously positive gap is mainly due to the difference of timing in adapting new interest rates to deposits and loans and lack of hedging instruments (such as interest rate futures, forward rate agreements, interest rate options and swaps) against interest rate risk.

2.3.3 Credit Risk

The credit risk of a bank can be defined as the risk that the interest or principal, or both, on securities and loans will not be paid as promised (Hempel & Simonson, 1991). Credit risk, which is mainly a function of the quality of the bank's loan portfolio, can be associated with three factors:

(1) fraud risk (e.g., insider transactions);

(2) foreign risk; and

(3) non-fraud/non-foreign or 'normal domestic' risk.

Fraud-type risk has been a major cause of current and past bank failure in the USA. Fraud and other irregularities were the most frequently cited causes of bank failures between 1865 and 1931, and accounted for about two thirds of failures between 1959 and 1971, and also from 1980 to mid-1983 (Lewis & Davis, 1987). Loans to business associates were the most common form of fraudulent activity (Benston & Kaufman, 1986).

After Mexico's financial collapse in the third quarter of 1982, foreign credit risk became increasingly important in international banking (Dale, 1986). Foreign credit risk is further broken down into sovereign or governmental credit risk and private credit risk. Regarding sovereign debt, an IMF safety net exists to protect against widespread defaults, and 'market discipline' serves to keep individual countries from repudiating their debts. However, the latter risk represents a particularly thorny problem because of the absence of an international bankruptcy law (Sinkey, 1992). Given that most bankers are honest and have no foreign loans, the major credit risk banks face is non-fraud, or 'normal domestic' risk.

As defined earlier, credit risk is simply the risk the borrower will not pay interest and/or principal on time. Realised credit risk takes the form of derivations of actual payments from expected ones. Moreover, since the borrowers never pay back more than the amount promised, a bank faces an asymmetric distribution of expected returns. This downside risk is usually associated with deteriorating economic conditions at the national, regional, or local level.

The credit risk (or quality) of a bank's loan portfolio depends upon two sets of factors:

(1) those factors exogenously determined, such as the state of the economy, natural disasters, etc.;

(2) those factors subject to managerial discretion.

Although the first category of factors is exogenously determined, bank managers can influence the effects of these forces on bank performance (e.g., earnings, loan losses, non-performing loans) through safe and sound banking practices and/or their attitudes toward risk-taking by holding a diversified loan portfolio, by doing careful credit analysis and underwriting, etc.. The second set of factors affecting the quality or riskiness of a bank's loan portfolio attempts to capture management's philosophy or attitude toward risk-taking (Keeton and Morris, 1987). Lender's attitudes toward loan portfolio risk-taking are reflected in bank loan policy, the quality of bank credit analysis and loan surveillance, and the expertise of bank loan officers. The expertise of loan officers can be expressed in terms of their skill, training, and experience. Therefore, the credit risk of a bank can be modelled by (Sinkey, 1992)

$$\text{Credit Risk} = f\,(\text{Internal factors, External factors}) \qquad \text{(B.3)}$$

Then, we can measure the credit risk of a bank by specifying proxy variables for the components of Equation B.3. Since banks cannot directly control the external factors affecting credit risk, the focus of the management of credit risk is on the internal factors. However, by holding diversified loan portfolios, bankers can be better prepared to mange the downside vulnerability associated with adverse external conditions.

Given a bank's policies with respect to the volume and composition of its loan portfolio, the credit analysis done by individual loan officers ultimately determines credit risk. Accordingly, the training, experience, judgment, and supervision of lending officers is crucial to the management of the credit risk function.

To measure the credit risk of a bank, we can utilise several indicators. The provision for loan losses on the income statement and the allowance for loan losses on the balance sheet can be informative. Each bank may identify, based on past experience, an annual provision for loan losses which is charged against current earnings. Although not equal to actual loan losses for the year, the provision reflects management's estimate of the additions to the allowance for loan losses on the balance sheet necessary to reflect total exposure to credit risk. A loss coverage ratio compares net income to the provision for loan losses or actual loan losses. The higher the this ratio, the more earnings are protected.

One of most informative measures is the ratio of non-performing loans to average loans outstanding. However, it is not possible to calculate this indicator because our data are not classified by past due or non-performing assets. Another is to use bank examiner's adverse classification such as 'substandard', 'doubtful', and 'estimated loss' as discussed in Chapter 3 (see Section 3.8.5). Since the amounts of a bank's classified assets are considered confidential information by the banking agencies, however, it is not easy to get such data on individual banks. Therefore, we select four indicators to measure the credit risk of a bank:

(1) provision for loan losses/total loans;

(2) allowance for loan losses/total loans;

(3) allowance for loan losses/total assets; and

(4) net income/provision for loan losses.

Ratios selected to measure credit risk are presented in Tables B.17-B.20 and their long-term trends are illustrated in Figures B.27-B.34. Tables B.17 and B.18 express the provision for loan losses and allowances for loan losses as percentage of total loans. Total loans are the same as loans in Table B.10. Table B.19 shows the ratio of allowances for loan losses to total assets. A trend analysis of these figures is particularly revealing. If the trends reveal a significant change, it is important to determine whether riskier lending policies have been implemented, or whether management has changed its view on the credit risk of loans made in past years.

Table B.17 and Figure B.27 show that the ratios of provision for loan losses to total loans have sharply fluctuated. The ratio for all sample banks rapidly rose from 0.14% in 1982 to

0.88% in 1985 and dropped to 0.42% in 1987. However, this ratio rose again until 1989, but thereafter this ratio gradually decreased. During the period 1982-1991, the average ratios are 0.52% for all sample banks, 0.77% for NCBs and 0.31% for RBs, respectively. The average ratio of NCBs is higher (about 2.5X) than that of RBs. This reflects that NCBs have relatively more bad loans than RBs. All NCBs, with the exception of the Bank of Seoul (0.42%), have maintained a ratio well above 0.5% during the period 1982-1991. It is noteworthy that Shinhan Bank has the highest ratio of 2.42%: it is generally known that this bank is sound and safe. This bank was established in 1982 by Japanese Korean who live in Japan. The high ratio of the Shinhan Bank reflects management's attitudes toward sound banking practices and risks.

In 1991, Table B.17 shows that the average ratios are 0.47% for all sample banks, 0.76% for NCBs and 0.24% for RBs. Out of NCBs, the Shinhan Bank has the highest at 1.43%, followed by the 0.84% of the Cho Hung Bank and the 0.70% of the Commercial Bank of Korea. Out of RBs, the Pusan Bank has the highest at 0.52%, followed by the 0.35% of Kwangju Bank. It is also noteworthy that this ratio closely related to return measures, such as NIM, interest income to earning assets ratio, net burden and debt service coverage. When banks made more profits, they allocated more provision for loan losses. This implies that the Korean banks smoothed their income when their earnings were up as shown in Figure B.29. Figure B.29 illustrates the trends of net income after tax and provision for loan losses to total assets. The Korean banks allocated a large provision for loan losses in 1985 and 1989. If they did not allocate large provision for loan losses in 1989, the ratio of net income after tax to total assets would reach the highest point.

Table B.18 shows the ratio of allowances for loan losses to total loans, and Figures B.30 and B.31 illustrate the long-term trend and average ratio of each bank for 10 years. During the period 1982-1991, the average ratios are 1.57% for all sample banks, 1.44% for NCBs and 1.67% for RBs. The average ratio of RBs is slightly higher than that of NCBs. As shown in Table B.17, NCBs allocated more provision for loan losses than RBs. However,

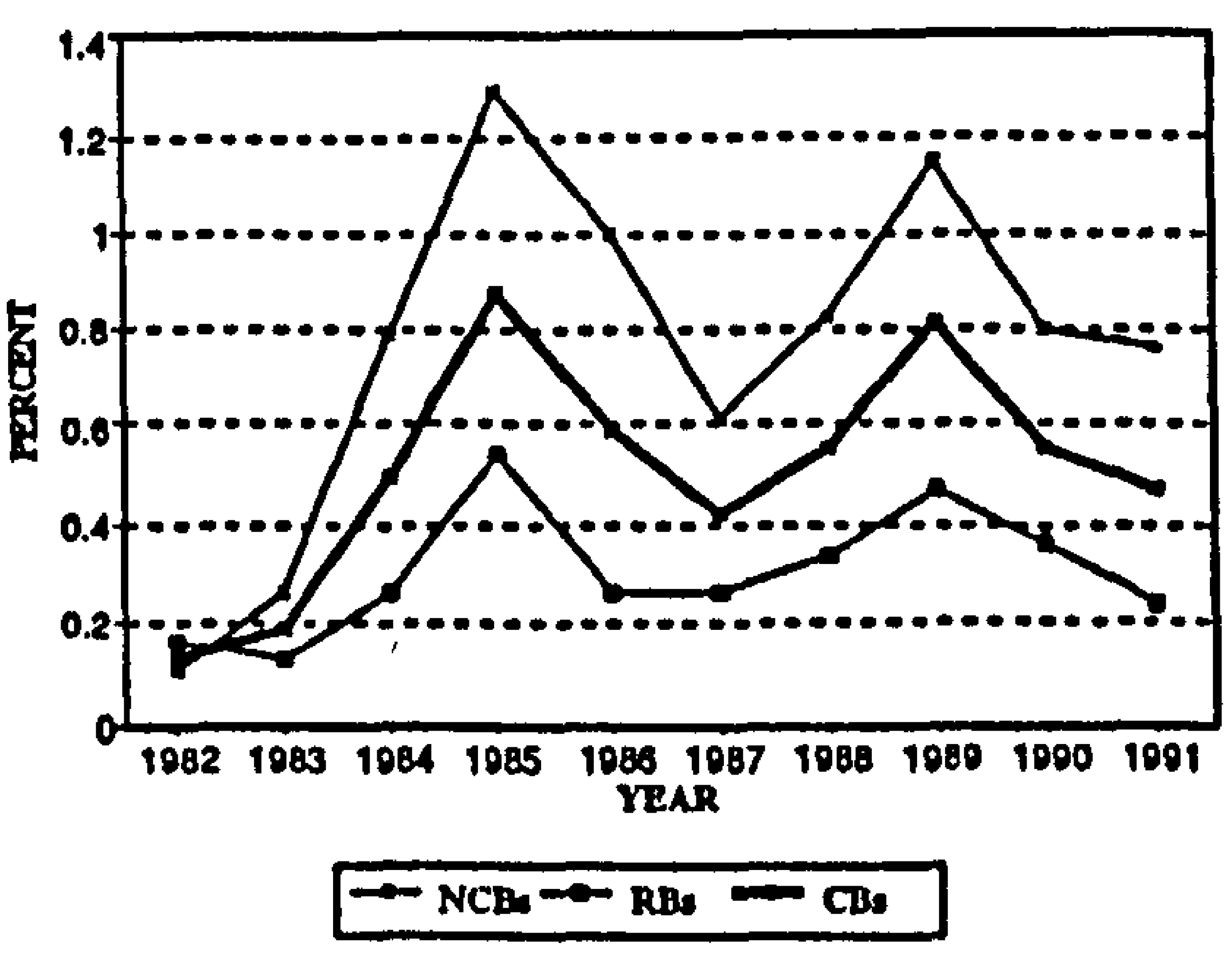
<Table B.17> Provision for Loan Losses to Total Loans

Unit: %

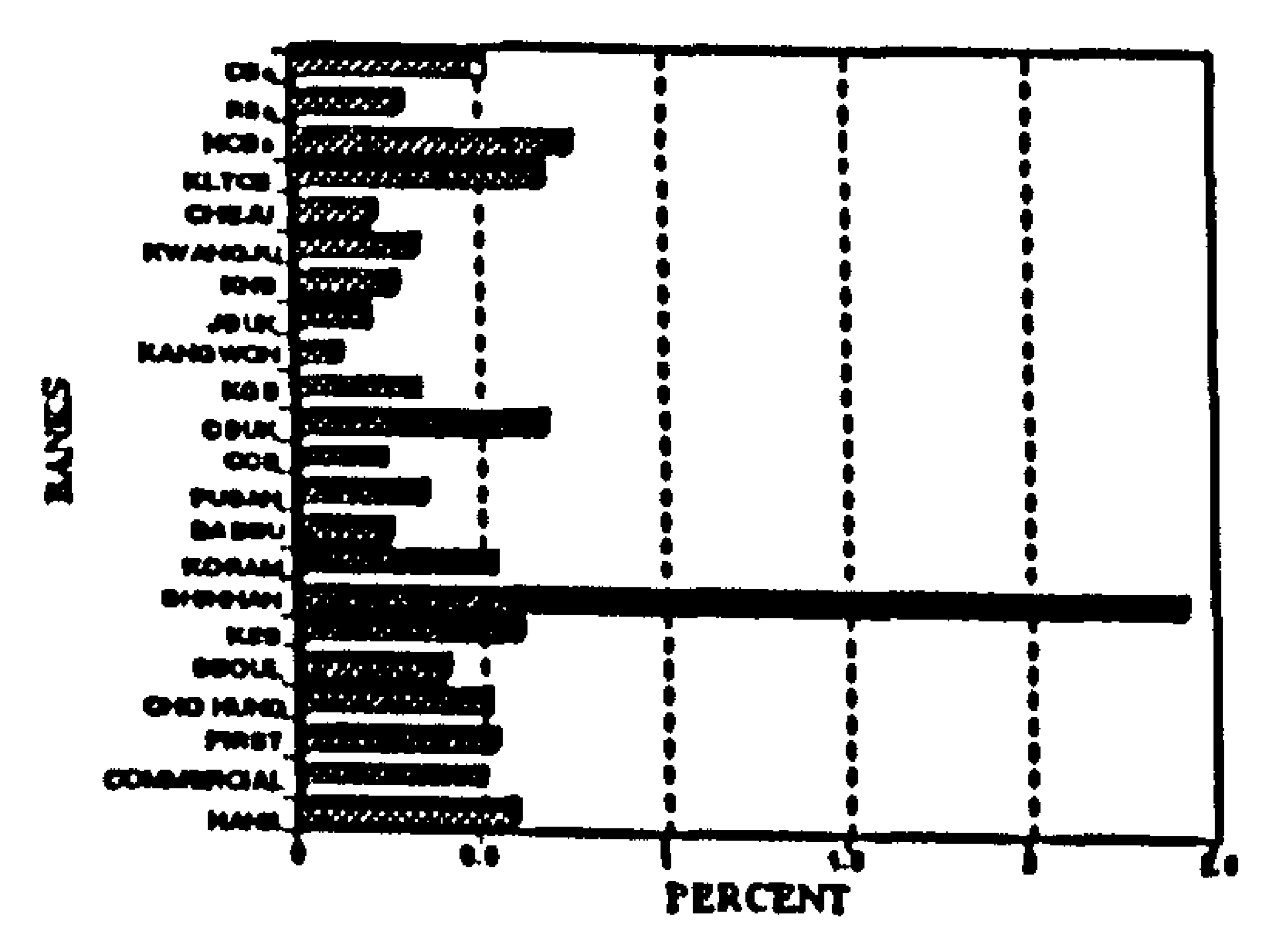
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	*	0.10	0.24	0.60	0.45	0.64	0.75	1.23	0.71	0.66	0.60
COMMER	0.00	0.07	0.76	0.97	0.16	0.26	0.62	1.02	0.52	0.70	0.51
FIRST	0.01	0.26	0.04	0.94	0.87	0.42	0.67	0.99	0.56	0.61	0.54
CHO HUN	0.01	0.19	0.21	0.32	0.28	0.41	0.88	1.09	0.99	0.84	0.52
SEOUL	0.00	0.00	0.22	0.46	0.47	0.31	0.64	1.03	0.53	0.51	0.42
KEB	0.60	0.68	0.60	0.60	0.57	0.65	1.03	0.43	0.40	0.64	0.62
SHINHAN	0.00	0.47	3.61	5.67	4.67	1.86	1.62	2.89	1.96	1.43	2.42
KORAM	**	0.34	0.61	0.74	0.50	0.40	0.42	0.48	0.72	0.69	0.54
DAEGU	0.00	0.06	0.36	0.55	0.33	0.22	0.24	0.38	0.30	0.15	0.26
PUSAN	*	0.04	0.22	0.51	0.15	0.24	0.23	0.73	0.58	0.52	0.36
CCB	*	0.15	0.40	0.72	0.15	0.04	0.12	0.20	0.28	0.20	0.25
CBUK	0.32	0.08	0.46	0.48	0.53	1.21	1.08	1.92	0.57	0.31	0.70
KGB	0.10	0.49	0.50	0.79	0.18	0.17	0.27	0.39	0.33	0.18	0.34
KANGWO	0.00	0.05	0.12	0.38	0.11	0.15	0.11	0.18	0.16	0.14	0.14
JBUK	0.43	0.07	0.14	0.56	0.31	0.05	0.17	0.14	0.18	0.11	0.22
KNB	*	0.08	0.15	0.62	0.28	0.26	0.29	0.40	0.26	0.20	0.28
KWANGJ	*	0.13	0.10	0.38	0.49	0.20	0.74 *		0.66	0.35	0.34
CHEJU	*	0.12	0.13	0.53	0.12	0.12	0.10	0.40	0.30	0.22	0.23
KLTCB	0.20	0.12	0.15	0.36	0.95	1.62	1.23	1.11	1.21	0.00	0.69
NCBs	0.11	0.26	0.79	1.29	1.00	0.62	0.83	1.15	0.80	0.76	0.77
RBs	0.17	0.13	0.26	0.55	0.26	0.27	0.34	0.48	0.36	0.24	0.31
CBs	0.14	0.19	0.49	0.88	0.59	0.42	0.56	0.82	0.56	0.47	0.52

NOTE: "*" denotes that provision for loan losses was not allocated.
"**" denotes that KorAm Bank was not established in 1982

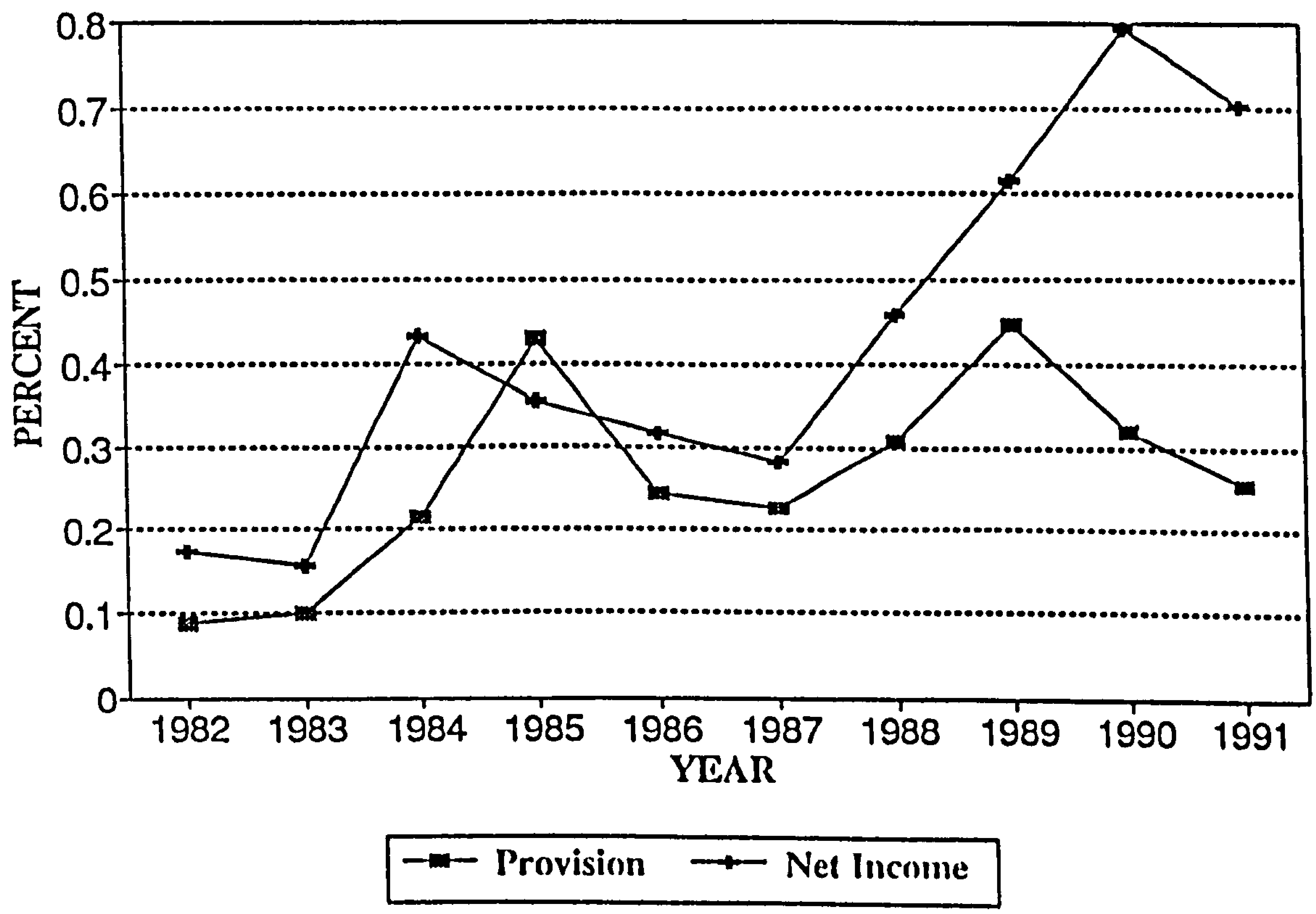
<Figure B.27> Trends of Provision for Loan Losses/Total Loans Ratio



<Figure B.28> Ratio of Provision for Loan Losses/Total Loans by Banks (10 Year Average)



<Figure B.29> Trends of Net Income & Provision for Loan Losses to Total Assets



as balances, the ratio of allowances for loan losses to total loans of NCBs is slightly lower than that of RBs as presented in Table B.18 and Figure B.30. Therefore, we may infer that NCBs have written off more bad loans on their balance sheets than RBs. As shown in Table B.18, the Kwangju Bank has the highest ratio (1.81%), whereas the Bank of Seoul has the lowest one (1.19%). During the period 1982-1991, the average ratio of all sample banks sharply increased from 0.99% in 1982 to 1.71% in 1985 and thereafter has steadily increased to 1.91% in 1991. Corresponding ratios of NCBs and RBs have increased from 0.93% and 1.12% in 1982 to 1.81% and 1.99% in 1991, respectively. In 1991, seven banks which include three NCBs and four RBs have more than 2%. The Kwangju Bank marks the highest point (2.32%).

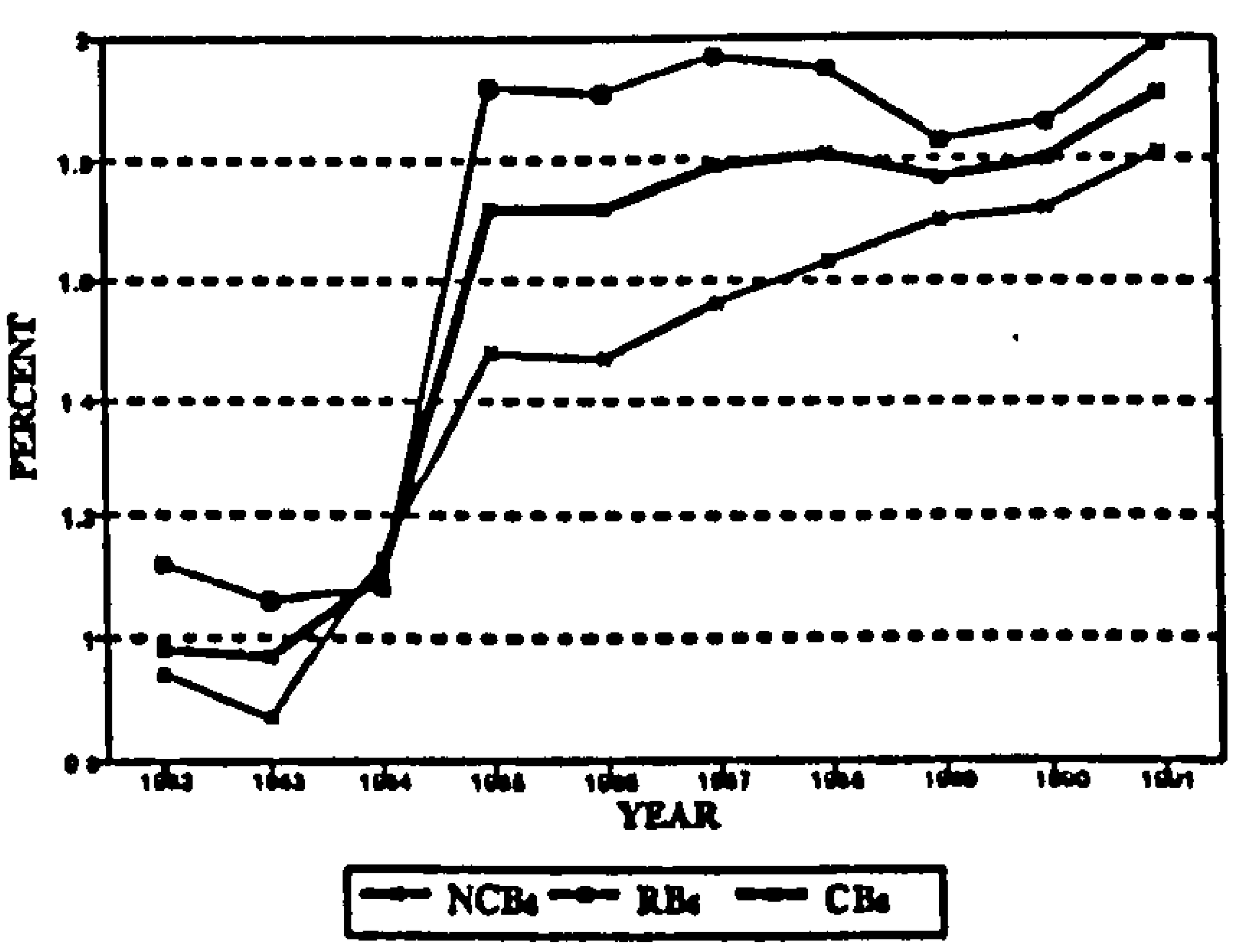
<Table B.18> Allowances for Loan Losses to Total Loans

Unit: %

BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	1.14	1.13	1.12	1.34	1.27	1.46	1.66	1.65	1.51	1.75	1.40
COMMER	1.10	0.91	1.15	1.45	0.84	0.86	1.06	1.55	1.62	1.88	1.24
FIRST	0.68	0.82	1.11	1.53	1.71	1.78	1.87	2.13	2.10	2.18	1.59
CHO HUN	1.11	1.09	1.14	1.24	1.14	1.32	1.38	1.45	1.52	1.32	1.27
SEOUL	1.08	0.86	1.03	1.26	1.37	1.33	1.29	1.20	1.11	1.40	1.19
KEB	1.44	1.60	1.65	1.61	1.68	1.74	2.02	1.66	1.66	1.76	1.68
SHINHAN	0.00	0.19	1.05	2.07	2.28	2.31	1.99	2.12	2.12	2.12	1.62
KORAM	**	0.34	0.81	1.32	1.45	1.66	1.80	1.79	2.08	2.11	1.48
DAEGU	0.84	0.83	1.08	1.68	1.62	1.86	2.05	1.94	1.97	1.90	1.58
PUSAN	1.06	1.03	1.21	1.91	1.27	1.59	1.64	1.72	1.74	2.07	1.52
CCB	1.52	0.35	0.88	2.05	2.03	1.98	1.93	1.79	1.80	1.98	1.63
CBUK	1.26	1.30	1.21	1.46	1.70	2.10	1.87	2.20	2.00	2.25	1.74
KGB	1.13	0.96	1.03	1.84	2.03	2.05	2.03	2.03	2.05	2.00	1.72
KANGWO	1.55	1.53	1.23	2.08	2.15	2.16	2.15	1.74	1.77	1.55	1.79
JBUK	1.08	1.01	1.03	2.03	2.08	2.06	2.01	1.91	1.84	1.96	1.70
KNB	1.25	1.02	0.98	1.91	1.96	1.78	1.83	1.80	1.75	1.91	1.62
KWANGJ	1.51	1.55	1.14	2.18	2.21	2.07	2.05	1.22	1.80	2.32	1.81
CHEJU	0.00	1.02	1.04	2.07	2.10	2.10	1.95	1.99	1.89	1.97	1.61
KLTCB	0.82	0.72	0.66	0.79	1.31	0.00	0.00	0.00	0.00	0.00	0.43
NCBs	0.93	0.87	1.13	1.48	1.47	1.56	1.63	1.69	1.72	1.81	1.44
RBs	1.12	1.06	1.08	1.92	1.92	1.98	1.95	1.84	1.86	1.99	1.67
CBs	0.99	0.97	1.10	1.72	1.72	1.79	1.81	1.77	1.80	1.91	1.57

NOTE: '**' denotes that KorAm Bank was not established in 1982

<Figure B.30> Trends of Allowances for Loan Losses/Total Loans



<Figure B.31> Ratio of Allowances for Loan Losses/Total Loans by Banks (10 Year Average)

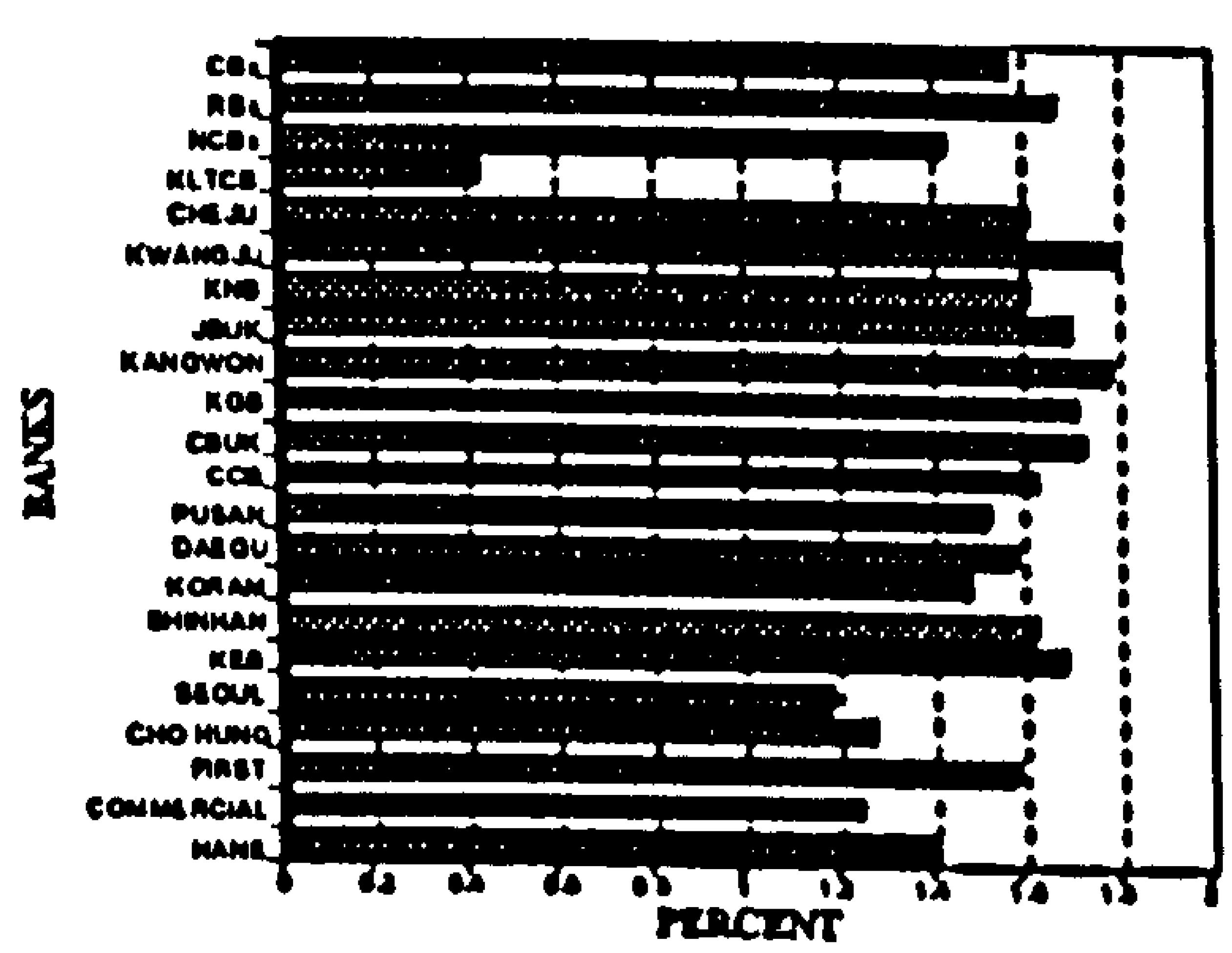


Table B.19 shows the ratio of allowances for loan losses to total assets, and Figures B.32 and B.33 illustrate the long-term trend and average ratio of each bank for 10 years. The results are similar to Table B.18 and Figures B.30 and B.31. During the period 1982-1991, the average ratios are 0.65% for all sample banks, 0.57% for NCBs and 0.71% for RBs. The ratio of all sample banks has increased from 0.38% in 1982 to 0.82% in 1991. Corresponding figures of NCBs and RBs have risen from 0.31% and 0.46% in 1982 to 0.78% and 0.85% in 1991, respectively. As shown in Figure B.32, this ratio sharply increased until 1985 and thereafter steadily rose.

Table B.20 and Figure B.34 illustrate the loss coverage ratio and its long-term trend. This ratio compares net income to provision for loan losses. The higher the ratio, the more earnings are protected. Since several banks did not allocate provisions for loan losses or allocated very small amounts in 1982, the ratios of net income to provision for loan losses in 1982 were much higher than those for other years. Figure B.34 shows that the ratios sharply dropped until 1985 and thereafter have risen. The reason why numbers in 1985 sharply dropped is that as shown in Table B.17 and Figure B.27, large amount of provision for loan losses was allocated in 1985. In 1991, the average ratios are 349% for all sample banks, 206% for NCBs and 463% for RBs, respectively. JBUK marks the highest point (1003%), while KEB has the lowest ratio of 57%.

In sum, as for credit risk of the Korean banks, four credit risk measures were analysed. From this analysis, several things were revealed. First, the ratio of provision for loan losses to total loans shows that the Korean banks allocated more funds for loan loss provision in 1985 and in 1989 when they made more profits and less in 1987 when they earned relatively less. In addition, NCBs allocated more provision for loan losses that RBs. Second, examining the ratios of allowances for loan losses to total loans and total assets reveals that the average ratios of RBs are slightly higher than those of NCBs. This implies that NCBs wrote off more bad loans than RBs during the entire period. Finally, the loss coverage ratio of RBs is slightly higher than that of NCBs. This indicates that RBs' ability to protect earnings is higher than NCBs.

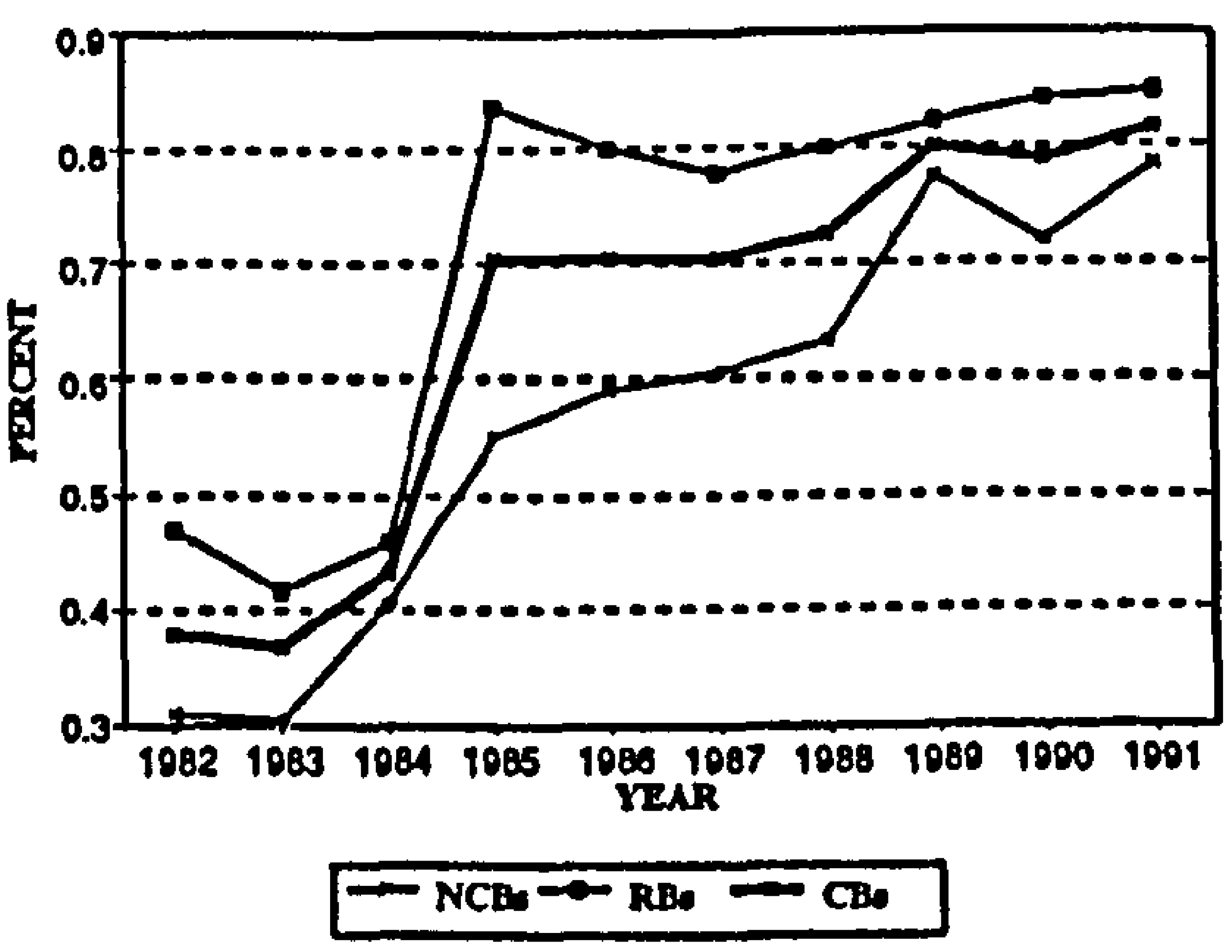
<Table B.19> Allowances for Loan Losses to Total Assets

Unit: %

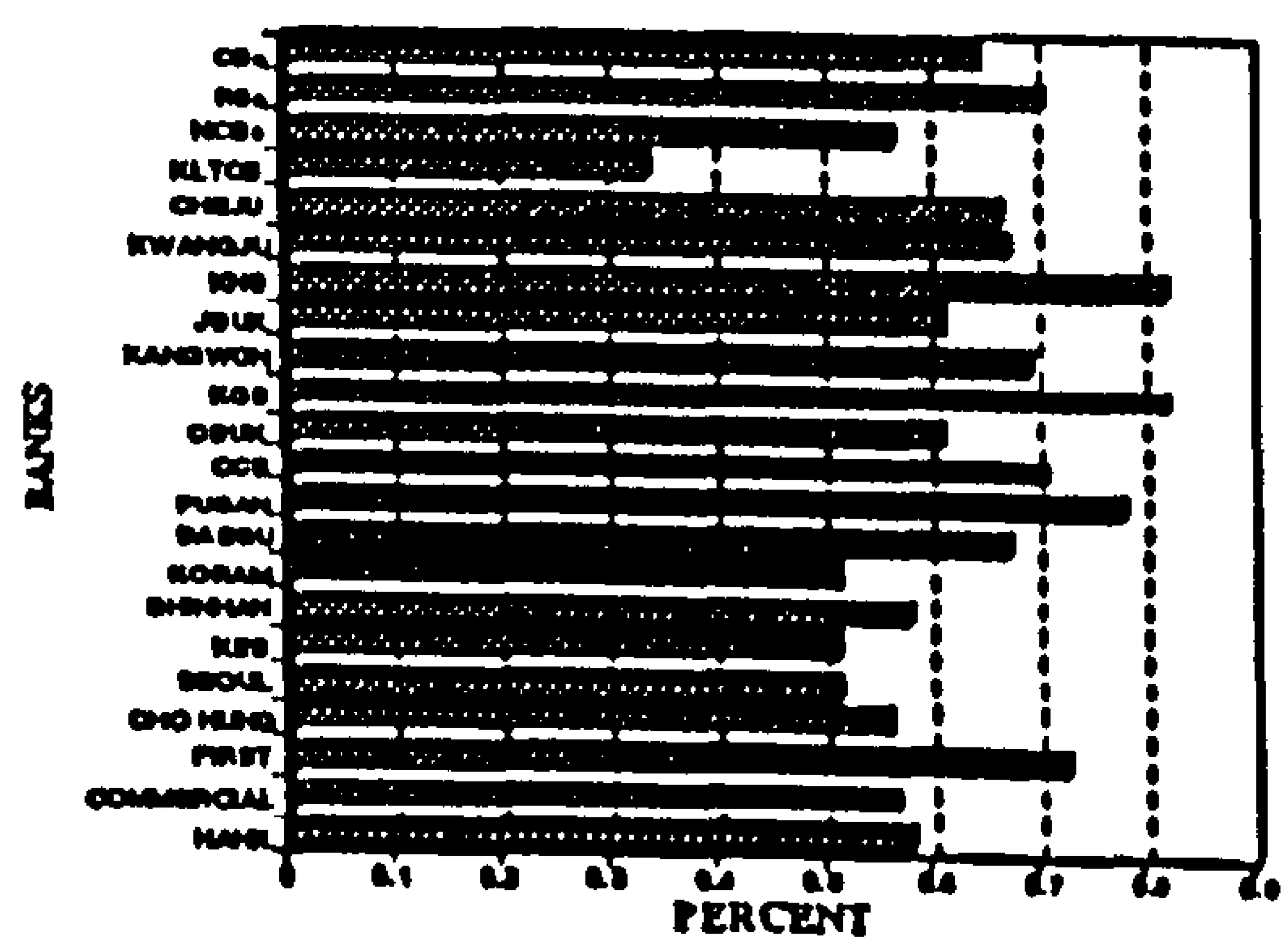
BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	0.42	0.44	0.48	0.58	0.60	0.63	0.63	0.72	0.60	0.71	0.58
COMMER	0.37	0.33	0.44	0.62	0.44	0.42	0.51	0.80	0.78	0.93	0.57
FIRST	0.26	0.34	0.44	0.68	0.85	0.84	0.80	1.08	0.96	1.02	0.73
CHO HUN	0.43	0.43	0.45	0.53	0.54	0.60	0.58	0.71	0.69	0.65	0.56
SEOUL	0.41	0.36	0.43	0.55	0.63	0.55	0.50	0.58	0.49	0.65	0.52
KEB	0.26	0.28	0.30	0.34	0.42	0.57	0.68	0.75	0.74	0.80	0.52
SHINHAN	0.00	0.06	0.32	0.57	0.70	0.69	0.76	0.86	0.91	0.92	0.58
KORAM	**	0.16	0.36	0.50	0.55	0.55	0.61	0.68	0.61	0.59	0.51
DAEGU	0.34	0.33	0.42	0.71	0.62	0.70	0.81	0.94	0.97	0.90	0.67
PUSAN	0.51	0.50	0.62	0.99	0.67	0.76	0.82	0.92	0.91	1.10	0.78
CCB	0.68	0.15	0.43	1.02	0.95	0.77	0.79	0.74	0.79	0.77	0.71
CBUK	0.59	0.45	0.41	0.48	.0.53	0.64	0.63	0.89	0.79	0.72	0.61
KGB	0.55	0.42	0.50	0.97	1.03	0.94	0.90	0.96	0.97	0.97	0.82
KANGWO	0.58	0.53	0.48	0.81	0.78	0.76	0.78	0.81	0.74	0.62	0.69
JBUK	0.43	0.38	0.35	0.76	0.76	0.73	0.68	0.66	0.72	0.65	0.61
KNB	0.58	0.46	0.48	1.02	1.07	0.91	0.97	0.92	0.90	0.89	0.82
KWANGJ	0.39	0.44	0.37	0.73	0.77	0.75	0.82	0.57	0.88	1.04	0.68
CHEJU	0.00	0.46	0.45	0.89	0.87	0.87	0.79	0.79	0.75	0.82	0.67
KLTCB	0.66	0.57	0.51	0.62	1.04	0.00	0.00	0.00	0.00	0.00	0.34
NCBs	0.31	0.30	0.40	0.55	0.59	0.61	0.64	0.77	0.72	0.78	0.57
RBs	0.46	0.41	0.45	0.84	0.80	0.78	0.80	0.82	0.84	0.85	0.71
CBs	0.38	0.36	0.43	0.71	0.71	0.70	0.73	0.80	0.79	0.82	0.65

NOTE: "**" denotes that KorAm Bank was not established in 1982.

<Figure B.32> Trends of Allowances for Loan Losses/Total Assets Ratio



<Figure B.33> Ratio of Allowances for Loan Losses/Total Assets by Banks (10 Year Average)



<Table B.20> Net Income to Provision for Loan Losses

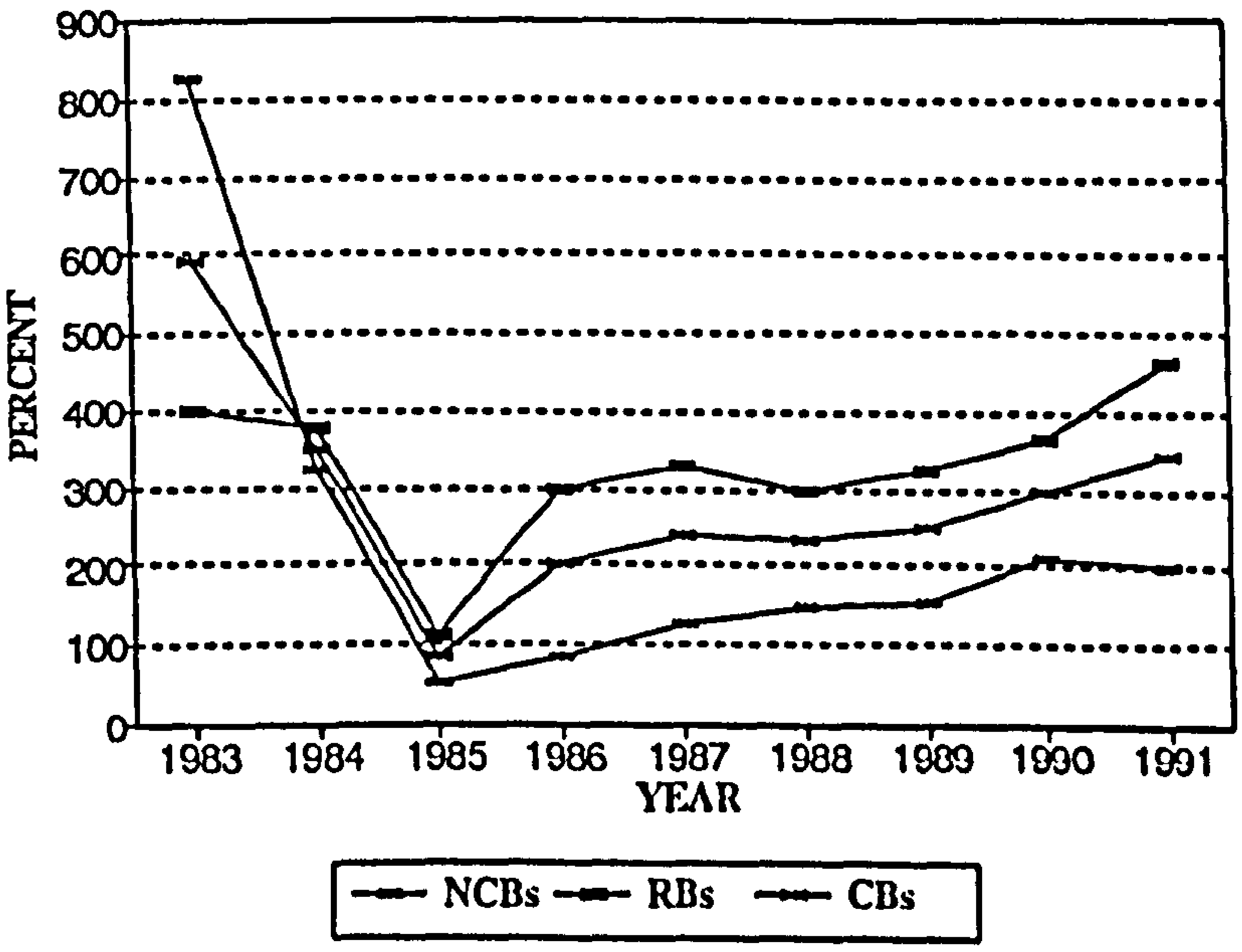
Unit: %

BANKS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	MEAN
HANIL	*	251	192	34	49	53	134	116	199	200	136
COMMER	33600	268	62	20	91	52	52	62	155	95	3446
FIRST	3150	74	1644	22	26	67	104	114	196	176	557
CHO HUN	2080	103	118	63	66	47	57	107	106	110	286
SEOUL	6080	5750	216	54	64	92	131	109	165	161	1282
KEB	128	41	87	69	92	69	65	117	99	57	82
SHINHAN	*	422	138	95	128	379	317	289	451	540	307
KORAM	**	-279	140	88	148	264	356	342	321	308	187
DAEGU	5600	62	65	28	43	68	158	130	255	472	688
PUSAN	*	346	91	14	52	23	28	21	71	75	80
CCB	*	102	187	50	335	1027	427	503	360	343	370
CBUK	16	122	23	32	26	9	50	40	196	244	76
KGB	127	27	126	47	266	177	188	257	310	449	198
KANGWO	2030000	2544	1535	496	1118	421	1097	925	807	662	203961
JBUK	14	121	137	38	37	489	516	1048	917	1003	432
KNB	*	262	395	54	106	76	150	174	340	387	216
KWANGJ	*	207	613	148	54	86	56	0	120	160	160
CHEJU	*	186	609	226	956	956	333	141	313	836	506
KLTCB	777	911	732	251	87	141	279	343	323	0	384
NCBs	9008	829	325	56	83	128	152	157	212	206	785
RBs	407151	398	378	113	299	333	300	324	369	463	20669
CBs	208080	589	354	88	203	242	234	250	293	349	11832

NOTE: 1) "*" denotes that provision for loan losses was not allocated

2) "**" denotes that KorAm Bank was not established in 1982.

<Figure B.34> Trends of Net Income/Provision for Loan Losses Ratio



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