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Book-to-market value of equity ratios and earnings realization.

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BOOK-TO-MARKET VALUE OF EQUITY RATIOS AND EARNINGS REALIZATION

A Thesis

Submitted to the University of Wales

in Fulfilment of the Requirements for the

Degree of Doctor of Philosophy

By

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ABSTRACT

This thesis increases our understanding of the book-to-market ratio via a detailed examination of how and when earnings are realised in relation to firms' "capitalisation" and "average useful-life of assets". Book-to-market ratios (*BMRs*) are regressed as a function of changes in market value of equity ratios for British industrial companies registered on the London Stock Exchange from 1987 to 1996. Data from a prior period (1976-1986) is also employed to stabilise for effects of earnings realisation before the regression period. The "average useful-life assets" for the firms in the sample determines the time horizon of the analysis. The path of abnormal earnings over this horizon reflects the pattern of expiration of the useful-lives of assets in place.

The analysis finds that an accrual measurement effect dominated in *BMRs* increases over the analysis period and also that accrual measurement is more influential in *BMRs* for firms with short than with long "average useful-life assets".

Changes in market value ratios are found to inform about future earnings up to at least six years, except for highly-capitalised firms with long useful-life assets (for which the relationship lasts up to 4 years). The length of the informative period is found to be inverse to the average useful-life of firms' assets. The effect of differences between annual changes in market value of equity ratios on *BMRs* across time diminishes soon (two years) after the initial market shock[1] occurs. Long useful-life assets have no further effect on *BMRs* evolution at more distant lags.

Contrary to previous research (in the USA), changes in market value of equity ratios (for UK firms) are found to be associated more with short than with long useful-life assets. Although not specially tested for, this result supports the notion of "short-terminism" of which the UK stock market is sometimes accused. The apparent "short-terministic" outlook by investors in UK firms coincides with improved predictability of *BMRs* in the UK compared with the US market. The high coefficients of determination from changes in market value of equity ratios as a function of *BMRs*, identified in the study, motivates a further test for a prediction model which is able to predict 29.2% of the variation in book-to-market value of equity ratios 8 years in advance.

[1] The influence of an event on the market value of equity

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Glossary

BMR : Book-to-market value of equity ratio
BV : Book value of equity
CAPM : Capital asset pricing model
CMVTMJMT : A ratio representing change in the market value in the year a group of assets is acquired, divided by the market value in the year when the variable is observed
CMVTMSMT : A ratio representing change in the market value in the year when the variable is observed minus the time elapsed since the market shock occurred, divided by the market value in the year when the variable is observed
DCF : Discounted cash flow
DPR : Depreciation expense
ECF : Expected cash flow
FADPR : Total fixed assets (net) to depreciation expense ratio
FATA : Total fixed assets (net) to total assets ratio
HMFADPR : Highly-capitalised firms with long useful-life assets
HMFATA : Highly-capitalised firms
LMFADPR : Highly-capitalised firms with short useful-life assets
LMFATA : Low capitalised firms
LSV : Lakonishok, Shleifer and Vishny
MFADPR : The mean {total fixed assets (net) to depreciation expense} ratio
MFATA : The mean {total fixed assets (net) to total assets} ratio
MV : Market value of equity
NSO : Adjusted number of shares outstanding
P/B : Share price divided by book value of equity
P/E : Price-earnings ratio
ROE : Return on equity
SFAS : Statements of financial accounting standards
SP : Closing share price
S/P : Sales-price ratio
TA : Total assets
TFAN : Total fixed assets (net)

PART ONE

Background and literature survey

Part one comprises the following chapters:

1. Background and objectives of the thesis

2. Component parts of the book-to-market ratio

3. The book-to-market value of equity ratio

4. Interpretations of book-to-market ratios

The first chapter provides a background to and states the objectives of this thesis. It also provides an overview of the main research questions and findings.

Chapter 2 examines the component parts of book-to-market ratios (*BMRs*) and the influences upon them. Chapter 3 deals with the *BMR* itself and Chapter 4 examines *BMR* in relation to other similar variables. Chapter 4 also contains a summary of what is and what is not known about *BMRs* to prepare the ground for the interpretations of *BMRs* which begin in Part Two of this thesis.

Contents of chapter 1

Background and objectives of the thesis

1.1 Introduction

1.2 Background information about book-to-market ratios

1.3 The motivation for this thesis

1.4 Objectives of the thesis

1.5 Thesis layout

1.6 Research implementation

1.7 Key aspects of the research

1.8 Main empirical results

1.9 Conclusion

CHAPTER ONE

Background and objectives of the thesis

1.1 Introduction

This chapter introduces and provides a background to book-to-market ratios. This is followed by an explanation of key aspects of the thesis and a summary of its empirical results.

1.2 Background information about book-to-market ratios

Early in the 1940s, *Molodovsky*, noted that "stocks obey any law or serve any sovereign". He was one of the earliest stock market commentators to discuss the need to understand the nature of variables which determine the value of stocks and the need to discover the indefinite future over which their influences prevail.

One such variable is the book-to-market ratio (*BMR*) which has, for a long time, been of interest to finance academics and practitioners because *BMR* encaptures both market and accounting information. Market and accounting information both affects and reflects many of a firm's activities and policies so the *BMR* is therefore potentially useful for decision making. The analysis of *BMR* has a long tradition in finance and security analysis.

Recently, the *BMR* has received considerable attention to this end because of its apparently important (but not well understood) role in explaining patterns in stock returns.

For example, *BMRs* have been found to have high information content in equity markets (US, UK, Japan, Germany, France and Switzerland (*Capaul, Rowley and Sharpe (1993)*)). This influence is not restricted to just a few markets, but it is clear in most large equity markets (see *Chan, Hamao and Lankonishok (1993)* and *Chui and Wei (1998)*).

BMRs have also been found to provide information about mis-pricing of shares. Mis-pricing allows opportunities for profitable investments based on possible market overreaction to growth prospects.

Book-to-market ratios are associated with many variables used for prediction. These variables include stock prices, profitability, beta and cash flow. It is therefore not surprising that previous research used the relation between book and market value of equity for predicting stock returns, profitability and return on equity. Research also suggests strong associations between *BMRs* and beta and sales-to-share price ratios.

Although research has focused on the relationship between accounting data and equity valuation the *BMR* has been treated largely as a "black box", with limited understanding of its determinants or evolution.

1.3 **The motivation for this thesis**

There are many ways to value stocks. Investors and financial analysts continue to search for methods that will enable them to find the "true" value of shares. Knowledge of such a

method would put the investor in the powerful position of knowing what and when to buy and sell and thus how to make large profits from investing.

Two particular valuation methods are examined in this thesis for how they interrelate so that further knowledge of share valuation may be gained. The first type of value is called "book value". Accountants, who have access to much information about the past, establish book values. The second type of valuation is called "market value" which is largely determined by investors who have relatively little information and who look towards the future.

Book value is determined on a cost basis (using accounting information), whereas market value is a result of investors' expectations (non-accounting information). The difference between the book and market value of equity (unrecorded goodwill) of a firm is sometimes used as a proxy for the firm's earnings ability.

The "true" relationship between unrecorded goodwill and earnings realization is, however, open to many interpretations. This thesis aims to answer important questions about this general relationship; namely, what are the magnitude, timing and duration of expected earnings associated with today's *BMRs*? Investors, analysts and financial managers are much concerned with how and when earnings are realized because the information is useful in searching for profitable opportunities and decision making.

The interplay between the accountants' and investors' approaches to valuing stocks is captured within the book-to-

market ratio (*BMR*), which is the subject of this thesis. By examining the behaviour of this ratio over time it is possible to examine issues such as:

-The evolution of *BMRs* and earnings realization.

-The association between this evolution and "capitalisation"[1] and "average useful-life assets".

-The relationship between the "size of the future" in which indirect investment earnings are realised (through share ownership) and the actual "size of the future" (the period over which the firm makes direct investments in fixed assets).

The examination enables us to answer questions such as:

-What are the interrelationships between *BMRs* and other similar variables useful for predicting market information?

-What is the duration of the *BMRs* evolution?

-How does the magnitude of this evolution change?

[1] Size of firm's long-lived assets (net) to total assets

-Is the investor's investment horizon (as evidenced in share price movements) compatible with the investment horizon of the physical activities of the firm itself (as evidenced in the length of time over which fixed assets are used to generate earnings)?

-Do "capitalisation" and "average useful-life assets" affect the evolution of *BMRs* and, if so, how?

-Does market information predict accounting information or vice versa?

The methodology chosen to investigate these questions is based on examining the relationship between changes in market value of equity ratios and *BMRs* over time in relation to two firm-specific variables; namely, "capitalisation" and "useful-life of assets".

At the end of the investigation, the aim is to have a better understanding of the following issues:

-The relationship between the evolution of *BMRs* and earnings realization.

-The investment horizon for direct (real) investments and the investment horizon for indirect (financial) investments.

-The association between "capitalisation" and "average useful-life assets" and *BMRs*.

-The usefulness of past changes in market value of equity ratios for predicting future *BMRs*.

1.4 **Objectives of the thesis**

This study examines the evolution of *BMRs*, as earnings are realized, during the estimated useful-life of assets. The objectives of this research are therefore as follows: -

1) To investigate the evolution of *BMRs* and "capitalisation"

"Capitalisation" refers to the size of the firm's long-lived assets (net) to total assets. It is expected that the higher the "Capitalisation", the more negative the beta coefficients of the changes in market value of equity ratios will be. This is because the higher the "capitalisation" the more the accruals effect is likely to be noticeable.

2) To investigate the evolution of *BMRs* and "average useful-life assets"

Previous research (on US data) suggests that the longer the average useful-life of assets, the more negative the beta coefficients of changes in market value of equity ratios in examining the evolution of *BMRs* (as in *Ryan (1995)*). The findings of this thesis (using UK data) support the opposite argument that the shorter the useful-life of assets the higher the negative beta coefficients of changes in market value of equity ratios. This finding could be useful for

prediction but also to shed more light on the properties of the concept of "short-terminisim" and its influence on *BMRs* in the UK. A possible explanation for the close association of short-lived assets with *BMRs* is that the shorter the useful-life of assets the faster the difference between book and market value of equity is removed over time. Realised earnings and depreciation expenses of long-lived assets reduce this difference. The faster the difference between book and market value of equity is removed the larger the realised earnings are found to be. Also, the variability of the stock prices of highly-capitalised firms with short useful-life assets are found to be lower than those of firms with long useful-life assets.

3) To investigate the association between *BMRs* and window-dressing (income smoothing)

Accrual measurement comprises "generally accepted" processes such as delayed recognition and conservatism. Such "window dressing" is an important factor in causing differences between book and market values of equity.

Accrual measurement has been previously associated with earnings realization and it is likely to be used by management to smooth earnings. This issue is relevant to this thesis which relates *BMRs* to changes in market values of equity ratios. The thesis continues to examine the direction of this relation, and its duration.

Conservatism reflected in book-to-market ratios is associated with return on equity that does not decay over time because differences induced by conservative accounting produce

permanent differences in book values and earnings. On the other hand, the influence of delayed recognition on *BMRs* decays over time as gains and losses are recognised.

4) To investigate the usefulness of *BMRs* in searching for profitable investment opportunities

The book-to-market ratio represents and relates accounting data (book value) to equity valuation (market value). The ratio displays unrecorded goodwill (the portion of value that is not already captured in book value). It also informs about how much realized and expected earnings are to be transformed into share prices.

This aspect of the research is likely to be of particular interest to investors, because it gives insight into the relationship between *BMRs* and earnings realization. This is because knowing the level of book-to-market ratios provides information about the magnitude and timing of future earnings. Previous researchers have examined this association between the level of *BMRs* and the magnitude and timing of earnings. They suggest that growth stocks (those with low *BMR*) tend to be associated with high current earnings and low potential expected future earnings compared to value stocks (those with high *BMR*). They also suggest that low *BMR* stocks have low average returns because future earnings growth is weaker than the market expects, and high *BMR* stocks have high average returns because earnings growth is stronger than was expected.

This research continues this line of investigation and finds that highly-capitalised firms with short-lived assets tend to be more profitable than those with long-lived assets.

Reasons for this discrepancy between current and previous findings are put forward and argued, firstly, in relation to the concept of "short-terminisim". The argument is then developed further (and more generally) in terms of how *BMRs* are influenced by differences between investor's and management's perceptions of the size of the future during which earnings are to be realised.

5) To investigate the usefulness of changes in market value of equity ratios to predict *BMRs*

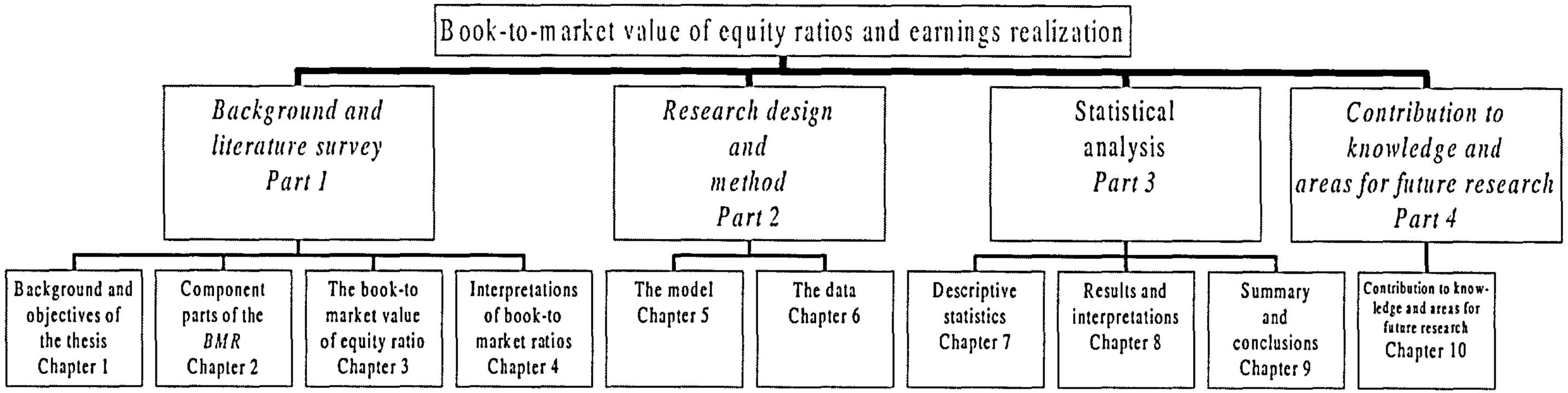
The "size of the future", in which present value remains positive, is also important for prediction. The present value of expected cash flows (*ECF*) depends on the required interest rate (the rate on which investors, apparently, agree) and their envisaged size of the future. This "future" has been hypothesised to be limited to a reasonably short period because the present value of expected future payments diminishes rapidly as time passes.

The high coefficients of determination from changes in market value of equity ratios, as a function of *BMRs* attained in this thesis, motivates a further test of the usefulness of changes in market value of equity ratios for predicting *BMRs*. This test finds that the relationship between *BMRs* and earnings lasts for a fairly long period (up to 8 years).

1.5 **Thesis layout**

This study consists of four parts (as in Figure 1.1 below).

Figure 1.1
Book-to-market value of equity ratios and earnings realization



Part One provides an overview of the literature, states the objectives of the thesis, presents the component parts of *BMR* separately and explains the structure of the ratio itself. It also summarises selected references that focus on the relationships between *BMR* and other relevant concepts and variables used for prediction.

Part Two explains the methodology, lists the raw data, defines the variables and discusses the derivation of the sub-samples used for the investigation.

Part Three describes statistically the variables used in the analysis, presents the results and their interpretations. The research is then related to previous literature and reflected upon for its relevance to wider issues such as the influence of "short-terminisim" on *BMRs* and how *BMRs* are influenced by the general relationship between investors' and management's investment horizons.

Part Four summarises the contribution to knowledge from the thesis and suggests possible areas for future research.

1.6 **Research implementation**

The research methodology is similar to that used by *Ryan (1995)* to investigate the US Market. The general intuition behind the methodology is as follows:

There are external and internal influences on the difference between book and market value of equity. The external differences are caused by events occurring after the acquisition of assets or liabilities that affect book and market value of equity differently. These differences exist throughout the useful-life of assets. Internal influences also affect the relation between book and market value of equity. This relation is assumed to be one to one at assets' acquisition. The relation between book and market value of equity then changes during the useful-life of assets but is assumed to return to one to one at retirement. This thesis examines how this relationship holds over time.

1.7 **Key aspects of the research**

Key aspects of the research methodology are as follows: -

The study period is determined according to the average useful-life of assets. The "average useful-life assets" for the overall sample is 8.65 years. Ten annual changes in market value of equity ratios are therefore used as independent variables to cover the average useful-life of assets (9 years to cover the average useful-life of assets, plus one year as a reference point).

The sample consists of the British industrial companies registered on the London Stock Exchange that provided the necessary information during the study period (see Appendix 3, page 240). The required yearly information items are; book value of equity, closing share prices, number of shares outstanding, fixed assets, total assets and depreciation expense (see Appendix 1, page 236).

Beta coefficients trend of the independent variables (changes in market value of equity ratios) is expected to be negative in relation to *BMRs*. This intuition is expected because:

a- The difference between book and market value of equity is narrowed by earnings realization and yearly fixed assets depreciation during the useful-life assets and

b- Fixed assets' earnings-ability decreases over time.

1.8 **Main empirical results**

The main empirical results are as follows: -

1 The accrual measurement effect increases over the analysis period.
2 High (low) "capitalisation" is associated with a large (low) accrual measurement effect.
3 For highly-capitalised firms, short (long) useful-life of long-lived assets is associated with large (low) accrual measurement effects.
4 Fluctuations of share prices are higher for firms with short-lived assets than for firms with long useful-life assets.

5 F-tests show significant linear relationships between *BMRs* and changes in market values of equity.

6 Changes in market value of equity ratios are significant in interpreting *BMRs* up to at least six years from the initial market shock, except for highly-capitalised firms with long useful-life assets, for which the significant period is up to 4 years.

7 Beta coefficients from changes in market value of equity in relation to *BMR* rise towards zero over time.

8 Selected significant tests do not support *H3* that beta coefficients are more negative at further lags for highly-capitalised firms with long useful-life assets.

9 Changes in market value of equity ratios can explain 29.2% of the variation of *BMRs* 8 years into the future.

1.9 **Conclusion**

This chapter provides background information about book-to-market ratios, discusses the motivation to, objectives, research implementation and key aspects of the thesis. It also lists the main empirical results. This allows us to proceed to the literature survey of the book-to-market value of equity ratios.

Literature survey

Firstly, in this literature survey, the book-to-market ratio's component parts are examined separately. The influences on book value of equity (only) and market value of equity (only) are explained. This is followed by an explanation of the (internal) interrelations between book and market values of equity. Next, outside influences on the book-to-market value of equity ratio are examined. Then, possible interpretations of the ratio are presented and accompanied by a detailed examination of variables that can influence the value of the ratio.

Having examined the possible meanings of the ratio and the influences on it, the literature survey continues with a survey of previous research into the use of the book-to-market ratio for prediction purposes. This is accompanied by a survey of the book-to-market value of equity ratio's competitors (other similar variables that are used for prediction). An evaluation of the book-to-market ratio and how it relates to it's competitors is then undertaken and conclusion drawn.

A summary is then provided to clearly identify those aspects of the book-to-market ratio which are well understood and those which are not.

Finally, an explanation of how the empirical research undertaken in Section 5.3 of this thesis, increases our understanding of book-to-market ratios is provided.

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2.2 Book value of equity

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CHAPTER TWO

Component parts of the book-to-market ratio

2.1 Introduction

This chapter explains, separately, the component parts of the book-to-market ratio. The possible meanings of "book value of equity" and the determinants of its value are also discussed. A similar treatment of "market value of equity" and the influences on it then follows.

2.2 Book value of equity (*BV*)

Book value of equity is usually defined as the firm's net total assets after deducting liabilities (total assets minus total liabilities).

Book value of equity loses much of its relevance if the valuations on the balance sheet do not approximate a fair market value of the firm.

At acquisition, the book value of an asset is often viewed as a proxy for its expected cash flow. It is usually assumed that, at acquisition and retirement, the book value of an asset equals its market value. However, almost always during the useful-life of an asset, book value does not equal market value of that asset.

As a variable constructed from accounting information book value can have important implications for matters such as

conservatism, individual rights and the "clean surplus relation":

a- Book value of equity reflects accounting information

Generally, book value of a firm's equity is recorded at cost (historical cost). It does not reflect any changes in market value caused by non-accounting information. Generally accepted accounting principles (*GAAP*), according to the conservatism concept, permit only mark-downs (such as impairment) to historical cost. Therefore, book value is generally viewed as a conservative estimate of the firm's value.

Book value per share of stock is the amount each share would receive if the firm were liquidated on the basis of amounts reported on the balance sheet.

b- Situations where book value per share is important

Book value per share is important in many contracts and in court cases where the rights of individual parties are based on cost information. Objectivity concept supports this dependence. Cost information (book value) is more objective than market information (market value).

c- Changes in book value of equity and the "clean surplus relation"

In the income statement the change in book value equals earnings minus dividends (net of capital contributions). This relation is referred to as the "clean surplus relation" because all changes in assets and liabilities unrelated to dividends must pass through the income statement.

2.2.1 Variables affecting book value of equity

The following influences affect the book value of equity:

2.2.1.1 Estimation methods
2.2.1.2 Contingent losses
2.2.1.3 Historical cost principle
2.2.1.4 Alternative accounting methods
2.2.1.5 Monetary unit assumption
2.2.1.6 Going concern assumption
2.2.1.7 Timing and window dressing

Each of these will be considered in turn:

2.2.1.1 *Estimation methods*

The estimation of accounting numbers is a function of unknown future events and developments. This means that current period revenues and expenditures can be evaluated on a subjective basis only. The effects of future events cannot be perceived with certainty. Accounting estimates will thus change as new events occur, as more experience is acquired, or as additional information is obtained.

Different estimates result when accounting transactions are valued subjectively. These estimations include the following:

a) Allowance for uncollectible receivables

This allowance covers balances arising from credit sales that prove to be uncollectible.

b) Periodic depreciation

The depreciation expense depends on the estimation of the useful-life of long-lived assets and its residual value.

c) Accrual and deferral expenses

Deferrals comprise amounts paid in advance of an asset's use or consumption. The deferrals represent an asset on hand at the end of the period. Accruals are expenses that have been incurred during the financial year but have not been recorded or paid until the end of the period.

d) Income taxes

Almost always, income taxes need to be estimated because net income may not be accepted for tax purposes. Book value of equity is influenced by the accuracy of these estimates.

2.2.1.2 *Contingent losses*

FASB[1] defines a contingency as an "existing condition, situation, or set of circumstances involving uncertainty as to possible gain or loss". Firms are required to accrue a

[1] *SFAS* 5, paragraph 1.

loss contingency when both of the following conditions are met:

a- It is probable that assets have been impaired or a liability has been incurred at the date of the financial statements.

b- The amount of the loss can be reasonably estimated.

Firms generally report contingencies as losses only when the probability of loss is high. If the anticipated loss amount lies within a range, the most likely amount should be accrued. When no amount in the range can be estimated, the firm may report the minimum amount in the range[2]. Recognition and measurement of loss contingencies involve judgement and are subjective at best. The estimation of contingent losses then has an effect on book value of equity.

Gain contingencies are claims or rights to receive assets (or to have a liability reduced) whose existence is uncertain but which may become valid eventually (*Kieso and Weygandt (1992)*).

The conservatism assumption implies that gain contingencies should not be recorded but should be disclosed in the footnotes unless the likelihood of the contingency to become real is high.

[2] *FASB* interpretation No. 14 , Reasonable estimation of the Amount of a Loss

2.2.1.3 *Historical cost*

GAAP require that most assets and liabilities be accounted for and reported on the basis of historical cost. This principle is supported by the following concepts:

a- Historical cost is assumed to equal the market value at the purchasing date.

b- The objectivity principle supports historical cost.

b- The going concern assumption supports historical cost.

c- Use of other costing methods in evaluating assets implies using the same methods for evaluating liabilities. This will create many difficulties.

d- Assets revaluation does not change the benefits of those assets.

On the other hand, when prices are changed, historical cost is "out of date". Measured economic transactions are therefore recorded at their historical cost. The historical cost comprises all costs incurred and necessary until the asset is available for sale or production. The book value of an asset generally remains the same despite any changes in value subsequent to acquisition.

Financial statements are based on historical cost and, generally, they are not adjusted for price level changes. Therefore the recorded value of assets is unlikely to

approximate market value except at acquisition and retirement dates.

2.2.1.4 *Alternative accounting methods*

GAAP permit the usage of any generally accepted accounting method and estimate. The choice of accounting methods can greatly affect the reported financial position of a firm, which includes the book value of equity. This choice also affects reported profitability and possibly the market value of a firm.

Variations among companies in the application of *GAAP* have yearly effects on the book value of equity. For example, during an upward price trend, a company using the *FIFO* (first in first out) method of inventory costing would have high reported income. On the other hand, a company in the same industry using *LIFO* (last in first out) method of inventory costing would have a low reported inventory balance. If the inventory balances were large in both companies, it would be necessary to make adjustments in order to compare the values of owner's equities. Also, differences exist between methods for reporting items such as depreciation, depletion, and amortisation.

The main alternative accounting methods, which can cause variations in book value, are now discussed under the following headings:

a- Depreciation
b- Inventory costing methods
c- Allowances for doubtful debts

a- Depreciation

Traditional financial accounting theory conceptualises depreciation measurement as a cost allocation procedure that matches an investment's cost with the flow of benefits it produces. The annual depreciation expense can be calculated using different depreciation methods. Different yearly depreciation expenses within the estimated useful-life of a fixed asset will result from each depreciation method.

Accumulated depreciation will, however, be the same at the end of the useful-life of a fixed asset no matter which depreciation method was followed. So, using different depreciation methods would result in different book values during the useful-life of a fixed asset but an identical book value at the end of the useful-life of that asset.

b- Inventory costing methods

Inventories are initially recorded at cost. In order to show a "true and fair" financial position for the firm and an indication of its profitability, an inventory costing method is needed. The value of inventory varies according to the inventory costing method being used. Therefore, book value of equity will be influenced accordingly.

Total profits or losses from the sales of inventory are the same whichever costing method is used. Therefore, the effect of inventory cost on book or market value must be the same on the dates of acquiring and selling the inventory.

c- Allowances for doubtful debts

Receivables are usually shown in the balance sheet at their net cash realisable value[3]. The net cash realisable value excludes amounts that the company estimates it will not be able to collect.

The income statement is also affected by the amount of uncollectible debt. An expense for estimated uncollectible debt is recorded to make certain that expenses are matched with related sales revenues. The receivables (net) balance and bad debts expense therefore clearly affects the book value of equity.

A variety of methods may be used in estimating uncollectible amounts and the estimation itself is a sort of judgement. The effects on the book value of equity will differ according to the estimation and method used.

2.2.1.5 *Monetary unit assumption*

This assumption requires that only transaction data that can be expressed in terms of money should be included in the accounting records of the economic entity. The assumption enables accounting to measure economic events but it excludes any transaction that can not be measured in terms of money from the accounting records.

This assumption assumes the equality of monetary units across time whereas, in practice, the purchasing power of the

[3] Net amount expected to be received in cash

monetary unit changes from time to time. For example, a straight comparison of a Jordanian Company's income before and after the 1987 crash (when the purchasing power of the Jordanian currency decreased in comparison to other currencies) would be misleading.

2.2.1.6 *Going concern assumption*

Financial reporting relies on the going concern assumption, i.e. that the firm will continue in operation long enough to carry out its existing objectives. The alternative assumption (liquidation or sale of the firm) requires different measures of assets and liabilities values. The historical cost principle would be of limited usefulness if eventual liquidation were assumed. Under a liquidation approach, for example, asset values are better stated at net realisable value than at historical cost. Also, only by assuming normal future operations is it possible, for example, to depreciate long-lived assets over their useful-lives rather than valuing them at their estimated disposal values.

2.2.1.7 *Timing and window dressing*

Data used in accounts are taken from specific points in time when financial statements are prepared. This may be misleading. For example, the financial year-end may correspond to the low point of a firm's operating cycle when reported levels of assets and liabilities may not reflect normal operation levels. Also, in seasonal businesses, financial statements may not reflect normal balances for the rest of the year.

Transactions at year-end may motivate manipulation of some balances to show the firm in a more favourable light. This is often called window dressing.

2.2.2 Section summary

To conclude this section, it can be said that estimation, contingent losses, historical cost, alternative accounting methods, monetary unit and going concern assumptions and timing and window dressing can all influence recorded book values. Therefore, these variables will also influence the book-to-market value of equity ratios. The next section proceeds to examine market value and the factors that may cause it to vary.

2.3 **Market value of equity** (*MV*)

Market value of equity can be defined as book value of equity plus the present value of future expected abnormal earnings (goodwill).

Market value of equity is of most relevance to the company and the users of financial information. The various definitions of market value of equity found in the literature rely on different concepts. These definitions and concepts often relate to future earnings, future cash flow, future dividends and the valuation of individual assets and liabilities.

Ohlson (1995) suggests that the core of the valuation function expresses value as a weighted average of capitalised

current earnings (adjusted for dividends) minus current book value.

Opponents of market value accounting, however, contend that market value information is subjective and therefore not verifiable.

In this thesis, market value of equity is always defined and calculated as the firm's share price at the end of its financial period multiplied by the number of outstanding shares of that firm at that date. However, it is useful to examine the influences on market value of equity which can occur by even this simple definition.

2.3.1 Variables affecting market value of equity

In the literature, market value is commonly described as a product of both contemporaneous accounting and non-accounting information. The main influences on market value are related to:

2.3.1.1 Earnings
2.3.1.2 Dividends
2.3.1.3 Discounted cash flow
2.3.1.4 Rule of present worth
2.3.1.5 Size of the future
2.3.1.6 Interest rate

Each of these will now be considered in turn.

2.3.1.1 *Earnings*

a- The association between share prices and earnings

The idea of a relationship between share prices and earnings is fundamental to modern finance. For example, many valuation models rely on discounting future earnings at an appropriate rate to arrive at current share prices. However, within this simple concept there is much room for questions about the detailed process of how the relationship usually occurs.

For example, *Benston (1966)* and *Ball and Brown (1968)* find a significant positive correlation between price changes (prices of common stock securities) and earning changes (accounting earnings). *Ball and Brown (1968)* add that prices anticipate earnings because of more timely sources of information. *Beaver, Clarke and Wright (1979)* suggest that the relationship between share prices and earnings is not only statistically significant but also large enough to be economically important.

Beaver (1998), however, concludes that this significant correlation is not a simple one-to-one relationship. It is less than one. He suggests the following interpretations to support this conclusion: -

1- Although in most cases accounting earnings and security prices are influenced by the same events, sometimes they are affected differently.

2- Although price changes move in the same direction as earnings changes, they typically do not move as far.

3- Prices behave as if investors perceive that accounting earnings convey information about the value of a security.

Beaver also suggests that prices behave as if market participants perceive there is an accrual measurement effect (delayed recognition and conservatism components) on earnings and book value of common equity.

For more research, which supports this relationship, see *Beaver, Lambert and Ryan (1987)*.

A further influence on prices is the component of "conservatism". The reliance of generally accepted accounting principles (*GAAP*) on historical cost accounting induces substantial lags in the book values of assets and common equity relative to economic values and to market value. A major feature of financial reporting under historical cost is delayed recognition. Conservative behaviour involves choosing lower (rather than higher) revenues, higher rather (than lower) expenses, and recognising unrealised losses but not unrealised gains. There is, however, also a timing dimension to the choice not reflected in this definition.

Another way to examine the relationship between prices and earnings is simply by examining the price-to-earnings ratio. *Beaver and Morse (1978)* find that stocks with high price-earnings ratios at the end of a year have experienced low

earnings growth in that year and high earnings growth in the subsequent year. On the other hand, low price-earnings ratios stocks experience high growth in the year just ended and low growth in the subsequent year as shown in Figure 2.1.

Figure 2.1

Price-to-earnings and earnings growth

P/E	Earnings growth	
	First year	Subsequent year
High	Low	High
Low	High	Low

This is exactly the behaviour that would be expected if earnings behave as if they contain a transitory component, which is perceived by investors.

b- Prices as a predictor of earnings

Even if there is an association between earnings and prices, what is the direction of causality in this relationship? There appear to be arguments in support of both possibilities.

Beaver (1998) noted that the natural relation between earnings and prices assumes that accounting information predict market information. He points out, however, that recent research has turned around the familiar relation between share prices and earnings. Researchers now are using market information (share prices) to predict accounting earnings.

a) A lead relationship

Ball and Brown (1968) support the "natural relation" between earnings and share prices. On the other hand, *Beaver, Lambert and Morse (1980)* and *Beaver, Lambert and Ryan (1987)* support the argument that prices predict earnings. Prices can be used to forecast earnings (a feature known as "the information content of prices", as in *Ball and Brown (1968)*.

b) A lag relationship

Beaver, Lambert and Morse (1980)) suggest that price-based forecasting models of earnings can predict future earnings "better" than forecasting models based on a statistical extrapolation of past and current earnings.

Beaver, Lambert and Ryan (1987) examine the relation between percentage changes in price and future percentage changes in earnings. They explain current percentage change in earnings as a linear function of current percentage change in prices and lagged percentage change in prices. The coefficients on current and lagged percentage changes in price variables are positive and significant. The coefficient on last year's price change provides a basis for forecasting earnings based on this year's price changes. Share price changes lead earnings changes, and earnings reflect some economic events on a delayed basis relative to when share prices reflect the effects of those events. Therefore, the component of earnings is not timely relative to the information reflected in prices.

2.3.1.2 *Dividends*

Molodovsky (1953) remarked that: -

> "The commercial value of property consists in the expectation of income from it"

and suggested that dividends form the hard core of stock values. He discussed the concept that the value of a stock depends on future dividend payments required by investors, separately and jointly, to discover the indefinite future in which the expected dividends will be received. The link between dividends and market value is well documented in the literature. In the words of *Molodovsky (1953)*,

> "As early as (1938) Williams defined the firm's price as the discounted value of the firm's expected future dividends".

Ohlson (1995), page (681) concludes that:

> "Dividends reduce market value on a dollar-for-dollar basis because dividends
>
> a) reduce book value similarly on a dollar-for-dollar basis but
>
> b) do not affect the expected abnormal earnings sequence.
>
> The analysis demonstrates further that dividends reduce subsequent periods' expected earnings. This is because a firm's earnings must align with its book value (net investment). Dividends today therefore reduce future earnings "via" a reduction of current book value…".

Ohlson (1995) also shows that the present value of expected dividends determines a firm's value.

2.3.1.3 *Discounted cash flow (DCF)*

Standard textbook approaches argue that *DCF* is the only way to value the firm, supporting this view with the fact that *DCF* takes into account the timing with which cash inflows and outflows occur. *DCF* needs to undo the accruals process and convert earnings back to cash flows. Yet, among financial analysts, accounting earnings have also survived for a long time, so they must be providing some useful information.

Standard textbook approaches also argue that present value of expected future cash flow is the primary factor in pricing the company. Market value is more determined by future earnings and predicted rate of return.

2.3.1.4 *Rule of present worth*

Market value of an asset today is different from its value in the future. The more distant that future, the greater the discount rate that is applied to calculate present value. Also, the more distant that future the larger the number of uncertainties that affect the market value. In the words of *Molodovsky, 1953,* page (29):

"The concept that the value of stock depends on future dividend payments erects an apparently impregnable barrier. Investors stand before the immensity of the indefinite future. They must be able to envision, separately and jointly, that throughout all the years of the entire future corporate existence, all the

> dividends to be paid by the companies whose stocks they are appraising…. The concept of present worth is one of the pillars of the economics of finance…. The law of present worth bears in it the charity of death…. Present worth does not extend indefinitely into the future".

Therefore, we need to examine the size of the future (investors time horizon).

2.3.1.5 *Size of the future*

Market value, when considered as the present value of expected cash flows (*ECF*), depends, in addition, on the required interest rate (the rate on which investors, apparently, agree) and the size of the future. This future is limited to a reasonably short period because the present value of expected future payments diminishes rapidly while time passes. The methodology of this thesis assumes that the expected cash flow's time horizon, from a group of long-lived assets, is determined by its average useful-life.

By examining the evolution of *BMRs* in relation to average useful life of assets it is also possible to make observations about the relationship between firms' investment horizons and those of the market in which the firms' financial assets are traded.

2.3.1.6 *Interest rate*

Expected cash flows from an asset occur at a future point in time or in different periods in the future. Therefore the required interest rate varies according to the size of the

future (besides other variables). This variation in the required interest rate affects the net present value of the expected future cash flows and, as a result, the market value. There are, of course, many other variables that may influence the interest rate, such as supply and demand, the overall outlook for the economy and investors' levels of risk aversion.

2.4 **Summary**

This chapter examines influences on book and market values, the component parts of the *BMR*. Main influences on book value are estimation methods, contingent losses, the historical cost principle, alternative accounting methods, the monetary unit and going concern assumptions and timing and window dressing. Main influences on market value are earnings, dividends, discounted cash flow, the rule of present worth, the size of the future and interest rates.

Having examined the component parts of the book-to-market ratio individually we proceed in the next chapter to examine the *BMR* itself and the influences upon it.

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3.2 The nature of book-to-market ratios

3.3 Variables affecting the relation between book and market value of equity

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CHAPTER THREE

The book-to-market value of equity ratio

3.1 Introduction

Each component of the *BMR* has now been examined so we may now proceed to examine the ratio itself. In this chapter the structure of the *BMR* is explained and followed by the identification and examination of the variables that affect the relation between book and market values of equity.

The nature of the firm's activities, accounting methods, profitability, the overall economy, management's financial reporting choices, information timeliness, leverage, delayed recognition and conservatism, footnote disclosures and discretionary and nondiscretionary components of accounting numbers are the main variables that affect the relation between book and market values of equity.

3.2 **The nature of the book-to-market ratios**

The market prices the firm as a whole. Security prices are influenced by tangible and intangible assets and also by liabilities (*Barth, Beaver and Landsman (1993)*).

Barth, Beaver and Landsman (1993) indicate that the market prices both assets and liabilities. They find that assets have a significant positive coefficient, whereas liabilities have a significant negative coefficient when associated with

share prices. However, the coefficients are not equal to one and vary between asset and liability accounts.

Unrecorded assets and liabilities are also priced. *Barth, Beaver and Landsman (1993)* report that book value of assets, book value of liabilities and net income are all significant factors, explaining approximately 75 to 80% of the variation in the market value of equity. They find that the unrecognised portion of pension assets and liabilities (unrecorded but disclosed in the footnotes) is priced by the market in ways that imply that the market regards the pension assets as assets of the company and pension obligations as liabilities.

The difference between book and market values of equity for a firm is often referred to as unrecorded goodwill. The notion of goodwill is therefore relevant to this section. Also relevant is the rate of abnormal returns and *Tobin's Q* as will be explained under the following headings:

3.2.1 Book and market values equality
3.2.2 Book and market values during the useful-life of assets
3.2.3 Book-to-market ratios in relation to goodwill
3.2.4 Book-to-market ratios in relation to abnormal earnings
3.2.5 The use of book-to-market ratios for analysis
3.2.6 Book-to-market value of equity and *Tobin's Q* ratio

3.2.1 Book and market value equality

Book value is based on recorded historical costs; market value reflects the subjective judgement of a vast number of stockholders and prospective investors about a company's potential for future earnings and dividends.

Previous research assumes that the book value of an asset equals its market value at acquisition and retirement. It is assumed that the historical cost of an asset equals the market cost at acquisition. At retirement, it is assumed that the residual value of an asset equals its market value. This is because, if it is necessary, the estimated useful life or the residual value of an asset can be modified during the useful life of that asset in order to depreciate the entire depreciation base.

3.2.2 Book and market values during the useful-life of assets

Book value almost always does not equal market value during the useful life of the asset. This inequality can be generalised to owners' equity.

Market value per share is usually greater or less than book value per share, but this does not necessarily mean that the stock is over- or under-priced. The value of *BMR* is almost always changeable in relation to itself and to the average *BMRs* of the same industry.

For some analysts, reported book value is an index against which to compare the stock price. Under the assumption that

the difference between market price and book value should be similar for firms in the same industry, this kind of analysis turns on whether the relationship for a given firm is in line with a comparable population of firms.

3.2.3 Book-to-market ratios in relation to goodwill

Generally, book value, plus the present value of unrecorded goodwill, equals market value.

Goodwill is also the net present value of firms' expected future abnormal earnings, as measured by accounting earnings minus the cost of capital times the start-of-period book value *(Feltham and Ohlson (1996))*.

Under this definition, book value of equity equals market value of equity for a firm when the actual rate of return equals the required rate of return. If the actual rate of return exceeds the required rate of return there will be positive growth opportunities. In this case the share of a firm whose expected rate of return is higher (lower) than the required rate of return should sell at a price above (below) book value. The excess of market over book value is hence an indication of the firm's goodwill.

3.2.4 Book-to-market ratios in relation to abnormal earnings

Market value of equity can be determined according to the discounted stream of future abnormal earnings. Abnormal earnings bear on the difference between market and book values; that is, they bear on a firm's goodwill (*Ohlson*

(1995)). Abnormal earnings (residual income)[1] influence a firm's value. If the firm is expected to have zero abnormal earnings in the future, its market value will, in theory, equal its book value.

3.2.5 The use of book-to-market ratios for analysis

As previously mentioned in Section 1.1, the use of book-to-market ratios has a long tradition in finance and security analysis. Recently, this measure has received considerable attention because of its apparently important (but not well understood) role in explaining patterns in stock returns *(Beaver (1998))*.

3.2.6 Book-to-market and *Tobin's Q* ratio

The relationship between a firm's market and book value can be measured by *Tobin's Q* ratio. *Tobin's Q* is defined as the market value of a company divided by its book value on a replacement cost basis. *Q* values below 1 (price less than replacement book value) imply that the firm earns less than the required rate of return. On the other hand, the firm has an incentive to invest when *Q* is greater than 1. Therefore, the assets' market value is worth more than it costs to replace.

Tobin's Q is similar to market-to-book ratio, but there are some differences. The most important difference is that the numerator of *Tobin's Q* includes all the firm's debt and equity securities, not just its common stock. The denominator includes all assets, not just the firm's net worth.

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[1] This accounting-based performance measure is defined by earnings minus a charge for the use of capital as

3.3 Variables affecting the relationship between book and market values of equity

The relationship between market and book value depends to a great extent on the following factors:

3.3.1 The nature of the firm's activities
3.3.2 Accounting methods
3.3.3 Profitability
3.3.4 The overall economy
3.3.5 Management's financial reporting choices
3.3.6 Information timeliness
3.3.7 Leverage
3.3.8 Delayed recognition and conservatism
3.3.9 Footnote disclosures
3.3.10 Discretionary and nondiscretionary components of accounting numbers

Each of these factors is now considered in turn.

3.3.1 The nature of the firm's activities

Share prices are associated with the firm's activities. Generally, technological firms have more opportunities to increase their income from "innovation ideas". Other firms, in general, behave at or near the same range of others in the same industry. On the other hand, the higher the productivity of the firm's assets, the more the expected income opportunities that will ensue from ownership of these

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measured by beginning-of-period book value multiplied by the cost of capital.

assets. This will increase the market value of a firm's equity.

3.3.2 Accounting methods

Use of different "generally accepted" accounting methods (such as inventory costing and fixed assets depreciation methods) affects the recorded profitability and the financial position of the firm. At the same time, it may affect book and market values of equity.

As mentioned several times previously, previous research assumes that market value equals book value of an asset at acquisition and retirement. Therefore, the initial book value (at acquisition) minus the estimated residual value (at retirement) of an asset equals investment expenditures. The accumulated depreciation expense across periods equals the amounts invested. This is a useful concept for the design of the research methodology in Chapter 5.

3.3.3 Profitability

One definition of profitability is "the ability of the firm to generate income". The book-to-market equity ratio is a function of the expected level of this future profitability and retained earnings from current income (even if the future is unknown).

Profitability therefore influences both the book value of equity (by the retained income) and the market value of equity (by the investors' response to the profitability level).

3.3.4 The overall economy

In the economy, in general, many variables such as the level of supply and demand, prices and interest rates influence *BMRs*. Also, the purchasing power of the monetary unit depends partially on overall economic conditions. In recession periods the purchasing power of the monetary unit is greater than it is in inflationary periods.

3.3.5 Management's financial reporting choices

Management's financial reporting choices are exercised as a part of a management policy realization. These choices affect the allocations of revenues and expenses across time periods, and as a result, these choices influence reported asset and liability balances. They may also influence market share price.

3.3.6 Information timeliness

The release of accounting information almost always precedes the announcement date. Prices also respond to more timely non-accounting information. This conclusion has been shown in previous research. For example, *Beaver (1968)* and *Beaver and Ryan (1996)* suggest that price changes lead earning changes and book values of equity by as much as six years. Hence, the market responds quickly and in an anticipatory manner to earnings.

Beaver (1968) adds that large price changes (in either direction) are more likely to occur during the week of the

annual earnings announcement than at other times during the year.

Benston (1976) and *Ball and Brown (1968)* state that much of the price reaction associated with earnings occurs prior to the announcement of annual earnings. They provide important evidence on the issue of the timeliness of earnings. They suggest that annual earnings are not timely information and are pre-empted by alternative, more timely, sources.

Further studies find that security prices anticipate earnings prior to the earnings announcement. For example, the *Ball and Brown (1968)* study indicates that, for firms with good earnings news, the cumulative residual price changes are positive well before the announcement month, which means prices are anticipating the earnings news for several months prior to the annual announcement. Part of this anticipation is simply due to the release of quarterly earnings announcements. However, this anticipatory effect also occurs because of the availability of other information that permits investors to revise expectations about earnings.

3.3.7 Leverage

Leverage provides an indication into the extent to which non-equity capital is used to finance the assets of the firm. The less the leverage, the more the firm's ability to generate new investments. Leverage measures the level of protection available to creditors and lenders, and it reflects the level of the investment risk from debt financing.

Early studies, for example, *Graham, Dodd and Cottle (1962)*, describe *BMR* as being influenced by leverage. Moreover, *BMR* is considered by analysts as a " margin of safety" and as a "comparison of price to liquidation value" (*Bodie, Kane and Marcus, 1989)*.

3.3.8 Delayed recognition and conservatism

Delayed recognition and conservatism influence the difference between book and market values of equity. For this aspect it is useful to refer to the work of *Beaver and Ryan (1993)* who decompose the book-to-market ratio into two components; the "delayed recognition" component and the " conservatism" component:

a. Delayed recognition component

Delayed recognition is a feature of reporting under historical cost. This means that book value is not influenced immediately by some shocks in the market. It induces differences in book values of assets and common equity relative to market value.

b. Conservatism component

Conservatism means "when in doubt, choose the solution that will be least likely to overstate assets and income". It is a biased recognition and it is allowed by *GAAP*.

Thus delayed recognition and conservatism cause differences between book and market values of equity.

Beaver and Ryan (1993) forecast future earnings as implied by return on equity. They find that firms in which the book-to-market ratio is dominated by delayed recognition show a difference in return on equity compared to other firms and this difference decays over time as the gains and losses are eventually recognised in earnings and book value. In contrast, those firms whose book-to-market ratio is dominated by conservatism have an initial difference in return on equity compared to other firms and this difference does not decay over time because differences induced by conservative accounting produce permanent effect in book values and earnings. *Ryan (1995)* also finds that book-to-market values of equity ratios are associated with six annual lagged changes in market values. This result documents the delayed recognition and lack of timeliness of book values based on historical cost valuation.

3.3.9 Footnote disclosures

The notes to financial statements generally explain the items presented in the main body of the statements. Information in footnotes is likely to influence the judgement and decisions of informed user. It might include, for example, a description of the accounting polices and methods used in measuring the elements reported in the financial statements and explanations of uncertainties and contingencies. It might also include the market values of certain financial instruments according to *SFAS* 107. These footnotes are helpful and essential to understanding the firm's performance and position.

Research indicates that, in many cases, information that is disclosed in the footnotes to the annual report is priced

even though this information is not recognised in the main body of the financial statements themselves (*Beaver, Financial Reporting (1998)*).

3.3.10 Discretionary and non-discretionary components of accounting numbers

Share prices are associated differently with discretionary and nondiscretionary components of accounting numbers. For example, *Beaver and Engel (1996)* find that the market prices of banks behave as if the capital market decomposes the allowance for loan losses into discretionary and nondiscretionary components and assigns significantly different "prices" to each component. For loan losses, the nondiscretionary component is negatively priced and the discretionary component is less negatively priced. For positive situations the relationship is likely to be the other way around. The different reactions of the market to discretionary and nondiscretionary components of accounting numbers adds another source of difference between book and market values of equity.

3.4 **Summary**

This chapter explains the "meaning" of the book-to-market ratio and the factors which cause it to change. In examining the wide range of influences on *BMRs* it becomes clear that *BMR* is, in fact, a very complex variable and, as such, unlikely to be interpreted in a single way. There is room for many interpretations of *BMR* and these are examined in the next chapter.

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4.1 Introduction

4.2 Relations between book-to-market value of equity ratios and other variables

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4.5 Conclusion

CHAPTER FOUR

Interpretations of book-to-market value of equity ratio

4.1 Introduction

This chapter focuses on the relations between book-to-market ratios and other variables used for prediction.

There is a wide literature on interpreting book-to-market ratios and to cover all of it would be an enormous task. Therefore, in order to deal with the subject, selective references are included and summarised in this chapter. This summary is supported by a survey of interpretations of the ratio in relation to other relevant concepts.

In order to summarise the wide range of opinions we can examine *BMRs* in relation to stock returns, profitability, changes in accounting methods, risk, cash flow, growth, return on equity, price-to-earnings ratios and sales-to-price ratios.

By examining *BMRs* in this way the main possible interpretations of the ratio may be understood.

4.2 Relationships between book-to-market values of equity ratio and other variables

This section reviews the relationship between book-to-market value of equity ratio and other variables useful for prediction. As suggested in the introduction to this chapter, the book-to-market value of equity ratio is often considered in relation to the following variables:

4.2.1 Stock returns
4.2.2 Corporate profitability
4.2.3 Changes in accounting methods
4.2.4 Value stocks versus growth stocks
4.2.5 Beta of equity
4.2.6 Cash flow
4.2.7 Growth
4.2.8 Return on equity ratios (*ROE*)
4.2.9 Price earnings ratios (*P/E*)
4.2.10 Sales price ratios (*S/P*)

Each of these relations is discussed in turn.

4.2.1 Book-to-market value of equity ratios and stock returns

In this section, firstly, studies that test for any relationship at all between *BMRs* and stock returns are presented. There is considerable evidence for such a relationship so there is then the question of whether this relationship is positive or negative. It therefore seems appropriate to examine the literature on both possible relationships (positive or negative association).

Historical research on *BMRs* in relation to stock returns is summarised in Table 4.1.

Table 4.1

Interpretations of book-to-market ratios in relation to stock returns

Researcher	Main findings
Graham, Dodd and Cottle (1962)	*BMR* is interpreted as an indicator of return on equity.
Rosenberg, Reid and Lanstein (1985)	A positive relation is found between average return and *BMR* for the US stocks. *BMR* is an indicator of mis-priced stocks.
Chan, Hamao, and Lakonishok (1991, 1993)	A positive association exists between average stock returns and *BMRs*.
Fama and French (1992)	*BMRs* has a stronger association with average returns than with size in the US. *BMRs* of individual stocks explain cross-sectional stock return variation. High (low) *BMRs* are associated with under- (over-priced) stocks.
Bernard (1993)	*BMRs* predict gains/losses in liquidation or take-over situations.
Kothari, Shanken and Sloan (1995)	*BMRs* capture cross-sectional average return variation. There is no significant relationship between *BMRs* and stock returns at the S&P industry level.
Kothari and Shanken (1997)	*BMRs* predict average returns.

Mukherji, Dhatt and Kim (1997)	Annual stock returns are positively related to *BMRs*.
Strong and Xu (1997)	*BMRs* can explain cross-sectional variation of UK stock returns.
Pontiff and Schall (1998)	*BMRs* predict market returns and small firm excess returns.
Chui and Wei (1998)	*BMRs* have significant association with stock return indices in some (but not all) financial markets in the Pacific-Basin.

From Table 4.1 it can be seen that research into book-to-market ratios relationship with stock returns goes back (at least) to *1962* when *Graham, Dodd and Cottle* found evidence for such a relationship. *Fama and French (1992)* also find that the book-to-market value of equity ratios have a strong association with average returns.

Generally, from Table 4.1, it can be seen that *BMRs* are positively associated with stock returns and that *BMRs* of individual stocks explain some cross-sectional variation in stock returns and capture information about expected future returns.

The relationship is likely to be positive (higher *BMRs* being associated with higher returns and vice versa) (*Rosenberg, Reid and Lanstein (1985); Chan, Hamao and Lakonishok (1991, 1993) and Mukherji, Dhatt and Kim (1997)*). In relation to under- and over-pricing of stocks, high *BMRs* were associated with under-priced stocks (and vice versa) (*Fama and French, 1992*).

Moreover, *BMRs* predict gains/losses arising when companies liquidate or are taken over (*Bernard (1993)*). *BMRs* could also be used for prediction of average returns (*Kothari and Shanken (1997)*). Even more recently, *Pontiff and Schall (1998)* confirmed *BMR*'s usefulness for prediction, particularly for the excess returns of small firms.

However, some empirical research does not find evidence of a relationship between *BMRs* and stock returns (for example, *Kothari, Shanken and Sloan (1995)* and *Chui and Wei (1998)*). These studies tend to use indices (rather than individual stock returns) for examining this relationship.

To summarise the literature so far, there seems to be a positive association between *BMRs* and returns of individual stocks, but this relationship is less strong (through a diversification effect) when tested for in relation to market indices. Positive relationships between *BMRs* and stock indices have been found in Hong Kong, Korea and Malaysia, but not in Taiwan and Thailand *(Chui and Wei (1998))* or even in the USA (*Kothari, Shanken and Sloan (1995)*).

4.2.1.1 *Further details about the relationship between BMRs and stock returns*

Having established that, in general, there is a relationship between *BMRs* and individual stock returns we can now proceed to examine it in more detail.

a- The association between *BMRs* and stock returns

1. In USA and Japan

Chan, Hamao and Lakonishok (1991) and Fama and French (1992)) document that the *P/B* ratio explains mean stock returns and conjecture that it is a proxy for risk or an indicator of distress (the difference between market and book leverage) or mis-priced stocks.

After studying US stock returns for the period from 1963-90, *Fama and French (1992)* conclude that returns are not explained by beta (as would be suggested by standard theory) but rather by two easily measured variables, size and book-to-market value of equity. Furthermore, their results show that, if anything, the ratio of book to market value plays a larger role than size in explaining equity returns.

Other researchers (for example, *Pontiff and Schall (1998); Ball (1978); Berk (1995)* and *Sharathchandra and Thompson (1994)*) find that the book-to-market value of equity ratio captures information about expected future returns and suggest that this is because book value proxies for expected cash flows. Thus, the book-to-market value of equity ratio is the ratio of a cash flow proxy to the current price level.

2. In the Pacific-Basin

Chui and Wei (1998) examine the relationship between expected stock returns and book-to-market ratios in five Pacific-Basin financial markets (Hong Kong, Korea, Malaysia, Taiwan and Thailand). Using market indices they find that *BMRs* have

significant association with stock returns in Hong Kong, Korea and Malaysia.

b- *BMRs* usefulness for predicting stock returns

Kothari and Shanken (1997) document that the book-to-market value of equity ratio of the Dow Jones Industrial Average Index predicts market returns over the period 1926-1991. Also, *Pontiff and Schall (1998)* show that, for the period 1926-1994, the Dow Jones Industrial Average Index book-to-market value of equity ratio predicts market returns and small firms' excess returns. They document a structural difference between their pre- and post-1960 sub-samples. The ability of the book-to- market ratio to predict returns dissipates in the second half of the sample. One explanation they offered for this result is that the Dow Jones Industrial Average Index is less representative of the equities market as a whole in the post-1960 period.

In addition, *BMRs* can predict gains/losses arising when companies liquidate or are taken over (*Bernard (1993)*).

c- *BMRs* explain the cross-sectional variation of stock returns

N. Strong and X. G. Xu (1997) suggest that book-to-market value of equity and leverage are consistently significant in explaining the cross-section of UK stock returns.

4.2.1.2 *Positive relation between BMRs and stock returns*

Some researchers, (for example *Rosenberg, Reid and Lanstein (1985); Fama and French (1992); Chan, Hamao and Lakonishok (1991, 1993) and Mukherji, Dhatt and Kim (1997))* find that the relationship between *BMRs* and average returns is positive. This positive relationship may be attributed to returns. It is expected that the larger the returns, the higher the book value of equity and, hence, the larger the *BMR*.

a- In Japan

Chan, Hamao and Lakonishok (1991, 1993) show that expected stock returns in Japan are positively related to *BMR* (and cash flow yield).

b- In Korea

Mukherji, Dhatt and Kim (1997) find that annual stock returns are positively related to book-to-market ratios for the Korean stocks during the period from 1982 to 1993.

4.2.1.3 *BMRs in relation to under- or over-priced stocks*

Fama and French (1992) attribute high (low) *BMRs* to under-(over-priced) stocks. Correction of such mis-pricing, it is argued, explains the observed link between *BMRs* and subsequent returns. There is an opportunity for investors to gain profits from this relationship.

There is no support in the literature for a negative relationship between average returns and *BMRs*.

4.2.1.4 *More about the usefulness of BMRs for explaining cross-sectional variation of returns*

Not only is there likely to be a relationship between book-to-market ratios and expected returns. *BMRs* can also provide information about variations of returns. Most studies of this aspect find a positive relationship between *BMRs* and variation of returns, with high *BMR* being associated with high stock price volatility. These studies include *Fama and French (1992)* and *Kothari, Shanken and Sloan (1995)*.

Fama and French (1992) find that the book-to-market ratio of individual stocks has the ability to explain cross-sectional variation in stock returns. They conclude that book-to-market equity ratio and firm size do a good job of capturing the cross-sectional variation in average returns over the 1963 to 1990 period.

4.2.2 Book-to-market value of equity ratios and corporate profitability

Any relationship established between stock returns and *BMRs* is likely also to be found in relation to corporate profitability. The relationship is unlikely to be one-to-one, however, due to the complexities of the relationship between corporate profitability and common stock returns. Therefore, this section examines, specifically, the relationship between *BMRs* and corporate profitability.

Historical research on *BMRs* in relation to profitability is summarised in Table 4.2.

The table summarises the results of research (for example, *Penman (1991)* and *Fama and French (1995)*) which examines the association between *BMRs* and profitability. These studies attempt to identify the duration of this relationship.

Table 4.2

Interpretations of book-to-market ratios in relation to earnings

Researcher	Main findings
Penman (1991)	Low *BMR* firms remain more profitable than high *BMR* firms for 5 years after portfolio formation.
Fairfield (1994) and Ohlson (1995)	*BMR* is a function of the expected level of future profitability.
Fama and French (1995)	High *BMR* stocks are less profitable than low *BMR* stocks for four years before and at least five years after portfolio formation.

4.2.2.1 *The relationship between BMR level and Profitability*

In general, low *BMRs* tend to be more associated with higher current profits than high *BMRs*. On the other hand, high *BMRs* tend to be associated with higher future profits than low *BMRs*. This finding (supported by *Fairfield P.M. (1994);*

Ohlson (1995) and *Fama and French (1995))* suggests a strong "expectations" component in the *BMR*.

Further support comes from *Fairfield P.M. (1994)* and *Ohlson (1995)* who demonstrate that *P/B* is a function of the average level of future profitability. *Fama and French (1995)* examine the relationship in more detail and show that high *BMRs* signal persistent low future profits and low *BMRs* signal high future profits. They also suggest that, in rational markets, short-term variation in profitability should have little effect on stock price and book-to-market value of equity. Also, *Fama and French (1995)* find that *BMR* is a stronger indicator of profitability than firm size.

4.2.2.2 *BMRs and the profitability time horizon*

a- Duration of period during which value stocks produce low returns

In Section 4.2.4 it is suggested that low *BMR* stocks are associated with high current income but low future income (and vice versa). It is appropriate, therefore to examine how long it takes for this change in fortunes to take place.

Fama and French (1995) confirm that *BMR* stocks are related to persistent properties of earnings. High *BMR* stocks signal sustained low earnings on book equity and they are less profitable than low *BMR* stocks for four years before and at least five years after portfolio formation. Low *BMR* stocks then have low average returns because future earnings growth is weaker than the market expects, and high *BMR* stocks have

high average returns because earnings growth is stronger than expected.

b- Duration of period during which growth stocks produce high returns

For the opposite situation (low *BMR* and high current earnings) perhaps the most relevant research is that undertaken by *Penman (1991)* who finds that portfolios of firms with low *BMRs* remain more profitable than portfolios of firms with high *BMRs* for at least five years.

4.2.3 Book-to-market value of equity ratios and changes in accounting methods

Changes in accounting methods are permitted by GAAP. The process can be undertaken by firms' management to serve its polices.

The interpretations of *BMRs* in relation to changes in accounting methods are summarised in Table 4.3. There is evidence both for and against a relationship between changes in accounting methods and *BMRs*.

Table 4.3

Interpretations of book-to-market ratios in relation to changes in accounting methods

Researcher	Main findings
Archibald (1972) and Ball (1972)	Accounting method changes have no favourable impact on security prices.
Beaver and Dukes (1973)	Changes in depreciation methods influence security prices.
Hong, Kaplan and Mandelker (1978)	Accounting method changes that do not alter dividend-paying ability do not influence prices.
Penman (1996)	*BMR* is influenced by changes in accounting methods.

The literature survey summarised in Table 4.3 refers to the concentration of empirical research on this aspect in the 1970s and 1990s.

The findings of *Penman (1996)* (that changes in accounting methods influence *BMRS*) support the results of *Beaver and Dukes (1973)* who find that stock prices are influenced by changes in accounting methods.

This influence on stock prices is narrowed down to changes in accounting methods that do not alter dividend-paying ability *(Hong, Kaplan and Mandelker (1978))*.

However, *Archibald (1972)* and *Ball (1972)* suggest an opposite effect whereby security prices act as if investors take into account the different accounting methods by which earnings are generated.

It can be seen from Table 4.3 that the overall picture emerging from results of the empirical research on this matter is not clear. One group finds that changes in accounting methods influence *BMR* and the other group suggests that investors know that reported earnings are being generated by different accounting methods.

4.2.3.1 *The case for a relationship between changes in accounting methods and BMRs*

Previous research suggests that there is an association between changes in accounting methods and *BMRs*. The empirical research of *Beaver and Dukes (1973)* and *Penman (1996)* and theory by *Beaver (1998)* supports this association.

Beaver and Dukes (1973) find that the price-to-reported earnings ratios for firms that use accelerated depreciation do significantly differ from those of firms using straight-line depreciation. However, when reported earnings are adjusted to compute pro-forma earnings (based on a common method of computing depreciation) the price-earnings ratios are not significantly different. This finding is consistent with a market that adjusts for accounting method differences (in contrast to a market in which there is limited reliance placed on reported earnings). *Beaver (1998)* theorised that not all accounting changes should have this property. A change in accounting methods should only affect stock price if it is perceived to alter the production or financing activities of the firm in such a way as to alter the expected after-tax future cash flows.

On the same matter, *Penman (1996)* shows empirically that *P/B* does differ under different accounting rules and suggests this reflects accounting operations that deal with problems of measurement in imperfect markets.

4.2.3.2 *The case against a relationship between changes in accounting methods and BMRs*

Other research shows no (favourable) impact from changes in accounting methods on *BMRs*, as in the empirical research of *Archibald (1972), Ball (1972) and Hong, Kaplan and Mandelker (1978).*

Archibald (1972) and *Ball (1972)* find that prices behave as if the change in accounting methods has no favourable impact on security prices. A possible explanation is that prices act as if investors look beyond accounting numbers and take into account the fact that reported earnings are only being generated by different accounting methods.

Hong, Kaplan and Mandelker (1978) conclude that the use of the "pooling versus purchase" treatment of accounting for business combinations produces no apparent superior stock price performance. No effect is observed even though pooling leads to higher reported earnings than the purchase treatment.

However, some research suggests that *BMRs* are associated with changes in accounting methods when the ability to pay dividends is influenced (*Hong, Kaplan and Mandelker (1978)*). In this regard, *Beaver* (in his book *Financial Reporting (1998))* theorises that this result indicates that prices

behave as if investors "look beyond" reported accounting earnings. Investors also attempt to make adjustments for the effects of events on earnings that do not imply altered dividend-paying ability, and hence have no effect on the price of common equity.

4.2.4 Value stocks versus growth stocks

"Value stocks" are those with high *BMRs*. They have low market prices compared with book prices, and there is an opportunity to increase future earnings because the high *BMR* reflects anticipated ability of the company to improve future investment. On the other hand, current low market value reflects low anticipated future earnings.

"Growth stocks" have low *BMRs*, which means that they have high market prices compared with book prices. It suggests that the assets of the company are currently well-invested and there are less potential future earnings than for value stocks. On the other hand, high current market value reflects high anticipated future returns. Low *BMRs* indicate better current quality investment.

The desire to invest, depending on returns, is expected to be stronger in growth stocks than in value stocks. This is because investors in growth stocks currently receive higher returns than from value stocks.

Some previous research, however, indicates the opposite to this general conclusion (for example, *Fama and French (1998)*). Therefore, we need to examine both views.

4.2.4.1 *First view*:

> *Growth (value) stocks tend to be associated with high (low) current earnings and low (high) future earnings.*

This conclusion is clearly supported in the results of the empirical research of *Capaul, Rowley and Sharpe (1993); Fama and French (1995)* and *Pontiff and Schall (1998)*.

Potential favourable growth prospects raise a firm's stock price and hence reduce its *BMR*. In contrast, high *BMR* stocks are more likely than others to have high asset values and less potential growth *(Capaul, Rowley and Sharpe (1993))*. Moreover, *Capaul, Rowley, and Sharpe (1993)* present evidence that value stocks (high *BMR*) earn higher returns than growth stocks (low *BMR*) in France, Germany, Japan, Switzerland, the United Kingdom, and the United States.

In the same regard, *Fama and French (1995)* and *Lakonishok, Shleifer and Vishny (1994)* find that firms with high *BMRs* tend to have persistently low earnings and firms with low *BMRs* tend to have high earnings. They suggest that *P/B* is an indicator of "value stocks" versus "glamour stocks".

From examining the link between earnings and cash flow, *Pontiff and Schall (1998)* show that value stocks (High *BMR*) indicate potential future earnings from increased expected cash flow. Growth stocks (low *BMR*) indicate a high current level of growth from high current earnings, and thus a high current cash flow level.

In summary, one view is that growth stocks have a high current growth level but have less ability to increase this level in the future compared with value stocks. Value stocks have more expected future growth. High *BMR* firms have potential high future earnings. This can be explained by the firm's potential ability to increase and improve investments. The opposite of this first view is now examined.

4.2.4.2 *Second view:*

Value (growth) stocks have high (low) total returns.

Total returns from value stocks are likely to be higher than those of growth stocks, as can be seen in the research of *Roll (1995), Mukherji, Dhatt and Kim (1997) and Fama and French (1998).*

Fama and French (1998) find that value stocks have higher returns than growth stocks in markets around the world for the period from 1975 to 1995. *Roll (1995)* similarly reports that, in Indonesia, the mean daily return is 0.1218 percent higher for high *BMR* stocks than for low *BMR* stocks (although this difference is not statistically significant because of a large degree of noise in the returns). More robust results come from *Mukherji, Dhatt and Kim (1997*) who find that annual stock returns during the 1982-93 period were positively related to book-market ratios in Korea, and that value stocks outperform growth stocks over long periods. They find that the median return is largest for a portfolio of high *BMR* stocks (30.39 percent) and smallest for a portfolio of low *BMR* stocks (7.86 percent).

4.2.4.3 *Value and growth stocks' properties in relation to earnings and cash flow*

A summary of the properties of growth and value stocks in relation to earnings and cash flow is provided in Table 4.4.

Table 4.4

Summary properties of growth and value stocks in relation to earnings and cash flow

	Growth stocks	**Value stocks**	**Researcher**
Panel A: Growth and value stocks in relation to earnings			
Current earnings	High	Low	Fama and French (1995)
Future earnings	Low	High	Fama and French (1992)
Panel B: Growth and value stocks in relation to cash flow			
Current cash flow	High	Low	Pontiff and Schall (1998)
Expected cash flow	Low	High	Pontiff and Schall (1998)

From Table 4.4 we can say that value (growth) stocks are associated with low (high) current earnings and cash flow and high (low) expected earnings and cash flow.

4.2.5 Book-to-market value of equity ratios and "risk"

Risk in finance can be "measured" using many variables. These include total variation in returns, firm-specific variation, or exposure to systematic risk using beta. Among studies that have examined the relationship between *BMR* and such risk measures are *Capaul et al. (1993)*, *Fama and French (1992)* and *Harris and Marston (1994)*. Such research finds a

relationship between *BMRs* and risk measures, but the direction of this relationship is not consistent.

The interpretations of *BMRs* in relation to the overall risk[1] of a firm are summarised in Table 4.5. The empirical research results in Table 4.5 show no clear picture for the relationship between *BMRs* and risk. Rather, the results are divided into two opposite groups. The first group (for example, *Fama and French (1992)* and *Harris and Marston (1994)*) find a positive association between *BMRs* and risk. The other group (for example, *Capaul et al. (1993)*) find a negative relationship between *BMRs* and risk. The association between BMRs and risk, however, could be more clear by examining it in relation to useful-life of assets.

Table 4.5

Interpretations of book-to-market ratios in relation to equity beta

Researcher	Main findings
Fama and French (1992)	High *BMRs* are associated with high risks
Capaul et al. (1993)	Value stocks have lower betas than growth stocks
Harris and Marston (1994)	Potential growth is positively correlated with beta.

[1] Business and financial risk

4.2.5.1 *Arguments for a negative relationship between BMRs and equity beta*

It is argued in finance textbooks that return is associated positively with exposure to risk (for example, in the *CAPM*). As previously seen in Table 4.4, low *BMR* stocks tend to have high current earnings which, in equilibrium, should be accompanied by high beta. However, *Capaul et al. (1993)* show that value stocks (high *BMR*) typically have lower, not higher, betas than growth stocks, so the risk argument must rely on the importance of risk measures other than beta.

Investment risk affects market share prices. Low *BMRs* are associated with high current returns and therefore also with high market share prices (other things being equal). High market share prices are earned, in part, as compensation to risk. That is, high-risk needs high-expected returns.

4.2.5.2 *Arguments for a positive relationship between BMRs and equity beta*

The results of the empirical research of *Fama and French (1992)* and *Harris and Marston (1994)* suggest the opposite to that found in *Capaul et al. (1993)*.

Fama and French (1992) suggest that the positive association between average share returns and *BMR* reflects the fact that high *BMRs* are associated with high risks. Hence, the empirical association between return and *BMR* is consistent with rational, efficient pricing in equity markets.

However, the empirical results of *Fama and French (1985)* suggest that the inverse relationship between *BMR* and beta, that others have observed, is attributable to a failure to control adequately for growth. Beta and forecasted growth are themselves significantly positively correlated, and failure to control for growth is at the root of the observed link between *BMR* and beta. The negative correlation between *BMRs* and beta does not fit well with the notion that increased beta risk leads to lower market prices and, hence, higher *BMR*. Once one controls for growth, both *BMR* and beta show a significant positive relationship, as one would expect from pricing models which assume that investors are averse to beta risk. This association provides evidence that beta is priced in the market.

Harris and Marston (1994) explicitly examined the role of beta risk in the determination of *BMR* ratios. Their results shed further light on the role of beta in market pricing and provide evidence that, once growth is controlled for, beta has a significant positive link with *BMRs*. Therefore, higher prospective growth is associated with higher market risk as share prices are penalised for beta risk.

4.2.6 Book-to-market value of equity ratios and cash flow

If, as previous research suggests, cash flow is positively associated with earnings and earnings are negatively associated with *BMRs*, it follows that cash flow should be negatively associated with *BMRs*.

Table 4.6 summarises some research which support this relation between *BMRs* and cash flow. The table includes

conclusions from the *Pontiff and Schall (1998)* model, which finds evidence that *BMRs* are useful for predicting cash flow. *Pontiff and Schall's* model supports the negative association between *BMRs* and cash flow and a positive relationship between *BMRs* and future returns.

Table 4.6

Interpretation of book-to-market ratios

in relation to cash flow

Researcher	**Main findings**
Bernard and Stober (1989)	Economic conditions influence the information content of cash flow and accruals.
Sloan (1996)	Residual earnings sensitivity from cash flow is the same as from accruals.
Pontiff and Schall (1998)	Book-to-market ratio equals the discount rate plus {the discount rate multiplied by the error term, divided by the expected cash flow}

The first two studies in Table 4.6 relate, indirectly, accruals to cash flow. These two studies are included because *Beaver and Ryan (1993)* (see Section 3.3.8) decompose book-to-market ratio into two components: delayed recognition and conservatism. These two components comprise the accrual measurement. The last study in Table 4.6 (*Pontiff and Schall (1998)*) is explained in greater detail (in Section 4.2.6.3) because it relates *BMRs* to cash flows in a particularly useful way.

4.2.6.1 *Information content of cash flow*

The influence of changes in economic conditions on the information content of cash flow is tested by *Bernard and Stober (1989)* who find that the information content of cash flow and accrual numbers varies with economic conditions.

4.2.6.2 *Residual earnings change's sensitivity to cash flow*

Sloan (1996) examines the residual earnings' sensitivity from cash flow coefficients. He concludes that the market does not assign significantly different sensitivity coefficients to the accrual and cash flow components of residual earnings change, even though the cash flow component appears to contain a more permanent component than the accrual component does.

4.2.6.3 *Uses of BMR for predicting cash flow*

Pontiff and Schall (1998) modeled the ability of *BMR* to predict cash flow. They assumed that the book value of an asset (*BV*) is a proxy for its expected cash flow (*ECF*).

$$BV = ECF + \text{error term } (u).$$

The relation between book to market ratio and cash flow can be modeled as follows:

The current price level of market value of an asset (*MV*) is determined by a discount rate (*R*), and by the expected cash flow.

$$MV = ECF / R$$

As the discount rate (R) changes, the price level changes, and therefore the book to market ratio changes. Holding expected cash flow constant, an increase in the discount rate produces a decrease in market value and thus an increase in the book-to-market ratio. This could explain a positive relation between current book-to-market ratios and future returns.

The realised cash flow (CF) in any period is the expected cash flow (ECF) plus the error term.

$$CF = ECF + u$$

The relation between book-to-market ratio and cash flow can then be modeled as follows:

$$BV / MV = \{ECF + u\}/\{ECF /R\} = R +\{uR / ECF\}$$

This means that *BMR* equals the discount rate plus the discount rate multiplied by the error term, both divided by the expected cash flow.

Using this model *Pontiff and Schall (1998)* find evidence that the *BMRs* ability to predict market returns is related to the ability of book value to forecast future cash flows because dividing an expected cash flow proxy (book value) by a price level (market value) yields a discount rate proxy. Consistent with this explanation, they find that, after 1960, the Standard & Poor's U.S. Index book value is better than

the Dow Jones Industrial Average Index book value for predicting market cash flow.

4.2.7 Book-to-market value of equity ratios and growth[2]

Historical interpretations of *BMRs* in relation to growth are summarised in Table 4.7.

Table 4.7

Interpretations of book-to-market ratios in relation to growth

Researcher	Main findings
Haugen and Baker (1993)	Prices are bid up (down) to unrealistic levels for stocks with high growth (low growth) forecasts.
Bernard (1993)	*BMRs* should be explained by growth in book value, profitability and discount rates.
Harris and Marston (1994)	*BMRs* are negatively related to growth. Growth plays a more significant role in explaining *BMR* than does beta.
Fama and French (1995) and LSV[3] (1994)	Growth earnings rates of low and high *BMRs* become more similar in the years after portfolio formation.
Penman (1996)	*BMRs* indicate future growth in (cum-dividend) book value.

From this table it can be seen that differences in the level of growth may affect *BMRs*. *Harris and Marston (1994)* find a negative relationship between *BMRs* and growth (using analyst-forecast data). *Fama and French (1995)* find that growth in

[2] Growth in earnings

earnings from high and low *BMRs* converge in the early years after portfolio formation.

4.2.7.1 *BMRs and stock prices*

The level of prospective growth (using analyst-forecast data) does not clearly forecast stock prices. This conclusion is evidenced in the empirical research of *Haugen and Baker (1993)* and *Penman (1996)*.

Haugen and Baker (1993) provide a specific conjecture for *BMR*-related mis-pricing based on possible market overreaction to growth prospects. They suggest that prices are bid up (down) to unrealistic levels for stocks with high growth (low growth) forecasts. As high growth forecasts are subsequently disappointed, high growth stocks (ex ante) with low *BMRs* earn low returns. They support their argument with evidence that growth itself tends to be highly unpredictable and mean reverting.

Penman (1996) finds that *P/B* is associated with future growth[4] in (cum-dividend) book value; that is, the ability to enhance book values through future earnings.

4.2.7.2 *BMRs in relation to forecasts of future growth*

BMRs are negatively related to forecasts of future growth. *Harris and Marston (1994)* support this conjecture. Their empirical results reveal that *BMR* is negatively related to forecasts of future growth as the market rewards potential

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[3] Lakonishok, Shleifer and Vishny
[4] Growth in the stock of equity value

growth with higher share prices which drive down *BMR*. Also, their empirical results shed further light on the proposition that this "*BMR* effect" may arise from differences between high and low growth stocks. They add that growth plays a more significant role in explaining *BMR* than does beta. *Harris and Marston (1994)* also show (by tracking returns on portfolio strategies based on either *BMR* or growth forecasts) that the two metrics, *BMR* and growth forecasts, yield different results. In particular, avoiding high-growth stocks or investing in low-growth stocks is not sufficient to attain the benefits of a *BMR* strategy (the *BMR* effect may arise from differences between high- and low-growth stocks). Such a result indicates that the *BMR* effect is not explained solely by the notion that the market systematically mis-prices growth opportunities.

4.2.7.3 *The relationship between earnings growth and BMRs*

Fama and French (1995)[5] allocated stocks to portfolios based on size and *BMR* and found that the market makes unbiased forecasts of earnings growth. They also find that growth rates of earnings of low and high *BMR* stocks converge during the years after portfolio formation. *LSV* (*Lakonishok, Shleifer and Vishny (1994)*) argue that this convergence of earnings growth does not influence the market share prices.

[5] Fama and French evidence on the evolution of profitability and earnings / price ratios in relation to size and B / M is consistent with rational pricing.

4.2.8 Book-to-market value of equity and return on equity (*ROE*) ratios

Book value of equity is one of the two component parts of both *BMR* and *ROE* ratios. The remaining components of these two ratios (earnings and market value of equity) are also products of many similar influences. Therefore, the relationships between the three component parts (*BV*, *MV* and earnings) of the two ratios (*BMR* and *ROE*) are important to discuss.

Research into the relationship between *BMRs* and *ROE* ratios is summarised in Table 4.8.

Table 4.8

Interpretations of book-to-market ratios in relation to return on equity ratio

Researcher	Main findings
Beaver (1970) and Freeman, Ohlson and Penman (1982)	*ROE* reverts toward central values over time.
Wilcox (1984)	A strong linear relationship exists between *BMRs* and *ROE*. Stable earnings growth does not necessarily lead to higher prices.
Beaver and Ryan (1993)	*BMRs* dominated by management polices (window dressing) influence *ROE*.
Penman (1991), Bernard (1993) and Fama and French (1995)	Current return on equity predicts future *ROE* more accurately than *BMRs*.
Penman (1996)	P/B is a good indicator of future *ROE*.

From the table it can be seen that *BMRs* tend to be associated with *ROE* (*Wilcox (1984)*). *Beaver and Ryan (1993)* continued the investigation into this relationship and find that *BMRs* dominated by management polices (window dressing) tend to influence *ROE*.

In *1991, 1993 and 1995 Penman, Bernard and Fama and French,* respectively, find that current *ROE* predicts future *ROE* better than *BMRs*.

Finally, *Penman (1996)* suggests that *BMRs* are "reasonable markers" of future *ROE* ratios.

4.2.8.1 *BMRs and the ROE model*

a- The model

Wilcox (1984) provides a useful model of the relationship between *P/B*[6] and *ROE*[7], which includes variables for: -

1- The investment horizon

2- Required shareholder return

3- The market consensus of expected return on equity (using historical data).

Wilcox (1984) finds, on a 1981 cross-section of food-processing stocks, a strong linear relation between price-to-book value and return on equity.

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[6] Future return on equity
[7] Historical return on equity

In his research he utilises the following equalities:

$(P/B)/(ROE) = (P/B)/(E/B) = (P/B)*(B/E) = P/E.$

In terms of book value of equity, price is by definition:

$P = B * (P/B)$

Where P : share price

B : firm's book value

E : earnings per share

The percentage price change equals percentage growth in book value, plus the percentage change in the P/B multiple.

Wilcox (1984) suggests that security analysts' estimates of future return on equity are similar to the estimates of the market. Their purchases should be biased toward stocks for which the estimated average *ROE* exceeds the market consensus expected return on equity.

b- The use of *BMRs* and *ROE* model

This is best explained by *Wilcox (1984)*, page (58) who notes that:

"The *P/B-ROE* model leads to some interesting conclusions about the relations between stock price and earnings stability, dividend policy, leverage and beta. It suggests that stable earnings growth does not necessarily lead to higher prices, that dividends do matter, that leverage can be either good or bad, and that stocks with higher betas do not seem to have

higher required returns in the way predicted by the *CAPM*. The *P/B-ROE* model suggests that no positive correlation exists between the shareholders' return found in about 35 industry studies and the average beta within each industry. Also, no negative correlation is found between betas and the individual stock residuals around industry *P/B-ROE* best-fit lines".

4.2.8.2 *The use of BMRs and current ROE for predicting future ROE*

BMRs are less useful for predicting future *ROE* than current *ROE* (as in *Penman (1991)*, *Fama and French (1995)* and *Bernard (1993)*).

The strong correlation between current *ROE* and *P/B* is explained by *Penman (1991)* and *Fama and French (1995)* who find that rate-of-return on equity is strongly and positively serially-correlated.

In a comparison of the ability of *BMRs* and current *ROEs* to predict future *ROEs*, *Bernard (1993)* finds that the price-to-book ratio predicts future *ROEs* less accurately than do current *ROEs* and adds little incremental predictive value. Thus, large variation in price-to-book ratio cannot be due to variation in future *ROE*. He provides evidence that, while *ROE* eventually mean reverts, current *ROE* predicts future *ROE* for up to 3 to 5 years. Therefore, *ROE* at any time should explain price-to-book ratio at that time cross-sectionally. Also, *Bernard (1993)* finds that variation in price-to-book is associated with large variations in subsequent growth in book values.

Penman (1996) finds that the *P/B* ratio is determined by projection of future return on equity. Under GAAP, *P/B* is a sufficient indicator of future return on equity. Further, under all clean-surplus accounting principles, the *P/B* ratio is a sufficient indicator of future return on equity. This relationship between *P/B* and future return on equity may arise from the information that the *P/B* provides about the expected future earnings.

4.2.8.3 *The influence of accruals on ROE*

BMRs dominated by delayed recognition and/or conservatism influence *ROE* ratios. The difference in *ROE* from the delayed recognition dominated in *BMRs* decays over time but differences caused by conservatism do not. This finding is provided by *Beaver and Ryan (1993)* who, as previously mentioned in Chapter 3, used *BMRs* for forecasting return on equity. They found that *BMR* and *ROE* are together influenced by delayed recognition but this influence decays over time as gains and losses are eventually recognised in earnings and book value. In contrast, firms whose *BMRs* are influenced by conservatism have an initial difference in *ROE* that does not decay over time because these differences produce permanent differences in book values and earnings.

4.2.9 Book-to-market value of equity and price-earnings (*P/E*) ratios

Previous research suggests a positive association between *P/B* and future return on book value of equity. This relationship between *BMRs* and *P/E* ratios is summarised in Table 4.9.

Table 4.9

Interpretations of book-to-market ratios

in relation to price earnings ratios

Researcher	Main findings
Fisher Black(1980)	*P/B* ratios seem less constant than *P/E* ratios.
Fairfield (1994)	*BMRs* are more stable than *P/E* ratios. *P/B* ratios are positively associated with future return on book values.

From the table, it can be seen that *Fisher Black (1980)* and *Fairfield P.M. (1994)* examined the variability of *P/B* and *P/E* ratios and tried to interpret it.

Fisher Black (1980) found that price-to-book value ratios are less constant than price-to-earnings ratios both across firms and over time. He relates this finding to the stronger relation between earnings (after excluding extra-ordinary items) and share prices than between share prices and book values (excluding goodwill).

By examining the direction of the relationship, *Fairfield P.M. (1994)* shows that share price-to-book value of equity (*P/B*) ratios correlate positively with future return on book values, and that price-to-earnings (*P/E*) and price-to-book (*P/B*) together reveal information about future profitability relative to current profitability. *P/B* ratios are, in general, more stable than *P/E* ratios. This is to be expected since *P/B* is a function of the expected level of future profitability, while *P/E* is a function of expected changes in future profitability.

4.2.10 Book-to-market value of equity and sales-price (*S/P*) ratios

In Section 4.2.9, *BMRs* were discussed in relation to *P/E* ratios. Here, the discussion extends to include the association between *BMRs*, *P/E* and *S/P* ratios.

Sales-to-price ratios appear more reliable for predicting market value than *P/E* or *BMR*, as shown in Table 4.10. This reliability may be attributed to management smoothing activities. The management smoothing is more noticeable in earnings and book values of equity than in sales.

Table 4.10

Interpretations of book-to-market ratios in relation to sales-to-price ratio

Researcher	Main findings
Barbee, Mukherji and Raines(1996)	*S/P* tend to be a more reliable indicator of firms relative market valuation than *P/E* or *BMR*.
Mukherji, Dhatt and Kim (1997)	*BMR* and *S/P* ratios are more efficient indicators of value than *E/P* ratios.

Barbee, Mukherji and Raines (1996) test the reliability of the *S/P* ratio as an indicator of a firm's market value. They suggest that the sales-price ratio may be a more reliable indicator of firms relative market valuation than *P/E* or *BMR* because different accounting methods for depreciation and inventory costing affect earnings and book values of equity but not sales.

Also, for Korean stocks (as in *Mukherji, Dhatt and Kim (1997)*), book-market value of equity and sales-price ratios are more efficient indicators of value than the earnings-price ratio. The research shows that the median return is largest for a portfolio of high *BMR* stocks (30.39 percent) and smallest for a portfolio of low *BMR* stocks (7.86 percent).

4.3 Identical results for the powerful influence of *BMRs* on many of the world's equity markets

Many researchers find that *BMRs* have high information content in various equity markets. They conclude that this influence is not restricted to just a few markets, but it is clear in most large equity markets.

Such a powerful role for *BMR* echoes earlier findings in the United States. *Chan, Hamao and Lakonishok (1991,1993)* also found *BMR* important in Japan. After extensive examination of 1971-88 period, they concluded that there is

> "Significant relation between returns in the Japanese market and four fundamental variables: earnings yield, size, book-to-market ratio, and cash flow yield".

The authors noted, however, that *BMR* has the largest effect of any single variable.

Research has also found that the "*BMR* effect" is not restricted to the United States and Japan. *Capaul, Rowley and Sharpe (1993)* found evidence of a "*BMR* effect" in each of six major equity markets: United States, Japan, Germany,

United Kingdom, France and Switzerland. They concluded that, during their study period (January 1981 through June 1992), portfolios of high *BMR* stocks provided risk-adjusted returns superior to those from low *BMR* stocks.

4.4 **Summary (key points about book-to-market ratios)**

Many aspects of book-to-market ratios have been discussed in the literature survey. The intention, in this section, is to extract an overall picture from the many details of what is and what is not known about *BMRs*.

The evidence to support the following statements is fairly clear. This represents "what we know" about *BMRs*.

4.4.1 <u>"What we know" about *BMRS*</u>

4.4.1.1 *BMRs and returns*

a) There is an association between *BMRs* and returns.

b) Annual stock returns are positively related to *BMRs*.

c) High (low) book-to-market values of equity ratios suggest underpriced (overpriced) stocks.

d) *BMRS* provide information about variations in returns.

e) *BMRs* predict market returns and small firms' excess returns.

4.4.1.2 *BMRs and Profitability*

a- Low (high) *BMRs* are associated with strong (poor) current earnings and low (high) potential future earnings.

b- Portfolios of high *BMR* stocks tend to be less profitable than portfolios of low *BMR* stocks in the current period but this difference narrows with the process of time.

c- Low *BMR* stocks remain more profitable than high *BMR* stocks for at least five years after portfolio formation.

4.4.1.3 *BMRs and ROE*

BMRs have a strong, linear relationship with *ROE* ratios.

For the following aspects the evidence is less clear or inconsistent. This represents "What we do not know" about *BMRs*.

4.4.2 "What we do not know" about *BMRS*

4.4.2.1 *BMRs and returns*

Is there an association between *BMRs* and stock return indices (rather than with returns of individual stocks)?

4.4.2.2 *BMRs and accounting methods*

How do changes in accounting methods influence *BMRS*?

4.4.2.3 *BMRs and beta*

Is there a relationship between *BMR* and beta?

4.4.2.4 *The association between BMRs and cash flow is not clear.*

4.4.2.5 *The association between earnings growth and BMRs is not clear.*

The studies from which these conclusions are drawn are shown in Table 4.11.

Table 4.11

Research underpinning statements

made in Section 4.4

Aspect NO.	**Researcher**
4.4.1.1 a	Graham, Dodd and Cottle (1962) and Fama and French (1992)
b	Rosenberg, Reid and Lanstein (1985); Chan, Hamao and Lakonishok (1993) and Mukherji, Dhatt and Kim (1997)
c	Fama and French (1992)
d	Fama and French (1992); Kothari, Shanken and Sloan (1995) and Strong and Xu (1997)
e	Kothari, Shanken and Sloan (1995); Pontiff and Schall (1998)
4.4.1.2 a	Fama and French (1995)
b	Fama and French (1992)
c	Penman (1991)
4.4.1.3	Wilcox (1984); Penman (1996)
4.4.2.1	Kothari, Shanken and Sloan (1995) and Chui and Wei (1998)
4.4.2.2	Archibald (1972); Ball (1972); Hong, Kaplan and Mandelker (1978)
4.4.2.3	Fama and French (1985)
4.4.2.4	Sloan (1996)
4.4.2.5	Harris and Marston (1994) and Penman (1996)

4.5 **Conclusion**

This chapter examined interpretations of *BMR* and its relations to other similar variables. The main interpretations were:

a) *BMRs* have information content for current and expected earnings and corporate profitability.

b) High *BMRs* suggest under-priced stocks and vice-versa.

c) Sales-to-price ratios appear to be more reliable for predicting *MV* than *BMRs* or price-to-earnings ratios.

d) The variability of price-to-earnings ratios is higher than that of *BMRs*.

e) There are inconsistent associations between *BMRs* and Beta, cash flow and stock returns' indices.

f) The relation between *BMRs* and changes in accounting methods is unclear.

The variables that provide interpretations to *BMR* are stock returns, profitability, changes in accounting methods, risk, cash flow, growth, return on equity, price-to-earnings ratios and sales-to-price ratios.

Finally, in this chapter, an overview of what is and what is not known about *BMRs* is provided. This represents the starting point for the analysis which follows in Part Two of this thesis which aims to improve our understanding of *BMRs*, particularly in relation to the earnings realisation process.

PART TWO

Research design and method

Part Two of the thesis explains the methodology for examining the evolution of *BMRs* as earnings are realized over time. This involves examining the relationship between changes in market values of equity and the book-to-market value of equity ratio.

Part Two consists of the fifth and sixth chapters:

Chapter 5: The model
Chapter 6: The data

Chapter Five explains the key steps in the methodology. The regression equation to be used for tracking the trend of book-to-market value of equity ratio is explained (hypothesis one). This regression equation is then "re-parameterized" to test hypotheses two and three which concern how the beta coefficient[1] increases and how it is associated with the useful-life of assets (see Section 5.4). The assumptions necessary for building the regression equation are then discussed. Chapter Six introduces the raw data and lists and describes the basic, created and dummy variables used in the empirical investigation.

Results from the empirical investigation follow in Part Three.

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[1] The slope of the book-to-market value of equity ratio

Contents of Chapter 5

The Model

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CHAPTER FIVE

The Model

5.1 Introduction

This chapter explains the methodology for examining the relationship between changes in market value ratios and the book-to-market ratio. The aim is to improve our understanding of the key points about book-to-market ratios summarised at the end of Chapter 4.

Hypotheses for testing are explained in Section 4 of this chapter. They aim, initially, to investigate the evolution of the book-to-market value of equity ratios over time but then continue to examine trends of the *BMRs* in relation to the firm's "capitalisation" and its "average useful-life of long-lived assets". Assumptions necessary to perform the analysis are then described.

The starting point for the analysis is *Ryan's model (1995)*. This model is then modified and used to test the implications for the evolution of the book-to-market ratio (Hypothesis One). The model incorporates nine lagged market value changes and the book value of equity divided by its market value ten years before *BMR* is observed to forecast its mean reversion. The modified model is then re-parameterized to test Hypotheses 2 and 3.

In Section 5.3 hypotheses for testing are then explained and set out. The aims and key steps of the statistical analysis are summarised. Finally, the steps of the methodology to interpret the regression of the differences between book and market value of equity during the useful-life of assets are explained.

5.2 **Assumptions made to structure the model**

The explanation of the model follows but first, here are the assumptions necessary for its construction.

5.2.1 Useful-life of assets
5.2.2 Accrual measurement
5.2.3 Time horizon
5.2.4 Book values at acquisition and retirement
5.2.5 Unrecorded goodwill for specific assets as "a moving average process in lagged, mean-zero market value shocks occurring after assets are acquired".

Each of these assumptions is considered in turn.

5.2.1 Useful-life of assets

It is generally accepted that the book value of a specific asset equals its market value at acquisition. At retirement the asset's expected future earnings are nil (if we ignore the residual value of that asset). Also, we can assume that the book value of a group of assets equals the market value of these assets at retirement. The book value of a specific asset does not equal its market value within the period between acquisition and retirement of that asset. This is

because market information causes "shocks" in market values (which are not absorbed into book values immediately). This period between acquisition and retirement of an asset is its useful-life. We assume that each asset has a known useful-life.

5.2.2 Accrual measurement

The model of accrual measurement captures the intuition that book value is untimely or "smoothed" relative to market value. Thus movements in market value have relatively high variance and low predictability compared with movements in book value.

Assumptions about accrual measurement restrict unrecorded goodwill at acquisition and retirement of assets. The model of accrual measurement is couched in terms of the "capitalisation" and "depreciation of fixed assets". Each year the firm acquires fixed assets with a known, finite useful-life. Shocks to the market value of assets occur each year. The assumptions of the model restrict how these shocks affect asset book values.

5.2.3 Time horizon

The determination of the time horizon of subsequent earnings in the literature (in, for example, *Ou and Penman (1993)*) depends on two variables; future total earnings and future book value.

a- Future total earnings

The time horizon is determined by the period over which expected aggregate earnings are representative of subsequent earnings. Thus the permanent aspect of the earnings is evaluated rather than the transitory element.

b- Future book value

The time horizon of subsequent earnings is determined at the point at which book value is expected to be equal to price and thus representative of subsequent earnings to infinity. Abnormal earnings are evaluated with the purpose of tracking the decay of the transitory element to zero. Changes in book value to the horizon (through earnings) are evaluated rather than book value at the horizon.

Consistent with the assumption of *Ryan (1995)*, the model implies that the horizon beyond which abnormal earnings are expected to be zero is determined by the remaining useful-life of assets. The path of abnormal earnings over this horizon reflects the pattern of expiration of the useful-lives of assets in place.

5.2.4 Book values at acquisition and retirement

The model assumes that book value for specific asset equals market value for that asset, both at acquisition and retirement. This assumption determines the period over which the differences between book and market value of specific assets return to zero. This assumption is explained as follows:

5.2.4.1 *Book value equals market value of assets at acquisition.*

$$BV^{t}_{t} = MV^{t}_{t} \quad \Rightarrow \quad URG^{t}_{t} = 0$$

Where:

BV : book vale of assets

MV : market value of assets

URG: unrecorded goodwill

t : the year in which the variable is observed

5.2.4.2 *Book value equals market value of assets at retirement.*

$$BV_{t}^{t-j} - MV_{t}^{t-j} = 0 \quad \Rightarrow URG_{t}^{t-j} = 0 \ \ldots \ t - j \geq K$$

Where:

t-j: the year in which a group of assets is acquired

K: the useful-life of assets, beyond which they have zero value.

The equality of book and market value of an asset at acquisition and retirement implies that unrecorded goodwill,

which arises during the useful-life of specific assets, must revert to zero over the remaining useful-life of the assets.

This assumption determines the period over which unrecorded goodwill for specific assets must become recognised (i.e. *Ou and Penman's (1993)* abnormal earnings horizon). *Ou and Penman (1993)* do not imply that unrecorded goodwill for the firm reverts to zero over any finite period, even on average. For example, conservative accounting with asset growth can yield positive unrecorded goodwill for the firm indefinitely.

Also, this assumption does not restrict the path of the reversion of unrecorded goodwill for specific assets.

5.2.5 Unrecorded goodwill for specific assets as a "moving average process in lagged, mean-zero market value shocks occurring after assets are acquired".

Unrecorded goodwill during the useful-life of specific assets equals the difference between book and market value for these assets.

$$MV_t^{t-j} - BV_t^{t-j} = URG_t^{t-j} \quad \Rightarrow \quad MV_t^{t-j} \neq BV_t^{t-j}$$

The derivation of this assumption depends on the description of the accounting system. The accounting system reports expectations of the assets market value conditional on all information available to the market. As in *Ryan (1995)*, two kinds of information are available to the market:

5.2.5.1 *Accounting information allowed by GAAP*

This kind of accounting information affect, in general, both book and market value.

5.2.5.2 *Other information (non-accounting information)*

Non-accounting information is more likely to cause differences between market and book value of equity for the following reasons:

a) At the date of acquisition, assets are recorded at their historical cost (accounting information).

b) Historical cost amortisation smoothes the incorporation of market value shocks into book values. The recognition of gains and losses only upon realization delays the incorporation of market value shocks into book values.

c) Unrecorded goodwill is the cumulative impact of market value shocks due to all information being realized after the acquisition of assets.

d) The market value shocks are mean-zero and these market value shocks affect the book and the market value of a specific assets similarly for all the useful-life of these assets.

For the purpose of conducting the analysis, and based on the preceding discussion, unrecorded goodwill for specific assets is assumed to follow a moving average of the market value

shocks during the useful-life of the firm's assets. Thus the simple moving average characterises the path of unrecorded goodwill for specific assets.

5.3 **Explanation of the model**

This section explains, in general terms, the relationship between real world processes and the effects captured by the model. The basic idea is that annual changes in market values reflect "shocks"[1] to the market value of assets. These "shocks" are, essentially, caused by information about the firm and its prospects, which cause share prices to change. These shocks that occur each year do not get absorbed into book values immediately. Rather, they are due to conservatism, historical cost amortization and delayed recognition of market value changes due to recognition upon realization. Each shock then affects unrecorded goodwill (the difference between book and market value of equity) over the expected average useful-life of assets.

The accrual process affects the difference between book and market value of equity. Book values are smoothed compared with market values. Market value fluctuates more than book value because the latter fails to recognise shocks to market value that occur during the useful-life of the assets.

In our study, the median useful-life of assets for the overall sample is about nine years. For highly-capitalised firms it is about ten years. An assumption is that no shock has an impact that lasts longer than the average useful-life

[1] Market information

of assets because, after that, all of the relevant assets have expired.

5.3.1 Explanation of the main estimation equation

The changes in market value do not occur only when the assets are purchased; they are happening all the time during the useful-life of the assets. The difference between book and market value is assumed to be a function of the change in the market value during that time. The time-frame for the study period can thus be determined according to the average useful-life of assets from the sample data (see Table 7.1 page 144-145).

The equation that represents the difference between book and market value of equity as a function of changes in market values is as follows:

$$BV_{i,t} - MV_{i,t} = b_0 \Delta MV_{i,t} + b_1 \Delta MV_{i,t-1} + b_2 \Delta MV_{i,t-2} + \ldots + b_9 \Delta MV_{i,t-9} \qquad Equation\ 1$$

Where:

$BV_{i,t}$: Book value of equity for firm *i* in year *t*

$MV_{i,t}$: Market value of equity for firm *i* in year *t*

t-j : The year in which the assets are acquired

b_j : The explained variance of the dependent variable by the independent one

$\Delta MV_{i,t-j}$: The change in the market value of equity for firm i between the year the variable is observed and the year the assets are acquired

In general, the market values of equity tend to exceed the book values. This is because market shocks affect market values and do not get absorbed into book values immediately. The sign of the difference between book value of equity and market value of equity is therefore expected to be negative. The bigger the values of $\Delta MV_{i,t-j}$ (i.e. the more market value has been increasing) the bigger will be the current value of $MV_{i,t}$ and the smaller will be $BV_{i,t} - MV_{i,t}$. Therefore, we expect to find $b_j < 0$ for all j. The absolute value of b_j is the proportion of any shock at time $t-j$ which has not been absorbed into book value by time t and which therefore contributes to unrecorded goodwill at time t. b_j should decrease in absolute value as j increases because, as the time after each shock increases, the proportion of the shock effect which has not been absorbed into goodwill should decrease.

We would expect b_j to be larger in absolute terms for highly-capitalised firms (firms with a higher ratio of total long-lived assets (net) to total assets) because shocks affecting long-lived assets will have a greater proportionate effect on $BV_{i,t} - MV_{i,t}$.

In previous literature, *Ryan (1995)* finds that b_j is larger in absolute terms for firms with longer useful-life of assets. He explains that it will take longer for any shock

to work its way out of the system if the assets that it affects last longer.

Rearranging (1) and adding an error term $u_{i,t}$ forms the estimable model: -

$$\frac{BV_{i,t} - MV_{i,t}}{MV_{i,t}} = b_0 \frac{\Delta MV_{i,t}}{MV_{i,t}} + b_1 \frac{\Delta MV_{i,t-1}}{MV_{i,t}} + b_2 \frac{\Delta MV_{i,t-2}}{MV_{i,t}} + \ldots + b_9 \frac{\Delta MV_{i,t-9}}{MV_{i,t}} + u_{i,t} \quad \textit{Equation 2}$$

Where:

$u_{i,t}$: The disturbance term of the variable *i* when it is observed

By carrying $MV_{i,t} / MV_{i,t} = 1$ across the "equals" sign and replacing it with the constant term $\alpha_{i,t} + \frac{BV_{i,t-10}}{MV_{i,t-10}}$ we arrive at the following multiple regression equation: -

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + b_0 \frac{\Delta MV_{i,t}}{MV_{i,t}} + b_1 \frac{\Delta MV_{i,t-1}}{MV_{i,t}} + b_2 \frac{\Delta MV_{i,t-2}}{MV_{i,t}} + \ldots + b_9 \frac{\Delta MV_{i,t-9}}{MV_{i,t}} + \gamma \frac{BV_{i,t-10}}{MV_{i,t-10}} + u_{i,t} \quad \textit{Equation 3}$$

Where:

$\alpha_{i,t}$: The constant term

γ: The explained variance of the dependent variable by the independent ones

$BV_{i,t-10}$: The book value of equity for firm *i* (when the variable is observed) ten years before assets are acquired

$MV_{i,t-10}$: The market value of equity for firm *i* (when the variable is observed) ten years before assets are acquired

$BV_{i,t-10}$ / $MV_{i,t-10}$ represents the ground we start from to explain the effect of the change in market value of equity on the evolution of *BMRs*.

To increase the efficiency of the estimation, the ten-year lagged book-to-market ratio $\frac{BV_{i,t-10}}{MV_{i,t-10}}$ is included as the time when the analysis starts. The inclusion of $\frac{BV_{i,t-10}}{MV_{i,t-10}}$ allows for a bit more flexibility in the estimation because, in general, it provides more information about the firm's earnings ability. The additional covariate is justified as a crude "proxy" for any omitted variables, including effects of changes in market value over more than ten periods if, for example, the assumption about the expected average useful-life of assets is wrong.

Equation (3) can be re-written as:

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + \sum_{j=0}^{9} b_j \frac{\Delta MV_{i,t-j}}{MV_{i,t}} + \gamma \frac{BV_{i,t-10}}{MV_{i,t-10}} + u_{i,t} \qquad \textit{Equation 4}$$

To conserve time-series observations, we include ten market value changes in equation (4) and restrict tests of hypotheses to those coefficients. This is because the median of the average useful-life of assets (total fixed assets

(net) to depreciation expense) for the firms in the overall sample is 8.65 years. Under the assumptions of the model, the inclusion of ten market value changes is consistent with a useful-life of assets of eleven years. Eleven years exceeds a simplistic estimate of the median remaining useful-life of fixed assets for the firms in the sample.

5.3.2 Re-Parameterising the estimation equation to test Hypothesis 2 (*H2*).

Equation 4 tests Hypothesis one (*H1*) (beta coefficient is negative during the useful-life assets). Then Hypothesis two *H2* is tested to correspond with the estimation equation 4 explained in Section 5.3.1 of this chapter. To test $H_0 = b_0 - b_1 = 0$ against $H_1 = b_0 - b_1 < 0$, the simplest way is to "re-parameterise" the model as follows:

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + \lambda_0\left(\frac{\Delta MV_{i,t}}{MV_{i,t}} + \frac{\Delta MV_{i,t-1}}{MV_{i,t}}\right) + \lambda_1\left(-\frac{\Delta MV_{i,t-1}}{MV_{i,t}}\right) + b_2\left\{\frac{\Delta MV_{i,t-2}}{MV_{i,t}}\right\} + b_3\left\{\frac{\Delta MV_{i,t-3}}{MV_{i,t}}\right\} + \ldots + b_9\left\{\frac{\Delta MV_{i,t-9}}{MV_{i,t}}\right\} + \gamma\left[\frac{BV_{i,t-10}}{MV_{i,t-10}}\right] + u_{i,t}$$

Therefore

$$\lambda_0\left(\frac{\Delta MV_{i,t}}{MV_{i,t}} + \frac{\Delta MV_{i,t-1}}{MV_{i,t}}\right) + \lambda_1\left(-\frac{\Delta MV_{i,t-1}}{MV_{i,t}}\right) = \lambda_0\frac{\Delta MV_{i,t}}{MV_{i,t}} + \lambda_0\frac{\Delta MV_{i,t-1}}{MV_{i,t}} - \lambda_1\frac{\Delta MV_{i,t-1}}{MV_{i,t}}$$

$$= \lambda_0\frac{\Delta MV_{i,t}}{MV_{i,t}} + (\lambda_0 - \lambda_1)\frac{\Delta MV_{i,t-1}}{MV_{i,t}}$$

$$\Rightarrow \lambda_0 = b_0 \Rightarrow \lambda_1 = b_0 - b_1$$

$$\Rightarrow (\lambda_0 - \lambda_1) = b_1$$

Therefore, the t-statistic on λ_1 allows us to test $H_0 = b_0 - b_1 = 0$ directly.

Similarly, if we want to test $H_0 = b_1 - b_2 = 0$ against $H_1 = b_1 - b_2 < 0$, another "re-parameterized" model should be estimated:

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + b_0\left(\frac{\Delta MV_{i,t}}{MV_{i,t}}\right) + \lambda_1\left(\frac{\Delta MV_{i,t-1}}{MV_{i,t}} + \frac{\Delta MV_{i,t-2}}{MV_{i,t}}\right) + \lambda_2\left\{-\frac{\Delta MV_{i,t-2}}{MV_{i,t}}\right\} + b_3\left\{\frac{\Delta MV_{i,t-3}}{MV_{i,t}}\right\} + \ldots + b_9\left\{\frac{\Delta MV_{i,t-9}}{MV_{i,t}}\right\} + \gamma\left[\frac{BV_{i,t-10}}{MV_{i,t-10}}\right] + u_{i,t}$$

As before,

$$\Rightarrow \lambda_1 = b_1$$

$$\Rightarrow \lambda_2 = b_1 - b_2$$

Therefore, the t-statistic on λ_2 allows us to test $H_0 = b_1 - b_2 = 0$, directly.

The same procedure can be followed for each of the other tests.

5.3.3 Re-Parameterising the estimation equation to test Hypothesis 3 (*H3*).

Hypothesis three (*H3*) is tested to correspond with estimation equation 4 in Section 5.3.1 of this chapter. To test $H_0 : \Delta b_0 = 0$ against $H_1 : \Delta b_0 < 0$, estimation equation 4 in Section 5.3.1 of this chapter is "re-parameterized".

Before we show how the estimation equation 4 (Section 5.3.1) in the methodology is "re-parameterized", Δb_j is calculated among the related samples. The related samples, chosen to test Hypothesis three (*H3*) are as follows:

a) Highly- and low-capitalised firms

b) Highly-capitalised firms with long and short useful-life assets.

c) Highly-capitalised firms with long useful-life assets and low capitalised firms.

Each observation of every variable for each of the three groups above is multiplied by a dummy variable. The dummy variable has two values. 0 is assigned to firms above the median and 1 is assigned to firms below the median. This dummy variable is determined according to the median that differentiates each group as follows:

a- The median of the first and the third groups(a) and c) above) is $TFAN_t / TA_t$ from the overall sample.

b- The median of the second group (b) above) is $TFAN_t / DPR_t$ from the highly-capitalised firms sub-sample.

The selection of these related samples aims to examine the association between the average useful-life of assets and the evolution of *BMRs*. Highly-capitalised firms are expected to have long useful-life assets, while low-capitalised firms are expected to have short useful-life assets. The selection of highly-capitalised firms with long and short useful-life assets is used to examine the average useful-life of assets in highly-capitalised firms. The median of highly-capitalised firms with long useful-life assets and low-capitalised firms is used to examine the overall effect of the "average useful-life of assets".

The re-parameterized estimation model to test Hypothesis three (*H3*) is:

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + \sum_{j=0}^{9} b_j \frac{\Delta MV_{i,t-j}}{MV_{i,t}} + \sum_{j=0}^{9} \lambda_j \left(\frac{MV_{i,t-j}}{MV_{i,t}} * dv \right) + \gamma \frac{BV_{i,t-10}}{MV_{i,t-10}} + u_{i,t}$$

Where:

dv: Dummy variable

5.4 **Formal hypotheses for testing**

The formal hypotheses for testing are as follows:

H1: b_j is non-positive for $0 \leq j \leq 9$.

H2: b_j increases monotonically toward zero with lag j, $0 \leq j \leq 9$.

H3: b_j is more and more negative at further lags j, $0 \leq j \leq 9$ for highly-capitalised firms with long useful-life assets.

Hypothesis one (*H1*)

It is assumed at acquisition that book value of a group of assets equals market value. During the useful-life of these assets, non-accounting information causes shocks that change the market value of equity and this is not absorbed immediately into book value.

Initially, market shocks usually cause an increase in the market value of equity and a decrease in the book-to-market ratio because the market value is the numerator. Then, the market value decreases as income is realized during the period from the initial shock until the retirement of these assets when the *BMR* increases. So Hypothesis one (*H1*) tests the association of the changes in market value ratios with book-to-market ratios. Hypothesis one (*H1*) is used to examine the trend of beta for the independent variables on *BMRs*.

Hypothesis two (*H2*)

The difference between the market value of a specific asset and its book value is assumed to decrease across time after the initial market shock and within the useful-life of the assets. The negative beta coefficients, assumed in Hypothesis one (*H1*), increase towards zero during the useful-life of assets. Therefore, Hypothesis two (*H2*) tests the magnitude of interpretation of the variation in the book-to-market ratio by changes in market values and how it decreases during the useful-life of the assets. This means that b_j increases monotonically towards zero with lag j, $0 \leq j \leq 9$.

Hypothesis three (*H3*)

The longer the useful-life of assets, the higher is the difference between book value and market value of equity. Therefore, b_j which is assumed as before as negative, is expected to be more and more negative at further lags j, $0 \leq j \leq 9$, as the useful-life of assets, K, increases.

5.5 **Aims of the statistical analysis**

The analysis focuses on the regression of the change in market value of equity on book-to-market ratio. The time horizon for the analysis is determined by the "average useful-life of long-lived assets" for the firms in the sample. The path of abnormal earnings over this horizon reflects the pattern of expiration of the useful-lives of assets in place.

5.5.1 Classifications of sub-samples

The purpose of sample sub-classifications are as follows: -

a) For the overall sample

The analysis shows the regression of the differences between book and market value of equity in general.

b) For the high and low-capitalised firms sub-samples

The analysis compares the regression of the differences between book and market value of equity ratio for highly-capitalised firms with those of low-capitalised firms.

c) For long and short useful-life of assets sub-samples:

The analysis compares the regression of the differences between book and market value of equity for highly-capitalised firms with long useful-life assets with those of highly-capitalised firms with short useful-life assets.

5.5.2 Prediction procedure

The independent variables used in the regression are used to predict book-to-market value of equity ratios (by establishing key parameters on 1978 to 1985 data and then testing them on 1986 data). After this the relationship between the actual and predicted book-to-market value of equity ratios can be calculated.

5.6 **Steps of the methodology**

The steps of the methodology are as follows:

5.6.1 Elementary steps

5.6.1.1 *Obtain the following yearly data* (at the end of each financial year), for the period from 1976 to 1996, for each company in the sample:

a- Book value of equity (*BV*)

b- Closing share price (*SP*)

c- Number of shares outstanding (*NSO*)

5.6.1.2 *Obtain the following yearly data* (at the end of each financial year), for the period from 1987 to 1996, for each company in the sample:

a- Total assets (*TA*)

b- Total fixed assets (net) (*TFAN*)

5.6.1.3 *Obtain the yearly depreciation expense*, for the period from 1987 to 1996, for each company in the sample, (*DPR*).

5.6.1.4 *Calculate the yearly market value of equity* (*MV*) at the end of each financial year, for the period from 1976 to 1996, for each company in the sample, as follows:

$$MV = SP * NSO$$

5.6.1.5 *Calculate the following yearly ratios* (at the end of each financial year), for the period from 1977 to 1996, for each company in the sample.

a) Book-to-market value of equity ratio (*BMR*), as follows:

$$BMR = BV / MV$$

b) Total fixed assets (net) to total assets ratio (*FATA*) as follows:

$$FATA = TFAN / TA$$

c) Total fixed assets (net) to depreciation (*FADPR*) ratio as follows:

$$FADPR = TFAN / DPR$$

5.6.1.6 *Calculate the yearly change in market value of equity to market value of equity ratio*, for each company in the sample, as follows:

a- Yearly change in market value of equity in the year the variable is observed minus the time elapsed since the market value shock occurred, to market value of equity in that year, for the period from 1987 to 1996 (*CMVTMSMT*).

b- Yearly change in market value of equity in the year a group of assets is acquired to market value of equity in the year the variable is observed (*CMVTMJMT*).

1. Yearly change in market value of equity to market value of equity, both in the year when the variable is observed (*CMVTMT*).

2. Change in market value of equity in the year a group of assets is acquired one year before the variable is observed, to market value of equity in the year the variable is observed (*CMVTM1MT*).

3. Change in market value of equity in the year a group of assets is acquired two years before the variable is observed, to market value of equity in the year the variable is observed (*CMVTM2MT*).

This procedure is followed repeatedly to calculate the variables *CMVTM3MT* to *CMVTM9MT*.

5.6.1.7 *Derivation of sub-samples according to "Capitalisation"*

The overall sample is divided into two sub-samples according to whether their mean total fixed assets (net) to total assets ratio is higher (highly-capitalised firms, *HMFATA*) or lower (low-capitalised firms, *LMFATA*) than the median of the mean fixed assets (net) to total assets (*MFATA*). The difference between market value of equity and book value of equity in the highly-capitalised firms is expected to be larger than for low-capitalised firms.

5.6.1.8 *Derivation of highly-capitalised firms sub-samples according to the "average useful-life of assets"*

The highly-capitalised firms sub-sample is divided into two other sub-samples according to whether their mean total fixed assets (net) to depreciation is higher (*HMFADPR*) or lower (*LMFADPR*) than the median of the mean fixed assets (net) to depreciation expense (*MFADPR*). Long-lived assets are anticipated to be an important variable in causing the difference between market and book value of equity.

5.6.2 Stages of the statistical analysis

Firstly, the basic variables are described statistically. Then the book-to-market ratio is regressed on the change in market value of equity. Finally, the changes in market value of equity ratios are examined as predictors of *BMRs*. The main steps are as follows:

5.6.2.1 *Calculate the descriptive statistics* from the overall sample and the sub-samples for the following variables: -

a) Book-to-market ratio for the **study period** (1987 to 1996)

b) Book-to-market ratio for the **prior period** (1977 to 1986)

c) Change in the market value ratio over the study period

d) Total fixed assets (net) to total assets over the study period

e) Total fixed assets (net) to depreciation expense over the study period

5.6.2.2 *Regress book-to-market ratio on current and nine lagged annual market value changes, and the ten-year lagged book-to-market ratio, using the fixed effect estimation and the generalised least squares method for the study period from 1987 to 1996.*

5.6.2.3 *Establish a prediction model for the first part of the data (for the period from 1978 to 1985) to predict book-to-market ratios in 1986.*

5.6.2.4 *Estimate book-to-market value of equity ratios according to the results of the regression equation established in 5.6.2.3 above for the period from 1988 to 1995 to predict book-to-market ratios in 1996.*

5.6.2.5 *Examine the relationship between actual and predicted values of book-to-market value of equity ratios in 1996.*

5.7 **Summary**

This chapter set out the methodology to explain the questions to be addressed in general terms and discusses the assumptions necessary to conduct the analysis for addressing them. The regression model is then presented along with the method for re-parameterized to test the hypotheses. This is followed by an explanation of the aims and steps of the preliminary and statistical analysis.

Further explanations of the variables used in the analysis are available in the next chapter, in Appendix 1 and in Glossary on page xvii.

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CHAPTER SIX

Data and Classification of the Sample

6.1 Introduction

This chapter explains the source and nature of the raw data for the empirical analysis using the methodology explained in Chapter 5. The method for transforming the raw data into regression variables is explained and so are procedures for categorising the data into sub-samples. This is followed by a discussion of the influence of the firm and time effects as dummy variables on *BMRs*.

a- Data collection

The analysis focuses on the differences between market value of equity and book value of equity for British industrial companies registered on the London Stock Exchange from 1987 to 1996 (10 years). The sample consists of 93 British industrial companies (see Appendix 3, page 240) out of a total population of 141 industrial companies. Complete data for the remaining 48 companies were unavailable for all the period from 1976 to 1996 and hence these firms were left out of the analysis.

Despite the main analysis being on firms' performances between 1987 to 1996 it was necessary to collect data going back a further eleven years (to 1976). This data collection from the earlier period is important for examining the

validity of the assumption that "unrecorded goodwill[1] for specific assets is a moving average process in lagged, mean-zero market value shocks occurring after assets are acquired" (see Section 5.2.5). The 1976 to 1986 data are used to estimate the fixed effects and the generalised least squares estimations of the independent variables on the book-to-market ratio (*BMR*, the dependent variable).

BMR is calculated as the percentage of the book value of equity to its market value for each year, from 1987 to 1996, for each company.

Raw data are now listed and described along with created variables and dummy variables used in the analysis. Classification of the overall sample and the sub-samples is then explained.

[1] Unrecorded goodwill, here, means the difference between market value and book value of equity

6.2 **Raw data**

All the data for the analysis were obtained from Datastream and are as follows: -

6.2.1 Book Value of Equity (*BV*)

6.2.2 Share Price (*SP*)

6.2.3 Number of Shares Outstanding (*NSO*)

6.2.4 Depreciation expense (*DPR*)

6.2.5 Total fixed assets (net) (*TFAN*)

6.2.6 Total assets (*TA*)

6.2.7 Market value of equity (*MV*)

Precise details of the construction of these variables are set out in Appendix 1.

6.3 **Variables used in the analysis**

From the raw data, the following variables were constructed:

6.3.1 Basic variables

6.3.1.1 *Book- to- Market value of equity ratio* (BV_t/MV_t) (*BMR*)

BMR is calculated yearly by dividing *BV* (as shown in item A.1.1 in Appendix 1) by *MV* (as shown in item A.1.7 in Appendix 1) at the end of each year. This is the dependent variable.

6.3.1.2 *Total fixed assets (net) to Total assets ratio* ($TFAN_t/TA_t$) (*FATA*)

FATA shows the proportion of total fixed assets (net) to total assets. This ratio is an indicator of the "capitalisation" of each firm. It is calculated by dividing fixed assets (net) (as shown in item A.1.5 in Appendix 1) by total assets (as shown in item A.1.6 in Appendix 1) for each company in each year within the study period.

6.3.1.3 *Total fixed assets (net) to depreciation*($TFAN_t/DPR_t$) (*FADPR*)

FADPR shows the average useful-life of a firm's fixed assets and is calculated by dividing total fixed assets (net) (as shown in item A.1.5 in Appendix 1) by depreciation expense (as shown in item A.1.4 in Appendix 1) for each company in each year within the study period.

The basic and created variables are summarised in Table 6.1.

Table 6.1

Variables used in the analysis

	Variable	Formula	Definition	Purpose
1	*BMR*	BV_t / MV_t (See note 1)	Book value of equity divided by market value of equity at the end of each year	Dependent variable
2	FATA	$TFAN_t / TA_t$	Total fixed assets (net) divided by total assets	Proxy for capitalisation
3	FADPR	$TFAN_t / DPR_t$	Total fixed assets (net) divided by depreciation	Proxy for time horizon
4	CMVTMSMT	$\Delta MV_{t-s} / MV_t$ (See note 1)	The Change in market value in the year when the shock occurred divided by market value when the variable is observed	Descriptive statistics
5	CMVTMJMT	$\Delta MV_{t-j} / MV_t$ (see note 2)	The change in market value in the year when a group of assets is acquired to the market value in the year when the variable is observed	Independent variables
6	BMTM10	BV_{t-10} / MV_{t-10}	Book value of equity divided by its market value ten years before the variable is observed	Crude "proxy" for omitted variables

Note 1

S: is the time elapsed since the market value shock occurred.

Note 2

J: is the year a group of assets is acquired.

6.3.2 Created Variables

6.3.2.1 *CMVTMSMT, change in the market value in year t (the year when the variable is observed) minus s (where s is the time elapsed since the market value shock occurred) divided by the market value in year t (the year when the variable is observed) ratio* ($\Delta MV_{t-s} / MV_t$).

The change in market value of equity for each company, in each year, during the average useful-life of assets[2], is calculated in the year when the variable is observed minus the time elapsed since the market value shock occurred. The market value of equity is calculated when the variable is observed. *CMVTMSMT* relates the change in market value of equity in year *t* minus the time elapsed since the market shock occurred to the market value of equity in year *t*. It is assumed that each firm possesses assets of each possible age, 0[3] through 9[4]. *CMVTMSMT* then consists of 10 lagged variables (ten *CMVTMSMT*) as shown in Table 6.2.

These lagged variables capture the change in the market value ratio during the study period. The variables are described statistically for the overall sample and the sub-samples.

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[2] The median of the mean total fixed assets (net) /depreciation expense ratio for the study period is 10.121.
[3] Unrecorded goodwill can first arise in the first year of the useful life of assets.

Table 6.2

Calculation of *CMVTMSMT*: Lagged variables for the time elapsed since the market value shock occurred

CMVTS0MT	$MV_{1987} - MV_{1986} / MV_{1987}$
CMVTS1MT	$MV_{1988} - MV_{1987} / MV_{1988}$
CMVTS2MT	$MV_{1989} - MV_{1988} / MV_{1989}$
CMVTS3MT	$MV_{1990} - MV_{1989} / MV_{1990}$
CMVTS4MT	$MV_{1991} - MV_{1990} / MV_{1991}$
CMVTS5MT	$MV_{1992} - MV_{1991} / MV_{1992}$
CMVTS6MT	$MV_{1993} - MV_{1992} / MV_{1993}$
CMVTS7MT	$MV_{1994} - MV_{1993} / MV_{1994}$
CMVTS8MT	$MV_{1995} - MV_{1994} / MV_{1995}$
CMVTS9MT	$MV_{1996} - MV_{1995} / MV_{1996}$

For example:

For 1987, for each firm, *CMVTMSMT* is calculated as the market value of equity in 1987 minus the market value of equity in 1986 all divided by the market value of equity in 1987.

For 1988, for each firm, *CMVTMSMT* is calculated as the market value of equity in 1988 minus the market value of equity in 1987 all divided by the market value of equity in 1988.

[4] Unrecorded goodwill for a group of assets is assumed to revert to zero at the end of the useful-life of these assets.

For 1996, the last year of the study period, for each firm, *CMVTMSMT* is calculated as the market value of equity in 1996 minus the market value of equity in 1995 all divided by the market value of equity in 1996.

6.3.2.2 *CMVTMJMT, change in the market value in year t minus j (the year a group of assets is acquired) to the market value of equity in year t (the year the variable is observed) ratio*

$$\left\{ \Delta MV_{t-j} \Big/ MV_t \right\} .$$

CMVTMJMT relates change in the market value of equity in the year a group of assets is acquired to the market value of equity in the year the variable is observed. This time period extends for ten years, to cover the average useful-life of fixed assets in the study sample. *CMVTMJMT* for every year *t* consists of ten lagged variables as shown in Table 6.3.

These variables capture the current and nine-lagged market value changes during ten years since the variable is first observed. The current and lagged market value changes are a moving average process in lagged, mean-zero market value shocks occurring after assets are acquired. Table 6.3 shows the ten lagged variables for *CMVTMJMT* for the year *t* = 1987.

Table 6.3

Calculation of *CMVTMJMT*: The ten lagged variables for the change in market value of equity since the year a group of assets is acquired for an example for the 1987 data

CMVTMT	$\Delta MV_t / MV_t$	$MV_{1987} - MV_{1986} / MV_{1987}$
CMVTM1MT	$\Delta MV_{t-1} / MV_t$	$MV_{1986} - MV_{1985} / MV_{1987}$
CMVTM2MT	$\Delta MV_{t-2} / MV_t$	$MV_{1985} - MV_{1984} / MV_{1987}$
CMVTM3MT	$\Delta MV_{t-3} / MV_t$	$MV_{1984} - MV_{1983} / MV_{1987}$
CMVTM4MT	$\Delta MV_{t-4} / MV_t$	$MV_{1983} - MV_{1982} / MV_{1987}$
CMVTM5MT	$\Delta MV_{t-5} / MV_t$	$MV_{1982} - MV_{1981} / MV_{1987}$
CMVTM6MT	$\Delta MV_{t-6} / MV_t$	$MV_{1981} - MV_{1980} / MV_{1987}$
CMVTM7MT	$\Delta MV_{t-7} / MV_t$	$MV_{1980} - MV_{1979} / MV_{1987}$
CMVTM8MT	$\Delta MV_{t-8} / MV_t$	$MV_{1979} - MV_{1978} / MV_{1987}$
CMVTM9MT	$\Delta MV_{t-9} / MV_t$	$MV_{1978} - MV_{1977} / MV_{1987}$

These ten variables are as follows:

1. *CMVTMT* $\left\{ \Delta MV_t / MV_t \right\}$

This variable represents the change in the market value in year *t-j* (the year a group of assets is acquired and the variable is observed) to the market value in year *t* (the year the variable is observed).

For example:

CMVTMT is, for 1987, for each firm, the market value of equity in 1987 minus the market value of equity in 1986 (the change in market value in the year when the variable is observed) all divided by the market value of equity in 1987.

CMVTMT is, for 1988, for each firm, the market value of equity in 1988 minus the market value of equity in 1987 (the change in the year when the variable is observed) all divided by the market value of equity in 1988.

CMVTMT is, for 1996, for each firm, the market value of equity in 1996 minus the market value of equity in 1995 (the change in the year when the variable is observed) all divided by the market value of equity in 1996.

2. *CMVTM1MT* $\left\{ \Delta MV_{t-1} / MV_t \right\}$

This variable represents the change in the market value in year t minus 1 (a group of assets is acquired a year before the variable is observed) to the market value in year t (the year the variable is observed).

For example:

CMVTM1MT is, for 1987, for each firm, the market value of equity in 1986 minus the market value of equity in 1985 (the change in the year a group of assets is acquired one year before the variable is observed) all divided by the market value of equity in 1987.

CMVTM1MT is, for 1988, for each firm, the market value of equity in 1987 minus the market value of equity in 1986 (the change in the year a group of assets is acquired one year before the variable is observed) all divided by the market value of equity in 1988.

CMVTM1MT is, for 1996, for each firm, the market value of equity in 1995 minus the market value of equity in 1994 (the change in the year a group of assets is acquired one year before the variable is observed) all divided by the market value of equity in 1996.

3. *CMVTM9MT* $\left\{ {\Delta MV_{t-9}}/{MV_t} \right\}$

This variable represents the change in the market value in year t minus 9 (a group of assets is acquired nine years before the variable is observed) to the market value in year t (the year the variable is observed).

For example:

CMVTM9MT is, for 1987, for each firm, the market value of equity in 1978 minus the market value of equity in 1977 (the change in the year a group of assets is acquired nine years before the variable is observed) all divided by the market value of equity in 1987.

CMVTM9MT is, for 1988, for each firm, the market value of equity in 1979 minus the market value of equity in 1978 (the change in the year a group of assets is acquired nine years before the variable is observed) all divided by the market value of equity in 1988.

CMVTM9MT is, for 1996, for each firm, the market value of equity in 1987 minus the market value of equity in 1986 (the change in the year a group of assets is acquired nine years before the variable is observed) all divided by the market value of equity in 1996.

The same calculations for all the variables in Table 6.3 are repeated, from lags 0 to 9 above (similarly to Table 6.2) for every firm.

6.3.2.3 *BMTM10, the book value of equity divided by the market value of equity both in year t minus 10 (a group of assets is acquired ten years before the variable is observed) ratio* BV_{t-10}/MV_{t-10}

BMTM10 is justified (as explained in Section 5.3.1) as a crude 'proxy' for any omitted variables, including effects of changes in market value over more than the ten periods (if the assumption about the useful-life of assets is wrong).

6.3.3 Dummy variables

The dummy variables used in the analysis are:

a- time effects

b- firm effects

To avoid spurious association between changes in market value in the time series, the time variable is introduced into the model. The time variable assumes that the time series

exhibit a linear trend. Therefore the slope of change in market value of equity ratios reflects the true association with book-to-market value of equity ratios, net of linear time effects (see also Section 8.5).

6.4 **Calculation of proxies for firm's "capitalisation" and "average useful-life of assets"**

Two proxies for the firm's average useful-life of assets were calculated from the data:

6.4.1 The ratio of total fixed assets (net) to total assets

This proxy is used for the proportion of fixed assets in relation to total assets in the firm and is useful for subdividing the overall sample into high and low-capitalised firms.

6.4.2 The ratio of total fixed assets (net) to depreciation expense

This proxy is used to determine the average useful-life of fixed assets. The average useful life of fixed assets is used for sub-dividing the highly-capitalised firms' sub-sample into firms with:

a) Long and
b) Short useful-life assets.

Both proxies are most justified if depreciation is straight-line and salvage values are zero.

6.5 **Derivation of sub-samples**

Firms are first partitioned according to whether their mean total fixed assets (net) (*TFAN*) to total assets (*TA*) ratio (*FATA*) is higher or lower than the median. Firms with higher mean total fixed assets (net) to total assets than the median are considered to be highly-capitalised firms. Firms with lower mean total fixed assets (net) to total assets than the median are considered low-capitalised firms.

Highly-capitalised firms (firms with above median *MFATA*) are further partitioned according to whether their mean total fixed assets (net) to depreciation expense is higher or lower than the median. This enables us to differentiate between firms with long useful-life assets and firms with short useful-life assets.

The overall sample (93 firm) is then divided into two sub-samples, according to the median of the *MFATA* ratio (0.3348) for all the firms for the study period from 1987-1996, as follows: -

6.5.1 Low-capitalised firms

(46 firms below the median of the *MFATA*)

6.5.2 Highly-capitalised firms

(47 firms above the median of the *MFATA*)

The highly-capitalised firms sub-sample is further divided into two sub-samples, according to the median of the mean total fixed assets (net) to depreciation expense (*MFADPR*) (10.121 years) as follows: -

6.5.2.1 *Highly-capitalised firms with short useful-life assets*

23 firms below the median of the *MFADPR*

6.5.2.2 *Highly-capitalised firms with long useful-life assets*

24 firms above the median of the *MFADPR*

The derivation of these sub-samples is shown in Figure 6.1.

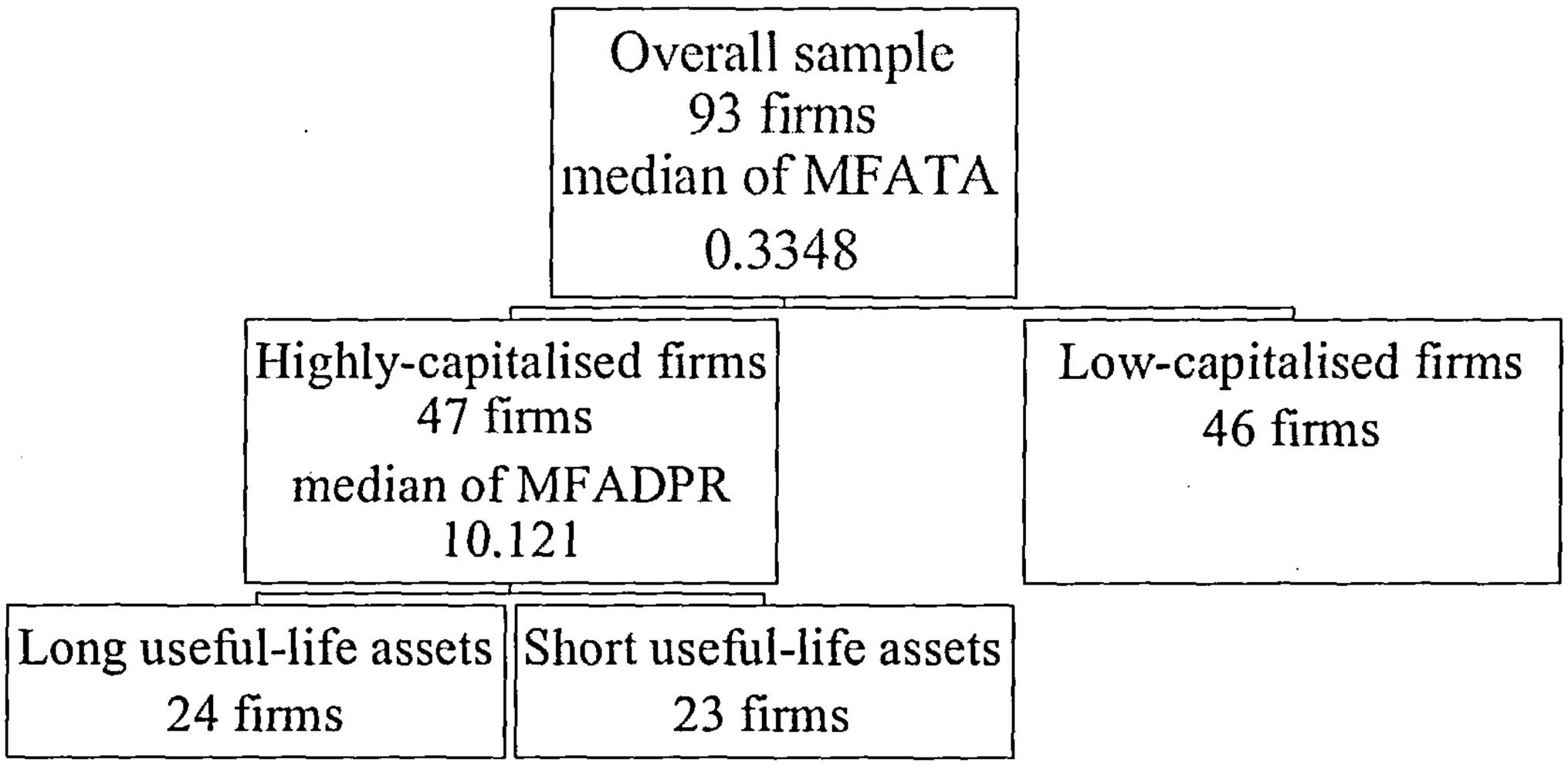

Figure 6.1 Derivation of sub-samples

6.6 **Summary**

This chapter lists the items of the raw data (Further details are shown in Appendix 1). Basic variables are defined and created variables are explained. This is followed by a discussion of the firm and time effects as dummy variables. Then the derivation of sub-samples from the overall sample according to "capitalisation" and "average useful-life of assets" is explained.

The methodology and steps to be followed in the analysis of the evolution of book-to-market ratios continues in Part 3.

PART THREE

Statistical analysis

The commentary on the statistical analysis is divided into three parts. The first part discusses the descriptive statistics of the basic variables (see Section 6.3). The second part provides and interprets the results. The third part summarises, concludes the important results and discusses the association between *BMRs* and the concept of "short-terminisim".

The statistical analysis consists of three chapters:

Chapter 7: Descriptive statistics

Chapter 8: Evolution of the book-to-market ratio (Results and interpretations)

Chapter 9: Summary, conclusions and discussions

The statistical analysis investigates the association between book-to-market value of equity ratios and changes in market value of equity ratios as earnings are realized. Time-series and cross-sectional data are used in the analysis. The study period is the "average useful-life of long-lived assets".

Moreover, the statistical analysis examines the association between "capitalisation" and "average useful-life of long-lived assets" and the evolution of book-to-market ratios.

Finally, current changes in market value of equity ratios from a past sample are used to predict book-to-market value of equity ratios for a future sample.

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CHAPTER SEVEN

Descriptive statistics

7.1 Introduction

This chapter contains empirical analysis of book-to-market ratios for the firms in the whole sample and for the sub-samples from the study-period data (1987 to 1996) and the additional period from 1977 to 1986.

Descriptive statistics for the basic variables (see Section 6.3) from the overall sample and the sub-samples for the two periods are also presented.

7.2 The sub-samples

7.2.1 In addition to the overall sample, descriptive statistics are reported for sub-samples partitioned on proxies for

7.2.1.1 "*Capitalisation*": The ratio of total fixed assets (net) to total assets (the proportion of fixed assets)

7.2.1.2 "*Useful-life of assets*": The ratio of total fixed assets (net) to depreciation

7.2.2 Procedures

Five sets of descriptive statistics are presented for:

a) The whole sample

b) The low-capitalised firms sub-sample

c) The highly-capitalised firms sub-sample

d) Highly-capitalised firms with short useful-life assets

e) Highly-capitalised firms with long useful-life assets

7.2.2.1 *Method for establishing highly- and low-capitalised firms sub-samples*

The yearly ratio of total long-lived assets (net) to total assets, and total long-lived assets (net) to depreciation expense for each firm is calculated for the years 1987-1996. Firms are first partitioned according to whether their mean total fixed assets (net) to total assets ratio is higher or lower than the median of the *MFATA* (0.3348). The firms with a mean total fixed assets (net) to total assets ratio above (below) the median are considered as highly-capitalised firms (low-capitalised firms).

7.2.2.2 *For establishing firms with short and long useful-life assets sub-samples*

Highly-capitalised firms were further partitioned according to whether their mean total fixed assets (net) to depreciation expense is higher or lower than the median of *MFADPR* (10.121) of the sub-sample. The firms with mean total fixed assets (net) to depreciation expense above (below) the median are considered as highly-capitalised firms with long useful-life assets (highly-capitalised firms with short useful-life assets). Figure 7.1 shows the partition of the sample.

Figure 7.1

Partition of the overall sample

Capitalisation		**Useful-life assets**	
		Short	**Long**
High	47 firms	High/Short 23 firms	High / Long 24 firms
Low	46 firms	Low / Short	Low / Long

The methodology of the thesis does not include the partition of low-capitalised firms according to their average useful-life assets because it is unlikely that any effect will be noticeable. With negligible assets there would be little influence from an asset variable to trace.

7.3 Descriptive statistics of the overall sample and the sub-samples

The following variables are described statistically:

a) Book-to-market value of equity ratio for the study period (1987 to 1996)

b) Book-to-market value of equity ratio for the prior period (1977 to 1986)

c) Change in the market value of equity ratio over the study period

d) Total fixed assets (net) to total assets ratio over the study period

e) Total fixed assets (net) to depreciation expense ratio over the study period

Descriptive statistics for the overall sample and the four sub-samples are included in Table 7.1.

Table 7.1
Descriptive statistics
(1987 to 1996 data)
Overall sample and sub-samples

	Mean	25%	50%	75%	Max.
Panel A: Overall sample (930 observations)					
BV_t / MV_t	0.62	0.39	0.53	0.74	13.68
BV_{t-10} / MV_{t-10}	1.33	0.67	1.10	1.72	9.96
$\Delta MV_{t-s} / MV_t$ $0 \le s \le 9$	0.07	-0.05	0.12	0.26	0.96
$TFAN_t / TA_t$	0.34	0.24	0.34	0.44	0.82
$TFAN_t / DPR_t$	9.80	7.14	8.65	10.83	43.40
Panel B: Low-capitalised firms (460 observations)					
BV_t / MV_t	0.64	0.36	0.52	0.76	13.68
BV_{t-10} / MV_{t-10}	1.25	0.60	1.06	1.58	7.77
$\Delta MV_{t-s} / MV_t$ $0 \le s \le 9$	0.05	-0.04	0.12	0.27	0.96
$TFAN_t / TA_t$	0.24	0.18	0.24	0.30	0.50
$TFAN_t / DPR_t$	8.03	6.37	7.54	8.81	24.57
Panel C: Highly-capitalised firms (470 observations)					
BV_t / MV_t	0.60	0.42	0.53	0.70	2.32
BV_{t-10} / MV_{t-10}	1.41	0.71	1.17	1.85	9.96
$\Delta MV_{t-s} / MV_t$ $0 \le s \le 9$	0.09	-0.05	0.12	0.26	0.92
$TFAN_t / TA_t$	045	0.38	0.43	0.51	0.82
$TFAN_t / DPR_t$	11.53	8.49	10.03	12.15	43.40

Panel D: Highly-capitalised firms with short useful-life assets (230 observations)					
BV_t / MV_t	0.55	0.43	0.53	0.66	1.10
BV_{t-10} / MV_{t-10}	1.63	0.90	1.40	2.07	9.96
$\Delta MV_{t-s} / MV_t$ $0 \le s \le 9$	0.12	-0.03	0.16	0.26	0.92
$TFAN_t / TA_t$	0.43	0.37	0.42	0.48	0.72
$TFAN_t / DPR_t$	8.57	7.67	8.57	9.45	20.34
Panel E: Highly-capitalised firms with long useful-life assets (240 observations)					
BV_t / MV_t	0.64	0.40	0.53	0.77	2.32
BV_{t-10} / MV_{t-10}	1.20	0.58	0.97	1.73	4.00
$\Delta MV_{t-s} / MV_t$ $0 \le s \le 9$	0.07	-0.07	0.09	0.25	0.68
$TFAN_t / TA_t$	0.47	0.39	0.45	0.53	0.82
$TFAN_t / DPR_t$	14.37	10.58	11.86	13.68	43.40

Notes on the contents of Table 7.1

a- The overall sample (**Panel A**) is composed of 93 firms for the years 1987 to 1996 with complete data on all variables available on the 1996 annual Datastream. Sub-samples (**Panel B and C**) are formed by partitioning firm-years observations based on whether their mean *TFAN/TA* is above or below the median of the mean *TFAN/TA*. Sub-samples (**Panel D and E**) are formed by further partitioning the above median *TFAN/TA* sub-sample according to whether *TFAN/DPR* is above or below the sub-sample median of the mean *TFAN/DPR*.

b- $BV_t (MV_t)$ denotes the book (market) value of the firm's common stock at the end of year *t*. $TFAN_t (TA_t)$ denotes net total fixed assets (total assets) at the end of year *t*. DPR_t denotes depreciation expense during year *t*.

The median book-to-market value of equity ratio for the overall sample is 0.53. This is consistent with both conservative accounting and book values not fully reflecting stock market changes during the period of study. More than ninety-nine percent of all book-to-market ratios fall between zero and two. Only 9 (out of 930) observations fall outside of this range. The median book-to-market ratio is about the same for the overall sample and the sub-samples (0.53 for the overall sample and all the sub-samples except the low capitalisation firms sub-sample, for which it is slightly below the median *TFAN/TA*, and is 0.52).

The mean book-to-market value of equity ratios for the study period is higher for the highly-capitalised firms[1] with long useful-life assets sub-sample[2] (0.64) than for the highly-capitalised firms with low useful-life assets sub-sample[3] (0.55). This suggests that conservative accounting and delayed recognition has a larger effect on firms with low useful-life assets.

Our expectation is that the higher (lower) the "capitalisation", the more (less) will be the difference between the firm's book value of equity and its market value. The mean *BMR* (book value of equity divided by market value of equity) in Table 7.1 supports this result. The mean *BMR* of highly-capitalised firms (0.60) is lower than that of low-capitalised firms (0.64). This suggests more difference between book and market value of equity for highly-

[1] Above the median of the total fixed assets (net) to total assets
[2] Above the median of total fixed assets (net) to total assets and total fixed assets (net) to depreciation
[3] Above the median of the total fixed assets (net) to total assets and below the median of the total fixed assets (net) to depreciation

capitalised firms than that for low-capitalised firms. The more the difference between book and market value of equity the higher is the effect of accrual measurement.

7.4 The mean *BMR* of the overall sample and the sub-samples

A comparison of the mean *BMR* of the overall sample and the sub-samples between the two periods (the study and the prior period) is shown in Table 7.2. This comparison reveals that, overall, the accrual measurement effect on book-to-market value of equity ratios is greater for the more recent period (1987 to 1996) than for the previous period (from 1977 to 1986).

Table 7.2

Mean *BMR* for the overall sample and the sub-samples

Sample	Mean BMR	
	BMR 1987 to 1996	BMR 1977 to 1986
Overall sample	0.62	1.33
Low-capitalised firms	0.64	1.25
Highly-capitalised firms	0.60	1.41
Highly-capitalised firms with short useful-life assets	0.55	1.63
Highly-capitalised firms with long useful-life assets	0.64	1.20

The difference in mean *BMR* between the study and the prior period is consistent with changes in the relationship between overall *BMRs* in the prior and study periods. For the prior period (1977 to 1986), on average, book value exceeds market value for the overall sample and the sub-samples. For the

study period (1987 to 1996) market value, on average, exceeds book value.

As can be seen from Table 7.2, the mean book-to-market value of equity ratios for the study period is higher for low-capitalised firms (0.64) than for highly-capitalised firms (0.60). The situation is the other way around in the prior period where the mean book-to-market value of equity ratios is higher for highly-capitalised firms (1.41) than for low-capitalised firms (1.25).

Table 7.2 also shows that the mean book-to-market value of equity ratios for the study period is higher for highly-capitalised firms with long useful-life assets (0.64) than for highly-capitalised firms with short useful-life assets (0.55). This situation is also the other way around for the prior period where the mean book-to-market value of equity ratios for the prior period is higher for highly-capitalised firms with short useful-life assets (1.63) than for highly-capitalised firms with long useful-life assets (1.20).

These opposite relationships between prior and study periods could be caused by many factors which can influence the lag between management decisions and investors' expectations. To some extent, it could also be the result of different effects of the accrual measurement process across time. It would also be consistent with an increase of management manipulations to accounting numbers over the analysis period.

7.5 The standard deviation of the *BMR* of the overall sample and the sub-samples

Standard deviations of the *BMR* for the overall sample and the sub-samples provides a rough indication of the amount of smoothing of accounting numbers in the study period compared with the prior period (see Table 7.3).

Table 7.3

Standard deviation of the BMR

for the overall sample and the sub-samples

Sample	Standard deviation	
	BMR 1987 to 1996	BMR 1977 to 1986
Overall sample	0.55	1.00
Low-capitalised firms	0.72	1.01
Highly-capitalised firms	0.30	0.98
Highly-capitalised firms with short useful-life assets	0.18	1.12
Highly-capitalised firms with long useful-life assets	0.37	0.78

Statistically, we find that the highly-capitalised firms with short useful-life assets sub-sample are more influenced by accrual measurement than the other sub-samples (see Section 7.4).

Also, we find that the higher the "capitalisation", the lower are the stock price fluctuations. The longer the "average useful-life of assets" the higher are the stock price fluctuations (see Section 7.9).

Consistent with these results, the shorter the useful-life of assets (low-capitalised firms) the higher the depreciation expense and the greater the fluctuations in book-to-market values of equity ratios.

Consequently, we expect that the variability of *BMRs* for highly-capitalised firms with short useful-life assets will be the highest compared with other sub-samples.

The results show that the standard deviation of the *BMR* for highly-capitalised firms with short useful-life assets in the prior period (1.12) coincides with our expectations in the previous paragraph. However, the standard deviation of the *BMR* in the study period (0.18) is the lowest for all sub-samples. This lower variability could be possibly attributed to smoothing of accounting numbers by management.

The smoothing process during the study period is more clear for highly-capitalised firms with short useful-life assets (standard deviation is 0.18) than for highly-capitalised firms with long useful-life assets (standard deviation is 0.37). This result can be interpreted as follows:

The depreciation expense will be distributed over a long period for highly-capitalised firms with long useful-life assets compared with highly-capitalised firms with short useful-life assets. Therefore, the difference between book and market values of equity within the time period of the useful-life of assets remains higher in the *HMFADPR* sub-sample than in the *LMFADPR* sub-sample.

The standard deviation in the study period is higher for the long useful-life of assets sub-sample (0.37) than for the short useful-life of assets sub-sample (0.18). The relationship is the other way around in the prior period. The standard deviation in the prior period is higher for the short useful-life assets sub-sample (1.12) than for the long useful-life assets sub-sample (0.78) as can be seen from Table 7.3. The decrease of standard deviation of the overall sample and the sub-samples between prior and study period may refer to the increase in smoothing activities over time.

The smoothing process is also clearer in highly-capitalised firms (standard deviation is 0.30) than in low-capitalised firms (standard deviation is 0.72). A possible explanation is that less uncertainty is associated with the expected future cash flows from short useful-life assets than from long useful-life assets. Market values will therefore be more accurately determined for short useful-life assets than for long useful-life assets. As a result, the difference between book and market values of firms with long useful-life assets will be less (higher uncertainty will lower its market price) than for firms with short useful-life assets.

7.6 The average useful-life of assets in the overall sample and the sub-samples

The average useful-life of assets for the overall sample is 8.7 years. It increases for highly-capitalised firms (10 years) and decreases for low-capitalised firms (7.5 years). The maximum useful-life of assets recorded is 43.40, while the minimum useful-life of assets is 1.34.

7.7 The median *BMR* of equity for the overall sample and the sub-samples

The median *BMR* of equity for the study period from the overall sample and sub-samples is 0.53, except for low-capitalised firms, for which it is 0.52.

The median *BMR* of equity for the prior period (1977 to 1986) for the overall sample is 1.10. It is higher for the highly-capitalised firms and the low useful-life assets sub-sample (1.40) than for the highly-capitalised firms and the long useful-life assets sub-sample (0.97). It is clear that, on average, book value of equity exceeded market value of equity in the prior period (1977 to 1986).

7.8 The median change in market value ratio for the overall sample and the sub-samples

The median $\Delta MV_{t-s}/MV_t$ $(0 \le s \le 9)$ for the overall sample and both the high- and low-capitalised firms sub-samples is 0.12. It is lower for the highly-capitalised firms with long useful-life assets sub-sample (0.09) than for the highly-capitalised firms with short useful-life assets sub-sample (0.16). This, too, is consistent with the previous result (see Table 7.1 Panels D and E) that conservative accounting and delayed recognition has the largest effect on firms with short useful-life assets. The shorter the useful-life of assets the more the stock prices fluctuate.

7.9 The variability of the change in market value ratio for the overall sample and the sub-samples

The difference of the average $\Delta MV_{t-s}/MV_t$ $(0 \leq s \leq 9)$ between highly-capitalised firms with short useful-life assets and those with long useful-life assets could be attributed to market information. Market information is accumulated faster in the former than in the latter. The result suggests that the market price fluctuations are greater and more rapid for highly-capitalised firms with short useful-life assets than for highly-capitalised firms with long useful-life assets.

The variability in $\Delta MV_{t-s}/MV_t$ $(0 \leq s \leq 9)$ is higher for low-capitalised firms (0.60) than for highly-capitalised firms (0.26). This indicates that investment in low-capitalised firms is more risky than investment in highly-capitalised firms (other variables remaining the same). Also, the variability in $\Delta MV_{t-s}/MV_t$ $(0 \leq s \leq 9)$ is higher for the highly-capitalised firms with long useful-life assets sub-sample (0.29) than for the highly-capitalised firms with short useful-life assets sub-sample (0.23). This indicates that the longer the firms useful-life of assets, the higher the investment risk (other variables remaining the same).

7.10 The median total fixed assets (net) to total assets ratio for the overall sample and the sub-samples

The median total fixed assets (net) to total assets value (*FATA*) for the overall sample is 0.34. It ranges from 0.24 for the median of low-capitalised firms to 0.45 for the median of highly-capitalised firms with long useful-life

assets. These results show that, for the overall sample and the four sub-samples of the British industrial companies, long-lived assets are less than half of total assets. This also suggests that the longer the useful-life of assets, the greater the firms' capitalisation.

7.11 **The variability of total fixed assets (net) to total assets ratio for the overall sample and the sub-samples**

The variability of *FATA* of the highly-capitalised firms with long useful-life assets sub-sample (0.12) is more than the variability of *FATA* of the highly-capitalised firms with short useful-life assets sub-sample (0.10). A possible interpretation is that the longer the useful-life of assets the higher is the capitalisation and the depreciation base.

7.12 **Median "capitalisation" compared with " average useful-life of assets"**

A comparison of the medians of the capitalisation of assets (*FATA*) with the median of the average useful-life of assets (*FADPR*), for the overall sample and the sub-samples, reveals that the capitalisation of assets varies positively with the useful-life of assets the firms possess. It is clear that the larger the median of the useful-life of assets, the more capitalised a firm is. This is shown in Table 7.4.

Table 7.4

"Capitalisation", "average useful-life of assets"

and the median of *BMRs*

Sample	Median	
	FATA	*FADPR*
Overall sample	0.34	8.65
Low-capitalised firms	0.24	7.54
Highly-capitalised firms	0.43	10.03
Highly-capitalised firms with short useful-life assets	0.42	8.57
Highly-capitalised firms with long useful-life assets	0.45	11.86

7.13 **Summary (key points from the descriptive statistics)**

This chapter statistically describes the main basic and created variables for the overall sample and the four sub-samples. The variables are:

a) Book-to-market value of equity ratio for both the study and prior periods

b) Change in market value of equity ratio

c) Total fixed assets (net) to total assets

d) Total fixed assets (net) to depreciation expense

The sub-samples are derived according to two concepts:

a) Capitalisation

b) Average useful-life of assets

The main points from the descriptive statistics results are as follows:

1. The firms' book value of equity in the sample does not fully reflect the stock market changes during the study period.

2. Contrary to expectations, accrual measurement has a larger effect on the book-to-market value of equity ratio for highly-capitalised firms with short useful-life assets than for highly-capitalised firms with long useful-life assets.

3. The higher *FATA* (firm's fixed assets as a proportion of total assets) the higher the difference between book value and market value of equity and the larger the accrual measurement effect. This result is in-line with and confirms previous research.

4. Book-to-market value of equity ratios are less influenced by conservatism and delayed recognition in the prior period than in the study period.

5. The useful-life of assets is associated positively with "capitalisation".

6. The average market price changes are higher for highly-capitalised firms with short useful-life assets than for highly-capitalised firms with long useful-life assets.

7. The lower the "capitalisation" the more the stock prices fluctuate.

Having examined the descriptive statistics, we can now proceed to the regression analysis.

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CHAPTER EIGHT

Evolution of the book-to-market ratios (Results and interpretations)

8.1 Introduction

This part of the thesis contains results from the empirical analysis and interpretations of them. Two regression methods are used to explain the evolution of the book-to-market value of equity ratio as earnings are realized. These two regression methods are:

a) Fixed effect (*FE*) and

b) Generalised least squares (*GLS*)

The hypotheses explained in the methodology (Section 5.4) are tested. Significant variables are identified. Interpretation of the results then follows, bearing in mind the level of significance of results for individual variables.

Our interest is in the interpretation of the effect of the current and nine lagged changes in market value of equity ratios on the book-to-market value of equity ratio. We are concerned with finding how the average book-to-market value of equity ratio changes over time in relation to changes in the market value of equity ratios. Also, our concern is with

predicting the average book-to-market value of equity ratios as a function of the changes in market value of equity ratios.

8.2 **Tests of hypotheses**

For testing Hypothesis one *H1* (beta *j* is non-positive for $0 \leq j \leq 9$) a regression of book-to-market value of equity ratio on current and nine lagged annual market value changes and a ten-year lagged book-to-market value of equity ratio (before the variable is observed) for the overall sample and the sub-samples is performed for each of the ten years from 1987 to 1996.

For testing Hypothesis Two *H2* (beta *j* increases monotonically toward zero with lag j) the trend of the difference between every two adjacent betas for the overall sample and for the highly-capitalised firms with long useful-life assets sub-sample for the study period is examined. The reason for testing this hypothesis by using the data from these two samples is that non-positive betas and the increase towards zero is expected to be stronger in highly-capitalised firms with long useful-lives.

For testing Hypothesis Three *H3* (beta *j* coefficients are more and more negative at further lags of *j*, for highly capitalisation firms with longer useful-life assets) attention is paid to the regression of the book-to-market value of equity ratio on the change in the betas of every two similar sub-samples as follows:

a) High vs. low-capitalised firms sub-samples

b) Highly-capitalised firms with long useful-life assets vs. Highly-capitalised firms with short useful-life assets sub-samples

c) Highly-capitalised firms with long useful-life assets vs. low-capitalised firms sub-samples.

8.3 Explanation of the two estimation methods (fixed effects and generalised least squares estimation)

8.3.1 Least squares properties

The least-squares estimate properties are discussed here before explaining the two estimation methods (fixed effects and generalised least squares). *Gujarati (1995)* refers to the *Gauss-Markov Theorem*, which describes the properties of the best linear unbiased estimator as follows:

a) Unbiased

In the class of unbiased, that is, its expected value is equal to the true value.

b) Random variable

It is linear estimator, that is, a linear function of a random variable.

c) Minimum variance

Least squares estimate has minimum variance in the class of all such linear unbiased estimators; an unbiased estimator with the least variance is known as an efficient estimator.

8.3.2 Explanations for the two estimation methods

There is no important difference between fixed effects and generalised least squares estimations according to *Mundlak (1978)* and *Greene (1993)*. Fixed effects estimation captures any differences across firms and time. Generalised least squares takes the groups' variability into account. *Greene (1993)* argues that it tends to be incorrect interpretation that distinguishes between results of fixed and random effects models. Also, *Mundlak (1978)* argues that we should always treat the individual effects as random.

Greene (1993) suggests that the fixed effects estimation (with firm and time effects) captures any differences in the mean book-to-market value of equity ratio across firms or time in differences in the constant term. He confirms that the fixed effects model is simply analysed conditionally on the effects present in the observed sample.

Gujarati D. N. (1995) confirms that generalised least squares estimation takes the population's variability information into account explicitly and is therefore capable of producing best linear unbiased estimators. *Greene (1993)* adds that, in fixed effects estimation, there is no justification for treating the individual effects as uncorrelated with the other regressors because it is assumed in the random effects.

The random effects treatment, therefore, may suffer from the inconsistency of data due to omitted variables.

Ryan (1995), page 103, compares the two methods. His interpretation is that:

> "The fixed effects estimation is more powerful than the generalised least squares estimation because the firm effects remove the unmodeled effects of accounting conservatism and other omitted variables (which can persist indefinitely and so affect the coefficients on far-lagged market value changes). Explanatory power is a particular concern for tests of coefficients on far-lagged market value changes since these coefficients are small relative to the coefficients on near-lagged market value changes. Since the fixed effects estimation imperfectly copes with residual auto-correlation, however, the generalised least squares estimation results are also provided".

It should also be noted that the availability of all the variables for all years for a given firm induces survivorship bias.

8.4 **Linearity in the multiple regression relation**

Table 8.1 shows the probability values associated with the overall tests of significance (F-tests) in the fixed effects estimation for the overall sample and all the sub-samples. The significance values are very small (0.000001). An F-test tests if there is a significant linear multiple regression relation. Since the significance values (0.000001) associated with the F-tests of the overall sample and all the

sub-samples are very small (smaller than α = 0.05 (the significance level)) we conclude that there is a significant linear multiple regression relation between book-to-market value of equity ratio and the independent variables.

Table 8.1

Probability values associated with the overall tests of significance (F-tests)

Sample	**Overall significance**
Overall	0.000001
Low-capitalised firms	0.000001
Highly-capitalised firms	0.000001
Highly-capitalised firms with short useful-life assets	0.000001
Highly-capitalised firms with long useful-life assets	0.000001

8.5 **The importance of the dummy variables**

The independent variables in the regression analysis include firm and time effects as dummy variables. Fixed Effects and Generalised Least Squares estimations with firm and time effects capture any differences in the mean book-to-market ratio across firms or time. Results from the *F* tests imply that both firm and time effects are highly significant at the 0.000001 level. As suggested above, however, the firm effect captures the mean disturbance term for each firm, reducing the estimated serial correlation of the residuals at all lags and typically making the serial correlation of the residuals significantly negative at further lags.

8.6 **Beta coefficients across samples**

The coefficients between each independent variable and the dependent variable are estimated holding all other independent variables constant for both fixed effects and *GLS* multiple regression.

Panel A of Table 8.2 reports the fixed effects estimation multiple regression. Panel B of Table 8.2 reports the estimated generalised least squares (*GLS*) estimation of the regression equation (see Section 5.3).

TABLE 8.2
Regression of book-to-market ratio
on current and nine lagged annual market value changes
and a ten-year lagged book-to-market ratio
from 1987 to 1996
for the overall sample and sub-samples

Panel A: Fixed Effects Estimation					
Terms	Overall	Low-	Highly-	Highly-capitalised firms	
		Capitalised firms		Short useful-life assets	Long
b_0	-0.73 ** (-18.2)	-0.73 ** (-12.1)	-.072 ** (-13.7)	-0.71 ** (-9.9)	-0.57 ** (-7.0)
b_1	-0.48 ** (-11.3)	-0.50 ** (-7.8)	-0.57 ** (-10.7)	-0.55 ** (-7.6)	-0.43 ** (-5.0)
b_2	-0.53 ** (-13.2)	-0.53 ** (-9.0)	-0.49 ** (-8.2)	-0.46 ** (-6.0)	-0.29 ** (-3.1)
b_3	-0.27 ** (-5.9)	-0.25 ** (-3.8)	-0.40 ** (-6.4)	-0.41 ** (-5.2)	-0.23 * (-2.3)
b_4	-0.21 ** (-4.0)	-0.25 ** (-3.2)	-0.21 ** (-3.6)	-0.36 ** (-4.2)	0.01 (0.1)
b_5	-0.40 ** (-7.1)	-0.48 ** (-5.5)	-0.20 ** (-3.1)	-0.27 ** (-3.0)	-0.03 (-0.3)
b_6	-0.07 (-1.3)	-0.06 (-0.7)	-0.19 ** (-2.8)	-0.25 ** (-2.7)	-0.003 (-0.03)
b_7	0.058 (0.8)	0.08 (0.7)	-0.10 (-1.3)	-0.30 ** (-2.9)	0.14 (1.2)
b_8	0.37 ** (5.6)	0.40 ** (4.1)	-0.04 (-0.49)	-0.22 * (-2.1)	0.23 (1.7)
b_9	-0.16 * (-2.1)	-0.19 (-1.6)	-0.01 (-0.1)	-0.22 (-1.8)	0.31 * (2.1)
γ	0.014 (1.2)	0.04 (1.9)	-0.01 (-0.7)	0.02 (1.8)	-0.04 (-1.9)
R^2	0.848	0.859	0.842	0.757	0.881
# obs.	930	460	470	230	240

** Significant at 1% level

* Significant at 5% level

Panel B: Generalised least Squares estimation (*GLS*)					
Terms	Overall	Low-	Highly-	Highly-capitalised firms	
		Capitalised firms		Short	Long
				useful-life assets	
b_0	-0.72 ** (-18.5)	-0.72 ** (-12.4)	-0.71 ** (-13.7)	-0.67 ** (-9.7)	-0.56 ** (-7.1)
b_1	-0.46 ** (-11.3)	-0.48 ** (-7.9)	-0.56 ** (-10.7)	-0.52 ** (-7.4)	-0.42 ** (-5.1)
b_2	-0.52 ** (-13.2)	-0.51 ** (-9.1)	-0.48 ** (-8.2)	-0.42 ** (-5.7)	-0.29 ** (-3.2)
b_3	-0.25 ** (-5.6)	-0.23 ** (-3.5)	-0.40 ** (-6.4)	-0.37 ** (-4.9)	-0.23 * (-2.3)
b_4	-0.19 ** (-3.9)	-0.24 ** (-3.1)	-0.21 ** (-3.5)	-0.32 ** (-3.9)	0.01 (0.09)
b_5	-0.39 ** (-7.2)	-048 ** (-5.6)	-0.19 ** (-3.0)	-0.25 ** (-2.8)	-0.021 (-0.2)
b_6	-0.05 (-0.9)	-0.03 (-0.4)	-0.18 ** (-2.7)	-0.22 * (-2.5)	-0.001 (-0.01)
b_7	0.06 (0.8)	0.07 (0.6)	-0.10 (-1.2)	-0.31 ** (-3.1)	0.15 (1.2)
b_8	0.37 ** ()5.7	0.39 ** (4.0)	-0.04 (-0.4)	-0.23 * (-2.2)	0.23 (1.8)
b_9	-0.17 * (-2.2)	-0.20 (-1.7)	-0.004 (-0.04)	-0.23 (-1.9)	0.31 * (2.1)
γ	0.03 ** (2.7)	0.07 ** (3.3)	-0.002 (-0.2)	0.03 * (2.5)	-0.03 (-1.6)
R^2	0.639	0.708	0.353	0.241	0.428
# obs.	930	460	470	230	240

** Significant at 1% level
* Significant at 5% level

Notes on the content of Table 8.2

a- The equation estimated is:

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + \sum_{j=0}^{9} b_j \frac{\Delta MV_{i,t-j}}{MV_{i,t}} + \gamma \frac{BV_{i,t-10}}{MV_{i,t-10}} + u_{i,t}$$

b- The fixed effects estimation includes both firm and time effects.
c- The *GLS* estimation employs a first-pass fixed effects model with time effects only to estimate residual auto-correlations (assumed constant across firms) from one to nine lags. The estimated residual auto-correlations are then used to re-weight the observations in a second-pass fixed firm effect regression.
d- See the notes to Table 7.1 (pages 144-145) for description of the samples and the variables in equation (4).
e- t statistics are in brackets. The reported R^2s do not include the explanatory power of the fixed effects.

The beta coefficients of the independent variables are shown in Table 8.2 with the t-statistics in brackets. α is the constant term. Every beta coefficient reflects the association of the independent variable associated with α in the multiple regression model.

Beta coefficients for the dependent variables decrease (increase) if the sign of the coefficient is negative (positive) by the value of the coefficient when the variable associated by the coefficient changes by one unit (given that the other independent variables are held constant). It does not matter at what level they are held constant. For example, in the fixed effects estimation multiple regression, the b_0 coefficient in the overall sample is -0.73. This means that, on average, across the sample the *BMR* of equity (the dependent variable) decreases by 0.73 when the variable associated with b_0 coefficient (the change in the market value divided by market value, with both variables observed in the year when assets are acquired) increases by one unit.

8.7 **Hypotheses tests results**

Hypothesis one (*H1*) restricts the sign of beta *j* coefficients on current and lagged market value changes, so the *t* statistics in Table 8.2 test *H1*. Hypothesis two (*H2*) restricts the sign of differences of beta *j* coefficients at different lags *j*, and hypothesis three (*H3*) restricts the sign of differences of beta *j* coefficients across samples.

8.7.1 The probability value from the overall test of significance (F-test)

From the fixed effect estimation the probability value from the overall test of significance (F-test) for the overall sample and sub-samples is very small (0.000001) (see Table 8.1). This result refers to a significant linear multiple regression between book-to-market value of equity ratios and changes in market values of equity ratios.

8.7.2 The significance of beta coefficients

All betas are significant from all samples for the two multiple regression methods (fixed effects and *GLS*) up to period 3 (see Table 8.2). Highly-capitalised firms with long useful-life assets cease to record significant results at period 4 but all other samples record significant results up to period 5. Highly-capitalised firms continue to be significant in period 6. The most significant results are, however, recorded for highly-capitalised firms with short useful-life assets, which record significant results up to period 8 (see Table 8.2 pages 165-166).

Beta coefficients tend to be significant at the early periods and fall off later. Significant betas for each sample are as follows (and also summarised in Tables 8.3 and 8.4 and presented graphically in figures 8.2 to 8.11):

8.7.2.1 *The overall sample*

a) Fixed effects estimation

Betas for time periods 0 to 5 and 8 are significant at the 1% level. Beta for period 9 is significant at the 5% level (Panel A, Table 8.2).

b) Generalised least squares estimation

In addition to the significance of γ^1 the significance of betas from the *GLS* are similar to the fixed effects estimation. Betas for time periods 0 to 5, 8 and γ are significant at the 1% level and the beta for period 9 is significant at the 5% level (Panel B, Table 8.2).

The independent variables associated with betas for periods 6, 7 and γ in the fixed effects estimation and 6 and 7 in the generalised least squares estimation are not significant, even at the 5% level.

8.7.2.2 *Low-capitalised firms*

a) Fixed effects estimation

Betas for time periods 0 to 5 and 8 are significant at the 1% level (Panel A, Table 8.2).

b) Generalised least squares estimation

In addition to the significance of γ , the significance of betas are similar to the fixed effects estimation. Betas for time periods 0 to 5, 8 and γ are significant at the 1% level (Panel B, Table 8.2).

Independent variables associated with betas for periods 6, 7,9 and γ in the fixed estimation and 6, 7 and 9 in the generalised least squares estimation are not significant, even at the 5% level in the interpretation of *BMRs*.

8.7.2.3 *Highly-capitalised firms*

Betas for time periods 0 to 6 in both the fixed effects and the generalised least squares estimations are significant at the 1% level (Panels A and B, Table 8.2).

Independent variables associated with betas for periods 7 to 9 and γ in both the fixed effects and the generalised least squares estimations are not significant, even at the 5% level.

8.7.2.4 *Highly-capitalised firms with short useful-life assets*

[1] The explained variance of the dependent variable by the independent one

a) Fixed effects estimation

Betas for time periods 0 to 7 are significant at the 1% level and beta for period 8 is significant at the 5% level (Panel A, Table 8.2).

b) Generalised least squares estimation

Betas for time periods 0 to 5 and 7 are significant at the 1% level and betas for periods 6, 8 and γ are significant at the 5% level (Panel B, Table 8.2).

Independent variables associated with betas for periods 9 and γ in the fixed effects estimation and 9 in the generalised least squares estimation are not significant, even at 5% level.

8.7.2.5 *Highly-capitalised firms with long useful-life assets*

Both in the fixed effects and the generalised least squares estimations the betas for time periods 0 to 2 are significant at the 1% level and the betas for periods 3 and 9 are significant at the 5% level (Panels A and B, Table 8.2).

In both the fixed effects and the generalised least squares estimations independent variables associated with betas for periods 4 to 8 and γ are not significant, even at the 5% level.

However, the insignificant variables in the overall sample and the sub-samples contribute to the significance of the whole set of variables in each sample.

8.7.3 Signs of beta coefficients

The negative sign of beta indicates an inverse association between market value ratios and book-to-market value of equity ratios. The negative signs of betas, which are summarised below, therefore, support the first hypothesis *H1* (see Table 8.3).

Table 8.3

Signs of significant associations between changes in market value ratios and book-to-market ratios

Sample	Method	Significant betas	
		Negative	Positive
Overall	Fixed effects	0 to 5 + 9	8
	Generalised least squares	0 to 5 + 9	8 + γ
Low-capitalised firms	Fixed effects	0 to 5	8
	Generalised least squares	0 to 5	8 + γ
Highly-capitalised firms	Fixed effects	0 to 6	
	Generalised least squares	0 to 6	
Highly-capitalised firms with short useful-life assets	Fixed effects	0 to 8	
	Generalised least squares	0 to 8	γ
Highly-capitalised firms with long useful-life assets	Fixed effects	0 to 3	9
	Generalised least squares	0 to 3	9

8.7.3.1 *The overall sample*

For all significant relationships, except for period 8 in the two methods of the multiple regression (fixed effects and *GLS*) and γ in the *GLS*, the sign of beta is negative (Table 8.3).

8.7.3.2 *Low-capitalised firms*

As in the overall sample, the same variables have the same negative significant relationships for both methods of multiple regression (Table 8.3).

8.7.3.3 *Highly-capitalised firms*

For all significant relationships, using either method of multiple regression, the sign of beta is negative (Table 8.3).

8.7.3.4 *Highly-capitalised firms with short useful-life assets*

For all significant relationships using either method of multiple regression, (except γ in *GLS)* the sign of beta is negative (Table 8.3).

8.7.3.5 *Highly-capitalised firms with long useful-life assets*

For all significant relationships, for both multiple regression methods (except for period 9), the sign of beta is negative (Table 8.3).

8.7.3.6 *Negative significant relationships and the useful-life of the fixed assets*

Theoretically, it is expected that the negative association between *BMRs* and the change in market value ratios will continue during the useful-life of assets.

For the overall sample and the sub-samples, the period of the negative association between *BMRs* and changes in market value ratio is lower than the average useful-life of assets in each sample (Table 8.4).

Table 8.4

Negative significant relationships and the average useful-life of the fixed assets

Sample	Negative significant betas Period	Average useful-life assets
Overall	6 years	8.7 years
Low-capitalised firms	6	7.5
Highly-capitalised firms	7	10
Highly-capitalised firms with short useful-life assets	9	8.6
Highly-capitalised firms with long useful-life assets	4	11.9

These results from the overall sample for the fixed effects estimation are similar to *Ryan 1995*. The period of the negative association between *BMRs* and changes in market value

ratios in *Ryan's* article[2] from the overall sample for the fixed effects estimation is up to six years (b_5) and the average useful-life of fixed assets is 9.6 years.

The period of the association between *BMRs* and changes in market value ratios is lower than the average useful-life assets. This could be attributed to the inability of investors to predict the market clearly. The share prices are more influenced by future uncertainty than useful-life assets. According to a shopworn anecdote, Morgan the Elder, when asked for an opinion concerning the outlook for the stock market quipped that stocks will fluctuate (*Nicholas Molodovsky, 1953*).

8.7.4 Magnitudes of betas

Beta values from the overall sample and the sub-samples in the two methods of multiple regression for early periods are high in magnitude (immediately after the market shock[3] occurs) and tend to fall off afterwards (see Figures 8.2 to 8.11, page 177-178).

Usually, the future expected cash flows are higher in the first years than in the last years of the useful-life of an asset. In general, high earnings are positively correlated with high cash in-flows. Therefore, the realized income from this asset in the first years of its useful-life is high. As the income from the asset is realized, the difference between the market and the book value of this asset decreases (as in Figure 8.1).

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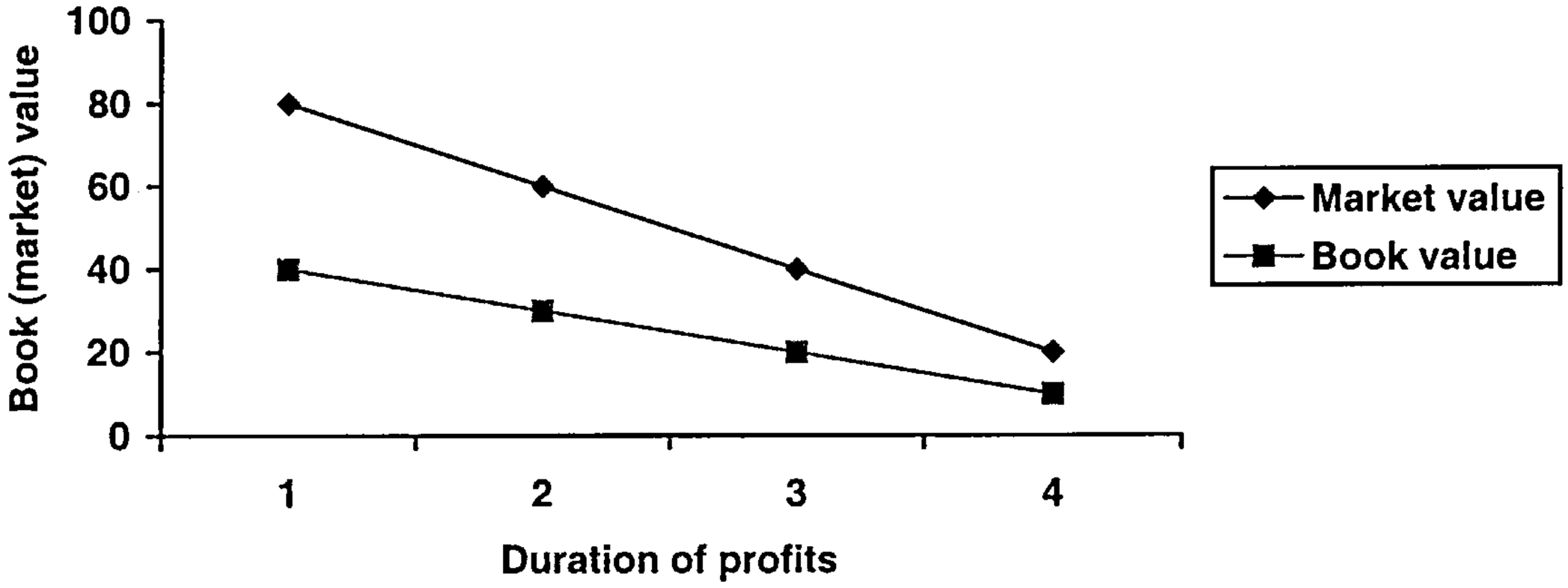
[2] Betas are significant at 5% level

Figure 8.1

Theoretical relationship between book value, market value and earnings realization



The depreciation expense from the accelerated depreciation methods is also higher in the early years of the useful-life of assets than in the last years.

As a result, beta values are expected to be high in magnitude after the initial market shock occurs and decrease year after year during the useful-life of the asset.

Figures 8.2 to 8.11 show the trend of beta coefficients for the overall sample and the sub-samples from the two methods of multiple regression. Negative significant betas for *HMFATA* and *HMFADPR* sub-samples tend to fluctuate less than those from the overall sample and the other sub-samples.

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[3] An effect to the market value of equity

Figure 8.2
Overall sample (Significant betas)
Fixed effects estimation

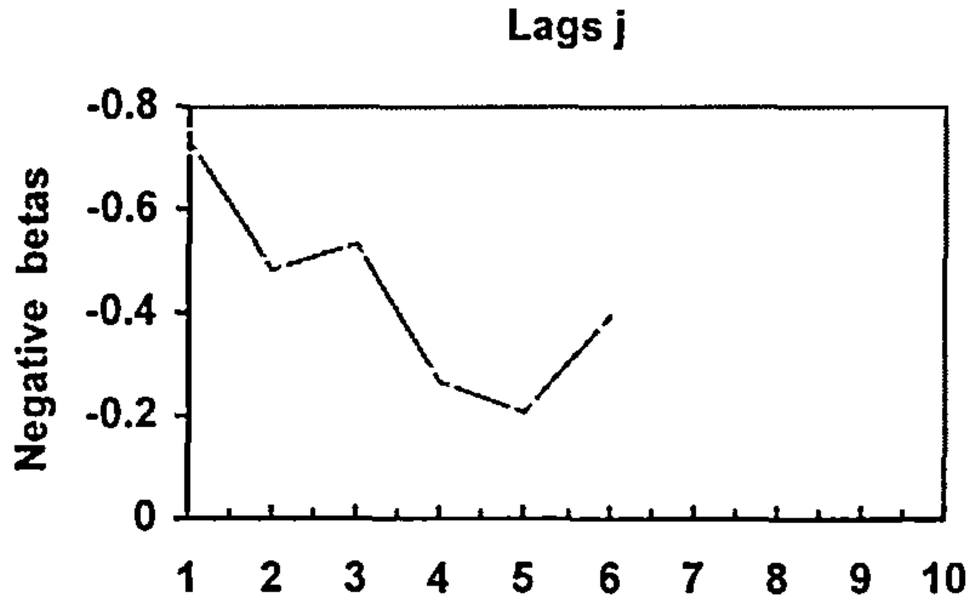


Figure 8.3
Overall sample (Significant betas)
Generalized least squares

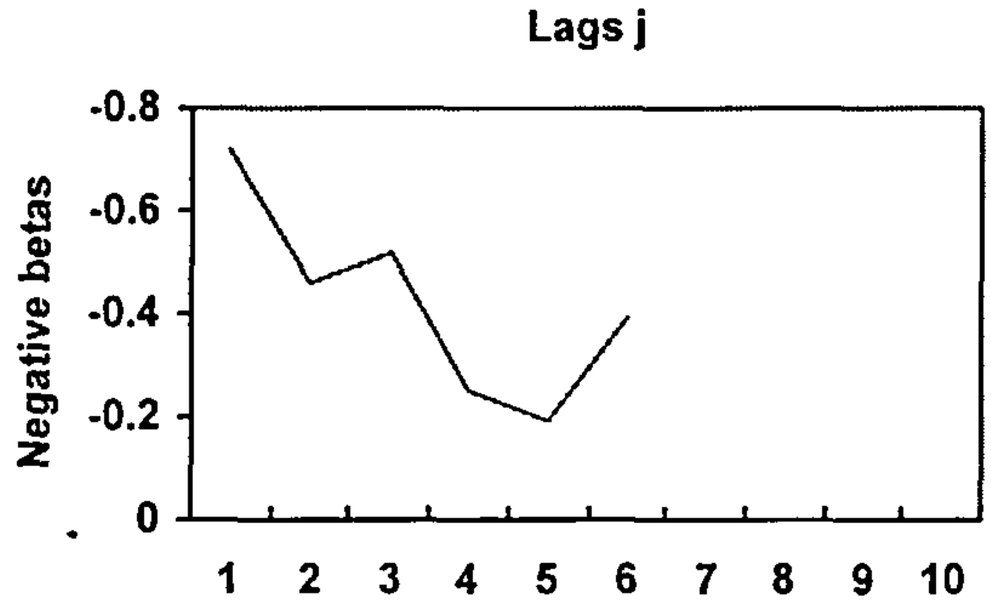


Figure 8.4 Low-capitalized *firms*
(Significant betas)
Fixed effects estimation

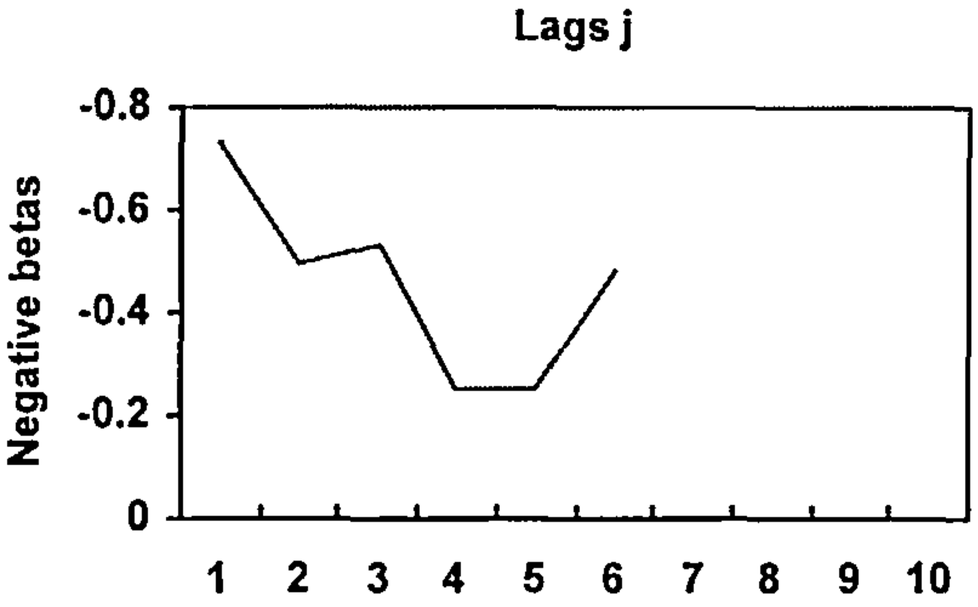


Figure 8.5 Low-capitalized firms
(Significant betas)
Generalized least squares

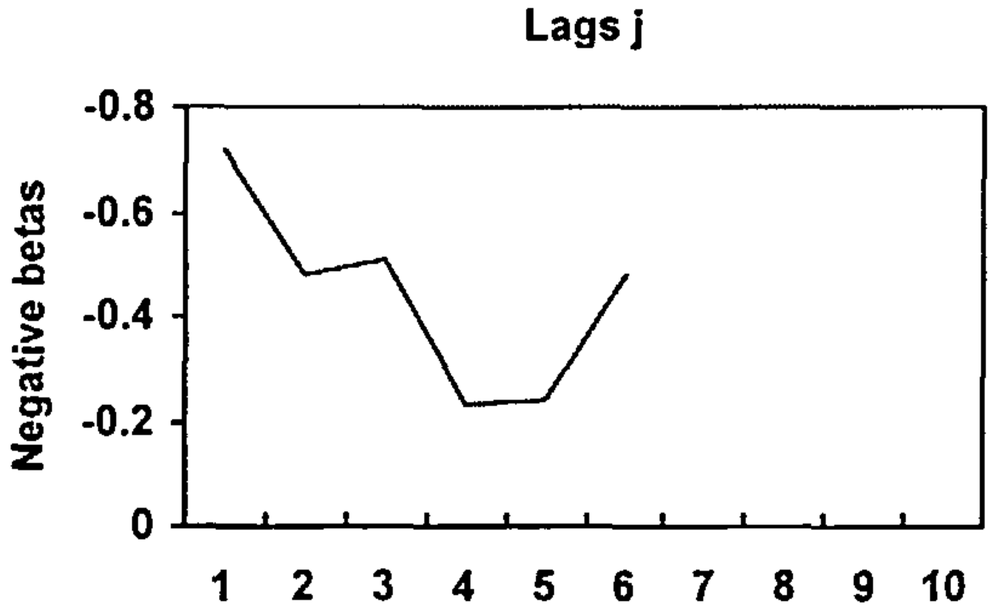


Figure 8.6 Highly-capitalized firms
(Significant betas)
Fixed effects estimation

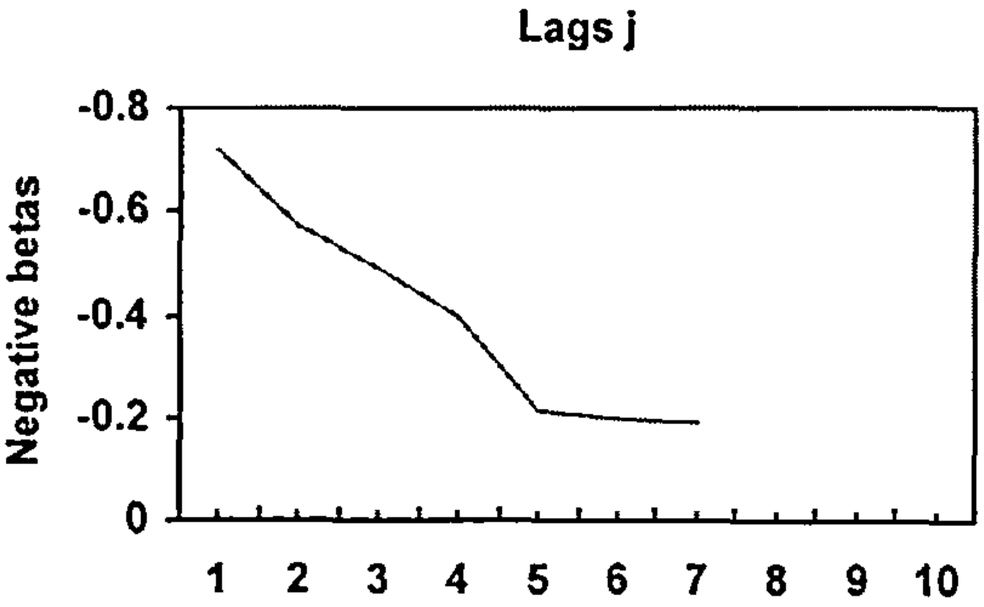


Figure 8.7 Highly-capitalized firms
(Significant betas)
Generalized least squares

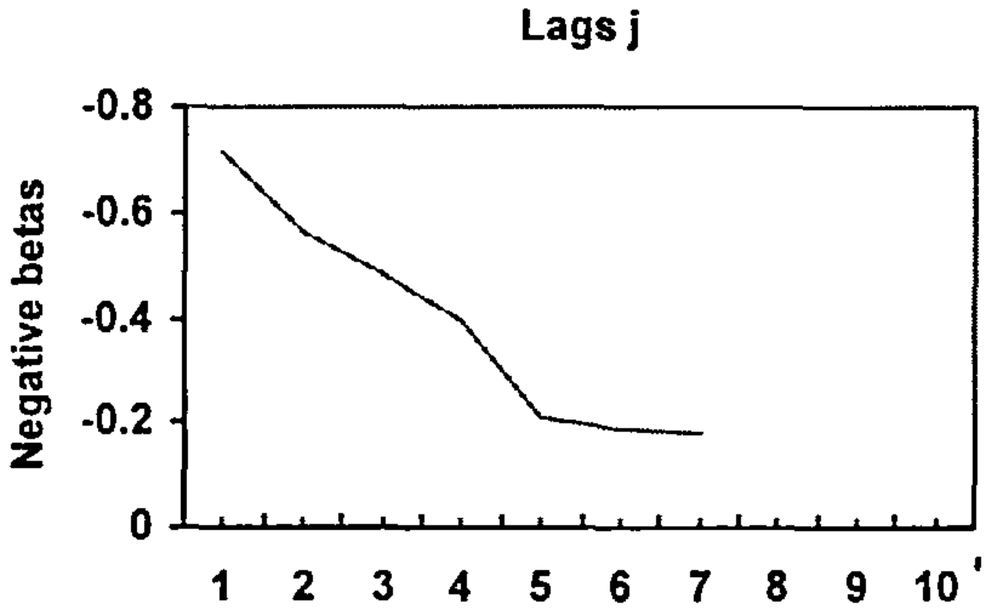


Figure 8.8 Highly-capitalized firms
with short useful-life assets
(Significant betas)
Fixed effects estimation

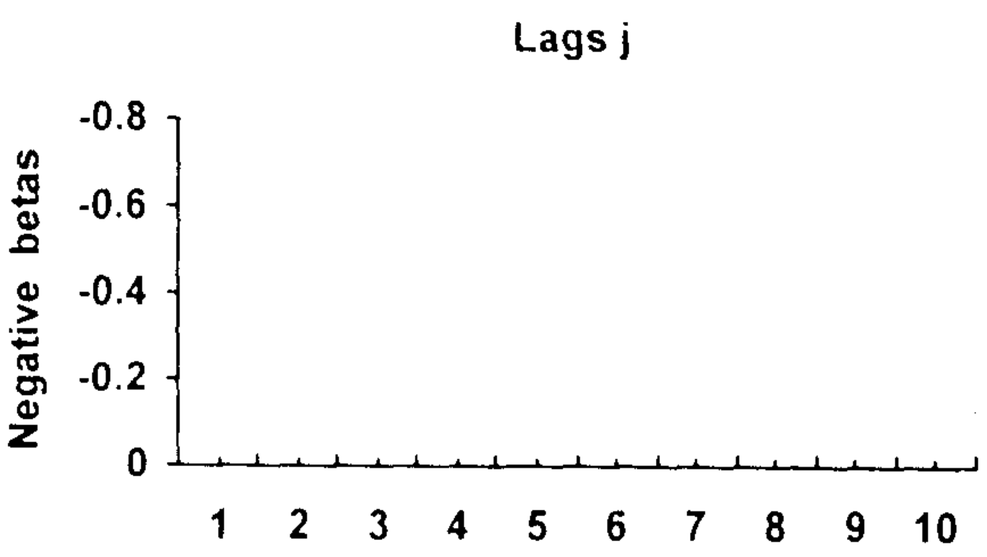


Figure 8.9 Highly-capitalized firms
with short useful-life assets
(Significant betas)
Generalized least squares

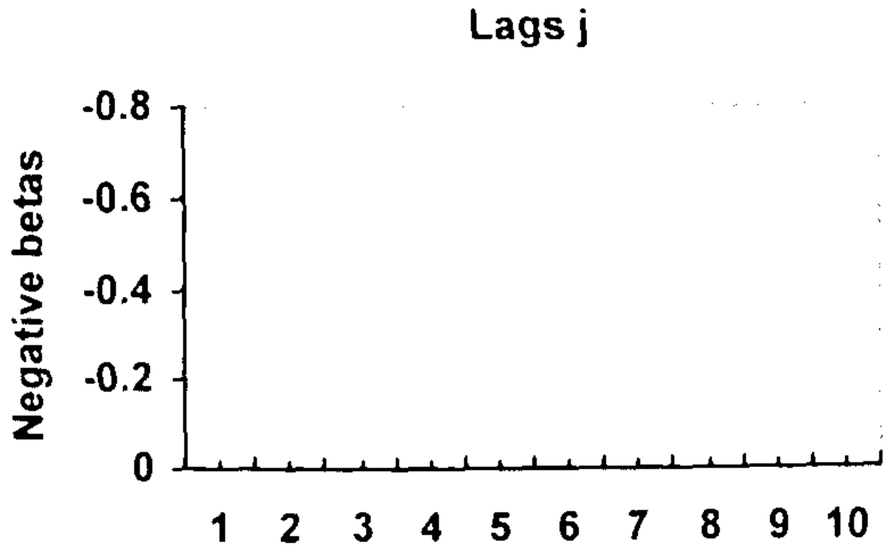


Figure 8.10 Highly-capitalized firms
with long useful-life assets
(Significant betas)
Fixed effects estimation

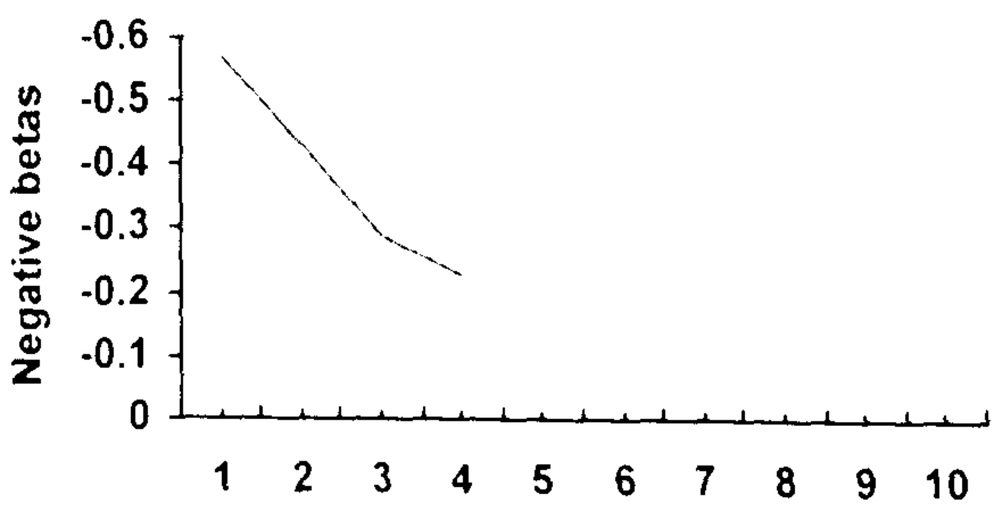
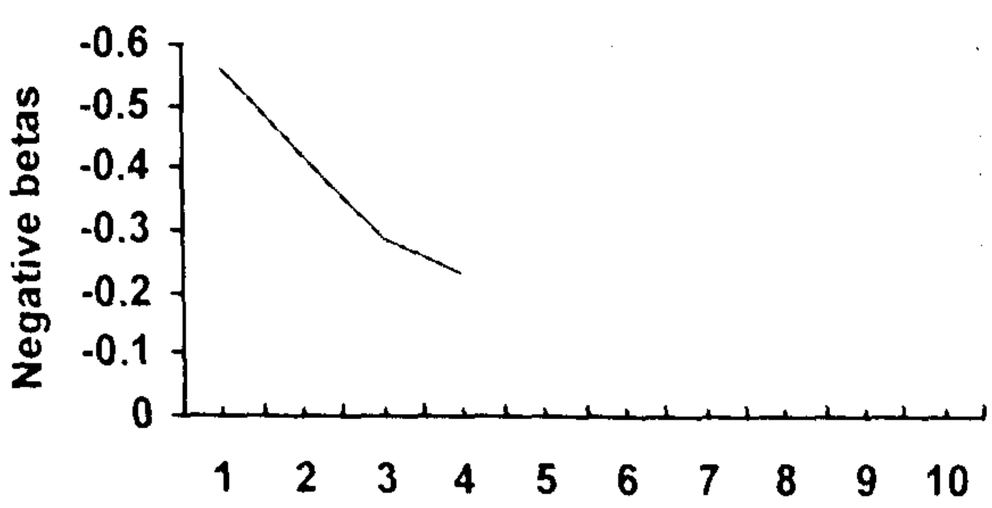


Figure 8.11 Highly-capitalized firms
with long useful-life assets
(Significant betas)
Generalized least squares



8.7.5 The trend of beta coefficients

Consistent with *H2*, Figures 8.6,8.7,8.10 and 8.11 (pages 177-178) show that the significant beta coefficients trend for

a) Highly-capitalised firms and

b) Highly-capitalised firms with long useful-life assets increase monotonically toward zero with lag j, $0 \leq j \leq 9$.

Figures 8.2 to 8.5, 8.8 and 8.9 (pages 177-178) show that the significant beta coefficients' trend for:

a) The overall sample,

b) Low-capitalised firms and

c) Highly-capitalised firms with short useful-life assets increases toward zero with lag j, $0 \leq j \leq 9$.

This downward trend of beta coefficients for highly-capitalised firms and highly-capitalised firms with long useful-life assets could be attributed to less fluctuation in the market value of long useful-life assets. Less fluctuation results from the distribution of the effect of any shock in the long useful-lives of assets. The distribution of the effect of any shock is longer in time for firms with long than for firms with short useful-life assets. Longer lags of market value changes have less predictive ability for book-to-market ratios than those nearer to the initial market shock. The absolute value of beta coefficients, in the overall sample and all the sub-samples,

decreases as the lags of market value changes increase (Panels A and B, Table 8.2, pages 165-166).

The decreasing absolute values of beta coefficients is logically accepted because the market shock effect is reduced with the lag of market value changes.

The absolute value of beta coefficients is high when the difference between market value and book value of equity is high. This can be seen in the first years after the market shock occurs. This absolute value is reduced with the increase of the lag of market value changes.

The significance of the negative beta coefficients for all samples suggest some consistency in the ability of the independent variables to interpret the variation of the dependent variable.

8.7.6 The overall R^2s from the overall sample and the sub-samples from the two methods of multiple regression

From Panels A and B, Table 8.2 (page 165-166), the overall R^2s from the overall sample and the sub-samples are higher for the fixed effects estimation than for the *GLS*. A possible explanation is that, in the fixed effects estimation, the firm effects remove the unmodeled effects of accounting conservatism, delayed recognition and other omitted variables. In the fixed effects estimation, reported R^2 excludes the explanatory power of the fixed effects.

The overall R^2s from the low-capitalised firms for both the fixed effects and *GLS* are higher than those from the highly-capitalised firms (Panels A and B, Table 8.2, pages 165-166).

This can be attributed to less uncertainty associated with low-capitalised firms, because low-capitalised firms have short useful-life assets on average (see Table 8.4, page 174).

This aspect of the results runs contrary to *Ryan (1995)*. His results show that the overall R^2 from highly-capitalised firms for the fixed effects is higher than that from the low-capitalised firms.

The overall R^2 from highly-capitalised firms with long useful-life assets for the fixed effects and *GLS* is higher than that from the highly-capitalised firms with short useful-life assets (Panels A and B, Table 8.2, pages 165-166). A possible explanation is that the longer the useful-life of assets the more the accrual measurement effect is likely to be noticeable. The more the accrual measurement effect, the higher the expected smoothing is.

The highest R^2 is recorded for the highly-capitalised firms with long useful-life assets sub-sample (from the fixed effects estimation). This may be attributed to high capitalisation, which may cause more accrual measurement effects and, therefore, high expected smoothing.

8.7.7 <u>The importance of the book-to-market ratio variable, ten years before *BMR* is observed</u>

The addition of the last variable $BV_{i,t-10}/MV_{i,t-10}$ (instead of

$\Delta MV_{i,t-10}/MV_{i,t-10}$ which was used by *Ryan (1995)*[4]) in the regression equation adds

1) More significance to the beta coefficients of the individual variables. Using the variable $BV_{i,t-10}/MV_{i,t-10}$ in the regression equation for the fixed effects estimation adds significance to three further variables. These variables are associated with betas as follows:

   a) The variable associated with beta 9 from the overall sample

   b) The same variable in (a) above from the highly-capitalised firms with long useful-life assets sub-sample

   c) The variable associated with beta 8 from the highly-capitalised firms with short useful-life assets sub-sample.

2) Increased prediction ability of *BMRs* as a function of changes in market value of equity ratios. R^2 of *BMRs* as a function of changes in market value of equity ratios for the overall sample and the sub-samples, from both the estimation methods used, are higher for UK firms than for Ryan's US firms.

Using $\Delta MV_{i,t-10}/MV_{i,t-10}$ (as used in *Ryan (1995)*) instead of $BV_{i,t-10}/MV_{i,t-10}$ does not add significance to any variable (see Table 8.5).

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[4] It may be a typing error in Ryan's article (1995). However, by all means, this thesis adds a new variable.

Table 8.5
Additional significant betas
Using $BV_{i,t-10}/MV_{i,t-10}$ vs. $\Delta MV_{i.t-10}/MV_{i,t-10}$
Fixed effects estimation

Variable	$BV_{i,t-10}/MV_{i,t-10}$ vs. $\Delta MV_{i.t-10}/MV_{i,t-10}$
Sample	
Overall	b_9
Highly-capitalised firms with short useful-life assets	b_8
Highly-capitalised firms with long useful-life assets	b_9

Table 8.5 shows that, by adding $BV_{i,t-10}/MV_{i,t-10}$ instead of $\Delta MV_{i.t-10}/MV_{i,t-10}$ to the regression equation, the magnitude of significant betas for the fixed effects estimation increases for:

a) The overall sample

b) Low-capitalised firms and

c) Highly-capitalised firms with short useful-life assets (see Panel A, Table 8.6 page 184 and Figures 8.12,8.13 and 8.14, page 186-187).

The magnitude of significant betas for the fixed effects estimation decreases for:

a) Highly-capitalised firms and

b) Highly-capitalised firms with long useful-life assets (Panel B, Table 8.6 P.184 and Figures 8.15 and 8.16, P.187).

Table 8.6
Comparison between the magnitude of significant betas
Using $BV_{i,t-10}/MV_{i,t-10}$ vs. $\Delta MV_{i.t-10}/MV_{i,t-10}$
Fixed effects estimation

Panel A: Significant betas magnitude using $BV_{i,t-10}/MV_{i,t-10}$ which are higher than counterparts using $\Delta MV_{i.t-10}/MV_{i,t-10}$

	Overall		Low-capitalised firms		Highly-capitalised firms with short useful-life assets	
	$BV_{i,t-10}/MV_{i,t-10}$	$\Delta MV_{i.t-10}/MV_{i,t-10}$	$BV_{i,t-10}/MV_{i,t-10}$	$\Delta MV_{i.t-10}/MV_{i,t-10}$	$BV_{i,t-10}/MV_{i,t-10}$	$\Delta MV_{i.t-10}/MV_{i,t-10}$
b_0	-0.73	-0.72	-0.73	-0.71	-0.71	-0.71
b_1	-0.48	-0.47	-0.50	-0.48	-0.55	-0.55
b_2	-0.53	-0.53	-0.53	-0.52	-0.46	-0.45
b_3	-0.27	-0.26	-0.25	-0.24	-0.41	-0.40
b_4	-0.21	-0.20	-0.25	-0.22	-0.36	-0.34
b_5	-0.40	-0.39	-0.48	-0.46	-0.27	-0.27
b_6					-0.25	-0.24
b_7					-0.30	-0.26
b_8					-0.22	

Panel B: Significant betas magnitude using $BV_{i,t-10}/MV_{i,t-10}$

	Highly-capitalised firms		Highly-capitalised firms with long useful-life assets	
	$BV_{i,t-10}/MV_{i,t-10}$	$\Delta MV_{i.t-10}/MV_{i,t-10}$	$BV_{i,t-10}/MV_{i,t-10}$	$\Delta MV_{i.t-10}/MV_{i,t-10}$
b_0	-0.72	-0.73	-0.57	-0.60
b_1	-0.57	-0.59	-0.43	-0.46
b_2	-0.49	-0.50	-0.29	-0.33
b_3	-0.40	-0.42	-0.23	-0.27
b_4	-0.21	-0.22		
b_5	-0.20	-0.21		
b_6	-0.19	-0.21		

A possible explanation for these differences in the magnitude of betas using $BV_{i,t-10}/MV_{i,t-10}$ or $\Delta MV_{i.t-10}/MV_{i,t-10}$ between samples can be attributed to the average useful-life of assets.

As can be seen from Panels A and B, Table 8.6, betas from low-capitalised firms, highly-capitalised firms with short useful-life assets sub-samples and the overall sample (fixed assets average useful lives are 7.5, 8.6, 8.7 years respectively) are higher using $BV_{i,t-10}/MV_{i,t-10}$ instead of $\Delta MV_{i.t-10}/MV_{i,t-10}$. Betas from highly-capitalised firms and highly-capitalised firms with long useful-life assets sub-samples (fixed assets average useful lives are 10 and 11.9 years respectively) are lower using $BV_{i,t-10}/MV_{i,t-10}$ instead of $\Delta MV_{i.t-10}/MV_{i,t-10}$.

The shorter the average useful-life of assets the more accurate are the expected returns and the valuation of the market value of these assets. Thus the differences between book and market value of equity are smaller. Therefore, using $BV_{i,t-10}/MV_{i,t-10}$ for samples with short useful-lives of long-lived assets is more appropriate than using $\Delta MV_{i.t-10}/MV_{i,t-10}$.

Figures 8.12 to 8.16 show the change in the magnitude of significant beta coefficients when using $BV_{i,t-10}/MV_{i,t-10}$ instead of $\Delta MV_{i,t-10}/MV_{i,t-10}$.

Figure 8.12 Changes in negative significant beta coefficients at further lags for the overall sample

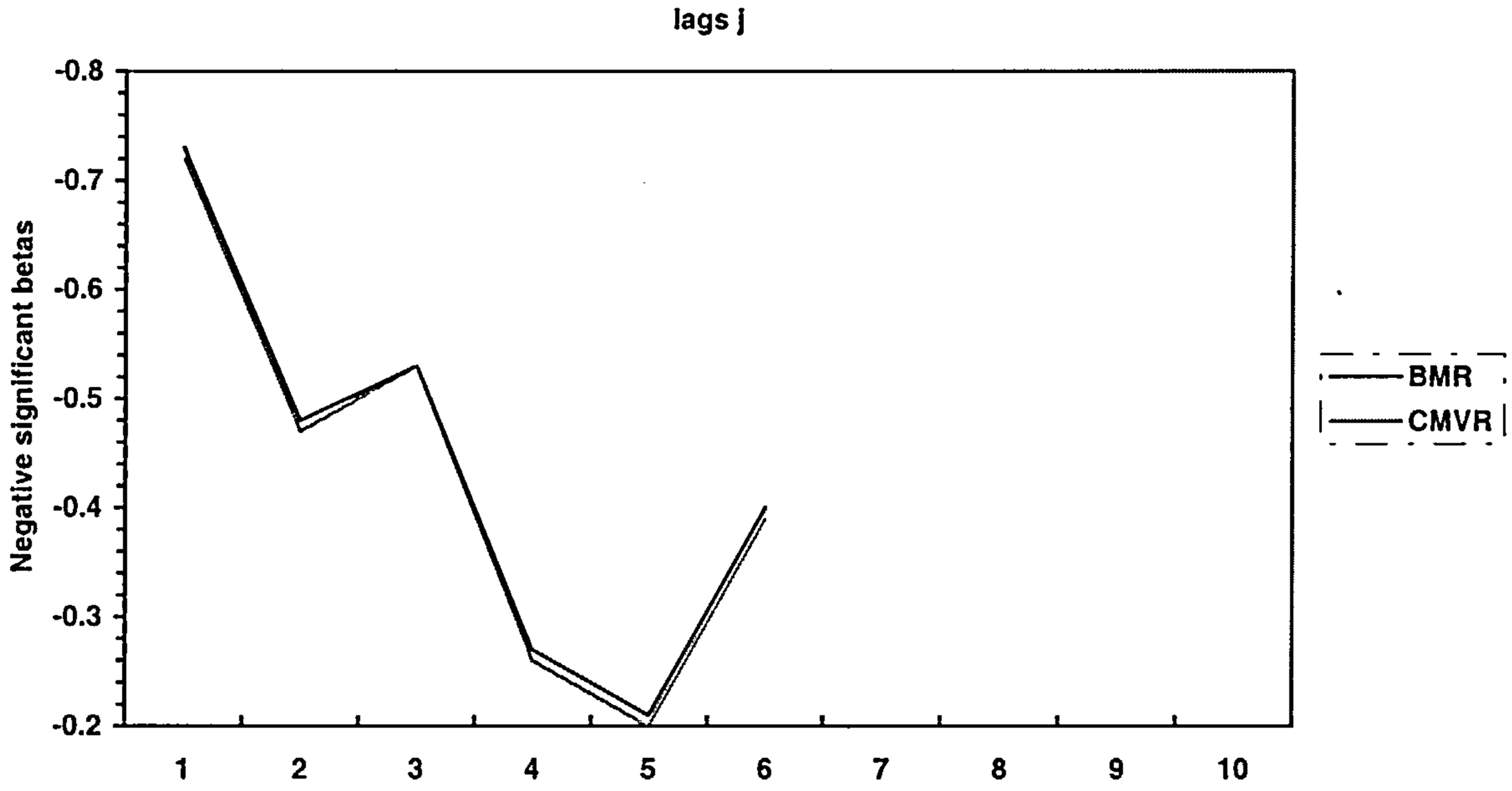


Figure 8.13 Changes in negative significant beta coefficients at further lags for the low-capitalised firms

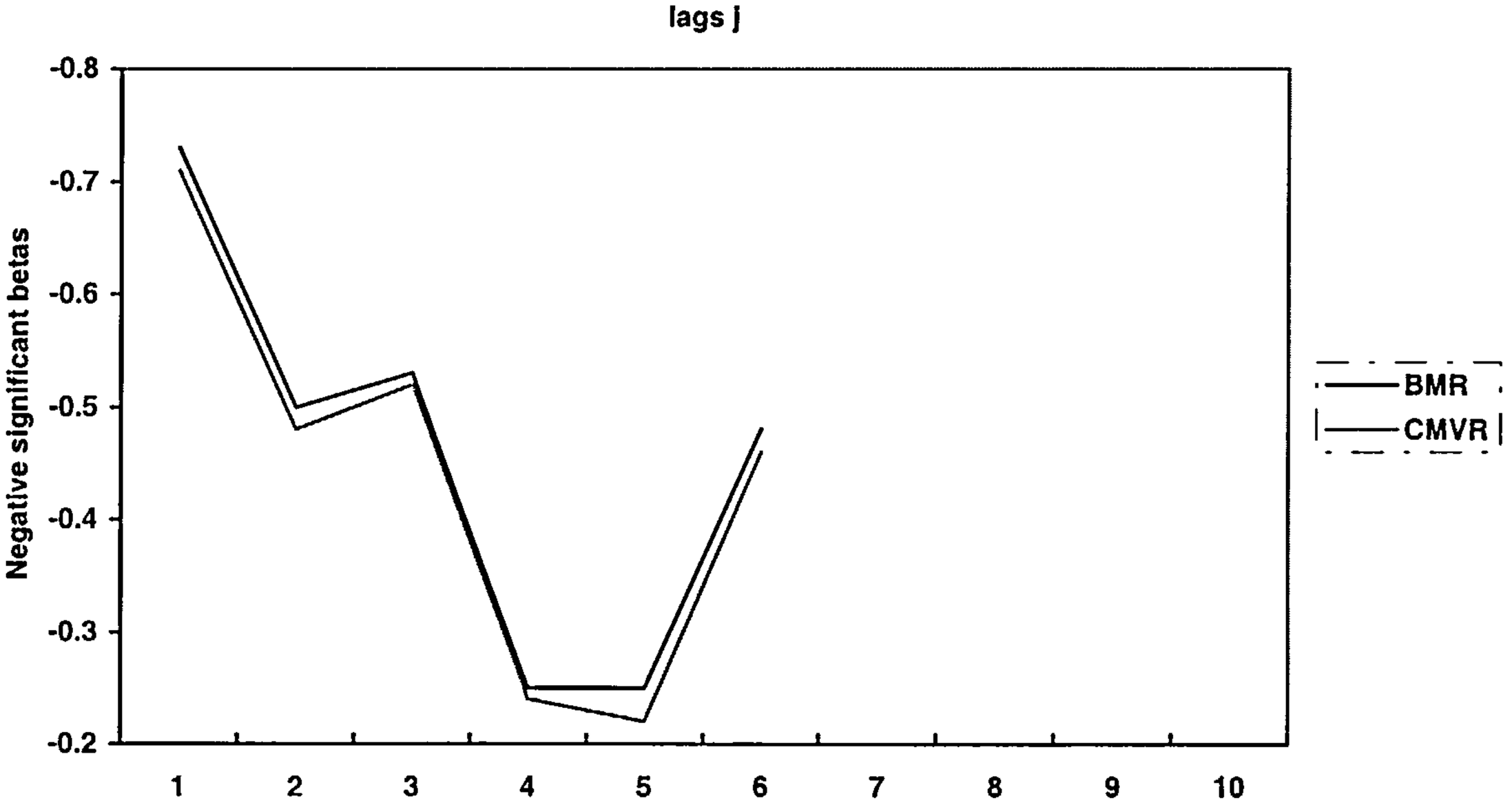


Figure 8.14 Changes in negative significant beta coefficients at further lags for the highly-capitalised firms with short useful-life assets

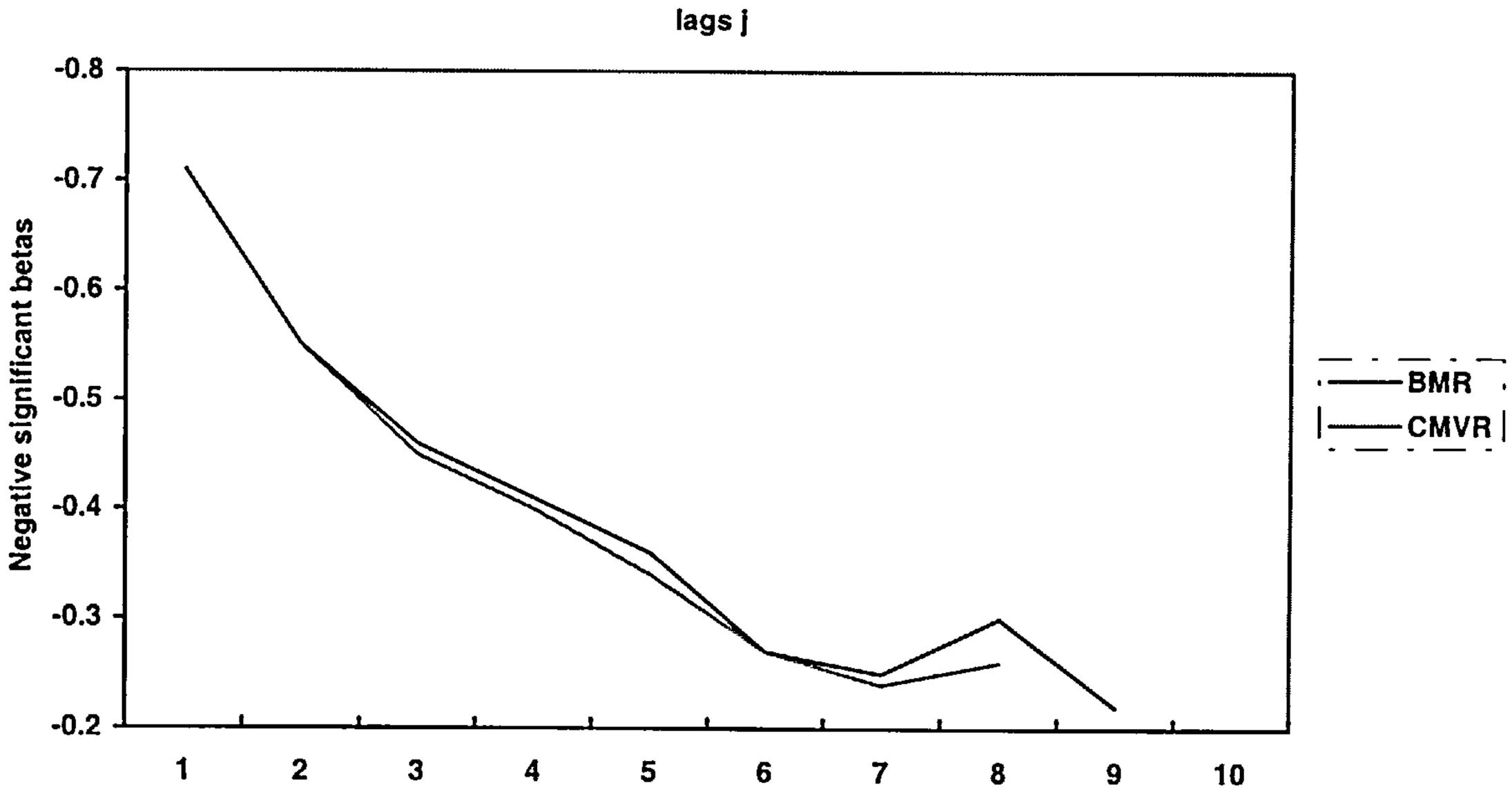


Figure 8.15 Changes in negative significant beta coefficients at further lags for the highly- capitalised firms

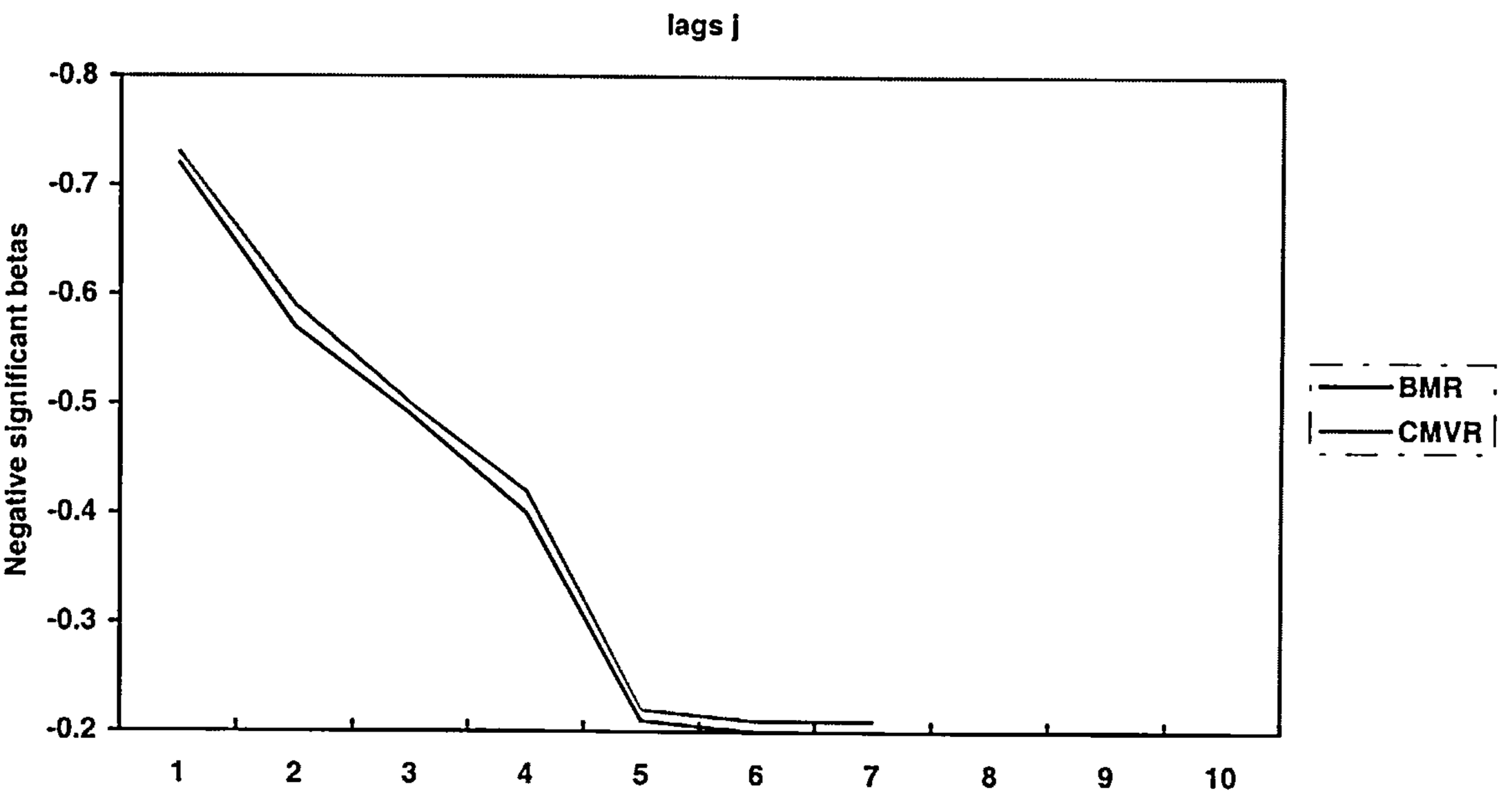
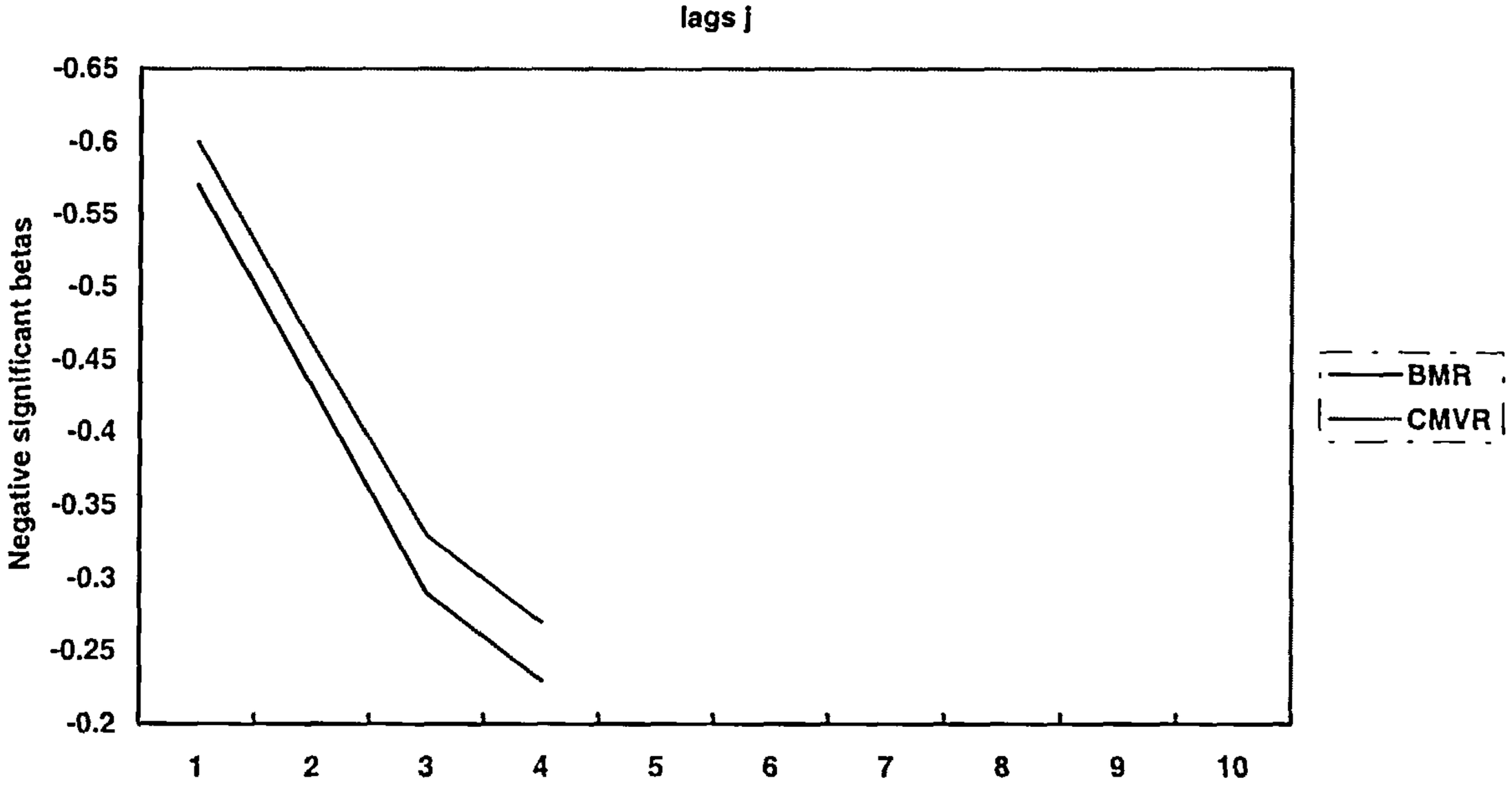


Figure 8.16 Changes in negative significant beta coefficients at further lags for the highly-capitalised firms with long useful-life assets



8.7.8 Robustness of the results

The significance of b_{t-j} refers to the ability of changes in market value ratios to explain the variation in book-to-market ratios.

Consistent with *H1*, market value changes predict book-to-market value of equity ratios in the overall sample and the sub-samples as follows:

8.7.8.1 *The overall sample*

For the overall sample, market value changes predict book-to-market ratios at least six years in advance. This result is obtained from both the fixed effects and generalised least squares estimations. b_0 through b_5 are negative and significant at the 1% level.

In addition, from both multiple regression methods, b_8 is positive and significant at the 1% level and b_9 is negative and significant at the 5% level. From the generalised least squares, b_9 is negative and significant at the 5% level and γ is positive and significant at the 1% level (Panels A and B, Table 8.2, pages 165-166).

Consistent with *H1*, t statistics associated with b_0 through b_5 are negative and significant at the 1% level.

8.7.8.2 *Low-capitalised firms*

For the low-capitalised firms' sub-sample, market value changes predict book-to-market ratios at least six years in advance in the fixed effects and *GLS* estimations. b_0 through b_5 are negative and significant at the 1% level.

In addition, from both multiple regression methods, b_8 is positive and significant at the 1% level. In the generalised least squares estimation, γ is positive and significant at the 1% level (Panels A and B, Table 8.2, pages 165-166).

Consistent with *H1*, the t statistic associated with b_0 through b_5 are negative and significant at the 1% level.

8.7.8.3 *Highly-capitalised firms*

For the highly-capitalised firms sub-sample, market value changes predict book-to-market ratios at least seven years in

advance using both multiple regression methods. b_0 through b_6 are negative and significant at the 1% level (Panels A and B, Table 8.2, pages 165-166).

Consistent with *H1*, the t statistics associated with b_0 through b_6 are negative and significant at the 1% level.

8.7.8.4 *Highly-capitalised firms with short useful-life assets*

For the highly-capitalised firms with short useful-life assets sub-sample, market value changes predict book-to-market ratios at least nine years in advance using both multiple regression methods.

From both multiple regression methods, b_0 through b_8 are negative and significant at the 5% level. In addition, γ is positive and significant at the 5% level from *GLS* (Panels A and B, Table 8.2, pages 165-166).

Consistent with *H1*, t statistics associated with b_0 through b_8 are negative and significant at the 5% level.

8.7.8.5 *Highly-capitalised firms with long useful-life assets*

For the highly-capitalised firms with long useful-life assets sub-sample, market value changes predict book-to-market ratios at least four years in advance using both multiple regression methods. b_0 through b_3 are negative and

significant at the 5% level. b_9, using both multiple regression methods, is positive and significant at the 5% level (Panels A and B, Table 8.2, pages 165-166).

Consistent with *H1*, t statistics associated with b_0 through b_3 are negative and significant at the 5% level.

8.7.9 The association between the useful-life of assets and book-to-market ratio

The significance of the association between book-to-market ratios and the independent variables, individually, using both multiple regression methods, is stronger for the highly-capitalised firms with short useful-life assets sub-sample than for the highly-capitalised firms with long useful-life assets sub-sample.

Beta coefficients (absolute values) of the individual variables from highly-capitalised firms with short useful-life assets sub-sample are larger than those from the highly-capitalised firms with long useful-life assets sub-sample (Panels A and B, Table 8.2, pages 165-166).

This strong significance for *LMFADPR* could be attributed to greater conservatism recorded on the part of management when it depreciates its assets over a short period (firms with short useful-life assets). The shorter the useful-life of assets, the higher the depreciation expense (other things remaining equal). Therefore, the differences between the market value of equity and the book value of equity comes to

a quicker end for the sub-sample of highly-capitalised firms with short useful-life assets.

Key points from tests of *H1* are presented in Section 8.10 along with key points from tests of *H2* and *H3*, which now follow.

8.8 **Selected tests of significance for hypothesis two (*H2*)**

8.8.1 Introduction

H2 restricts the sign of the differences of b_j coefficients at different lags j. b_j coefficients rise with lag j, $0 \leq j \leq 9$.

Table 8.7 provides selected tests for *H2* using both multiple regression methods.

Book-to-market ratio is regressed to correspond with the estimation equation (see Equation 4, Section 5.3) on the difference between the beta of every two adjacent variables in each sample. These variables are ten lagged market value changes and a ten-year lagged book-to-market ratio (before *BMR* is observed). The overall sample and the highly-capitalised firms with long useful-life assets sub-sample are used in this test.

Table 8.7

Selected Significance Tests for Hypothesis two (*H2*)

Hypothesis two: b_j rise with lag j (sample and estimation method)			
Overall		Highly-capitalised firms with long useful-life assets	
Fixed effects	*GLS*	Fixed effects	*GLS*
$b_0 - b_1$	-0.25 ** (-7.5)	-0.25 ** (-7.7)	0.018 * (2.6)	0.015 * (2.3)
$b_1 - b_2$	0.0216 ** (3.3)	0.022 ** (3.5)	0.021 ** (3.1)	0.020 ** (2.9)
$b_2 - b_3$	0.0002 (0.03)	-0.0004 (-0.08)	0.003 (0.5)	0.001 (0.2)
$b_3 - b_4$	0.004 (0.7)	0.005 (0.8)	-0.0001 (-0.02)	-0.001 (-0.2)
$b_4 - b_5$	0.014 * (2.3)	0.014 * (2.5)	0.001 (0.2)	-0.001 (-0.2)
$b_5 - b_6$	0.0001 (0.02)	-0.0001 (-0.02)	-0.0001 (-0.02)	-0.002 (-0.42)
$b_6 - b_7$	0.007 (1.2)	0.007 (1.2)	-0.007 (-1.4)	-0.009 (-1.8)
$b_7 - b_8$	0.008 (1.3)	0.01 (1.7)	-0.0004 (-0.07)	-0.001 (-0.2)
$b_8 - b_9$	0.008 (1.3)	0.01 (1.8)	0.009 (1.6)	0.007 (1.3)
# obs.	930	930	240	240

** Significant at 1% level

* Significant at 5% level

a) The hypothesis tests correspond to the estimation of the following equation

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + \sum_{j=0}^{9} b_j \frac{\Delta MV_{i,t-j}}{MV_{i,t}} + \gamma \frac{BV_{i,t-10}}{MV_{i,t-10}} + u_{i,t}$$

b) See the notes to Table 7.1 (pages 144-145) for the description of the samples and the variables in the regression equation. See the notes to Table 8.2 (pages 165-166) for description of the fixed effects and E*GLS* estimation methods.

c) t statistics are in brackets.

8.8.2 The selected samples

The data from the overall sample is assumed to be representative of all the sub-samples. Therefore, it is used to test hypothesis *H2*.

The highly-capitalised firms with long useful-life assets data are used to examine the additional influence of "capitalisation" and "useful-life of assets" on the book-to-market ratios.

8.8.3 Explanation of the results

As can be seen from Table 8.7, for the overall sample and the highly-capitalised firms with long useful-life assets sub-sample, the first two lags ($b_0 < b_1, b_1 > b_2$) are significant at the 5% level. For the overall sample, in addition, the fifth lag ($b_4 > b_5$) is significant at the 5% level. These results are similar from both multiple regression methods. All other differences (longer lags) of adjacent coefficients are insignificant even at the 5% level.

The results in Table 8.7 show that significant b_j coefficients increase toward zero within the first two lags after the initial market shock occurs for the two multiple regression methods.

8.9 **Selected tests of significance for hypothesis three (*H3*)**

Hypothesis Three (*H3*) restricts the sign of differences of b_j coefficients across samples. Hypothesis three (*H3*) tests if b_j coefficients are more negative at further lags j, $0 \leq j \leq 9$ for firms with more fixed assets with longer useful-life.

Table 8.8 provides selected tests for hypothesis three (*H3*) using both multiple regression methods.

8.9.1 Selected differences

The selected differences in b_js across samples for testing hypothesis three (*H3*) are as follows:

a- Highly-capitalised firms vs. low-capitalised firms.

b- Highly-capitalised firms with long useful-life assets vs. with short useful-life assets.

c- Highly-capitalised firms with long useful-life assets vs. low-capitalised firms.

Table 8.8

Selected significance tests for hypothesis three (*H3*)

Hypothesis three: b_j coefficients are more negative at further lags j for firms with more fixed assets with longer useful-life (samples compared and estimation method)						
	HMFATA vs. LMFATA		HMFADPR vs. LMFADPR		HMFADPR vs. LMFATA	
	Fixed effects	*GLS*	Fixed effects	*GLS*	Fixed effects	*GLS*
Δb_0	-0.06** (-3.9)	-0.06** (-4.5)	0.02 * (2.2)	0.024** (2.7)	-0.05 * (-2.4)	-.05** (-2.6)
Δb_1	0.01 (0.8)	0.008 (0.6)	0.03 ** (3)	0.03 ** (3.4)	0.03 (1.3)	0.03 (1.4)
Δb_2	-0.04** (-2.7)	-0.04** (-3.2)	0.03 ** (3.4)	0.03 ** (3.9)	-0.02 (-1.2)	-0.025 (-1.3)
Δb_3	0.02 (1.5)	0.02 (1.2)	0.01 (1.3)	0.02 (1.7)	0.03 (1.6)	0.03 (1.5)
Δb_4	0.03 * (2.1)	0.03 (1.8)	-0.001 (-0.1)	0.002 (0.2)	0.03 (1.4)	0.02 (1.3)
Δb_5	-0.004 (-0.3)	-0.01 (-0.8)	-0.008 (-1)	-0.006 (-0.8)	-0.005 (-0.3)	-0.01 (-0.5)
Δb_6	0.03 (1.9)	0.02 (1.3)	-0.002 (-0.3)	-0.001 (-0.1)	0.03 (1.4)	0.02 (1.1)
Δb_7	0.03 (1.6)	0.02 (1.3)	-0.03 ** (-3.8)	-0.03** (-3.6)	-0.005 (0.2)	0.001 (0.1)
Δb_8	0.04 * (2.5)	0.03 * (2.2)	-0.004 (-0.5)	-0.002 (-0.2)	0.03 (1.7)	0.03 (1.4)
Δb_9	-0.02 (-1.1)	-0.02 (-1.6)	-0.01 (-1.3)	-0.01 (-1.09)	-0.02 (-1)	-0.025 (-1.3)
#obs	470	470	240	240	470	470

** Significant at 1% level

* Significant at 5% level

a) The hypothesis tests correspond to the estimation of the following equation

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + \sum_{j=0}^{9} b_j \frac{\Delta MV_{i,t-j}}{MV_{i,t}} + \gamma \frac{BV_{i,t-10}}{MV_{i,t-10}} + u_{i,t}$$

b) See the notes to Table 7.1 (pages 144-145) for the description of the samples and the variables in the regression equation. See the notes to Table 8.2 (pages 165-166) for description of the fixed effects and *GLS* estimation methods.

c) Δb_j denotes the difference in b_j across sub-samples.

d) t statistics are in brackets.

The main point of this analysis is to compare highly-capitalised firms, especially those with long useful-life assets, with their counterparts[5]. The aim of this comparison is to examine the effect of the average useful-life of assets on the book-to-market value of equity ratios.

8.9.2 Explanation of the results

As can be seen from Table 8.8, b_j from the three differences (HMFATA vs. LMFATA, HMFADPR vs. LMFADPR and HMFADPR vs. LMFATA) and from both multiple regression methods in period 0 are negative and significant except that the differences in b_j between highly-capitalised firms with long vs. with short useful-life assets sub-samples are positive.

In period 1, the only significant differences in b_j are from highly-capitalised firms with long vs. with short useful-life assets for the two multiple regression methods. These beta coefficients are positive.

In period 2, b_j coefficients for all b_j differences except for highly-capitalised firms with long useful-life assets vs. low-capitalised firms are significant. There are other five distributed significant b_j coefficients.

Beta differences rise rapidly towards zero in the second lag. These results do not support *H3* that beta coefficients are

[5] Firms with short useful-life assets sub-samples

more negative at further lags *j*, for firms with more fixed assets with longer useful-life.

The results of the selected significance tests for *H3* do not support Hypothesis Three. The results are consistent with the following previous conclusions for the study period:

a) The longer the "average useful-life of assets" the less the differences between book and market value of equity (as the mean of the book-to-market value of equity ratios shows (see Table 7.2 P. 147)). Therefore, the accrual measurement is expected to affect book-to-market value of equity ratio less for the long useful-life assets sub-sample.

b) The shorter the "average useful-life of assets" the larger the average changes in stock prices are (see Table 7.1 Panels D and E page 145). Hence, the larger are the differences between book and market values of equity ratios and the higher is the accrual measurement effect for the short useful-life assets sub-sample.

c) The lower the "capitalisation" the larger the stock price fluctuations are. The standard deviation of the changes in market value ratios for the study period from low-capitalised firms sub-sample (0.60) is higher than that from the highly-capitalised firms' sub-sample (0.26). Therefore, "capitalisation" is negatively associated with stock price fluctuations.

d) Accrual measurement effects increase across time. As can be seen from Table 7.2, page 147, the mean book-to-market value of equity ratio in the prior period (1978 to 1986) from the overall sample and the sub-samples is higher than that for the study period (1987 to 1996). Therefore, the differences between book and market value of equity (and hence the accrual measurement effects) are higher in the study period than in the prior period.

e) We find the ability of the independent variables to interpret the differences in the book-to-market ratio is stronger at the beginning of the period (useful-life of assets). A possible explanation is that, as time passes, unexpected variables affect the relation. Therefore, the shorter the useful-life assets, the more significant are the changes in market value of equity for interpreting *BMRs*.

8.10 **Summary**

The regression equation is built from the idea that the future book-to-market value of equity ratio is a function of current changes in market value of equity ratios. Firms' "capitalisation" and "average useful life of assets" also influence the relationship.

The results of the multiple regression analysis show a negative significant linear relation between *BMRs* and changes in market value of equity ratios. This result coincides with the results of previous research.

Changes in market value of equity ratios are found to be useful in predicting book-to-market ratios for up to at least six years, except for highly-capitalised firms with long useful-life assets (for which it is 4 years). The ability of changes in market value of equity ratios from highly-capitalised firms with short useful-life assets to predict *BMRs* continues up to 9 years. The period in which changes in market value of equity ratios predict *BMRs* is found to be less than the average useful-life of firms' assets.

The magnitudes of beta values from *LMFADPR* are higher than those from *HMFADPR*. In general, beta values for early periods are high in magnitude (immediately after the market shock occurs) and tend to fall off afterwards. Also, the significance of beta coefficients tends to be high in the early periods and falls off later.

The negative regression coefficients rise toward zero in the first two lags after the initial market shock occurs.

Long useful-life assets are not associated with increased negativity of regression coefficients at further lags.

Using $BV_{i,t-10}/MV_{i,t-10}$ instead of $\Delta MV_{i,t-10}/MV_{i,t-10}$ adds more significance to the beta coefficients of the individual variables. Also, use of the new variable increases the magnitude of significance of betas from firms with short useful-life assets.

8.11 **The usefulness of changes in market value of equity ratios for predicting book-to-market value of equity ratios**

The R^2s from the $\Delta MV_{i,t-j}/MV_{i,t}$, as a function of the book-to-market value of equity ratios suggest a high ability for interpreting the evolution of book-to-market value of equity ratios. This motivates us to examine the usefulness of the change in market value ratios for predicting book-to-market value of equity ratios for the sample of British industrial companies.

8.11.1 Explanation of the prediction equation

The 1978 to 1985 data are used to estimate the prediction equation. This data comprises the changes in market values of equity ratios for eight years as independent variables and the book-to-market ratios as the dependent variable.

The multiple linear regression model is as follows:

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + b_1 \frac{\Delta MV_{1,i}}{MV_{1,i}} + b_2 \frac{\Delta MV_{2,i}}{MV_{2,i}} + \ldots + b_8 \frac{\Delta MV_{8,i}}{MV_{8,i}}$$

This equation can be written as follows:

$$\frac{BV_{i,t}}{MV_{i,t}} = \alpha_{i,t} + \sum_{j=0}^{8} b_j \frac{\Delta MV_{i,t-j}}{MV_{i,t}}$$

Where

$\alpha_{i,t}$: The constant term

b_j : The slope of *BMR* with one variable j (holding the other variables of j constant)

The results from the 1986 predicting year *BMR* are used in estimating the expected *BMRs* for the period (1988 to 1995). The financial crash year 1987 is excluded from the study period to avoid bias.

These estimates of expected *BMRs* are used in predicting 1996 year *BMRs*. Finally, to examine the accuracy of the prediction equation above, the correlation between the actual and predicted 1996-year *BMRs* is calculated. A linear relationship between each explanatory variable and the dependent variable is assumed.

8.11.2 Prediction results

The value of F-test is highly significant at 0.0001 level. It represents the relationship between *BMRs* and changes in market value ratios.

The coefficient of determination R^2 is 29.2%. Hence, current changes in market value ratios can explain 29.2% of the variation of future *BMRs*.

The results of the prediction equation for the period from 1978 to 1985 are as follows:

$$BMR_{1986} = 0.858 - 0.2210\ CMVR_{1978} - 0.004\ CMVR_{1979} - 0.2820\ CMVR_{1980} - 0.381\ CMVR_{1981} - 0.0635\ CMVR_{1982} - 0.220\ CMVR_{1983} - 0.2310\ CMVR_{1984} - 0.435\ CMVR_{1985}$$

The correlation between predicted and actual 1996 *BMRs* is 0.447. This positive correlation coefficient value signals a relatively weak straight-line relationship between *BMRs* and changes in market value ratios.

8.11.3 **Summary**

Changes in market value of equity ratios can explain about 29% of the variation of *BMRs*. The positive correlation between predicted and actual book-to-market value of equity ratios is about 45%.

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CHAPTER NINE

Summary and conclusions

9.1 Summary

This thesis interprets the evolution of book-to-market value of equity ratios as a function of changes in market value of equity ratios in relation to firms' "capitalisation" and "average useful-life of assets".

The empirical work uses the book-to-market value of equity ratio as a starting point to the analysis (instead of the change in market value of equity ratio as used in previous research). The book-to-market value of equity ratio, in general, is found to provide information about the firm's future earnings ability. Both book-to-market values of equity and changes in market value of equity ratios are calculated ten years before the *BMR* (the dependent variable) is observed. The study population is British industrial companies registered on London Stock Exchange. The study period is ten years, from 1987 to 1996. The results show that the new variable;

a) adds significance to some individual variables.

b) increases the ability of changes in market value of equity ratios to predict *BMRs* for the overall sample and the sub-samples.

c) increases the magnitude of significant betas for highly-capitalised firms as the "average useful-life assets" decreases.

Also, the results of this thesis can be used to compare results from British data with those from US data and to discuss the association between *BMRs* and "short-terminisim".

The results show the following:

a) *BMRs* of UK firms in the sample are more predictable than *BMRs* of US firms.

b) *BMRs* are negatively associated with changes in market value of equity ratios. This negative relationship continues up to at least six years after the market shock occurs except for the highly-capitalised firms with long useful-life assets sub-sample (for which it continues up to four years).

c) For highly-capitalised firms, the magnitude of the negative relationship increases as the useful-life of assets decreases.

d) Long useful-life of assets does not increase the effect of changes in market value of equity ratios on *BMRs* at further lags.

e) Current changes in market value of equity ratios explain 29.2% of the variation of future book-to-market values of equity ratios.

9.2 **Conclusions**

9.2.1 Conclusions from descriptive statistics:

1. Consistent with our expectations, the higher the "capitalisation", the higher is the difference between book and market value of equity ratios and hence, the higher is the accrual measurement effects.

2. Contrary to expectations, highly-capitalised firms with short useful-life assets are more influenced by accrual measurement than highly-capitalised firms with long useful-life assets.

3. Accrual measurement effects increases over the analysis period (1977 to 1996).

4. The lower the "capitalisation" the faster is the removal of differences between book and market values and the higher are stock price fluctuations.

9.2.2 Conclusions from regression analysis:

1. F-tests show significant linear relations between book-to-market value of equity ratios and changes in market value of equity ratios.

2. All regressions provide some statistically significant results. Where non-significant

results occur, they are mostly found in the later period rather than immediately after the initial market shock.

3. Beta coefficients of changes in market value of equity ratios from the overall sample and the sub-samples are negative and significant at the 1% level for both multiple regression methods at least up to six years (beta 5) after the initial market shock occurs. From the highly-capitalised firms with long useful-life assets sample (only) beta is significant for a shorter period (up to 4 years (beta 3)). The result, for the overall sample, from the fixed effects estimation, is the same as that in *Ryan (1995)*[1]. *Ryan's (1995)* results for the sub-samples are not available. He only provide significance of betas for the overall sample.

4. Beta coefficients of *BMRs* as a function of changes in market value of equity ratios are negative and significant at the 5% level up to 9 years from the short useful-life assets sub-sample. They are negative and significant for the long useful-life assets sub-sample only up to 4 years.

5. The magnitude of beta coefficients of *BMRs* as a function of changes in market value of

[1] Significance level 5%

equity ratios is higher for highly-capitalised firms with short useful-life assets than for highly-capitalised firms with long useful-life assets. Therefore, highly-capitalised firms with short useful-life assets are likely to be more profitable than those with long useful-life assets. This finding coincides with the results of previous research (see Section 4.2.2).

Possible explanations for the difference in negative significant betas (in 4 and 5 above) for highly-capitalised firms between short and long useful-life assets are that:

a) The shorter the average useful-life of assets for highly-capitalised firms the larger the difference between book and market value of equity ratios; hence, the larger the accrual measurement effects.

b) The shorter the useful-life assets for highly-capitalised firms the more the average stock price changes and the less the variability of these changes.

c) The yearly realization of earnings from assets, for highly-capitalised firms, is likely to increase as the useful-life of assets decreases.

d) Fixed assets are depreciated more rapidly for short than for long useful-life assets sub-samples.

e) Short useful-life assets are accompanied by less uncertainty than long useful-life assets. This causes future expectations to be clearer for firms with short useful-life assets than for firms with long useful-life assets.

6. The coefficients of determination (R^2s) are, in general, high. They range from 75.7% to 88.1% in the fixed effects estimation and from 24.1% to 70.8% in the generalised least squares estimation (see Table 8.2 pages 165-166). This difference in R^2s between fixed effects and generalised least squares estimations may be attributed to the firm and time effects that are captured by the fixed effects estimation.

7. The time-period of the negative association between *BMRs* and changes in market value ratios is shorter than the average useful-life of assets for the overall sample and the sub-samples. This may be attributed to a lag between investors' expectations and managers decisions and also may be explained by the market's inability to predict prices clearly.

8. Differences between beta coefficients over time from the selected significance tests for Hypothesis Two, of the two samples for both

the estimation methods, rise towards zero at the second year (see Table 8.7 page 193).

9. The selected tests for significance do not support Hypothesis Three *(H3)* that b_j coefficients are more negative at further lags as the useful-life of assets increases. This can be attributed to:

a) An increase in the level of conservatism and delayed recognition across time (see Section 8.9.3) which may suggest additional management manipulations over time.

b) The longer the average useful-life assets the less are differences between book and market values of equity and, hence, the less apparent are the accrual measurement effects (see Section 8.9.3).

c) For highly-capitalised firms, the longer the average useful-life of assets the lower are average changes in market value of equity ratios (see Table 7.1 pages 144-145) and the higher the variability of the stock prices (see Section 7.9).

10. The value of (F-test) for the predictive ability of the change in market value of equity ratios to predict book-to-market ratios is highly significant at the 1% level. This analysis shows that current changes in market value of equity ratios can explain 29.2% of the variation of future

book-to-market ratios. The correlation between actual and predicted 1996-year *BMRs* is 0.447.

9.3 Discussions

9.3.1 Comparisons with previous research

1. The ability of changes in market value of equity ratios to predict *BMRs* and therefore earnings realisation for the overall sample and the sub-samples from both the two estimation methods is higher for UK firms than *Ryan's* (1995) US firms as shown in Table 9.1.

Table 9.1

The prediction ability of *BMRs*

Comparison between

the UK (1987-1996) and the US (1980-1989) data

(summary of R^2 to illustrate)

Sample		Overall	Highly-	Low-	Highly-capitalised firms	
Estimation method			Capitalised firms		Short	long
					Useful-life assets	
UK	Fixed effects	0.85	0.86	0.84	0.76	0.88
	Generalised least squares	0.64	0.71	0.35	0.24	0.43
US	Fixed effects	0.37	0.35	0.41	0.32	0.61
	Generalised least squares	0.34	0.35	0.33	0.30	0.39

A possible explanation for the higher ability to predict *BMRs* for UK firms during this period could be the prevalence of "short-terminisim" in the UK market.

2. Changes of market value ratios

There is no obvious difference in the median changes of market value ratios between low- and highly-capitalised firms for both sub-samples LMFADPR and HMFADPR it is 0.12). In *Ryan (1995)*, however, the median changes of market value ratios from low-capitalised firms (0.10) is higher than that from highly-capitalised firms (0.06). Hence, we may say that industry share prices in the UK during 1987-1996 are less influenced by "capitalisation" than in the US between 1980-1989.

3. *BMRs* in the UK and the US

It can be seen from Table 9.2 that:

Table 9.2

The median *BMRs*

The overall sample and the sub-samples

The study and prior periods in UK and US

Country	UK		US	
	Period			
Sample	**Study**	**Prior**	**Study**	**Prior**
Overall	0.53	1.10	0.73	0.31[2]
Low-capitalised firms	0.52	1.06	0.59	0.80
Highly-capitalised firms	0.53	1.17	0.84	0.96
Highly-capitalised firms with short useful-life assets	0.53	1.40	0.74	0.86
Highly-capitalised firms with long useful-life assets	0.53	0.97	0.93	1.02

a) *BMRs* are less influenced by accruals in the prior period than in the study period. Also, in the prior period, the accrual effect is less noticeable in the *BMRs* of the UK firms than in the US firms (*Ryan 1995*).

b) The comparison of results between the study period and the prior period suggests that the direction of changes in accruals reflected in *BMRs* in the UK firms are opposite to that in the US firms (*Ryan 1995*). For the study (recent) period, it is obvious that accrual measurement is lower in the sample of US firms than in the sample of UK firms. This situation was the opposite in the prior period. A possible

[2] It may be a typing error in *BMRs* median from the prior period for the overall sample in *Ryan's (1995)* results.

explanation for changes in accruals between UK firms and US firms may be attributed to "short-terminisim" in the UK (discussed further in Section 9.3.2). However, these changes in accruals effects between UK firms and US firms could also be affected by time differences.

c) The median *BMRs* for the overall sample and the sub-samples of UK firms is about the same, while it is different in US firms. A possible explanation is that there is less influence of "capitalisation" and "average useful-life of assets" on *BMRs* of the UK firms than on *BMRs* of the US firms.

4. Price changes and *BMRs*

The results of this study find that share price changes predict *BMRs* for at least six years after the market shock occurs except for highly-capitalised firms with long useful-life assets sub-sample (for which it is 4 years).

This result coincides with *Ryan (1995)*. He finds that, from his overall sample and sub-samples, price changes predict *BMRs* for at least six years after the market shock occurs.

Beaver and Ryan (1996) also suggest that price changes leads earnings changes and book values of equity for as much as six years.

All the results above document the domination of delayed recognition, conservatism and information timeliness in *BMRs*.

5. "Capitalisation" in the UK and the US

"Capitalisation" is higher in US firms (*Ryan, 1995*) than in UK firms as can be seen in Table 9.3. This result could be attributed to a "short-terministic" approach to investment decisions on the part of UK firms.

Table 9.3

"Capitalisation" in the UK and the US

	Overall	Capitalised firms		Highly Capitalised firms	
		Low	High	Short	Long
				Useful-life assets	
UK	0.34	0.24	0.43	0.42	0.45
US	0.46	0.30	0.72	0.61	0.81

6. "Average useful-life assets in the UK and the US

The higher the "capitalisation", the longer the useful-life of assets. Table 9.4 shows that the median useful-life of assets for the US firms from the overall sample and all the sub-samples is higher than that for the UK firms.

Table 9.4

"Average useful-life of assets" in the UK and the US

	Overall	Highly-capitalised firms		Highly Capitalised firms	
		Low	High	Short	Long
				Useful-life assets	
UK	8.65	7.54	10.03	8.57	11.86
US	9.63	7.84	16.18	10.48	25.22

This also may support the "short-terminisim" concept in the UK.

9.3.2 The evolution of *BMRs* and "short-terminisim"

9.3.2.1 *Introduction*

The purpose of this section is to examine the results of the thesis specifically in relation to the concept of "short-terminisim". Following this introduction, key aspects of the results which relate to "short-terminisim" are presented. This is followed by a synthesis of the many individual results to provide a surprisingly clear overall picture of how investors in UK firms with short-lived assets have fared.

The link between this thesis and the concept of "short-terminisim" relies largely on the following results:

1) The ability of changes in market value of equity ratios to predict *BMRs* is higher in UK firms than for US firms.

2) Over the study period, the overall ability of changes in market value of equity ratios to predict earnings is higher for low-capitalised firms than highly-capitalised firms.

3) Highly-capitalised firms with short useful-life assets have a longer prediction period than highly-capitalised firms with long useful-life assets.

4) The magnitude of betas (and therefore earnings) for highly-capitalised UK firms

> with short useful-life assets is higher than for highly-capitalised firms with long useful-life assets.

These results are consistent with the following definition of short-terminisim from *Franks and Mayer (1990)*, page 3.

> "Short-terminisim is a feature of investments in firm-specific assets that have a low resale value outside the firm. Thus it will be less prevalent in the development of oil fields and property sites, than in R + D and training."

The long-life assets sample (for which predictability is found poor in comparison with firms with short-life assets) would include firms with assets such as oil fields and property sites (long-lived assets) whereas those firms with "ideas and short-lived assets" would include firms which, proportionally, spent more on R + D and training. Under *Franks and Mayer's* definition it is in the latter category that "short-terminisim" would be prevalent (consistent with the results of this thesis). The key results, which support this view, are as follows.

a) The length of the period, during which negative significant beta coefficients of *BMRs* are recorded, is longer for highly-capitalised firms with short useful-life assets than for highly-capitalised firms with long useful-life assets. This finding suggests that *BMRs* (and hence earnings) are most predictable for firms with short useful-life assets.

b) For highly capitalised firms, useful life of assets is associated positively with share price fluctuations and the mean of changes in market value of equity ratios is higher for firms with short than for firms with long useful life assets. Thus investment in highly-capitalised firms with short useful-life assets is less risky and more profitable than investment in highly-capitalised firms with long useful-life assets.

c) The coefficient of determination of *BMRs* as a function of changes in market value of equity ratios is higher for low- than for highly-capitalised firms. This suggests that the investment future is clearer for short-term investments than for long-term investments.

d) Accrual measurement is associated positively with "capitalisation". This suggests that conservative accounting and delayed recognition has a larger effect on highly- than low-capitalised firms do.

9.3.2.2 *The overall picture of Short-terminisim in the UK*

From the preliminary statistics it is obvious that "capitalisation" and "average useful-life of assets" are both higher for *Ryan's (1995)* US firms than in the sample of UK firms (see Section 9.3.1). Therefore, "Short-terminisim" would have a higher effect on *BMRs* in the UK firms than in the US firms. The effect of this "short-terminisim" on *BMRs* could be interpreted as either favourable or unfavourable depending on which viewpoint is taken. This section

therefore proceeds with the results of this thesis to show the following favourable effects (for investors):

a) Higher profitability of firms with short-lived assets

The *BMRs* coefficient of determination as a function of changes in market value of equity ratios is higher for low- than for highly-capitalised firms. The magnitude of significant beta coefficients is also higher for highly- capitalised firms with short than with long useful-life assets. Thus low-capitalised firms are more profitable than highly-capitalised firms.

b) Higher predictability of firms with short-lived assets

The "capitalisation" and "average useful-life assets" are both higher in US firms than in the UK firms. *BMRs* in UK firms are found to be more predictable using changes in market value of equity ratios than in US firms. These two results lead us to the conclusion that short-term investment in UK firms is more predictable.

c) The "size of the future" is clearer for UK firms with short-lived assets

The length of the *BMRs* prediction period is longer for highly-capitalised firms with short-lived assets. This result suggests a clearer time-period for the direct investment process in such firms.

d) Lower risk associated with investment in firms with short-lived assets

The variability of changes in market value ratios is lower in highly-capitalised firms with short useful-life assets than in those with long useful-life assets. This lower variability suggests that investment is less risky in capitalised firms with short useful-life assets.

e) Fewer opportunities for "window dressing" for firms with short useful-life assets

The results in this thesis find that accrual measurement is less influential in low- than in highly-capitalised firms. The implication is that there are less opportunities for conservative accounting and delayed recognition which would reduce the lag between market and accounting information.

Grinblatt and Titman (1998), in their book Financial Markets and Corporate Strategies, put forward a view that the incentive of managers to increase current share prices makes managers reluctant to take on long-term investment projects that generate low initial cash flows. They explain that (*Grinblatt and Titman* (1998), pages 637-8)

"The reluctance to take on long-term projects arises because investors understand that managers have an incentive to falsely claim that their investment projects have substantial payoffs several years down the road. However, investors have no way of knowing whether the managers are telling the truth about

> future payoffs or whether they are simply making long-term promises to cover up their current poor performance"

Covering up current poor performance in order to maintain high current share prices would be a motivation towards "window-dressing" which, in this thesis, has been found to be least prevalent in low-capitalised firms.

Low-capitalised firms have therefore not suffered (as much as firms with long-lived assets) from decisions that simply signal favourable signals to shareholders rather than genuinely create value.

In summary, this thesis finds that investors in firms with short-lived assets have been rewarded in their investment activities with

- greater predictability
- higher earnings
- a relatively clear "size of the future"
- greater transparency on both accounting information and market signals.

Part four

Contribution to knowledge and areas for future research

This part of the thesis comprises one last chapter (Chapter 10) which focuses on the contribution to knowledge from the thesis and suggests areas for future research.

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Contribution to knowledge and areas for future research

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Chapter Ten

Contribution to knowledge and areas for future research

This chapter summarises research into *BMRs* to date and explains the contribution towards our understanding of *BMRs* from this particular research into the effects of firm capitalisation and useful life of assets on earnings realization.

10.1 **Summary of *BMRs* literature prior to this thesis**

Before this analysis was undertaken it was apparent (see Section 3.3.8) that:

1. Changes in market value of equity ratios

   a) are a function of *BMRs*

   and

   b) are associated negatively with *BMRs* for up to at least six years after initial market shocks occur.

2. Accrual measurement is influential in *BMRs*.

3. "Capitalisation" and "average useful-life assets" are both associated positively with accrual measurement.

In respect to the relationship between earnings realisation and book-to-market ratios, the timing and duration of earnings realisation is, however, less clear.

10.2 **Aspects of *BMRs* investigated in this thesis**

At the beginning of this thesis, it was explained that the book-to-market ratio, as a reflection of investors' and accountants' views of the firm, has been of interest as a potential indicator of the firm's future performance. Early studies found a significant relation between *BMRs* and earnings.

The research on the existence of a relationship between *BMRs* and earnings realization is strongly agreed upon. There is less agreement on;

a) the usefulness of *BMRs* in searching for profitable investment opportunities.

b) the magnitude and timing of earnings realization.

c) how much *BMRs* are associated with accounting numbers manipulations (smoothing activities) by management, and

d) the usefulness of changes in market value of equity ratios for predicting *BMRs*.

Possible causes of the mixed conclusions from previous studies on these aspects of *BMRs* is a large area which has received considerable attention only recently. Reasons why previous research is inconclusive on such matters is possibly due to a misdirected approach or oversimplification in the choice of variables when testing for relationships. Rather than adopting a simplistic "black box" approach using only the basic variables (ie. changes in market value and book-to-

market value) this research,in addition, used variables which are more reflective of the nature of the firm itself and its assets ("capitalisation" and "average useful-life of assets").

There are many other variables which could be taken into account for investigating the inconsistencies (for example, firm size, stock exchange listing (main or parallel market), degree of separation of ownership from control, domestic vs. international listing, capital structure, the percentage of firms' costs allocated to research etc..). These variables may indeed all be relevant. Further tests using such variables would contribute further towards our understanding of the discrepancies.

10.3 **Contribution to knowledge**

The main contributions from this research are as follows.

1. *BMRs* are useful for predicting earnings.

Book-to-market values of equity ratios predict earnings up to at least six years. A possible explanation is that the difference between assets' book and market values diminishes within the useful-life of the assets and this difference could be being used as a proxy for earnings on assets. The prediction period is limited to 4 years for highly capitalised firms with long useful-life assets while it continues up to 9 years for firms with short useful-life assets.

2. Capitalisation and useful-life of assets influence *BMRs*

The results of the thesis document the domination of accrual measurement in book-to-market value of equity ratios and its increase over the analysis period. This domination for UK firms is negatively associated with "average useful-life assets", contrary to previous research on US firms (using data for 1980-1989). A possible explanation is that smoothing of accounting numbers by management increases over the analysis period (1977-1996) and it is more likely to be noticeable for highly-capitalised firms with short useful-life assets. The larger accrual measurement effect recorded for short useful-life assets firms is more likely attributable to higher share price fluctuations in comparison with firms with long useful-life assets.

The negative association between accrual measurement and useful-life of assets is not just an extension of "what is known about *BMRs*". It casts doubt on previously generally accepted wisdom about *BMRs*. It should not, in future, be assumed that any findings from *BMR* tests on the US market should automatically apply to other markets. The research finds that accrual measurement dominated in *BMRs* and industry share prices are less influenced by "capitalisation" and "average useful-life assets" in the UK than in the US.

3. Relationships between "capitalisation" and share price variability

The variability of changes in market value of equity from low-capitalised firms is higher than from highly-capitalised firms. This suggests that investment in low-capitalised firms

and in firms with short useful-life assets is more risky than investment in highly-capitalised firms and in firms with long useful-life assets (other variables remaining the same).

4. Usefulness of changes in market value of equity for prediction

a) Changes in market value of equity ratios interpret earnings realization up to at least six years, except for highly capitalised firms with long useful-life assets (for which it is up to 4 years). This result coincides with previous research. However, contrary to *Ryan (1995)*, the interpretation period is negatively associated with "average useful-life assets". This opposite result could be explained if short useful-life assets are perceived as being accompanied by lower degrees of uncertainty and if market information accumulates faster for short than for long useful-life assets.

Ryan's (1995) contrary results could also be explained using similar (but opposite) reasoning to allow for a longer-term prospective on the part of US investors.

b) Current changes in market value ratios explain about 30% of the variation of book-to-market ratios 8 years in advance.

5. Predictive ability of equity ratios in the UK

This thesis finds high ability of changes in market value of equity ratios to predict *BMRs* and therefore earnings

realisation. This predictive ability is higher in the sample of UK firms than in *Ryan's (1995)* US firms. The strong prediction ability of *BMRs* of firms with short useful-life assets in the UK could be attributed particularly to a short-terministic approach to investment in the UK market. There are many incentives for management and equity holders to make short-term investments. It seems that, for UK investors, the shorter the investment period the more the earnings realization that is anticipated.

The "short-terminisim" concept, in general, is supported by other findings of this thesis. For example, the shorter the useful-life of assets, the more negative are the beta coefficients of changes in market value of equity and therefore, the higher the earnings realization. This result coincides with *Penman, 1991* and *Fama and French, 1995* (see Section 4.2.2).

Predictability using *BMRs* in the UK is enhanced by the UK's "short-terminism" through the fact that, on average, long-lived assets are less than half of UK industrial companies' total assets. "Capitalisation" and "average useful-life of long-lived assets", on average, are also lower in UK industrial companies compared with *Ryan (1995)* for US companies.

On this point it is interesting to note that many Americans believe that taking care of employees (not maximising stock prices) should be the primary goal of US corporations. A poll taken by *Yankelovich (1996)*[1] showed that 51% of

[1] The Wall Street Journal, Mar. 14, 1989.

Americans think a corporation's top obligation is to its employees, while only 17% think stockholders deserve highest priority.

Finally, the shorter "size of the future" for investment decisions evidenced in the UK in comparison with the US is helpful for prediction purposes.

6. Use of new variable

Using $BV_{i,t-10}/MV_{i,t-10}$ instead of $\Delta MV_{i,t-10}/MV_{i,t-10}$ for examining the evolution of *BMRs* as earnings are realized adds new significant variables to *Ryan's* model *(1995)*. It also increases the magnitude of significance for the independent variables from short useful-life assets firms and decreases it for the independent variables from long useful-life assets firms.

10.4 **Summary of contribution to Knowledge**

There is controversy over the relationship between earnings realisation and *BMRs* which is likely to continue for some time. From the investigation undertaken in this thesis we are now at least clear on the usefulness of changes in market value of equity ratios for informing about *BMRs* when "capitalisation" and useful-life of assets are also taken into account. The methodology applied in this thesis enabled prediction of *BMRs* up to at least six years into the future.

The ability to predict the performance for UK firms is more powerful than for US firms. This could be attributed to the

lower "capitalisation" and shorter "average useful-life assets" of UK firms compared with US firms.

In addition, current changes in market value of equity ratios are found useful for predicting *BMRs* up to 8 years in advance. A comparison of predictability using changes in market value of equity ratios between UK and US markets, unfortunately, is not possible since *Ryan (1995)* did not undertake a predictive test.

The increase of accrual measurement influential in *BMRs* over the analysis period (1977-1996) is also clear. This provides evidence of increased smoothing of accounting numbers over this period.

Finally, accrual measurement (differences between book and market values of equity) in the UK is found to be negatively associated with the average useful-life of firms' assets.

10.5 **Areas for future research**

The investigation into the nature of *BMRs* (literature survey) and the empirical analysis undertaken in this thesis prompts suggestions for future research. It would be useful to undertake the following further studies: -

a) From the thesis

1. Previous research, for example *Pontiff and Schall (1998)*, finds that accounting information predicts market information. Other studies suggest that the relationship is the other way around with market information leading

accounting information. This thesis finds that market information can lead *BMRs* (accounting and market information) up to six years. Therefore, despite the robust findings from this thesis, the direction of causality between accounting and market information is still not clearly determined. It would be worth suggesting that some types of accounting information lead market values whilst some other types lag. Future research should aim at finding out, more specifically, which types of accounting information lead and which lag.

2. It is argued (in the literature) that high (low) *BMRs* are associated with underpriced (overpriced) stocks. The relationships between *BMRs* and changes in market value of equity identified in this thesis (on 1977-1995 data) was tested for predictive ability (using 1996 data). It was discovered that, over the analysis period, investments in low-capitalised firms with short-lived assets were the most profitable. There was no attempt to simulate investment strategies based on the model. Such simulations could be useful towards finding profitable trading rules. There is therefore room for further more simulations of investment strategies using *BMRs* as key variables but also taking "capitalisation" and "useful-life of assets" into account.

3. *Pontiff and Schall (1998)* examine the prediction ability of the Dow Jones Industrial Average Index book-to-market value of equity ratio. They document a structural difference between their pre- and post-1960 sub-samples. The ability of the book-to-market ratio to predict returns dissipates in the second half of the sample. They

explained that this structural difference occurred because the Dow Jones Industrial Average Index became less representative of the equities market as a whole in the post-1960 period.

Could the difference in predictability between pre- and post-1960 be possibly attributed to differences between length of US investors' time horizons?

This thesis found short length time horizon good for predictability. Could such a change have occurred before and after 1960 in the US market? A study of this issue would be interesting.

4. Another potentially fruitful avenue for future research would be along the lines of international comparisons over similar time periods. This thesis compared US and UK firm samples drawn from different periods. Differences between results were found and interpreted for their general significance in relation to the evolution of *BMRs*. Conclusions were drawn in relation to how differences in investment horizons could be influencing the results. However, the comparison was between only two countries. Further tests across many different stock markets, presumably over the same time periods, would enable a much more rigorous analysis to determine whether all the results of this thesis continued to be uphold and, if not, what local market conditions could cause them to be questioned.

b) For further understanding of *BMRs*

1. The influence from changes in accounting methods on *BMRs* is still not clearly determined. Some researchers find

association between changes in accounting methods and *BMRs*. Others find that stock prices act as if investors look beyond accounting numbers and take into account the fact that reported earnings are only being generated by different accounting methods. There is therefore room for further studies of how changes in accounting methods (and what kind) influence *BMRs*.

2. Previous research, for example *Fama and French (1995)*, shows that high *BMRs* reflect the anticipated ability of a company to improve future investment. This association opens the door for new profitable investment opportunities. The direction of this association and its determinants are not clearly examined in the literature. Previous research finds evidence of two opposite directions of causality for the association between growth (value) stocks and current and future earnings. This thesis did not specifically investigate the relationship between *BMRs* and timing of earnings. It did, however, find association between changes in market value of equity ratios and BMRs in relation to capitalisation and useful-life of long-lived assets (ie. the same period). It was previously suggested that the "black box" approach to earnings prediction (using *BMRs* only) is likely to remain inconclusive because *BMRs* alone do not reflect enough information about the firm itself. Perhaps further research into the direction of causality could include additional variables (representing aspects of the firm itself (such as the capitalisation and life of assets variables used in this research)) to gain further insight into when *BMRs* lead earnings and when earnings lead *BMRs*.

Appendices

Appendix 1

Raw data

A.1.1. Book Value of Equity (*BV*)

BV is the total share capital and reserves for the company (including preference capital) thus *BV* consists of: -

A.1.1.1 Equity capital and reserves

The total share capital and reserves excluding preference capital, which consists of: -

A.1.1.1.1 *Ordinary share capital*

All ordinary share capital ranking pari-passu for dividends, including non-voting shares. Partly paid shares are not included here, but are shown in other equity capital.

A.1.1.1.2 *Other equity capital*

This includes deferred, participating preference, savings shares and other shares, which participate in profits, either now or at some time in the future, but do not rank pari-passu for dividends with ordinary shares. Partly paid shares are also included here. (Options and call money is classified under deferred liabilities).

A.1.1.1.3 *Share premium account*

The premium on shares issued net of other amounts arising from the issued and repayment of capital.

A.1.1.1.4 *Reserves*

This comprises the accumulated profit and loss account balances, general and capital reserves, available and non-available reserves, the excess of book value of subsidiaries acquired over their value in the parent company's accounts, investment grants reserves, revaluation reserves and currency and exchange reserves. Attributable reserves of associated companies are also included. Tax exempt reserves are also included.

A.1.1.2 Preference capital

This capital has a fixed dividend and does not participate further in the company's profits. Participating preference shares are shown under other equity capital.

A.1.2. **Share Price** (*SP*)

SP is the closing share price at the end of each year for each company.

A.1.3. **Number of Shares Outstanding** (*NSO*)

NSO is the weighted average number of shares outstanding for each year and company.

A.1.4. **Depreciation expense** (*DPR*)

DPR represents provisions for amounts written off and depreciation of fixed assets and leased assets.

A.1.5. **Total fixed assets (net),** (*TFAN*)

TFAN shows the net total value of land and buildings, plant and machinery, construction in progress and any other fixed assets. Assets leased out are excluded. *TFAN* is calculated as gross total fixed assets minus accumulated depreciation.

A.1.6. **Total assets,** (*TA*)

TA relates to the total assets employed by the company. It consists of the sum of:

A.1.6.1 Total fixed assets (net)

A.1.6.2 Total intangibles

A.1.6.3 Total investments (including investments in associates)

A.1.6.4 Other assets

A.1.6.5 Total current assets

A.1.7. **Market value of equity,** (*MV*)

Market value of equity is calculated by multiplying share price (as shown in item A.1.2 above) by the weighted average number of shares[1] (as shown in item A.1.3 above) at the end of each financial year for each company in the sample.

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[1] The number of shares adjusted for any subsequent scrip or rights issue and used for per share calculations, weighted average number of shares is used in the calculation for UK, US, Canada and Japan only.

Appendix 2

Table A.2.1

Regression of Book-to-Market Ratio on Current and Nine Lagged Annual Market Value Changes and a Ten-Year Lagged Market Value Changes Ratio (1987 to 1996)

Fixed Effects Estimation					
Terms	Overall	Capitalised firms		Highly-capitalised firms	
		Low	High	Short useful-life assets	Long useful-life assets
b_0	-0.72 ** (-18.2)	-0.71 ** (-11.9)	-0.73 ** (-14.1)	-0.71 ** (-9.9)	-0.60 ** (-7.60
b_1	-0.47 ** (-11.3)	-0.48 ** (-7.6)	-0.59 ** (-11.1)	-0.55 ** (-7.6)	-0.46 ** (-5.6)
b_2	-0.53 ** (-13.2)	-0.52 ** (-8.9)	-0.50 ** (-8.6)	-0.45 ** (-6)	-0.33 ** (-3.5)
b_3	-0.26 ** (-5.8)	-0.24 ** (-3.6)	-042 ** (-6.9)	-0.40 ** (-5.1)	-0.27 ** (-2.8)
b_4	-0.20 ** (-3.9)	-0.22 ** (-2.9)	-0.22 ** (-3.8)	-0.43 ** (-4.1)	-0.03 (-0.4)
b_5	-0.39 ** (-7.1)	-0.46 ** (-5.2)	-0.21 ** (-3.4)	-0.27 ** (-3)	-0.08 (-0.9)
b_6	-0.07 (-1.2)	-0.04 (-0.5)	-0.21 ** (-3.1)	-0.24 ** (-2.6)	-0.06 (-0.6)
b_7	0.07 (1)	0.11 (1.1)	-0.12 (-1.6)	-0.26 ** (-2.7)	0.10 (0.8)
b_8	0.39 ** (6)	0.45 ** (4.6)	-0.06 (-0.7)	-0.18 (-1.7)	0.18 (1.4)
b_9	-0.15 (-2)	-0.16 (-1.4)	-0.02 (-0.2)	-0.18 (-1.5)	0.26 (1.8)
γ	-0.02 (-0.8)	-0.04 (-0.9)	-0.01 (-0.4)	-0.04 (-1.7)	0.04 (1.2)
R^2	0.848	0.858	0.842	0.757	0.879
# obs.	930	460	470	230	240

** Significant at 1% level

* Significant at 5% level

Appendix 3

British industrial companies registered on London Stock Exchange
The overall sample

1. AGGREGATE INDUST
2. API GROUP
3. AVON RUBBER
4. BARRATT DEVELOPM
5. BBA GROUP
6. BEMROSE CORP.
7. BERISFORD
8. BICC
9. BLUE CIRCLE INDS
10. BOC GROUP
11. BODYCOTE INTL.
12. BOWTHORPE
13. BPB
14. BRITAX INTERNATI
15. BRIT.POLYTHENE
16. BRITISH VITA
17. BRYANT GROUP
18. BTP
19. BTR
20. BUNZL
21. CHARTER
22. COBHAM
23. COOKSON GROUP
24. COURTAULDS
25. CRODA INTL.
26. DE LA RUE
27. DELTA
28. EIS GROUP
29. ELLIS & EVERARD
30. FENNER

31. FIRTH RIXSON
32. GENERAL ELEC.
33. GKN
34. GLYNWED
35. HALMA
36. HANSON
37. ELEMENTIS
38. HENLYS GROUP
39. HEPWORTH
40. HEWDEN-STUART
41. HEYWOOD WILLIAMS
42. HUNTING
43. IBSTOCK
44. IMI
45. IMP.CHM.INDS.
46. JOHNSON MATTHEY
47. KALON GROUP
48. LAIRD GROUP
49. LAPORTE
50. LONRHO
51. LOW & BONAR
52. MACFARLANE GROUP
53. MARLEY
54. MARSHALLS
55. MAYFLOWER CORP.
56. MCALPINE(ALFRED)
57. MCKECHNIE
58. MEGGITT
59. MORGAN CRUCIBLE
60. MOWLEM (JOHN)
61. PILKINGTON
62. POWELL DUFFRYN

63. POWERSCREEN
64. RACAL ELECTRONIC
65. RENOLD
66. REXAM
67. RMC GROUP
68. ROTORK
69. RUGBY GROUP
70. SCAPA GROUP
71. SENIOR ENGR.
72. SMITH (DAVID S)
73. SMITHS INDS.
74. SPIRAX-SARCO
75. TARMAC
76. TAYLOR WOODROW
77. TI GROUP
78. TILBURY DOUGLAS
79. TOMKINS
80. TT GROUP
81. VERITY GROUP
82. VICKERS
83. VITEC GROUP
84. WADDINGTON
85. WAGON IND.HDG.
86. WASSALL
87. WATMOUGHS HDG.
88. WEIR GROUP
89. WHATMAN
90. WILSON(CONNOLLY)
91. WIMPEY (GEORGE)
92. WOLSELEY
93. YULE CATTO

REFERENCES

Ball and Brown, 1968, "An Empirical Evaluation of Accounting Income Numbers", *Journal of Accounting Research*, Autumn.

Banz Rolf. W., and William J. Breen, 1986, "Sample-Dependent Results Using Accounting and Market Data: Some Evidence", *Journal of Finance*, 41, p 779-793.

Barber B. M. and Lyon J. D., 1997, "Firm Size, Book-to-Market Ratio, and Security Returns: A Holdout Sample of Financial Firms", *The Journal of Finance*, Vol. LH, No.2, June.

Barbee William C., Jr., Sandip Mukherji and Gary A. Raines, 1996, "Do Sales-Price and Debt-Equity Explain Stock Returns Better than Book-Market and Firm Size?" *Financial Analysts Journal*: March/ April.

Beaver W. H., 1998, "*Financial Reporting*", Third Edition, Prentice Hall, Englewood Cliffs, USA.

_____, and S. Ryan, 1993, "Accounting Fundamentals of the Book-to-Market Ratio", *Financial Analysis Journal*, November-December.

Capaul, Carlo, Ian Rowley and William F. Sharpe, 1993, "International Value and Growth Stock Returns", *Financial Analysts Journal*, vol. 49, no. 1, January-February.

Chan Louis K. C., Yasushi Hamao and Josef Lakonishok, 1991, "Fundamentals and Stock Returns in Japan", *Journal of Finance*, 46, 1739-1764.

_____, 1993, "Can Fundamentals Predict Japanese Stock Returns?", *Financial Analysts Journal*, July/August, 63-69.

Chui Andy C. W. and K. C. John Wei, 1998, "Book-to-Market, Firm Size, and the Turn-of-the-Year Effect: Evidence from Pacific-Basin Emerging Markets", *Pacific-Basin Finance Journal*, 6, pp. 275-293.

Davis James L., 1994, "The Cross-Section of Realized Stock Returns: The Pre-Compustat Evidence" *Journal of Finance*, 49,1579-1593.

Fairfield Patricia M., 1994, "P/E, P/B, and the Present Value of Future Dividends", *Financial Analysts Journal*, July/August, 23-31.

Fama Eugene F. and Kenneth R. French, 1992, "The Cross-Section of Expected Stock Returns", *Journal of Finance*, 47, 427-65.

_____, 1995, " Size and Book-to-Market Factors in Earnings and Returns", *Journal of Finance*, 50, 131-155.

_____, 1998, " Value versus Growth: The International Evidence", *The Journal of Finance*, Vol. LH, No. 6, December.

Fischer Black, 1980, "The Magic in Earnings: Economic Earnings versus Accounting Earnings", *Financial Analysts Journal*, November/December.

Franks J. and Mayer C., 1990, "Capital Markets and Corporate Control: a Study of France, Germany and the UK", *Economic Policy*, April.

Grinbalatt M. and Titman S., 1998, "*Financial Markets and Corporate Strategy*", First Edition, McGraw Hill, USA.

Harris Robert S. and Felicia C. Marston, 1994, "Value Versus Growth Stocks: Book-to-Market, Growth, and Beta", *Financial analysts Journal*, September-October.

Holthausen R. W. and David F. L., 1992, "The Prediction of Stock Returns using Financial Statement Information", *Journal of Accounting and Economics*, 15, 373-411.

Hong, H. R. Kaplan and C. Mandelker, 1978, "Pooling vs. Purchase: The Effects of Accounting for Mergers on Stock Prices", *Accounting Review*, January.

Kothari S. P. and Shanken Jay, 1997, "Book-to-Market, Dividend Yield, and Expected Market Returns: A Time-Series Analysis", *Journal of Financial Economics*, 44, 169-203.

_____, Shanken Jay and Richard G. Sloan, 1995, "Another Look at the Cross-Section of Expected Stock Returns", *Journal of Finance*, 50, 185-224.

Molodovsky Nicholas, 1995,"A Theory of Price-Earnings Ratios", *Financial Analysts Journal*, January-February.

Mukherji Sandip, Manjeet S. Dhatt and Yong H. Kim, 1997, "A Fundamental Analysis of Korean Stock Returns", *Financial Analysts Journal*, May/June.

Ohlson James A., 1995, "Earnings, Book Values, and Dividends in Equity Valuation", *Contemporary Accounting Research*, Vol. 11, No. 2, spring, PP 661-87.

Ou Jane A. and Penman Stephen H., 1993, "*Financial Statement Analysis and the Evaluation of Market-to-Book Ratios*", working Paper, University of California at Berkeley.

Peasnill K. V., 1982, "Some Formal Connections between Economic Values and Yields and Accounting Numbers", *Journal of Business Finance & Accounting*, 9, 3, PP 361-81.

Penman Stephen H., 1996, "The Articulation of Price-Earnings Ratios and Market-to-Book Ratios and the Evaluation of Growth", *Journal of Accounting Research*, Vol. 34, No. 2, Autumn.

Pontiff Jeffrey and Lawrence D. Schall, 1998, "Book-to-Market Ratios as Predictors of Market Returns", *Journal of Financial Economics*, 49, 141-60.

Ryan Stephen G., 1995, "A Model of Accrual Measurement with Implications for the Evolution of the Book-to-Market Ratio", *Journal of Accounting Research*, Vol. 33, No. 1, spring.

Wilcox Jarrod W., 1984, " The P/B-ROE Valuation Model", *Financial Analysts Journal*, January/February.

Bibliography

Archibald, T., 1972, "Stock Market Reaction to Depreciation Switch-Back", *Accounting Review*, January.

Ball R., 1978, "Anomalies in Relationships Between Securities' Yields and Yield-Surrogates", *Journal of Financial Economics*, June/September.

Barth, Beaver and Landsman, 1993, "A Structural Analysis of Pension Disclosures Under SFAS 87 and Their Relation to Share Prices", *Financial Analysts Journal*, January-February.

Beaver W. H., 1968, "The Information Content of Annual Earnings Announcements", Empirical Research in Accounting: Selected Studies. *Supplement to the Journal of Accounting Research.*

_____, 1970, "The Time Series Behaviour of Earnings", *Journal of Accounting Research*, Supplement.

_____, Clarke and Wright, 1979, "The Association Between Unsystematic Security Returns and the Magnitude of the Earnings Forecast Error", *Journal of Accounting Research*, Autumn.

_____, and R. Dukes, 1973, "Inter-period Tax Allocation and Delta Depreciation Methods: Some Empirical Results", *Accounting Review*, July.

_____, and Engel, 1996, "Discretionary Behaviour with Respect to Allowances for Loan Losses and the Behaviour of Security Prices", *Journal of Accounting and Economics*, September.

_____, R. Lambert and D. Morse, (1980) "The Information Content of Security Prices", *Journal of Accounting and Economics*, March.

_____, R. Lambert and S. Ryan, 1987, "The Information Content of Security Prices: A Second Look", *Journal of Accounting and Economics*, July.

_____, and Morse, 1978, "What Determines Price-Earnings Ratios", *Financial Analysts Journal*, July-August.

Benston G., 1976, "There is no Real News in Earnings Reports", *Fortune*, April.

_____, 1996, "Published Corporate Accounting Data and Stock Prices", Empirical Research in Accounting: *Selected Studies, Supplement to the Journal of Accounting Research.*

Berk J., 1995, "A Critique of Size Related Anomalies", *Review of Financial Studies.*

Bernard and Stober, 1989, "The Nature and Amount of Information Reflected in Cash Flows", *Accounting Review*, October.

Bill Rees, 1995, "*Financial Analysis*", Second Edition, Prentice Hall, London.

Bodie Z., A. Kane and A. J. Marcus, 1989, "*Investments*", Homewood: Richard D. Irwin.

Brealey Richard A. and Myers Stewart C., 1988, "*Principles of Corporate Finance*", Third Edition, McGRAW-Hill, New York.

Chan Louis K. C., Narasimhan Jegadeesh and Lakonishok J., 1995, "Evaluating the Performance of Value versus Glamour Stocks: the impact of selection bias", *Journal of financial Economics*, 38, 269-296.

Cryer and Miller, 1994, "*Statistics for Business, Data Analysis and Modelling*", Second Edition, Duxbury Press, California.

Fama Eugene F. and Kenneth R. French, 1993, "Common Risk Factors in the Returns on Stocks and Bonds", *Journal of Financial Economics*, 33, 3-56.

Feltham Gerald A. and Ohlson James A., 1995, "Valuation and Clean Surplus Accounting for Operating and Financial Activities", *Contemporary Accounting Research*, Spring.

_____, 1996, "Uncertainty Resolution and the Theory of Depreciation Measurement", *Journal of Accounting Research* 34, 209-234.

Foster George, 1986, "*Financial Statement Analysis*", second edition, Prentice Hall, Englewood cliffs, USA.

Freeman Robert N., James A. Ohlson and Stephen H. Penman, 1982, "Book Rate-of-Return and Prediction of Earnings Changes: An Empirical Investigation", *Journal of Accounting Research*, Autumn, PP 639-53.

Graham B., D. L. Dodd and S. Cottle, 1962, "*Security Analysis: Principles and Techniques*", New York: McGraw-Hill.

Greene William H., 1993, "*Econometric Analysis*", 2d ed., Macmillan, New York.

Gujarati Damodar N., 1995, "*Basic Econometrics*", Third Edition, McGraw Hill, New York.

Haugen and Baker, 1993, "Interpreting the Evidence on Risk and Expected Return: Comment", *The Journal of Portfolio Management*, Spring.

Jeffrey Jaffe, Donald B. Keim and Randolph Westerfield, 1989, "Earnings Yields, Market Values, and Stock Returns", *Journal of Finance*, 44, 135-48.

Keim Donald B., 1983, "Size-Related Anomalies and Stock Return Seasonality: Further empirical Evidence", *Journal of Financial Economics*, 12, 13-32.

Kieso Ronald E. and Jerry J. Weygandt, 1992, "*Intermediate Accounting*", Seventh Edition, John Wiley, New York.

Lakonishok, Shleifer and Vishny, 1994, "Contrarian Investment, Extrapolation, and Risk", *Journal of Finance*, 49.

Loughran Tim, 1997, "Book-to-Market across Firm Size, Exchange, and Seasonality: Is There an Effect?", *Journal of Financial and Quantitative Analysis*, Vol. 32, No. 3, September.

Norman Strong and Xinzhong G. Xu, 1997, "Explaining the Cross-Section of UK expected Stock Returns", *British Accounting Review*, 29, 1-23.

Penman Stephen H., 1991, "An Evaluation of Accounting Rate-of- Return", *Journal of Accounting, Auditing and Finance*, Spring.

Richard Lewis and David Pendrill, 1994, "*Advanced Financial Accounting*", Fourth Edition, Pitman, London.

Rosenberg B., K. Reid and R. Lanstein, 1985, "Persuasive Evidence of Market Inefficiency", *Journal of Portfolio Management*, Spring.

Sloan, 1996, "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows About Future Earnings?", *Accounting Review*, July.

Watts Ross L. and Jerold L. Zimmerman, 1986, "*Positive Accounting Theory*", Prentice Hall, USA.

White, Gerald I., 1998, "*The analysis and use of financial statements*", second edition, John Wiley & sons, INC, USA.