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By

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Statement 1

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Abstract

The study of Islamic finance would not be complete without a thorough understanding of the core Islamic injunction on *ribā an-nasi'ah* that underlies current financial exchanges. However, several studies purport Muslim economic woes to be linked to the rigidities of this injunction. By employing a capital structure model in a rational expectations setting, we justify this religious injunction is in fact welfare-enhancing. This is because it averts: (i) economically inefficient financing structures; (ii) non-sustainable long-run equilibria stemming from the expropriation of wealth; (iii) fragile financial systems; and (iv) financial exclusion. We then present in this study a perspective of a quasi-equity financing tool to calibrate the Islamic financial system. Lastly, we attribute Muslim economic underdevelopment to weak-form property rights and lack of Islamic rulings (*ijtihad*) in the production of new financial instruments, institutions and markets.

The ensuing studies in this collection of Islamic finance essays draws from the above foundational research. Specifically, our second study contrasts an *interest-free* payday loan facility with *interest-based* schemes of mainstream credit and current payday loans. An examination of alternative form of credit facility is timely as inefficiencies in mainstream credit markets have pushed selected households to frequent high cost payday loans for their liquidity needs. Ironically, despite the prohibitive cost there is still persistent demand for the product. This paper rides on the public policy objective of expanding affordable credit to rationed households. Here, we expound a simple model that integrates inexpensive interest-free liquidity facility within an endogenous leverage circuit. This builds on the technology of Rotating and Savings Credit Association/ Accumulating Savings and Credit Association/ mutual/ financial cooperative and cultural beliefs indoctrinated in Islam. Our results indicate the potential economic efficiency of this interest-free circuit in contrast to the competing interest-bearing schemes of payday lenders and mainstream financiers. A version of this essay co-authored with M.S. Ebrahim and A. Jaafar has been accepted in the forthcoming Journal of Economic Organization and Behaviour.

The unravelling of the recent crisis underscores the pertinence of proper loan pricing that strips away the put option to default, particularly where there is extensive churning of the collateral in the financial system. This survey paper, the third in our collection of essays, explores this issue from an agency theoretic perspective of trading financial claims between

risk-averse lender and borrower, in rational expectations and symmetric information setting. Constructing on lender (financial intermediary) asset transformation and public depositor custodial functions, we intuitively deduce the economic efficiency of *pragmatically default-free* solution over *default-prone* one. By enforcing proper structuring of the former, it averts financial fragility and costly bailouts. Furthermore, it endows depositors with similar security of deposit insurance scheme without the associate moral hazard issues. Finally, we detail design of this pragmatically default-free structure that reduces in-moneyness of the put option to default.

Chapter 1: Introduction

1. Motivation of study

The Muslim world till the tenth century was a hallmark of advanced economy surpassing that of Western Europe (Kuran, 2004; Waywell, 2006). However, a snapshot of its present economic state shows otherwise. Despite accounting for nearly 22% of total world population, Muslim countries constitute only 6% of the world's Gross National Income (Pew Research Centre, 2009; World Bank, 2010). Based on the United Nations Human Development Index for 2010, 22 of the 56 Muslim countries received low scores, whilst only four were in the very high categories. Of the 14 Muslim countries included in the Financial Development Index 2010, five remained in the lowest quartile with marked deterioration from the preceding year's ranking (Bilodeau and Harrry, 2010).

What has instigated this apparent economic backwardness? One aspect of these studies proxies on the economics of religion and religious establishment, a field mooted by the seminal work of Weber (1930). Religious values set the 'moral base' that is intrinsic to efficient and sustainable economic growth (Wilbur and Jameson, 1980). Here, religion composing beliefs and values that transcends generations' is treated as endogenous to economic development (Iannaccone, 1998; Acemoglu et al., 2005; Noland, 2005; Guiso et al., 2006). Specifically with regards to the present Muslim state, questions arise: Is Islam, the religion of the land, and its religious establishment inimical to economic growth? Result of studies under this banner remains inconclusive.

Using the World Values Survey dataset to discern religious affinities and degree of religiosity with social attitudes conducive to economic growth, Guiso et al. (2003) observe that Islam is antithetical to financial development and economic growth. They find for example, in states where Islam is dominant Muslims favour less private ownership and competition, which are fundamental market forces. Kuran (2005, 2009), in his understanding of the economic trajectory of the Muslim and Western civilisation, points to Islam's continued prohibition of interest in restraining financial and commercial innovation, which sets the path to present Muslim countries economic degradation. Kuran (2009, p.595) rationalises, "*In regions under Islamic law, and thus subject to a formal [interest] ban, financial development differed from the paths taken in places with liberalized financial*

attitudes. By the middle of the second millennium western Europe was well on its way to a narrow interpretation of the Biblical prohibition of usury. Among Muslims the dominant view remained that all forms of interest are sinful. If the direct effects of this divergence were negligible, the indirect effect had cascading implications for relative economic performance". Archaic forms of financial transactions, accounting practices and organisational backwardness are evidentiary to this religious rigidity.

He contends that Islam essentially prohibits *ribā*, the doubling of debt for every delay in settlement. Thus, the unanimous juridical treatment that construes interest in financial transactions as *ribā* begs questions. Unlike in the Muslim world, "*the separation of church and state early in the second millennium enabled European entrepreneurs to develop institutions within an essentially secular space, and generally without worrying about clerical reactions*" (Kuran, 2008, p.43-44). As with Kuran (2005, 2009), Rubin (2011) analyses the economic impact of this ecclesial doctrine between Muslim and Christian (Western) societies. From a game theory perspective, he argues the prohibition of interest is economically restraining, and its continued persistency in Muslim states has led to this divergent economic path.

According to Kuran (2005), the over extension of the juridical decision proclaiming interest in financial transactions as *ribā* effectively delimits even innocuous interest-based loans. To comply with the letter of the *Shari'ah* (Islamic law) many resorted to '*hilah*' (legal stratagem that abides in form rather than substance of the law) in their financing design that effectively mimics the economic outcome of its mainstream counterpart (see El-Gamal, 2009). This inherent contradiction has precipitated critiques to question how 'Islamic' is Islamic banking? (see Khan, 2010), as this broad-based juridical interpretation is seen inimical to Muslim states' economic efficiency (Kuran, 2005, 2009; El-Gamal, 2009; Rubin, 2011). Furthermore, the application of equity-based contracts such as *mudarabah* heavily promoted by Islamic economists (see Siddiqi, 1983; Chapra, 2006) as solution to interest-based contracts seem distant even after fifty years of the establishment of the first Islamic bank in 1960s.

Contrary to the above, results of several studies such as Ragab (1980), Noland (2005), Chapra (2008) and Grosjean (2011) point to other contributory factors permeating the poverty trap of Muslim states. To Ragab (1980) degeneration of the Muslim world became visible during the Ottoman ruling, particularly in the eighteenth century when its indigenous

institutions failed to develop with times. In response, the political elites built a secular state fashioning the institutions of the West with mixed effects on economic participation by the people within the state. It is the lack of dynamism in *ijtihad* (juridical interpretation and deduction of Islamic sources) that has led to the stagnancy in the development of the *Shari'ah* and this is worsened by the political elites' foreign interest. Similarly, Noland (2005) in his cross-country and within-country panel data studies finds no affirmative evidence that Islam is a drag to economic growth.

In Chapra's (2008) case it is rather the political elites' failure to observe property rights coupled with the supporting decline in factors critical to development (i.e., education, research and development). To maintain their political legitimacy, dissenting jurists were prosecuted whilst others retreated to the confines of the *madrasah* (religious schools). Despondent jurists began to lose touch with the changing economic and legal environment and as such the knowledge related to Islamic jurisprudence failed to expand with the passage of time. The study by Grosjean (2011) reverberates earlier findings on weaknesses of institutions, "*it does not seem that what constituted an obstacle to the development of formal finance is Islam, as a religion, but rather the Islamic institutions implemented by the Ottoman Empire*" (p.13).

2. Rationale and objectives

With the above studies and several others (see also El-Gamal, 2009; Khan, 2010), each research centres on historical institutions and political elites legacies on the financial-economic construct of the Muslim world without venturing on understanding the economic rationale of this divine revelation. Unlike other Abrahamic faiths, religious tenet approbating the application of *ribā* remains the cornerstone of Islam even in commutative transactions. This is derived from the revealed sources (*Qur'ān* – the Muslim Holy Book and *Sunnah* – the Tradition of Prophet Muhammad PBUH) and consensus of Muslim jurists. Except for certain specific rulings, the *Qur'ān* and *Sunnah* mostly contain general guidance particularly with regards to social matters. It is here that the field of jurisprudence plays a critical role in ensuring the embodiment of the *Shari'ah*, such as the *ribā* prohibition.

Jurists hold the *ribā* injunction is of two forms. *Ribā an-nasi'ah* (also known as the evident *ribā*) draws from the *Qur'ānic* verses that renounce the oppressive deferred credit practices of pre-Islamic Arabia of doubling the debt for every delay in settlement (verses

2:275, 2:278-279, 2:281, 3:130-132, 4:161, 30:39), rather lenders are encouraged to grant respite to the borrower (verse 2:280). Furthermore in the revealed texts, *ribā* is directly contrasted with charity (verse 2:276-277, 30:39). The second form, *ribā al-fadl* (also known as the hidden *ribā*) derives its legal legitimacy from the *Sunnah* in relation to spot (barter) exchanges of similar genus without an equivalent counter value. *Ribā al-fadl* is prohibited to block the means that could lead to *ribā an-nasi'ah* (see Ibn Qayyim, 1973).

Inferences on the *ribā* prohibition are meted through legal reasoning (*usūl fiqh*) by Muslim jurists. To date, most of these juridical reasoning centres on extracting the necessary pre-conditions or *ratio legis* (*'illah*) of the injunction from the original Sources in application to current practices (see Kamali, 1996). It is here that the emphasis on the lexical interpretation of the Arabic *ribā* connoting increase or growth, that Muslim jurists have syllogistically confined it to interest operative in financial transactions (see Alfattouh et al., 2006; Al-Zuhaili, 2006). As encapsulated by Khalil (2006, p.55) "*...the controversy over riba is not whether it is legal or not, for the Quran clearly prohibits it. Rather, the debate is over the proper definition of riba and its application to certain transactions, particularly those involving banks and loans*", to the effect that the objective of the *Shari'ah* is relegated to secondary position.[1] If any, discussion by Islamic economists on the objectives is critiqued for its normative economics leanings (see Siddiqi, 1983; Chapra, 1985, 2006).

The blinded focus on the '*illah* of this Canonical injunction has led to the quagmire of present Islamic banking and finance practices and raised critiques from contemporary scholars. Without refuting the immutability of the revealed sources of the *Shari'ah*, we argue that an inquisition on the *hikmah* (rationale) for this prohibition underpinned by financial-economic theory provides a move forward in understanding the Islamic *weltanschauung* (worldview) and shaping the future financial architecture rather than subjugation to legal stratagem. Through this undertaking it forcibly interlinks the divine revelations to the contemporary schematics of economic and finance field. Our application of *hikmah* thus aims "*to solve many of the problems arising from the relationship of knowledge to religion and of knowledge to empirical reality*" (Kamali, 1996, p.5). The collection of essays in this thesis enhances the theoretical groundings of Islamic finance, which is still at a nascent stage

1 According to Al-Zuhayli (2003, p.343), "*the modern usage of the term riba is restricted to returns based on the deferment of payment of debts, which make it analogous to the pre-Islamic riba that multiplies with the passage of time. This is indeed the type of riba al-nasi'ah effected through loans and currency exchanges that is most common in today's economies*".

as well as the design of public policies relating to financial development. Our perspective is also different from Kuran (2005, 2009) and Rubin (2011) as we investigate the ban on *ribā an-nasi'ah* from a fundamental and thorough *Shari'ah* basis to explain the Muslim economic underdevelopment.

3. Thesis organisation

This thesis is a collection of three essays that centres on the prohibition of *ribā an-nasi'ah* (deferred exchanges) proscribed in the Islamic revealed sources and its implications with respect to financial transactions and the development of modern financial exchanges. Each of these essays explores different aspects of this area. The first essay enquires into the economic rationale (*hikmah*) for the Islamic prohibition of *ribā an-nasi'ah*, which differs from identification of the legal cause ('*illah*) dominant in the Islamic juridical approach, and proffers our perspective of the current economic malaise of the Muslim world. Premised on the economic rationale deduced above, we expound a *hybrid* structure that is *Shari'ah* compliant and economically efficient over *pure debt* as well as *pure equity* contracts in the presence of agency cost of debt.

The second essay is rooted in the Islamic religious tenets that discern *ribā* against charity (*sadaqah*).[2] The study expounds an institutional design of an *interest-free* loan facility aimed at smoothing inter-temporal income shocks of households who currently subscribe to the services of high cost payday lenders in recourse to being credit rationed by mainstream financiers. We deliberately explore the economic efficiency of this form of charitable contract due to its direct contrast with *usurious* payday loans and *credit rationing* in mainstream finance. The integration of Islamic cultural beliefs in our model concurs with the religious teachings of other Abrahamic faith such as the Jewish free loan societies for assisting the poor. Furthermore, it supports the 'democratisation of finance' to the masses espoused by Shiller (2008), and demonstrates its functioning beyond the rubrics of philanthropic endeavours suggested by Rahman (1964).[3]

Capitalising on the observations derived from the first essay, the third essay builds on the issue of financial fragility deduced from the economic rationale of the *ribā an-nasi'ah*

2 A version of this essay co-authored with A. Jaafar and M.S. Ebrahim has been accepted in the forthcoming Journal of Economic Organization and Behaviour (see Salleh et al., 2013).

3 See also Shiller (2012) 'Finance and the Good Society'.

injunction. This is discussed in the context of collateralised loan structures given its importance in financial intermediary securitisation and rehypothecation activities (see Gorton and Metrick, 2009; Singh and Aitken, 2010). Moreover, the study on collateralised loan structures merits attention for its inter-linkages with the real economy through the collateral channel (Fisher, 1933; Bernanke and Gertler, 1989; Reichlin and Siconolfi, 2004), and the controversies in the recent financial crisis (Foley and Stothard, 2012; Das, 2013). In the final essay we intuitively discuss the economic efficiency of *pragmatically default-free* collateralised loan with competing *risky* financial contract. In reality, it is very close to a hybrid contract as it makes allowance for equity to go slightly 'underwater'. This makes the structure quasi-Islamic as it resolves fragility and reduces the conflict of interest between borrowers and lenders in accordance with Al-Zuhayli (2003). We further explicate an iron-clad collateralised debt pricing structure that moderates the put option to default in agency cost of debt. This essay is written in a mainstream framework in order to have a stronger and more forceful impact on academics, policy makers and practitioners.

4. Description of thesis and findings

All three essays are guided by the Islamic religious tenets with groundings in economic and finance theory. Although the collection of essays is interlinked by the theoretical study on the economic objectives of this Canonical prohibition of *ribā an-nasi'ah*, each paper is independent of the other and therefore, contains its own literature review.

4.1 Has the prohibition of *ribā an-nasi'ah* hindered the economic development of the Muslim world?

Within the first essay, we critically appraise relevant studies that find the institutionalisation of this tenet retards financial development and hence, economic growth of Muslim countries (see Kuran, 2005, 2009; Rubin, 2011) and questions: (i) Why has Islam prohibited *ribā an-nasi'ah* in financial transactions? and (ii) Has this injunction impeded Muslim economic growth historically? We study the economic rationale of the injunction on *ribā an-nasi'ah* from a capital structure perspective. This approach contrasts to that of Rubin (2011) as we model the conflict of interest (agency perspective) between lenders and borrowers. This approach is consistent with Allen (2001) and is a significant improvement over Rubin (2011) who models the game theoretic perspective of the ruling elite with religious establishment to capture the dominant financial contracting scheme in terms of

interest bearing debt versus equity. Even though this is a rigorous model it fails to capture the agency issues of the conflicting parties to a contract. Our approach involves modelling the trading of *risk-free* and *risky* financial claims against payoffs of the underlying real assets of a project undertaken by a risk-averse financier and entrepreneur-manager. We incorporate the element of default accruing to the financier in the case of risky loans. Our approach of segregating the demand and supply financing functions differs from Modigliani and Miller (1958, 1963) and Miller (1977) in that it: (i) recognises the varying negotiating capabilities of each contracting parties; and (ii) endogenously determines the equilibrium parameters of the loan to derive at a close-form solution. Our loan pricing equilibria entails satisfaction of: (i) *Basic condition*: where in a risk-free loan, project payoffs are strictly positive even in the worst state of the economy. In the case of a risky loan, there exists elements of default in some states of the economy and as such its interest rate and debt ratio is higher than a risk-free one; (ii) *Debt pricing condition*: where both demand and supply functions equate; and (iii) *Asset pricing condition*: price of the project undertaken by the entrepreneur-manager equates the utility derived from the project payoffs.

Results from the model point to the promotion of economic welfare. First, we observe a hierarchy of economic efficiency of risk-free over risky debt in the presence of agency cost. Even when agency cost is low, risky loan is at best at par (*not* economically more efficient) to its risk-free competitor. This accrues from the project risk and cost of default that is incorporated in the debt pricing condition by the risk-averse financier. Our results also point to the amalgamation of Myers and Majluf (1984) Pecking Order Theory (in the absence of asymmetric information) and Myers (1984a) Static Trade-Off Theory (in the absence of taxes). This corroborates the difficulty in disentangling the effects of the competing theories as observed by Leary and Roberts (2010), and Fama and French (1998, 2002, 2005). Second, there is potential for *expropriation of wealth* if the loan is priced such that the interest rate (i) exceeds the unleveraged project returns (expropriation by financier); or (ii) is below zero (expropriation by entrepreneur-manager). [4] Third, given the interconnectedness of the

4 Advocates of libertarianism stress individuals' liberty to conduct. Thus, the issue of expropriation of wealth does not arise when each contracting parties are exercising their rights under the agreed contracted terms (i.e., mutually consenting). In this context, the Islamic prohibition of *ribā an-nasi'ah* would be seen as a paternalistic social policy that creates market friction and impedes efficiency. From an Islamic perspective, although the religion recognises individual private rights, it also forbids exploitative behaviour that is detrimental to socio-economic equity (see Al-Zuhayli, 2003). Rather than an impediment, this is borne from the need to balance once rights against ensuring long-run sustainable social equilibrium. This is evident from the *Qurānic* verse (4:29), "*O you who believe, eat not up your property among yourselves*

financial system, risky debts imbue *financial fragility* since defaults can instigate a negative domino effect in the system and real economy. Credit freeze situation can occur if there is high uncertainty on the solvency position of parties within the market. Fourth, where agency cost of debt deters trading of financial claims resulting in no equilibria (i.e., the three conditions mentioned above are unmet), this results in financial autarky. The breakdown exemplifies *financial exclusion* (outright credit rationing) by the financier. We find the economic efficiency of pure equity contract espoused by Siddiqi (1983) and Chapra (2006) materialises only in extreme cases of agency cost of debt.

The first essay also discusses mechanisms to defray the above mentioned issues. This involves structuring hybrid security that embeds the down-side 'risk sharing' as opposed to 'risk-transfer' in pure debt, with up-side 'profit-sharing' of the residual returns in pure equity contracts. Hybrid structures are malleable as it allows the financier to calibrate the returns in accordance with the project specificities. Apart from this, the participative element if properly structured avoids expropriation of wealth. It is generally economically efficient to pure debt contracts in that the equity option and project collateral moderates risk shifting, underinvestment and debt overhang issues of agency cost of debt. Moreover unlike convertible debt, the entrepreneur-manager retains control of the project even in good states of economy. The efficiency of hybrid securities in development of financial systems and as a continuous-workout financial solution is discussed in Shiller et al. (2013), Ebrahim and Hussain (2010) and Shiller (2008), respectively.

In reprieve to financial exclusion, the essay discusses the importance of developing institutions to fill the financial gap of for-profit financial providers, eg. charitable institutions that do not carry a for-profit mandate.[5] This perspective is elaborated further in our second essay. With respect to the underdevelopment of the Muslim world, we attribute it to the weaknesses of the political elites and Islamic jurists to uphold the essence of the *ribā* injunction in (i) protecting property rights, resulting in economic agents' disinclination to establish formal markets; (ii) structuring efficient fragile free financial contracts, emanating

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in vanity, but let there be among you traffic and trade in good will". We exemplify the expropriation of wealth aspect of pure interest-based debt and discuss the potential solution in Chapter 2 of this thesis.

5 The need to investigate the economic aspect of philanthropy in the 1960s has paved the way for recognition of altruism in economic conduct to the extent that this subject is recognised as a research area on its own right. In Islam, philanthropic endeavour plays a significant role as it accounts for one of the five pillars of Islam and is evident in the revealed sources (eg. *Qurānic* verse 2:276-277, 2:280). The importance of philanthropy in Islamic social development and the various mechanisms deployed are discussed in Chapter 3 of this thesis.

from the *Shari'ah* infatuation to deploy classical commutative contracts without assessing its economic and financial efficiency in present day markets; and (iii) enjoining institutions that assist in the economic pursuits of the underprivileged, with knock on effect on the state's economic sustainability. The significance of all three factors is founded in studies on economic history (Ibn Khaldun, 1967), institutional economics (North, 1981; Acemoglu et al., 2005), financial economics (Fisher, 1933; Minsky, 1992; Shleifer and Vishny, 1997; Johnson et al., 2002; Levine, 2005) and economic development (Beck et al., 2003; Claessens and Laeven, 2003).

4.2 Can an interest-free credit facility be more efficient than a usurious payday loan?

In the second essay, we draw from a survey by the Federal Deposit Insurance Corporation (FDIC) in 2009 that reports cohorts of American households suffering from credit rationing or outright financial exclusion by mainstream financiers. To bridge their consumption needs, these households have had to subscribe to the services of alternative financial service providers including payday lenders. Critiques of the payday loan industry point to the expropriation of wealth associated with this high cost credit. Invariably, studies on payday loans revolves on the credit behaviour of these borrowers, who are said to exhibit naive quasi hyperbolic discounting tendencies, i.e., overly optimistic expectations of future outcomes or ability to absorb future shocks that reflects self-control issues. The other strand of the literature investigates the welfare effects of this form of credit on the borrowers with mixed observations. We depart from this flow of studies by focusing on structuring a financial alternative to high cost payday lending. In particular, the study seeks to answer: Can an *endogenous interest-free* payday loan circuit provide a more efficient credit solution in contrast to current payday lenders and mainstream financiers?

This involves modelling an institutional design that draws from the groundings of institutional economics combined with cultural beliefs (i.e., Islamic charitable teachings). The former emphasises structuring efficient institutions that adapt to the environment to deliver services in a cost effective manner (see Coase, 1937; Alchian, 1950), whilst the latter recognises the instrumental role of beliefs in shaping policies and institutions (see Acemoglu et al., 2005). Endogenous circuit referenced here is synonymous with Rotating Savings and Credit Associations (ROSCA), Accumulating Savings and Credit Associations (ASCRA) and the more advance mutual and financial cooperatives. These establishments are revered for

their developmental role in the nineteenth century (see Commons, 1931; Besley et al., 1993; Bouman, 1995; Dagnelie and Le-May Boucher, 2012).

The assimilation of interest-free loan (*qard*) in our endogenous circuit permits direct contrast of the economic efficiency of this conduit with current usurious payday loans and credit rationing [outright exclusion] by mainstream finance. Furthermore, the application of this interest-free facility is unique as it critically challenges the economic literature that predicates interest as an efficient resource allocation tool. Even the well-known Islamic scholar Fazlur Rahman (1964) argues, "*the rate of interest occupies the same place as price and performs the all-important function that any price-mechanism performs, viz., of regulating the supply and demand of credit and rationing it among customers. If the rate of interest, i.e., the price of loaning money, is reduced to zero, then we would be faced with limited supply and an infinite demand*" (p.37).[6] Unsurprisingly, in closing he states, "*No economy can be built today, nor was one built by our forefathers on qard hassan (qardah-yi hasanah), although private institutions should be encouraged in this direction for purely philantrophic purposes*" (p.39-40).

In our model, risk-neutral economic agents converge to form an endogenous leveraged member-based circuit that offers inexpensive (i.e., interest-free), short-term liquidity facility to smooth their inter-temporal exogenous income shocks. Capital is attained from the members' periodical contributions and each member qualifies for the liquidity facility after satisfying a cooling off period. By pooling member financial resources, it supports mobilisation of funds that would have been kept out of circulation. Aside from this liquidity transformation function, the model demonstrates the risk sharing element of mutual scheme in Islamic insurance (*takaful*) where members guarantee each other from unexpected misfortune. Furthermore, in contrary to Rahman (1964) we demonstrate the structure of endogenous circuits facilitates the availability of funding despite the interest-free financing element.

We include specific instruments to control for adverse selection and moral hazard effect as follows. The periodic contribution (i) moderates adverse selection (especially during the

6 See Section 3 of Chapter 3 on the probable reason for the above comment by Rahman (1964). However, we demonstrate that lending is revived by embedding the interest-free credit facility within a circuit, which promotes group insurance. In particular (Models 2 and 3 in Chapter 3), funding is provided by the temporary idle funds of a proportion of members (non-borrowers/ lenders) to other liquidity strapped members (borrowers).

gestation period), as it reveals the financial status of the prospective borrower through an income constraint; (ii) forms an equity buffer that minimises member default; and (iii) acts as a commitment device that moderates self-control issues. The moral hazard element is addressed by: (i) instituting a loan constraint that is linked to the borrower income capability and circuit resources; (ii) implementing a collateral constraint in the form of a co-signer; and (iii) integrating compulsory financial programs aimed at enhancing the member financial capability.

As mentioned above, our interest-free payday loan facility competes with interest-bearing scheme of mainstream credit and current payday lenders. Through discounting the net financial flows of the circuit (generally the accumulated member contributions less loan disbursement after recoveries from defaulting members and repayment of savings to non-defaulting members) and using net present value to analyse the economic efficiency of these competing facilities, we find the interest-free payday loan is at par with competing (interest-based) solution where the equality sign holds. On the other hand, a resultant greater than inequality sign signifies that the former is economically efficient to its interest-bearing competitors.

4.3 Reinforcing resilience of the financial architecture with default-free collateralised loan

The third essay explores the central issue of financial fragility given the agency cost of debt inherent in interest-based financial contracts. This essay focuses on collateralised loan due to its significant representation in the financial institution balance sheet and intermediation activities. As presently seen, the traditional form of collateralised loan that is tied to real productive sector is now further churned to meet other financial obligations, i.e., securitisation and rehypothecation of debt to fulfil other financial obligations (see Gorton and Metrick, 2009; Singh and Aitken, 2010; Das, 2013). String of defaults permeating the recent financial crisis advocates a review of established literature on the functioning of collateral in moderating agency cost of debt (see Jensen and Meckling, 1976; Myers, 1977; Smith and Warner, 1979a,b; Barnea et al., 1981b). Thus, our third essay is pertinent in that it presents a timely discourse on the riskiness of collateralised loan contract accruing to the *endogeneity* of agency cost of debt (even in symmetric information setting).

Here, we contrast the economic efficiency of *pragmatically default-free* collateralised loan against a *default-prone* (risky) solution. In this essay, we classify a pragmatically default-free solution as one that does *not* allow the put option to default to be significantly in-the-money. That is, the project terminal payoff exceeds the loan balance to its tenure with very high probability. On the other hand, a default-prone solution either has *or* will have a put option to default in-the-money due to the potential default in states of economy. The embedded put option to default is deep-in-the-money the greater the relative divergence of the project payoffs with the outstanding loan. Where the recovery rate is stochastic, this further impinges on its efficiency. If the recovery rate is extremely low, default-prone collateralised loan is untenable resulting in default-free solution as the only economically efficient alternative.

We exemplify the financial ramification of each collateralised loan structure on the asset transformation (loan to deposit payoffs) in the financial system using three different permutations: (i) default-prone collateralised loan payoffs *without* deposit insurance; (ii) default-prone collateralised loan *with* deposit insurance; and (iii) default-free collateralised loan *without* deposit insurance. In the first and second permutation, default-prone collateralised loan leads to financial fragility particularly where borrower equity is deep underwater with spillover effect on the financial intermediary capacity to meet its deposit obligations. However, potential bank run is capped by the presence of deposit insurance. Nonetheless, this does not address the distress state and costly bailout of the intermediary. This is opposed to the default-free loan that allows the intermediary to earn economic surplus by sterilising the put option to default. Furthermore, this preserves the sanctity of depositors' interest without the need to institute a public safety net.

We extend a similar approach to study the liquidity effect of default-free [default-prone] solution to repurchase agreements (repo). The sensitivity of the repo terms to the quality of the underlying collateral highlights the pertinence of proper pricing of the loan to avert default. Flowing from this, we intuitively discuss the pricing of this pragmatically default-free loan structure. The object is to properly price the collateralised loan that restrains the embedded put option to default arising from principal-agent conflict of interest in agency cost of debt. It warrants ensuring that the borrower retains 'skin in the game' that moderates the likelihood of exercising the put option to default, i.e., equity does not enter into a negative region. By addressing the welfare of the principal and agent in the debt pricing, it

moderates financial fragility attributed to the Islamic injunction on *ribā an-nasi'ah*. This study also sets the framework for other research on the economic implication of trading of debt for debt and short-selling, issues that are debatable under the Islamic law.

5. Contributions

5.1 Has the prohibition of *ribā an-nasi'ah* hindered the economic development of the Muslim world?

In the first essay, we unravel the economic rationale for the Islamic *ribā an-nasi'ah* injunction puzzle. By applying capital structure paradigm involving trading financial claims between risk-averse entrepreneur-manager and financier, we deduce this injunction in Islam avoids dysfunctional commutative transactions from four perspectives. First, it mitigates deficient financing structure mired by endogenous agency cost of debt. Second, it curbs expropriation of wealth by each contracting party, which promotes sustainable long-run equilibrium. Third, the resultant effects from the above, contributes towards overall reduction in the financial system fragility. Finally, by ensuring equity in transaction it addresses financial exclusion of borrowers, whose participation may have been previously curtailed by credit terms that expropriates her/his wealth.

The above results debunk the observation of several scholars who deem this Canonical injunction as impeding development of the Muslim world. Instead, we view the economic underdevelopment emanates from the failure to uphold the economic essence of this Islamic injunction, including protection of property rights from expropriation of wealth, promoting robust financial contracts and institution of charitable bodies for the advancement of the underprivileged interests.

Additionally, based on our capital structure approach we observe an amalgamation of the Pecking Order and Static Trade-Off Theories (even with symmetric information and absence of taxes). This concurs with Leary and Roberts (2010), and Fama and French (1998, 2002, 2005) who highlight the difficulty in disentangling the effect of both theories in empirical capital structure studies. From the model, we also observe a hierarchical decreasing economic efficiency of equilibria of risky debt with increasing agency cost of debt.

5.2 Can an interest-free credit facility be more efficient than a usurious payday loan?

In respect of the second essay, it proffers interest-free credit facility as an alternative to usurious liquidity-stripping current payday loans. By this, it also supports public policy objects of extending affordable credit. Our results are distinct for it demonstrates the economic viability of this form of benevolent loan in current financial settings. That is, funding can still be deployed through endogenous leveraged circuit-based structures that pre-date to practices of ROSCA, ASCRA and their modern hybrids; mutual and financial cooperatives. It showcases interest-free credit facility as a financial development tool and challenges the closed view of Rahman (1964) who labels interest-free financing structures to only philanthropic endeavours.

Our interest-free liquidity facility also overcomes the credit rationing by mainstream financiers through 'democratisation of finance' to the masses. The integration of interest-free financing in providing the liquidity facility supports the institutionalisation of charitable mediums mentioned in the first essay above. Furthermore, the structure of our interest-free liquidity facility outlined in the second essay functions as a commitment device to correct partially naive quasi-hyperbolic discounting tendencies associated with payday loan borrowers.

5.3 Reinforcing resilience of the financial architecture with default-free collateralised loan

This essay firstly, demonstrates principal-agent conflict remains even when information asymmetry ceases to be an issue. Second, our study treats agency cost as an endogenous factor relative to other studies on the matter, which potentially points to the disparate empirical results observed by the latter. Third, our approach of segregating the welfare of the parties to contract provides structurally stable equilibria than that of Myers (1984b) and Strebulaev (2007), who aggregates the welfare of both parties. Fourth, our loan pricing model that treats default accruing to agency cost differs from the contingent claims pricing models as follows. The endogeneity of default in the structural-form of Black-Scholes-Merton (1973, 1974) arise from agent-firm value conflict. On the other hand, the reduced-form models of Jarrow-Turnbull (1995) and Duffie-Singleton (1999) treat default as exogenous and centres on pricing the economic cost of default. In terms of public policy

objects, a pragmatically default-free collateralised loan that controls agency cost reduces the financial fragility within the system and averts costly financial institution bailouts.

Chapter 2: Has the Prohibition of *Ribā An-Nasi'ah* Hindered Economic Development of the Muslim World

"Islam's formal commitment to the interest ban deprived the Islamic world of a prime engine of growth".

Kuran (2005, p.603)

1. Introduction

An established body of literature affirms the positive contribution of developed financial systems towards a nation's economic growth. The earliest study on this finance-growth nexus is traced to Bagehot (1878) and Schumpeter and Opie (1934), followed by empirical evidence from Goldsmith (1969) and McKinnon (1973). Financial systems perform a crucial intermediation function. This function serves to ameliorate market frictions accruing from information asymmetry and transaction cost, which impede efficient investment decisions, allocation of scarce capital and transmission of financial transactions (Coase, 1937; King and Levine, 1993). This intermediation function in turn influences capital accumulation decisions and technological innovations that are vital in defining the rate of a nation's long-term economic trajectory (King and Levine, 1993). Whilst traditional intermediation remains an essential functional characteristic of a developed financial system, the growth of financial markets and rise in financial innovations has also precipitated the metamorphosis of intermediation to encompass risk management and risk-trading capabilities (Allen and Santomero, 1997). Of late, research on financial development and economic growth has been augmented with analysis that emphasises the instrumental role of financial development in poverty and income inequality reduction. This is achieved foremost through economic growth and indirectly through the 'McKinnon conduit effect' of savings and the consequent credit channel (Jeanneney and Kpodar, 2011).

Financial development and economic growth are crucial in addressing poverty and income inequality, and perhaps go some way to explain the persistent poor economic

performance of the majority of Muslim countries.[7] Various exploratory studies have sought to identify the causes of this underdevelopment.[8] The motivation for this paper is set-out by Kuran (2005, 2009) and Rubin (2011) who argue that rigidities of the Islamic institutional framework, including the prohibition on interest, have blocked financial modernisation and caused the growth of Muslim economies to falter.[9] The argument goes that this prohibition (together with other constraints) has increased transaction costs, ultimately leading to a long-term drag on Muslim states' economic efficiency (El-Gamal, 2009). It is against this setting that our paper seeks to shed light on the following intriguing questions: (i) Why has Islam prohibited *ribā an-nasi'ah* in financial transactions? and (ii) Has this injunction impeded Muslim economic growth historically?

The strategy adopted in this paper is to first study the prohibition of *ribā an-nasi'ah* from a conventional capital structure perspective illustrated through a pure debt structure and highlights the limitations of this structure and its problems.[10] This involves modelling a pure *interest-based* financing contract between risk-averse entrepreneur-manager and financier, in a simple general equilibrium setting, with the framework of rational expectations.[11, 12]

7 Despite accounting for nearly 22% of the total world population, Muslim countries constitute only 6% of the world's Gross National Income (Pew Research Centre, 2009; World Bank, 2010). Based on the United Nations Human Development Index for 2010, 22 of the 56 Muslim countries received low scores, whilst only four were in the very high categories. Of the 14 Muslim countries included in the Financial Development Index 2010, five remained in the lowest quartile with marked deterioration from the preceding year's ranking (Bilodeau and Harrry, 2010).

8 For studies on Islam from perspective of: (i) historical economics see Ragab (1980); Kuran (2004, 2005, 2009); Rubin (2011) and Grosjean (2011); (ii) political economy see Chapra (2008); and (iii) economic development see Guiso et al. (2003) and Noland (2005).

9 Rubin (2011) is the closest paper to that of ours. Unlike our paper that studies the welfare effects of conflict of interest between borrowers and lenders from an agency theoretic perspective, Rubin's prognosis centres on connecting the economic disparity between Muslim and Christian worlds by modelling the conflict of interest between the ruling elite and the religious establishment in a game theoretic perspective. The outcome of his model is contingent on the extent to which early political authority derived their legitimacy from religious ones. Where there is low dependency, the political elite are more likely to relax interest regulations that impede commerce, this then feedbacks into gradually constricting the powers of the Church. These interactions did not take place in the Muslim world despite similar economic conditions. Our observation on the 'long divergence' of the Muslim world as elaborated in Section 6 of this paper contrasts that of Rubin (2011).

10 It should be noted that our model is conceived in a framework of well-functioning financial and capital markets. This may seem to be inconsistent with the seventh century in Islam, when these markets were absent. Nonetheless, our paper focuses on bridging the rationale for this ban with the issues surrounding it in the literature.

11 We choose the general equilibrium modelling approach due to its rigour and strong following in the academic and policy communities (see Zame, 2007). Additionally, we opt for a setting involving symmetric information, as equilibrium asset prices aggregate and reveal private information (see Biais et al., 2010). This draws upon the Efficient Market Hypothesis (see Fama, 1970; Bray, 1981; Malkiel, 2003). Based on this, financial market participants can easily decipher any private information held by any counterparty through observing their trading patterns.

Consistent with Allen (2001), we incorporate conflict of interest (agency perspective), by segregating the demand and supply side of financing under exogeneity of the costs of bankruptcy.[13, 14, 15] Pure interest-based debt contracts is used due to its connotation with the prohibited *ribā an-nasi'ah* by academics and Muslim scholars. We solve our model and derive results rationalising the injunction. We then link the results with recent literature on charitable teachings that are espoused as an alternative in Islamic scriptures (discussed below).

Our results suggest that the prohibition of *ribā an-nasi'ah* is welfare-enhancing, as it averts dysfunctional commutative transactions. Specifically, it mitigates: (i) deficient financing structures encumbered by the endogenous agency cost of debt; (ii) the market power of lenders or borrowers to expropriate each other's wealth, thereby leading to non-

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12 Maddock and Carter (1982, p.41) define rational expectations as "*the application of the principle of rational behavior to the acquisition and processing of information and to the formation of expectations*". It is *'self-fulfilling*' in the sense that the economic agents form correct expectations, given the pricing model and information (Bray, 1981).

13 Agency cost of debt refers to distortions in managerial decision making that are caused by conflicts of interest between stockholders and debtholders. The finance literature generally attributes agency issues to the presence of asymmetric information from ex-ante adverse selection and ex-post moral hazard issues (see Leland and Pyle, 1977; Harris and Raviv, 1991; Allen, 2001). Financing of real assets in a venture, however, constitutes a special case, where lenders (principals) can decipher any proprietary ex-ante information (i.e., adverse selection) held by borrowers (agents) through: (i) staged financing and board representation in the venture capital industry (see Gompers and Lerner, 2001); (ii) trading financial claims over a multi-period horizon, as illustrated in the literature on insurance contracting (see Cooper and Hayes, 1987; Hosios and Peters, 1989); and (iii) by incorporating amortisation (i.e., a restrictive form of sinking fund provision) in the financial contract (see Wu, 1993). Specifically in our model, the interest-based financing is a collateralised one. Thus, the lender is able to use ex-post information on the risk-return of the collateralised asset to evaluate the potential ex-ante return of the business venture/ project to control for adverse selection issues. On the other hand, moral hazard is addressed by ensuring that the tangible asset is adequately serviced (i.e., properly maintained, insured and payment of relevant taxes).

14 Moral hazard arises when economic agents maximise their own welfare to the detriment of others, especially in situations where they do not bear the full consequences of their actions. They therefore have a tendency to act less carefully than they otherwise would; leaving another party to bear some responsibility for the consequences of those actions (see Kotowitz, 2008). Moral hazard is generally considered in the literature as ensuing from ex-post information asymmetry. This too can be mitigated by underwriting iron-clad covenants in the financial contract (see Smith and Warner, 1979a; Billet et al. 2007).

15 This approach allows us to endogenously determine the equilibrium parameters of a loan. This is contrary to the prognosis of Modigliani and Miller (MM - 1958, 1963) and Miller (1977). The MM model *aggregates* the two adversarial claimants' (debt and equity) objective functions, thereby depriving the analysis of supply and demand functions and hence the optimal pricing parameters of debt. It is construed under risk neutrality (akin to a linear programming model), yielding a multitude of solutions (i.e., the well-known invariant result) in the absence of market imperfections (such as taxes), and a corner solution (i.e., 100% debt financing) under corporate tax deductibility of interest. A crucial assumption of the above invariant result is that individuals resorting to MM (1958) arbitrage have the same negotiating prowess with financiers as available to institutions. It should be noted that the Miller (1977) model is also subject to the same limitations as the MM (1963) analysis.

sustainable long-run equilibrium; (iii) fragile financial systems; and (iv) financial exclusion.[16] Thus, our results not only respond to the puzzle pointed out by Kuran (2005, 2009) and Rubin (2011), but also provide recommendations on structuring the financial architecture of the Muslim world. Our recommendations distinctly differ from notable Islamic economists such as Siddiqi (1983) and Chapra (2006).

The ramifications of our results are profound. We not only shed light on the historic underdevelopment of the Muslim world, but also provide the much needed framework for financial development to stem this decline and invigorate growth. Our results also illustrate the naivety of religious scholars in matters related to financial economics. This should lead to closer scrutiny on their rulings (*ijtihad*) and reopen inquiry (see Hallaq, 1984).

In addition to the above key findings, our capital structure model also reveals an amalgamation of the prominent Pecking Order (in the absence of asymmetric information) and Static Trade-off Theories (in the absence of taxes). This result concurs with Leary and Roberts (2010), Fama and French (1998, 2002, 2005) who highlight the difficulty in empirically separating the capital structure outcomes predicted by each of these two competing theories. Consistent with Jensen and Meckling (1976) and Myers (1977, 2001), we also find in our model a hierarchical order of decreasing economic efficiency of equilibria with increasing agency cost of debt.

This paper is divided into seven parts. Section 2 provides a discussion on interest-based financial practices. Notably, its foundation in the three Abrahamic religions, the subsequent diasporas, and related issues in contemporary financial markets. In Section 3, we develop a capital structure model using pure interest-based debt contract to illustrate the rationale for this prohibition. Section 4 provides a review of a higher form of economically efficient financing structure that moderates expropriation of wealth and financial fragility associated with pure interest-based debt contracts. In Section 5, we discuss the concept of charitable practices in bridging financial exclusion. To complete the paper, we incorporate in

16 Our observations are deduced from the Holy Scriptures of the *Qur'ān* (Muslim Holy Book - translated A.Y. Ali) and *Sunnah* (the Tradition of Prophet Muhammad), and grounded in economic theory. The primary revelations in the *Qur'ān*: (i) renounce those consuming *ribā*, for it leads to expropriating another person's assets or their resources (2:275, 2:278-279, 2:281, 3:130-132, 4:161, 30:39); (ii) ask lenders to give respite to their debtors (2:280); and (iii) contrast charity with *ribā* (2:276-277, 30:39). This is explicated further by the *Sunnah* which identifies the categorical aspects of assets and practices that are subjects of this prohibition (amongst the narrated Traditions of the Prophet relating to *ribā* include Sahih Al-Bukhārī - translated M. M. Khan Vol. 3, 34:2134 and 40:2312; Sahih Muslim - translated N. al-Khattab Vol. 4, 22:1584 and 22:1594).

Section 6 our observation on the central cause of the centuries of Muslim economic underdevelopment. Finally, Section 7 provides the concluding comments.

2. Contours of interest-based practice in antiquity to the modern state

Islam is an Abrahamic faith that shares common ground with various aspects of Judaism and Christianity, including injunction against *ribā* (*Qur'ān* 2:274-280, 3:130, 4:160-161, 42:13) that is widely associated with interest-based commutative exchanges. [17] Etymologically, interest and usury are synonymous, both traditionally having been used to refer to additional payment on money or goods lent. However, there has been a long and an on-going debate over the prohibition of interest and usury by academics and jurists, and whether these mean the same thing. From the stand point of Aquinas and Aristotle, the act of exacting interest is evil, since *"money was sterile and hence that the breeding of money from money is unnatural and justly hated"* (Homer, 1963, p.71). It invades property rights and has even been declared equivalent to robbery; a sin censured under the Seventh Commandment. Nonetheless, beginning from the eleventh century and thereafter, this Canonical understanding took on a more liberal tone. The Reformation by contemporary Christian exegesis marked the delineation between usury and interest. Usury, according to Calvin, relates to excessive interest that adversely impacts contracting parties. This narrow-bound interpretation fitted in well with the emergence of views on risk and time value of money (Mews and Abraham, 2007).[18] It also provided latitude to monetary gains in an economy dogged by inflation and an already weak enforcement system (Koyama, 2010). Interest, as presently practised, is now legalised and deemed as compensation owed to creditors arising from an opportunity loss incurred through lending (Homer, 1963).

As with Judeo-Christianity, the prohibition of *ribā* in Islam is revealed in the *Qur'ān* and reinforced in the *Sunnah*. There is no specific ruling in the original Sources identifying *ribā* with interest. Inferences on the matter are driven by Islamic jurists through the conduct of *ijtihad* (legal reasoning) where the primary aim is to identify the '*illah* (*ratio legis* or pre-conditions) from the original Sources. Generally, Islamic exegesis justify the interest

17 The prohibition is also explicated in the religious books of Judaism (Deuteronomy 19:20) and Christianity (Bible – Ezekiel, 18:8, 13:7, 22:12) (see Cornell, 2006).

18 Weber (1930) argues that the Calvinist doctrine is the impetus for the capitalist spirit. Calvin ascribes that man's predestination lies in application of his labour in worldly activities. This sets forth a paradigm shift in the Christian worldview with respect to economic gains and materialism, precepts which were previously scorned by the Church.

prohibition to a simplistic juristic view of any 'increase or growth' of the principal advanced. This stems from the grammatical delineation of the noun encompassing the Arabic word '*ribā*' (see Alfattouh et al., 2006; Al-Zuhaili, 2006).[19] This is further segregated into evident and hidden interest (see Table 1). The former, also known as *ribā an-nasi'ah*, relates to deferred credit practices of pre-Islamic Arabia, when creditors increased the outstanding debt for delays in settlement by the borrower. Instead of granting financial reprieve, the creditor expropriates the debtor's property, potentially leaving the borrower in a dire financial situation.[20]

Hidden interest or *ribā al-fadl* in the *Sunnah* is prohibited in order to block the means that could lead towards *ribā an-nasi'ah* (see Ibn Qayyim, 1973).[21] This governs deferred commodity exchanges without equivalent counter values, exchange of similar commodity with differing quantities, and trading of money for itself (see Sahih Al-Bukhārī Vol. 3, 34:2134; Sahih Muslim Vol. 4, 22:1584). Economic wise, such transactions involving barter may lead to inequities and abuse, thus impacting either party's property rights.[22] A just exchange of disparate commodities is best served through monetisation of transactions. Therefore, stability of monetary value is of utmost importance and this is only feasible if the currency is not traded for itself (Thomas, 2006).[23]

19 Linguistically, *ribā* in the *Qur'ānic* texts connotes a positive nuance of increase, rise, swell, grow, raise or attributed to the nurturing or teaching (Alfattuoh et. al, 2006; Al-Zuhaili, 2006). It is from the theological context that *ribā* or increase in financial transactions without an equivalent counter value in a commutative transaction is impermissible (Al-Zuhaili, 2006).

20 This is against the *ribā* injunction in the *Qur'ān* (2:279), which calls for preservation of rights of both parties, "*If ye do it not, take notice of war from God and His Apostle: But if ye turn back, ye shall have your capital sums: Deal not unjustly, and ye shall not be dealt with unjustly*". The term 'war' relates to the call for liberation of debtors from unjust dealings and oppressions (Ali, 2002). This is accentuated in the legal maxim '*bi-al-batil'*, which criticises those who consume other people's property without right, and thus causing hardship on the affected person (Ibn Qayyim, 1973).

21 It should be noted that our paper cites the recent publications of early Islamic scholars such as Ibn Khaldun, Ibn Qayyim and Ibn Taymiyah.

22 El-Gamal (2009) rationalises the inequities of the barter economy based on the *Sunnah*, where the Prophet Muhammad is reported to have recommended his companion Bilal to sell low quality dates for money and use the proceeds to buy high quality dates (see Sahih Al-Bukhārī Vol. 3, 40:2312; Sahih Muslim Vol. 4, 22:1594). See also Guriev and Kvassov (2004) for arguments on the exploitative nature of barter transactions.

23 Explicating Aristotle and Aquinas' argument on the sterility of money, Ibn Qayyim (1973, p.264) succinctly explained that "*money is not sought as individual objects, but what is sought is use of it as a means to commodities. If it itself becomes commodities sought as individual objects, then the affairs of the people become corrupted".*

Table 1: Classical *Shari'ah* scholars' perspective on the *ribā* prohibition

Category	
Ribā al-fadl - the hidden *ribā*	***Ribā an-nasi'ah*** - the evident *ribā*
Application	
Relates to spot exchanges	Relates to deferred exchanges
Legal Cause	
Excess in exchange without an equivalent counter value	Delay in payments with an increase above the original amount at the settlement date; or vice-versa (i.e., lowering the debt in return for an accelerated payment)
Specifically prohibited in transactions involving the six commodities in the *Sunnah* (see Sahih Al-Bukhārī Vol. 3, 34:2134; Sahih Muslim Vol. 4, 22:1584). Impermissibility of other commodities is generally based on the nomenclature developed by the *Shari'ah* scholars from the major *Sunni* schools of thought, namely: (i) intrinsic or monetary value; and (ii) volume or weight. However, there are additional conditions that are not shared amongst the major *Sunni* schools, that is: (i) the commodity being edible, nutritious or storable; (ii) the threshold for which the condition on weight or volume becomes applicable; and (iii) the interpretation on 'oneness in kind' or genus of the exchanged commodities. Following this nomenclature, commodities that do not have these characteristics are excluded from the *ribā* prohibition: (i) non-fungibles or (ii) fungibles that are measured by length or counted; which may in effect be significant. For example, in the exchange of animals or cloth.	
Rationalisation	
The *ribā* prohibition is aimed at avoiding exploitation and fraud for the protection of one's property, fairness and justice. The injunction of *ribā al-fadl* arises as blocking means to the evident *ribā* that is preventing access to a greater evil. The restriction on the exchange of the six commodities in the *Sunnah* extends from them, representing food staples and currencies, which during the period of the Prophet Muhammad and Caliphs (successors) were essential for survival and measure of price, respectively.	

Source: Ibn Qayyim (1973), Ibn Rushd (1997), Alfattouh et al. (2006), Al-Zuhaili (2006)

This simplistic juristic explication by classical scholars has led to the quagmire in present Islamic finance. Categorically, there is a narrow and broad interpretation of interest. One interpretation is that the *ribā* prohibition incriminates only excessive amounts of interest and even this restriction may be lifted if there is a greater benefit to be met. This is parallel to the more liberal stance of contemporary Judeo-Christian views and advocated by Muslim scholars such as Al-Sanhuri (1956) and Rahman (1964).[24] In contrast, proponents of a broad

24 Kuran's (2005, 2009) view stems from this liberal stance stated in his paper "*...what the Qur'an explicitly prohibits is riba, an ancient Arabian practice whereby the debt of the borrower doubled if he failed to make restitution on time (Qur'an 2:274-280, 3:130, 4:160-161). Riba commonly resulted in confiscation of the borrower's assets, even his enslavement, so it was a potent source of communal tension. In banning the practice, Islam effectively prohibited enslavement for debt (Rahman, 1964)*" (Kuran, 2009, p.595). Our

interpretation of interest, termed as 'neo-Revivalists' by Saeed (1996, p.2), emphasise the "*permanence and immutability of the rulings or instructions given in the Qur'ān and Traditions*" and object to any fundamental reinterpretation of this Islamic prohibition.

Despite interest being deeply entrenched in mainstream finance, it is not without its critics. Adam Smith and Gilbert K. Chesterton, strong proponents of the free market, faltered at allowing the market rate to find its own equilibrium due to concerns about abuses and the allocation of resources to only a limited segment of society who can satisfy the market rates, whilst disregarding those with pure entrepreneurial capabilities (Jadlow, 1977; Mews and Abraham, 2007). This is mirrored by the present issues of predatory pricing associated with usurious rates, repressive contractual terms, market manipulation and unfair trading that puts the underprivileged at comparatively greater risk (Carr and Kolluri, 2001; Thomas, 2006).[25] From an economic perspective, Minsky (1992) in his financial instability hypothesis alludes to the susceptibility of an interest-based financial system to ruptures from economic and financial disequilibrium. Such shocks can be *exogenous*, led by events in the real sector that impair the debt servicing capability of economic agents (Kindleberger, 2000), or *endogenous* due to the inherent characteristics of the financial system (Fisher, 1933; Minsky, 1992). Thus, it is unsurprising that despite concerted intervention and regulatory policies aimed at attenuating excessive volatilities within the system, an interest-based economy remains susceptible to business cycles extremities.

3. Model development

This essay investigates the welfare effects of interest-based finance and the economic rationale (*hikmah*) for the Islamic injunction from a capital structure perspective, rather than analogical reasoning of the common cause (*'illah*) to which the prohibition in the revealed Sources applies. It also contrasts with Islamic economists who are criticitised for their normative underpinnings (see Siddiqi, 1983; Chapra, 1985, 2006).

perspective is different from Kuran (2005, 2009), as we investigate the ban on interest-based contracting from a fundamental and thorough *Shari'ah* basis to explain the Muslim economic underdevelopment.

25 See Glaeser and Scheinkman (1988) for discussion on usury laws as a form of social insurance and regulatory tool.

We capture these effects by modelling the interaction of two agents (namely, an entrepreneur–manager and a financier) in the business sector of the economy.[26] For simplicity and mathematical tractability, we assume a two period economy. Variables denoted by EM and L signifies that of the entrepreneur-manager and financier, respectively. Description of each variable is provided in sections 3.1 and 3.2. In the model, both agents: (i) are endowed with distinct amounts of numeraire good in our economy $(e_0^{EM}, e_1^{EM}, e_0^{L}, e_1^{L})$, at times t = 0 and t = 1; and (ii) they maximise their respective welfare at t = 0.[27, 28]

There are two types of assets (investments) in our economy, a *real asset* and an *interest-based financial asset*. The *real asset* encompasses a project, whose payoffs at time t = 1 constitutes: (i) a Net Operating Income ($\tilde{q}_1$); and (ii) a terminal value ($\tilde{P}_1$), where $\tilde{q}_1$ and $\tilde{P}_1$ are non-negative random first-order Markov processes whose probability distribution is known to the agents. The *financial asset* includes a plain vanilla risk-free or a risky loan, encumbering the underlying real assets (of the project) and involves the trading of claims against its payoffs. The decomposition of the *financial assets* allows a higher order analysis of the economic efficiency between the two interest-based components.

The variables (described in sections below), representing (i) capital resources: Q^D – amount of numeraire good borrowed (i.e., demand for funds), Q^S – amount of numeraire good disbursed (i.e., supply of funds), P_0 – initial project value, $\tilde{q}_1$, $\tilde{P}_1$; or (ii) consumption parameters of the two agents: $c_0^{EM}, \tilde{c}_1^{EM}, c_0^{L}, \tilde{c}_1^{L}$, are denominated in terms of the numeraire good (in *real* terms).[29] The numeraire good is perishable, which thus warrants the entrepreneur-manager and lender to invest in the real and financial assets, respectively. Our

26 We implicitly assume the existence of *information architecture*, where property rights, foreclosure procedures needed for the underlying real assets of a firm to serve as collateral and accurate methods of valuation are well established (see Levine et al., 2000).

27 Our model employs a two-period version of the well-known Lucas (1978) model to price equity under risk-free and risky debt claims. Extension of model beyond this period enhances symmetric information as multi-period contracting reveals the behavioural preferences of the entrepreneur-manager (see Hosios and Peters, 1989).

28 For simplicity, we assume that the endowments are not stochastic. If they were to be stochastic, then the asset and loan pricing conditions would be contingent on the correlation between the endowment and the portfolio owned by either investor. Nonetheless, the quality of our results would not change with the addition of this intricate feature of the endowment.

29 If $Q^D < 0$, we will invert the model by making the entrepreneur-manager a lender and vice-versa. However, in the model we treat the entrepreneur-manager as having sole access to the project (eg. specialised skill) and the lender does not.

analysis is carried out foremost by modelling both agents in this economy (Sections 3.1 and 3.2), imposing market clearing conditions for both loans and the project (Section 3.3), and solving the model (for the loan amount, fractional investment in the project and interest rate), and the resultant discussion (Section 3.4).

3.1 The entrepreneur-manager (as an *agent* in the financial contract)

The goal of this agent is to optimally undertake 's' fraction of the project and Q^D amount of debt, in order to maximise her expected consumption utility.

$$\text{Max. } E_0\{U(c_0^{EM}) + \gamma U(\tilde{c}_1^{EM})\}$$

$$(\text{in } Q^D, e_0^{EM}, e_1^{EM}, s)$$

subject to her temporal budget constraint

$$c_0^{EM} = e_0^{EM} + Q^D - sP_0 = e_0^{EM} - [sP_0 - Q^D] \quad (1)$$

$$\tilde{c}_1^{EM} = e_1^{EM} + [s(\tilde{q}_1 + \tilde{P}_1) - Q^D(1 + \tilde{i}) \quad (2)$$

Where: $E_0\{\cdot\}$ is the expectation of the entrepreneur-manager at time 0.

$U(\cdot)$ is a strictly concave and twice continuously differentiable (Von Neumann-Morgenstern) utility function.

e_0^{EM} and e_1^{EM} are respective endowments at times 0 and 1.

γ is the discount factor where $\gamma \in (0,1)$.

s is the fractional investment in the project.

Q^D is the amount of numeraire good borrowed.

P_0 is the endogenous price of the project (incorporating all relevant transaction costs).

$\tilde{i}$ is the real interest rate.[30]

$\tilde{q}_1$ is the net operating income of the project.

$\tilde{P}_1$ is the terminal value of the project.

30 It is fixed for a risk-free loan and stochastic for a risky one. In contrast to existing literature (Glaeser and Scheinkman, 1988; Rubin, 2011), we do not distinguish between loans for consumption and those for investment. This is because investments are undertaken by economic agents to smoothen consumption.

$c_0^{EM}, \tilde{c}_1^{EM}$ are the consumption of the entrepreneur at times 0 and 1, respectively.

The budget constraint at t = 0 (Equation 1) illustrates consumption utilisation of the initial endowment (e_0^{EM}), after deducting sP_0 for the purchase of 's' fraction of a project financed by an interest-based loan of Q^D. The budget constraint at t = 1 (Equation 2) incorporates consumption from the future endowment (e_1^{EM}) in addition to the net payoffs of 's' fraction of a project after deducting the loan payment with interest $[s(\tilde{q}_1 + \tilde{P}_1) - Q^D(1+\tilde{i})]$. Therefore, non-project resources ensuing from the initial endowment and loan proceeds are expended in period zero to consume payoffs from project (net of loan payment) in period one.

The Lagrangian L can be written as

$$L = E_0\{[U(c_0^{EM}) + \gamma U(\tilde{c}_1^{EM}) + \lambda_0[e_0^{EM} - sP_0 + Q^D - c_0^{EM}] + \lambda_1\gamma[e_1^{EM} + [s(\tilde{q}_1 + \tilde{P}_1) - Q^D(1+\tilde{i})] - \tilde{c}_1^{EM}]\}$$

The First Order Necessary Conditions (F.O.N.C.s) are:

(i) At the optimum, the benefit of borrowing is equal to its associated cost. This simplifies the *demand* function for the loan described as follows. The inter-temporal marginal rate of substitution (IMRS) of the entrepreneur-manager $[IMRS_{EM} = \gamma(\frac{U'(\tilde{c}_1^{EM})}{U'(c_0^{EM})})]$ times the compound factor, consisting of one plus the real rate of interest, is equal to the unit value of funds loaned.

$$\gamma E_0\{\frac{U'(\tilde{c}_1^{EM})(1+\tilde{i})}{U'(c_0^{EM})}\} = 1 \qquad (3)$$

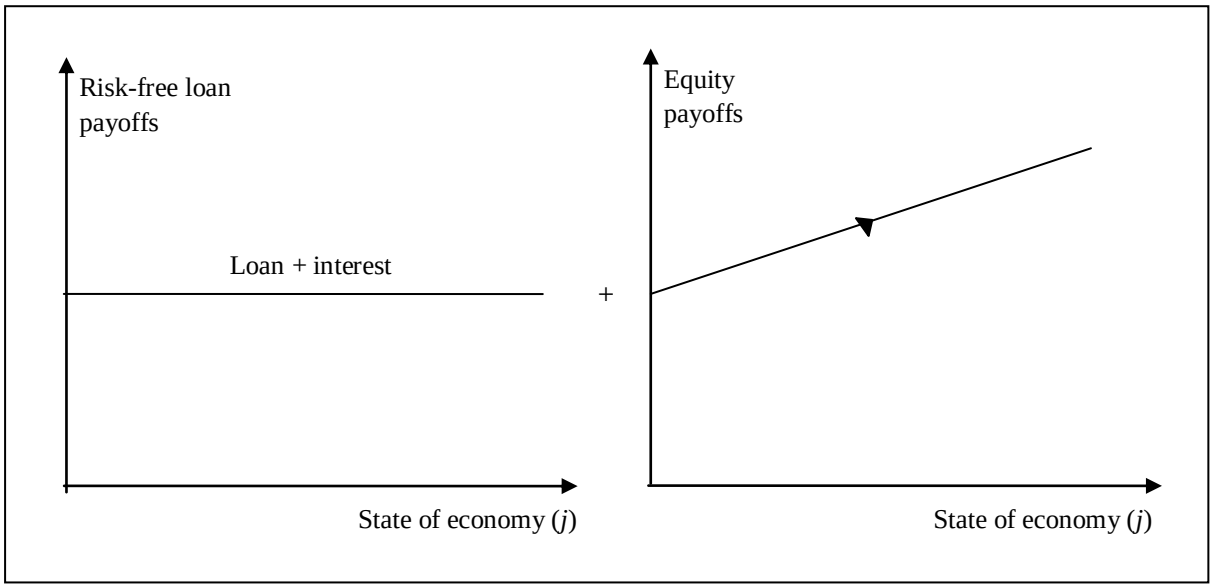
For a risk-free (RF) loan (see Figure 1) Equation (3) can be rewritten as

$$\gamma E_0\{\frac{U'(\tilde{c}_1^{EM})(1+i_{RF})}{U'(c_0^{EM})}\} = 1 \qquad (3a)$$

Figure 1 illustrates the profile of loan payoffs in *normal* (default-free) states of the economy. The model assumes only two claimants to the project payoffs, the lender and

entrepreneur-manager. The equity payoffs reflect that the latter earns the residual value after meeting the loan and interest accruing to the lender.

Figure 1: Risk-free loan and equity payoffs



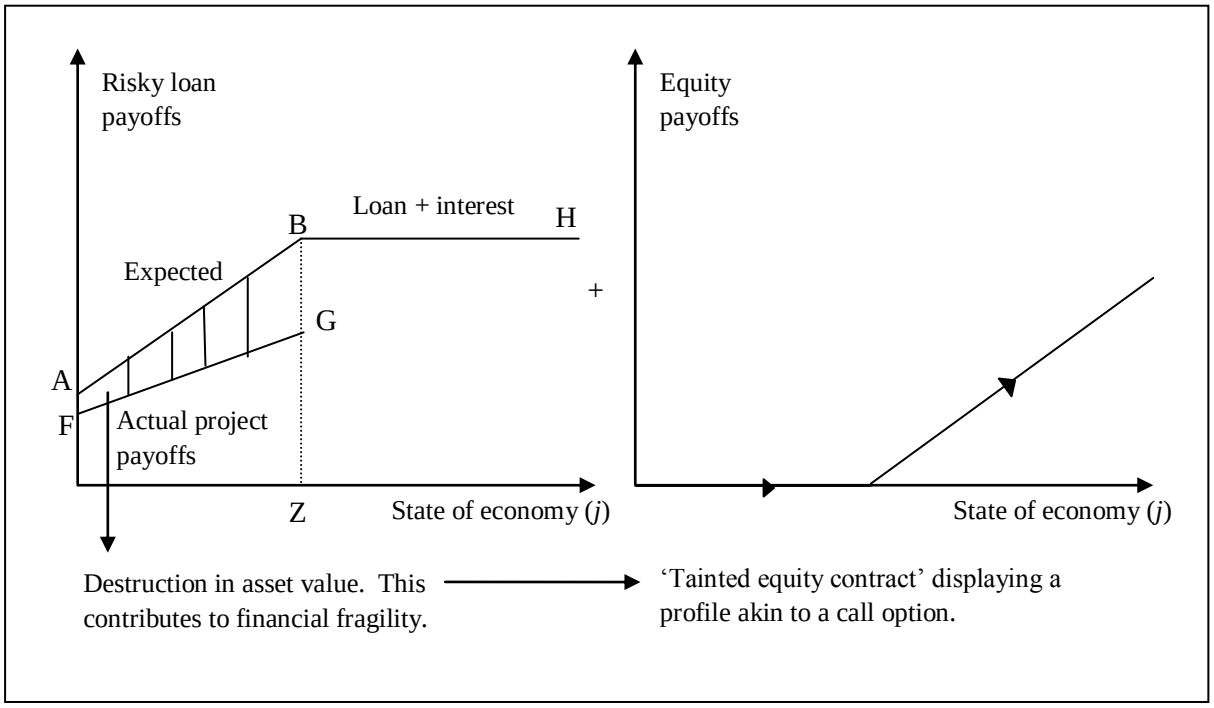
For a risky loan (see Figure 2), Equation (3) can be rewritten as

$$\gamma\int_{0}^{Z}\frac{U'(\tilde{c}_{1j}^{EM})[\tilde{q}_{1j}+\tilde{P}_{1j}]}{U'(c_0^{EM})Q_{Risky}^{D}}dj+\gamma\int_{Z}^{\infty}\frac{U'(c_{1j}^{EM})[1+i_{Risky}]}{U'(c_0^{EM})}=1 \qquad (3b)^{31}$$

Unlike the risk-free alternative, Figure 2 of Equation 3(b) incorporates two integral components: (i) *default* states (AFBG) before reaching the critical state 'Z'; and (ii) *normal* states above it. The critical state 'Z' is defined as the future state of the economy up to which the entrepreneur-manager is technically in default of her loan obligations, that is $Q_{Risky}^{D}(1+i_{Risky})>(q_{1j}+P_{1j}),\forall j\le Z\cdot$

31 The notation *dj* is defined as follows: $dj = f(q_{1j} + P_{1j})d(q_{1j} + P_{1j})$, where $f(\cdot)$ represents the joint probability density function of $(q_1 + P_1)$.

Figure 2: Risky loan and equity payoffs



(ii) At the optimum, the entrepreneur-manager will only bid for that fraction of a project that makes the net benefit of ownership equal to zero. Similarly, she will avoid investing in a project if net benefits are less than zero. This simplifies the *demand* function for a project described as follows. The price of the project bid by the entrepreneur-manager is equal to the IMRS of the entrepreneur-manager ($IMRS_{EM}$) times the proceeds from the net operating income plus the residual value.

$$P_0 = \gamma E_0\{\frac{U'(\tilde{c}_1^{EM})[\tilde{q}_1 + \tilde{P}_1]}{U'(c_0^{EM})}\} \tag{4}$$

For a risk-free loan, Equation (4) retains as follows

$$P_0 = \gamma E_0\{\frac{U'(\tilde{c}_1^{EM})[\tilde{q}_1 + \tilde{P}_1]}{U'(c_0^{EM})}\} \tag{4a}$$

For a risky loan, Equation (4) can be rewritten as

$$P_0 = \gamma \int_z^{\infty} \frac{U'(\tilde{c}_1^{EM})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{U'(c_0^{EM})} dj \tag{4b}$$

It should be noted that a risky loan is welfare reducing, as the entrepreneur-manager loses her key asset in the default state of the economy (AFBG), below the critical state ‘‘Z’ (see Figure 2).

3.2 The lender (as the *principal* of the financial contract)

Similar to the previous case, the goal of the lender is to optimally fund the project with Q^S amount of debt to maximise his expected consumption utility.

$$\text{Max. } E_0\{V(c_0^L) + \gamma^L V(\tilde{c}_1^L)\}$$

$$(\text{in } Q^S, c_0^L, c_1^L)$$

subject to his temporal budget constraint

$$c_0^L = e_0^L - Q^S \tag{5}$$

$$\tilde{c}_1^L = e_1^L + Q^S(1+\tilde{i}) \tag{6}$$

Where: $V(\cdot)$ represents a strictly concave and twice continuously differentiable (Von Neumann-Morgenstern) utility function of the lender. Finally, the notations with primes have the same meaning as that for the entrepreneur-manager.

The budget constraint at t = 0 (Equation 5) denotes consumption stemming from the initial endowment (e_0^L) after disbursing a loan of Q^S. The budget constraint at t = 1 (Equation 6) represents consumption resulting from the future endowment (e_1^L) along with the net reimbursement of the loan payment with interest $[Q^S(1+\tilde{i})]$. Here too, non-project resources emanating from the initial endowment are expended in period zero to consume loan payoffs in period one.

The Lagrangian L can be written as

$$L^L = E_0\{[V(c_0^L) + \gamma^L V(\tilde{c}_1^L)] + \lambda_0^L[e_0^L - Q^S - c_0^L] + \lambda_1^L\gamma^L[e_1^L + Q^S(1+\tilde{i}) - \tilde{c}_1^L]\}$$

The F.O.N.C.s is:

(i) At the optimum, the benefit of lending should equal its associated cost. This simplifies the *supply* function for a loan, described as follows. The IMRS of the lender ($IMRS_L$) times the compound factor, consisting of one plus the real rate of interest is equal to the unit value of the funds loaned.

$$\gamma^L E_0\{\frac{V'(\tilde{c}_1^L)(1+\tilde{i})}{V'(c_0^L)}\}=1 \tag{7}$$

For a risk-free loan Equation (7) simplifies to

$$\gamma^L E_0\{\frac{V'(c_1^L)(1+i_{RF})}{V'(c_0^L)}\}=1 \tag{7a}$$

For a risky loan Equation (7) simplifies to

$$\gamma^L k\int_0^Z \frac{V'(\tilde{c}_{1j}^L)[\tilde{q}_{1j}+\tilde{P}_{1j}]}{V'(c_0^L)Q_{Risky}^S}dj+\gamma^L\int_Z^\infty \frac{V'(\tilde{c}_{1j}^L)[1+i_{Risky}]}{V'(c_0^L)}=1 \tag{7b}$$

Equation (7b) is derived by decomposing the expectation operator in Equation (7) into two integral components: (i) incorporating *default* states (AFBG) prior to the critical state 'Z'; and (ii) *normal* states above it (see again Figure 2). The first integral reflects the fact that, in bankruptcy, the lender recoups a fraction 'k' (i.e., recovery rate) of the NOI (net operating income) plus terminal value of the project by foreclosing it on default.[32] In contrast, the second integral reflects full contractual payments of principal and interests in the *normal* states of the economy.

A unique constrained maximum of both agents' objective function (under each of the risk-free and risky loan) requires that the following conditions are satisfied: First, the deterministic budget constraint (at t = 0) represented by Equations (1) and (5), along with the stochastic budget constraint (for each state of the economy at t = 1) as depicted by Equations (2) and (6) are satisfied; Second, the simplified versions of the F.O.N.C.s, i.e., Equations (3a)/(3b), (4a)(4b) and (7a)/(7b) are satisfied. The second order conditions for a maximum

32 This assumption implies (1-k)% is the sum of direct and indirect costs of loan default.

are automatically satisfied, based on Chiang's (1984) result for a strictly concave and twice continuously differentiable utility function with linear constraints.

3.3 Market clearing condition and regulatory constraint

The following conditions are necessary for equilibrium:

(i) For the debt market to be in equilibrium:

Funds Borrowed (Q^D) = Funds Lent (Q^S). (8)

(ii) For the asset (project) market to be in equilibrium:

The fractional ownership of a project owned must total 100%. Since entrepreneurs do not like to relinquish control of the venture to financiers (Jensen and Meckling, 1976; Sargent, 1987).

$$s = 1 \quad (9)$$

3.4 Model solutions

Assuming competitive markets and no initial capital constraints, *two* unique and distinct Rational Expectations Equilibria (REE – implying a maximum of two equilibria) are feasible for the risk-averse entrepreneur-manager under interest-based risk-free and risky loan features, upon satisfaction of their F.O.N.C.s, as derived in Sections 3.1 and 3.2.

3.4.1 Necessary conditions for model solutions

Proposition 1: A REE for a risk-free loan requires satisfaction of the following necessary conditions:

(i) Basic Condition: The payoffs of a project (composed of the sum of its NOI plus terminal value) are strictly positive even in the worst state of the economy (in the following period). That is, min. $(q_{1j} + P_{1j}) > 0$. This requires the underlying real assets of the project to be of high quality. This condition is consistent with the prognosis of Shleifer and Vishny (1992).[33]

33 Shleifer and Vishny (1992) find liquidation value as a significant factor in debt capacity decisions. This is also found in Benmelech et al. (2005).

(ii) Debt Pricing Condition requires equality between the *demand* and *supply* functions for loan financing.

$$\gamma E_0\{\frac{U'(\tilde{c}_1^{EM})(1+i_{RF})}{U'(c_0^{EM})}\} = \gamma^L E_0\{\frac{V'(c_1^L)(1+i_{RF})}{V'(c_0^L)} = 1 \qquad (10a)$$

The above equation implies that for equilibrium to exist, the IMRS of both agents in the economy must adjust to solve for the unique price of the loan in terms of the interest rate and the loan amount.

(iii) Asset (Project) Pricing Condition requires the price of the project bid by the entrepreneur-manager to be equal to the expected value of the product of the IMRS of the entrepreneur-manager ($IMRS_{EM}$) times the project payoffs stemming from the NOI and the terminal value.

$$P_0 = \gamma E_0\{\frac{U'(\tilde{c}_1^{EM})[\tilde{q}_1 + \tilde{P}_1]}{U'(c_0^{EM})}\} \qquad (11a)$$

Proof: See the Appendix.

Proposition 2: A REE for a risky loan requires satisfaction of the following necessary conditions:

(i) Basic Conditions: (a) The loan is structured in such a way that it involves default in some state of the economy in the following period; (b) The interest rate contracted for the risky loan is greater than that for the corresponding risk-free loan solution determined above; (c) Finally, the debt ratio for the risky loan is greater than that for the corresponding risk-free loan solution determined in Proposition 1.

(ii) Debt Pricing Condition requires equality between the *demand* and *supply* functions for risky loan financing.

$$\gamma\int_0^Z \frac{U'(\tilde{c}_{1j}^{EM})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{U'(c_0^{EM})Q_{Risky}^D}dj + \gamma\int_Z^\infty \frac{U'(c_{1j}^{EM})[1+i_{Risky}]}{U'(c_0^{EM})} =$$

$$\gamma^L k\int_0^Z \frac{V'(\tilde{c}_{1j}^{L})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{V'(c_0^{L})Q_{Risky}^S}dj + \gamma^L\int_Z^\infty \frac{V'(\tilde{c}_{1j}^{L})[1+i_{Risky}]}{V'(c_0^{L})}dj = 1 \qquad (10b)$$

(iii) Asset (Project) Pricing Condition requires:

$$P_0 = \gamma \int_z^{\infty} \frac{U'(\tilde{c}_{ij}^{EM})[\tilde{q}_{1j} + \tilde{P}_{1j}]}{U'(c_0^{EM})} dj \qquad (11b)$$

Proof: See the Appendix.

3.4.2 Key results

3.4.2(a) Theorem

Project financing is undertaken in an *economically efficient* financial package that minimises the *endogenous* agency cost of debt. The following general results can be inferred from the model. First, if agency cost (stemming from the risk of the project and the costs of default) is low, then the risky loan is at best economically at par or neutral (and *not* economically more efficient) to its risk-free competitor. It also depicts a hierarchical order of decreasing economic efficiency with increasing agency cost of debt (attributed to default costs). In either case, the loan is priced to satisfy the Basic Condition, Debt Pricing Condition and Asset Pricing Condition described in Propositions 1 and 2. In the case of a risky loan, the debt pricing condition incorporates the risk of the project that is transmitted to the lender along with the costs of default (see Equation 10b). Our result also indicates an amalgamation of the Pecking Order Theory (in the absence of asymmetric information, i.e., by internalising the agency cost of debt – see Myers and Majluf, 1984) and Static Trade-Off Theory (in the absence of taxes, i.e., due to consumption smoothing – see Myers, 1984a). This, thus, debunks the criticality of asymmetric information and taxes that belies both theories, respectively.

Second, the equilibria indicate the potential of either lender or entrepreneur-manager to expropriate wealth from each other if $i > r_{unleveraged}$ *or* $i < 0$, respectively, where $r_{unleveraged}$ is the expected unleveraged return from the project.[34, 35] To mitigate expropriation of wealth by

34 Expropriation of wealth by either lender or entrepreneur-manager need not necessarily exist in only uncompetitive markets (see discussions by Bond et al. (2009) on mortgage financing market, Henderson and Pearson (2011) on structured financial instruments, Palank (2010) on real estate financing, and Harding et al. (2010) on emergency credit facilities provided by the Federal Reserve).

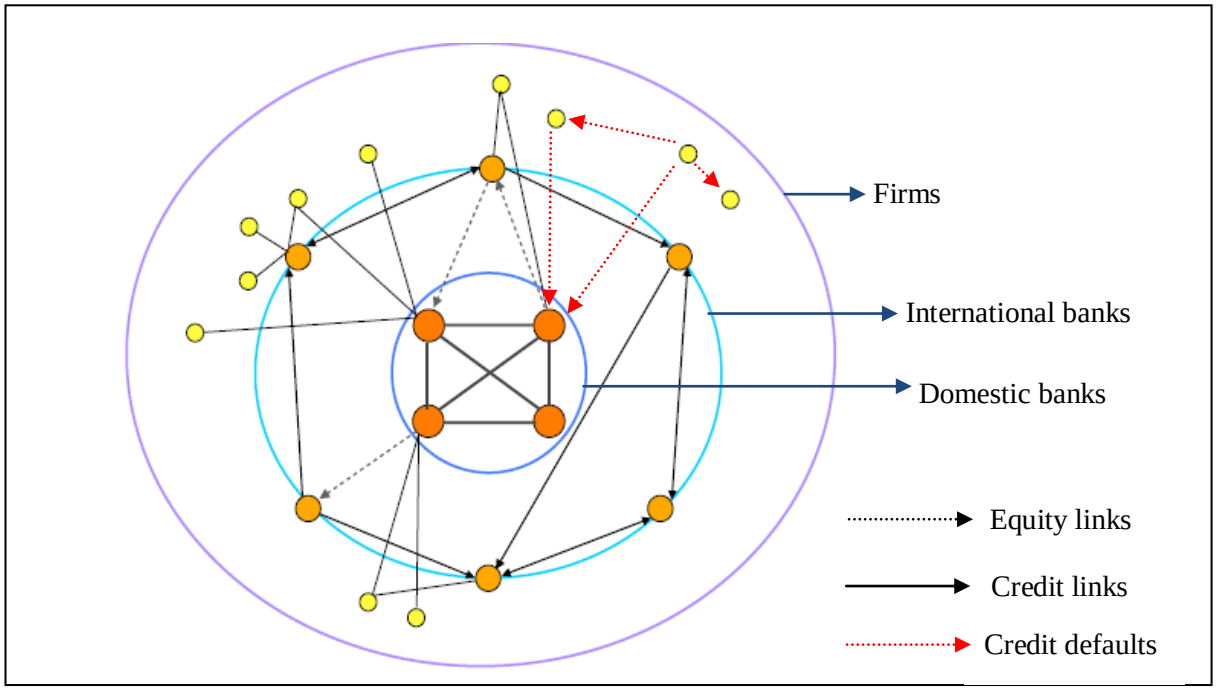
35 If our two-period (i.e., short-run) economy is extended to a multi-period (i.e., long-run) one, both solutions, that is $i > r_{unleveraged}$ or $i < 0$, yield non-sustainable equilibria. Intuitively, the entrepreneur-manager (or financier) will exit the project (or the financial intermediation market) respectively, if their resources are progressively dissipated.

either lender or entrepreneur-manager, we posit that a just and an equitable return should be, as a rule of thumb, within the following bounds:[36]

$$0 \leq i \leq r_{unleveraged} \quad (12)$$

Third, the economically neutral risky debt solution conveys fragility to the financial system. This is due to the interconnectedness of businesses and financial markets (Anand et al., 2013). When the entrepreneur-manager defaults, this can have a domino effect on her suppliers as well as clients. If suppliers and/or clients are serviced by the same financial institution, this has an overall negative impact on the financial system (see Figure 3). Where there is a high level of uncertainty regarding the solvency of the firm or financial institution, this can lead to a freeze in trade and/or credit markets (see: (i) Akerlof (1970) for an example of a breakdown in the used car market; and (ii) Milne and Wood (2008) on the impact of a credit freeze ensuing from the bankruptcy of Northern Rock in the United Kingdom). In the worst case, it could exacerbate systemic risk and cause financial contagion in neighbouring networks.

Figure 3: Stylised financial system network



Source: adapted from Anand et al. (2013)

36 An alternative payoff structure based on a collateralised financial package is discussed in Besley and Ghatak (2009, p.21). The authors posit that for proper recompense of the lender, his risky interest rate should be supported by the collateral value of the pledged asset and opportunity cost of the loan. It should be noted that this result is derived in a partial equilibrium framework (assuming the *exogeneity* of default) in contrast to our general equilibrium one with *endogeneity* of default.

Fourth, if the three conditions (i.e., Basic Condition, Debt Pricing Condition and Asset Pricing Condition) in Propositions 1 or/and 2 are not satisfied, we will fail to have an equilibrium. This implies that *endogenous* agency cost of debt deter the exchange of financial claims leading to autarky. This situation is akin to financial exclusion of the entrepreneur, which necessitates intervention in the market. An example of government policy intervention is the Small Business Administration (SBA) in the United States, established to assist entrepreneurs with low cost loans by providing credit guarantees.[37] The Islamic equivalent is the employment of charitable sources to nurture those borrowers who are not catered for by mainstream intermediaries.

Proof: see the Appendix.

3.4.2(b) Explanation of the above results

The presence of agency cost of debt stemming from project volatility and asset recovery rates (default risk) influences the hierarchical order of economically efficient financing structures. First, the prominence of the risk-free loan equilibrium under zero agency cost of debt is consistent with the prognosis of Myers (2001, p.96) who states that, "*Conflicts between debt and equity investors only arise when there is a risk of default. If debt is totally free of default risk, debt holders have no interest in the income, value or risk of the firm. But if there is a chance of default, then shareholders gain at the expense of debt investors*". Second, risky loan equilibrium is contingent on the high risk-tolerance of lenders and low costs of default. This facility is at best economically neutral to that of a risk-free loan. With the occurrence of default, lenders recoup only a fraction of the projects terminal value, whilst in a normal state, the lender secures full payment of his principal and the contracted interest. Additionally, risky loans also suffer from underinvestment issue discussed in Myers (1977). From the perspective of the entrepreneur-manager, risky loans are welfare reducing, since the lender embeds the default cost when pricing the loan, which is borne by the entrepreneur-manager. Finally, where the quality of the underlying asset is poor or there is excessive cost of default, leverage is not feasible, leading to autarky. This result is

37 See Garvin (1971) on presence of capital gap for small businesses, particularly in the context of minority enterprises in the United States.

aligned with Jensen and Meckling (1976) who argue that in extreme situations, the entrepreneur-manager is left to bear the brunt of the agency cost of debt.[38]

Thus, our results illustrate an amalgamation of the Pecking Order Theory (in the absence of asymmetric information) and the Static Trade-off Theory (in the absence of taxes), attributed to endogenising the agency cost of debt and consumption smoothing.[39] This is corroborated empirically in Leary and Roberts (2010, p.348), who state: "*...a number of studies have shown that information asymmetry is neither necessary nor sufficient for a financing hierarchy to arise..... Myers (2003) illustrates how incentive conflicts, in the sense of Jensen and Meckling (1976) can generate a similar pecking order because the costs of private benefits stay internalized with a debt issuance but are shared with outside shareholders with an equity issuance*". The criticality of tax shields is empirically contested in Fama and French (1998), where this is reiterated in their subsequent paper (2005, p.580): "*The tax benefits of debt in enhancing market values have also proven elusive in direct tests*". Additionally, our results highlight the frustrations of researchers such as Fama and French (2002), who find it difficult to demarcate the impact of the two competing theories. The futility of such attempts is voiced in their extensive empirical study on firm financing (2005, p.580-581): "*...it is probably time to stop running empirical horse races between them (i.e., pecking order and trade-off theories) as stand-alone stories for capital structure. Perhaps it is best to regard the two models as stable mates, with each having elements of truth that help explain some aspects of financing decisions*".

The likelihood for expropriation of wealth increases where credit markets are fragmented, and worsens with borrowers' poor credit ratings (Bhaduri, 1973). Lenders may engage in predatory pricing to induce default as a means to expropriate further wealth from the entrepreneur-managers (Bhaduri, 1977; Bond et al., 2009). This is despite the lenders' awareness of the existing poor prospects of the entrepreneur-managers. Bond et al. (2009) maintain that such financing with intention to expropriate wealth exacts borrowers' welfare in the form of: (i) equity stripping from the value of the project; and (ii) income stripping linked to the servicing of the loan up to its foreclosure. Even prime borrowers (i.e., those of lower

38 Our result contrasts with Aggarwal and Yousef (2000) who assume the existence of incomplete market that is invariant to mechanisms deployed to attenuate the twin issues of adverse selection and moral hazard (see Footnotes 13 and 14).

39 The need for consumption smoothing is reiterated in Jensen and Meckling (1976, p.343), "…e*ven in the absence of these tax benefits, debt would be utilized if the ability to exploit potential profitable investment opportunities is limited by the resources of the owner*".

risk) are exposed to expropriation, specifically where the equity value of the project is significant. Such market power abuses can trigger breakdown of morality and trust in the market with repercussions akin to Akerlof's (1970). Expropriation risk from the agency cost of debt also arise where: (i) entrepreneur-managers are incentivised to transfer downside risk of the project to lender (Smith and Warner, 1979a; and Barnea et al., 1981a, term this as risk shifting or asset substitution); or (ii) when they refrain from investing if the generated wealth is perceived to flow solely to the lender (Myers, 1977, terms it as the underinvestment issue). In the case of negative equity or investment 'underwater', the entrepreneur-manager can inflict harm on the lender by engaging in strategic default (Foote et al., 2008).

The economic neutrality of risky debt highlighted in our Theorem illustrates that pure interest-based debt contracts promote financial fragility. This accrues to the inflexibility of the arrangement to market changes. This is because financing terms based on projected returns "*...contain innumerable variables...Only in imagination can all these variables remain constant and be kept in equilibrium"* (Fisher, 1933, p.337), and "*[a]s long as loan contracts are expressed in conventional nominal terms, a high and variable rate of inflation—or more precisely a significant degree of uncertainty about the future price level—can play havoc with financial markets*" (Modigliani, 1974, p.1). With pure interest-based loans, the entrepreneur-manager is obliged to discharge the loan payment schedule irrespective of the state of the economy, and this is particularly onerous where project cash flows are depressed. Figure 2 illustrates the difference between the theoretical or expected payoffs (ABH) with the real project outcome (FGH). The extent of the departure erodes the project's margin of safety that protects the entrepreneur-manager. This in turn intensifies the project's leveraged position, which represses its investment value and heightens financial distress.[40] The ability to raise additional or new financing would be affected due to erosion in the entrepreneur-manager's credit rating and net worth resulting in a case of 'debt overhang'. Although it is possible to remediate the loan contract, it is nonetheless a costly option (Myers, 2001). When equity goes 'underwater', it becomes negative and serves as a 'free option' to the entrepreneur-manager, who may change her investment strategy by undertaking more risk. This change in behaviour is termed as moral hazard. As the entrepreneur-manager has 'no skin in the game', she may strategically impair the underlying assets of the project or as illustrated in Figure 2, cause destruction to its asset value. Ultimately, she may resort to

40 The *Qur'ān* (2:280) calls for creditors to provide latitude to debtors faced with financial hardship. In the second half of the same verse, the *Qur'ān* enjoins a greater reward to those who forfeit the said debts.

strategically default on the project. Apart from the above, we also find issues with pure interest-based debt structure even during good states of the economy. Specifically, it suffers from underinvestment and risk shifting issues due to agency cost of debt.

Our results that link pure interest-based loans to financial exclusion augment existing studies that confine this issue to only resource, self-exclusion, conditions, price and marketing (Kempson et al., 2000). The pervasiveness of financial relations in societal functioning causes those having financial difficulties in accessing these services to not only being socially excluded, but also triggers other socio-welfare issues (see (i) HM Treasury (2004) on spillover effects of financial exclusion; and (ii) Gloukoviezoff (2007) on '*financialisation of social relations*' paradox). In absence of financing from mainstream financial institutions, these economic agents resort to high cost alternative financial service providers for their financing needs (Kempson et al., 2000; HM Treasury, 2004).

3.4.2(c) Illustrative numerical example

Model calibration

The following numerical simulation illustrates the potential expropriation of wealth by either financier (lender) or entrepreneur-manager (borrower) in the model presented in Sections 3.1 and 3.2. Parameterisation in this simulation follows that of Mehra and Prescott (1985). As mentioned, both entrepreneur-manager and lender seek to maximise their expected consumption utility, i.e., smooth their consumption streams from periods of high endowments to those of low endowments. Due to the entrepreneur-manager budget constraint, she seeks to raise the requisite funds from the debt market in the form of a risk-free or risky loan.

We endow the entrepreneur-manager in our model with 'm' endowment (wealth multiple) of the lender in both periods, t = 0 and 1. The values of endowment for both economic agents are as follows. The endowment of the entrepreneur-manager (e_0^{EM}) is assumed to be (e – x), while that of lender (e_0^{L}) is assumed to be (e + x). The two are related as defined by the equation: (e + x) = m(e – x), where m = 1 to 10. We also assume the sum of the endowments of both parties in the beginning (t = 0) is 2 (i.e., $e_0^{EM} + e_0^{L} = 2$), while at the end of the period (t = 1) is 0.2 (i.e., $e_1^{EM} + e_1^{L} = 0.2$). We solve for the individual

endowments over the two periods by alternating the values of m ranging from 1 to 10, where m = 1 illustrates homogeneity of wealth, while m > 1 illustrates heterogeneity of the same.

Behaviour of both economic agents is represented by a Constant Relative Risk Aversion (CRRA) utility function, with the coefficient of risk aversion α ranging from 0.25 to 5. For mathematical tractability, we assume the project follows an equi-probable binomial distribution with the following payoffs: min. $(q_1 + P_1) = 1 - \sigma$ and max. $(q_1 + P_1) = 1 + \sigma$, where the risk of the project varies from σ = 0% to 25%. For simplicity, we assume there is just one binomial tree for the joint payoffs. As with Mehra and Prescott (1985), the discount factor is set at γ = 0.99.

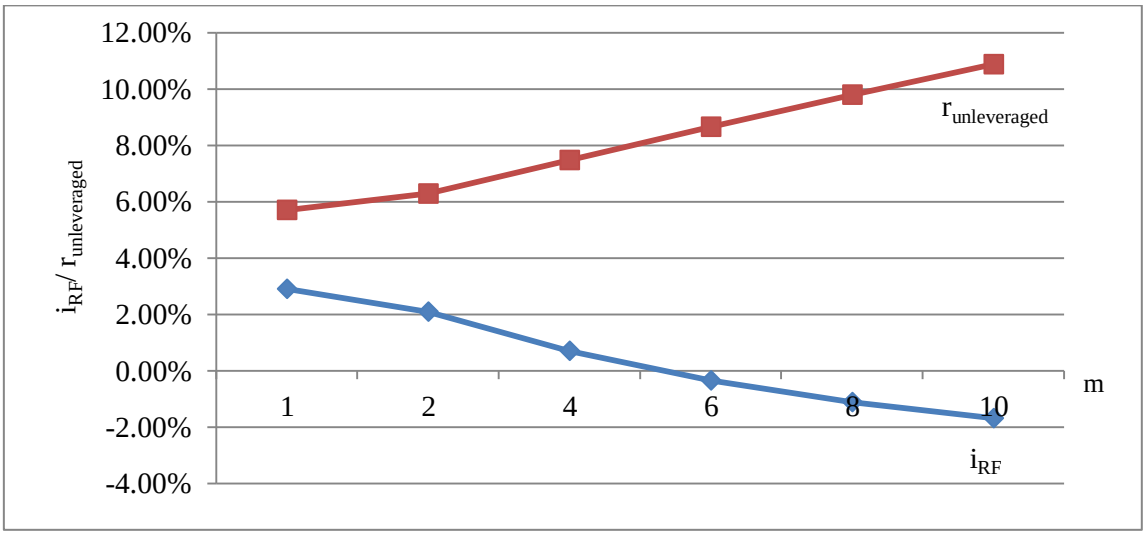
Model Solution[41]

We solve simultaneously the debt pricing and asset (project) pricing conditions for the risk-free loan model comprising Equations (10a) and (11a). Figure 4 illustrates our results for risk-free interest rates (i_{RF}) and the unleveraged project returns ($r_{unleveraged}$) in relation to the wealth multiple (m). An increase in wealth (i.e., m) for lenders, leads to a decrease in the interest rates (i.e., i_{RF}). This accrues to consumption smoothing and reduction of effective risk aversion due to wealth effects (see Guiso and Paiella, 2008).[42] Where m > 5, we observe expropriation of wealth of lender by borrower as the unleveraged project return is greater than the equilibrium risk-free loan interest rate, i.e., $r_{unleveraged} > i_{RF}$. Changes in m from 1 to 10 (not illustrated here) also lead to an increase in the debt ratio. This is attributed to the expansion of the supply of loan (due to a decrease in interest rate) and a simultaneous decrease in the value of the project value as illustrated in Figure 4 (increase in $r_{unleveraged}$).

41 The simulation is computed using Mathematica 8 software package.

42 Due to the above mentioned inter-relation in the endowment for both agents, whereby an increase in wealth for the lender leads to a simultaneous decrease in the same for the entrepreneur, this results in heightened risk aversion for the entrepreneur-manager. In accordance with Guiso and Paiella (2008), this thus leads to (i) reduction in the entrepreneur-manager project price bid (sP_0); and (ii) an increase in the unleveraged project returns ($r_{unleveraged}$).

Figure 4: Risk-free loan interest rate (i_{RF})/ unleveraged project returns ($r_{unleveraged}$) relationship with wealth multiple (m)



Next, we solve for the risky loan debt pricing and asset (project) pricing conditions comprising Equations (10b) by varying the costs of default (1–k%) and Equations (11b), respectively. As a base case of our model solution, we assume (i) highest project risk of σ = 5%; and (ii) wealth multiple m = 10. For this particular wealth multiple, we realise endowment for the entrepreneur-manager at t = 0 and t = 1 of e_0^{EM} = 0.18182 and e_1^{EM} = 1.8182, respectively. On the other hand, the endowment for the lender is e_0^{L} = 0.018182 (t = 0) and e_1^{L} = 0.18182 (t = 1). At the selected project risk of σ = 25%, we do not realise any solution for coefficient of risk aversion $\alpha > 0.25$. This thus demonstrates that a low risk aversion level leads to unique solution illustrating the above point of view of leverage along with consumption smoothing. On the other hand, a high risk aversion level leads to autarky (i.e., no solution).

Table 2 illustrates the equi-efficient solutions, where the lender prefers the risky loan, whilst the entrepreneur-manager prefers the risk-free alternative. The choice of the lender is attributed to expropriation of wealth by him, as the equilibrium risky loan interest rate is greater than the unleveraged project return, i.e., $i_{Risky} > r_{unleveraged}$, for default costs (1–k%) ranging from 0 to 0.1.[43] Note that for values of k below 0.8, there are no risky equilibrium indicating the detrimental impact of agency cost of debt in pure interest based loans. The

43 This implies a recovery rate of $0.9 \leq k \leq 1$.

entrepreneur-manager preference for risk-free loan is attributed to the expropriation of wealth by her as the interest rate is less than zero, at i_{RF} = -1.69%.

Table 2: Simulation results for risk-free and risky loans with risk aversion level $\alpha^{EM} = \alpha^{L} = 0.25$

Case A (Risk-free loan)							
	P_0	Q	Debt ratio (%)	$r_{unleveraged}$ (%)	i_{RF} (%)	SumU(Eq)	SumU(D)
	0.90193	0.7710	85.48	10.87	-1.69	0.56245	2.64019
Case B (Risky loan)							
k	P_0	Q	Debt ratio (%)	$r_{unleveraged}$ (%)	i_{Risky} (%)	SumU(Eq)	SumU(D)
1.00	0.9302	0.8181	87.95	7.50	11.09	0.5199	2.7422
0.95	0.9149	0.7998	87.41	9.30	11.43	0.5251	2.7434
0.90	0.8989	0.7805	86.83	11.25	11.73	0.5308	2.7438
0.85	0.8819	0.7602	86.20	13.39	11.95	0.5372	2.6355
0.80	0.8638	0.7386	85.51	15.77	12.07	0.5443	2.6256

Notes: The model is solved for the endogenous variables P_0, Q and i where P_0 is the price of the project, Q is the loan amount, and i is the interest rate. These are used to derive the values of the sum of expected utilities of the entrepreneur and the lender, denoted as SumU(Eq) and SumU(D), respectively. The exogenous parameters are assumed to be as follows: (i) all agents have CRRA utility, α^{EM} (coefficient of risk aversion) = α^{L} = 0.25, γ (discount factor) = 0.99, endowments for the periods t = 0 and t = 1 are: e_0^{EM} = 0.18182, e_0^{L} = 1.8182, e_1^{EM} = 0.018182, e_1^{L} = 0.18182; and (ii) the income plus liquidating value of the project follows an equi-probable binomial distribution such that: min $(q_1 + P_1)$ = 0.75 and max $(q_1 + P_1)$ = 1.25.

4. Mechanism to mitigate expropriation of wealth and financial fragility

Given this essay's argument and other studies highlighting concerns on the expropriation of wealth and fragility of a financial system built centrally on pure interest-based debt contracts, a more fundamental step is required to calibrate the core microstructure of financial contracts. Studies on optimal capital structures such as Smith and Warner (1979a) and Billet et al. (2007) provide some initial solutions. Our paper extends the framework of Ebrahim and Hussain (2010) augmented with that of Shiller (2008) on quasi-equity structures (see Figure 5) that incorporates risk sharing between the lender and entrepreneur-manager.[44]

44 Information asymmetry has been cited as one of the reason for Islamic financial institutions' reluctance to fully deploy profit and loss sharing financial modes (Kuran, 1995). The primary reason for the prevalence of debt based contracts is for mitigation of the twin issues of information asymmetry and moral hazard. These are easily resolved in the business sector of the economy, as elaborated in Footnotes 13 and 14.

This participatory structure is attractive, for it ranks higher than pure interest-based debt, and is generally preferable to a convertible debt. First, if this is configured to avoid expropriation of wealth, it leads to a more equitable resource allocation and enhances accountability in the project. Second, quasi-equity structures exhibit economic efficiency along with a reduction in financial fragility (see Corollary p.160 in Ebrahim and Hussain, 2010).[45] Its malleability allows moulding the returns based on various combinations of the project specific value generation; namely appreciation, income or equity based (see Figure 5). The lender may choose to subsidise the project's capped fixed lease payment in return for a share in the appreciation (Shared Appreciation Debt - SAD) or income (Shared Income Debt - SID) in excess of the critical capped amount of the project. Alternatively, he may choose a Shared Equity Debt (SED), where he then becomes a co-owner of the project and shares in the income of the operations. Through this, the lender can fulfil his financial objectives as well as map his risk preferences.[46] Third, the options embedded in a quasi-equity contract provide the 'equity kickers' for alleviating risk-shifting or asset substitution issue of agency cost of debt (see Barnea et al., 1981a). These 'equity kickers' enhance efficiency arising from the diversification within the financing structure as well as long run returns attributable to the equity returns.[47] Fourth, the project collateral of tangible assets mitigates other aspects of agency cost of debt associated with underinvestment and debt overhang issues (see Shleifer and Vishny, 1992). Nonetheless, agency issues can still emerge in the extreme situation of the SED. This reflects the criticality of agency costs in capital structuring decisions.[48] Finally, in contrast with convertible debt, quasi-equity contract allows the entrepreneur-manager to retain control rights over the project even in good state.

On a macroeconomic perspective, a financial system operating on a participative mode exhibits loss enduring capacity due to the direct linkage between the banks' assets and liabilities side. Furthermore, a financial system, that allows quasi-equity participation by

45 Shiller (2008) views that quasi-equity structures (such as continuous-workout mortgages proposed by him) allow the continuance of the project despite faced with economic volatility. This averts accumulation of problems to that of crisis level, which would in the current form of interest-based debt financing, trigger foreclosure calls by the lender (see also Shiller et al., 2013).

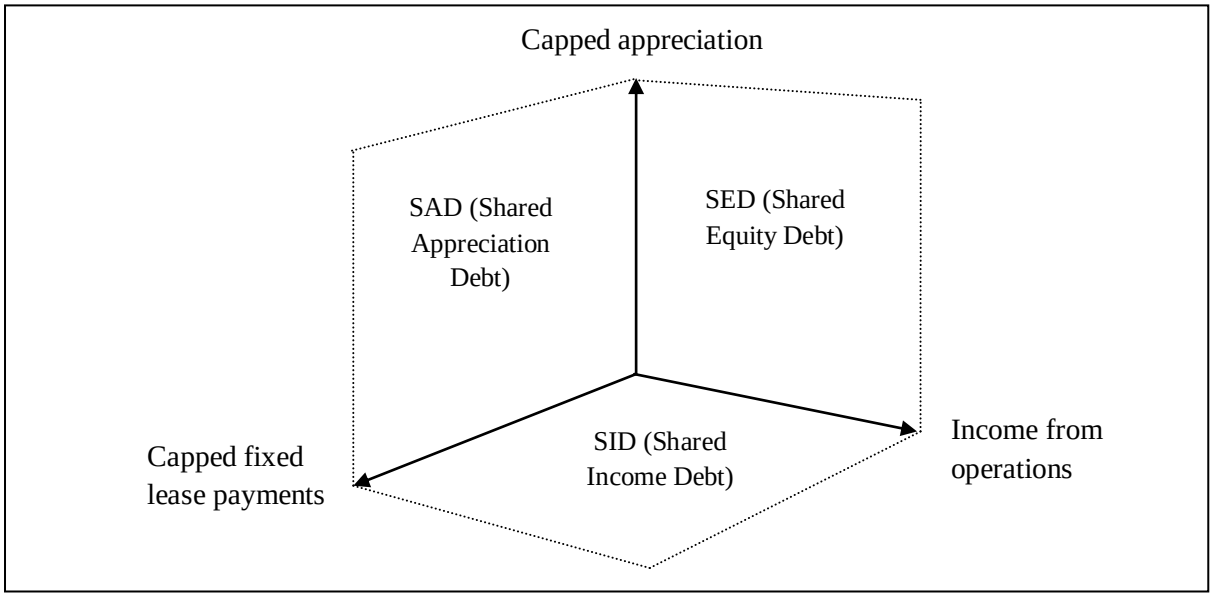
46 Its malleability can address the concerns on reward-risk continuum raised by Kuran (1986). A hybrid facility can also be employed as a primary funding vehicle as well as a workout one in the aftermath of a default.

47 This concurs with established literature on portfolio diversification theory and empirical findings on the equity premium puzzle (see Markowitz, 1952; Mehra and Prescott, 1985; Kocherlakota, 1996).

48 This illustrates that the assumption of perfect capital markets in the Modigliani and Miller (1958) *Capital Irrelevant Hypothesis* is quite strong one. Market imperfections stemming from agency issues are quite crucial and should be given due consideration.

banks, exhibits economic enhancement as compared to a specialised banking system (Ebrahim and Hussain, 2010). Apart from that, it also fulfils liquidity attributes, since it can be structured for trading on the secondary market. Generally, a quasi-equity structure is welfare-enhancing, for it increases expected utility and promotes efficient resource allocation (see Ebrahim and Hussain, 2010). We find that in extreme cases where any form of quasi structures are infeasible (i.e., presence of excessive agency costs), only then does the optimality of equity is realised, as discussed in Siddiqi (1983) and Chapra (2006).

Figure 5: Participatory project financing



5. Mechanism to mitigate financial exclusion

The existence of widespread financial exclusion within an interest-based financial system demonstrates the market's failure to provide essential financial services, with repercussions on economic growth, poverty and income inequality (Beck and Demirguc-Kunt, 2007). This has prompted policy makers' intervention in the market. Nonetheless, given the magnitude, government alone is unlikely to solve the problem. Our essay furthers the study of Salamon and Anheir (1996) on harnessing the 'third sector' in financial development, and hence economic growth and welfare.

Here, Islamic societies with their rich heritage of charitable institutions provide an alternative avenue to foster indigenous 'social capital' to meet the excess demand for

financing that is underserviced by for-profits markets (Bremer, 2004).[49] This concept is similarly found in the practices of Judaism. In response, "*each has developed different contractual forms of advancing funds for profitable investment that do not violate the prohibition of interest*" (Lewinson, 1999, p.334). For example, the existence of Jewish free loan societies is linked to the obligation in Judaism for extending free loans to poor persons. In the Islamic society, *zakāt*, *sadaqah* and other charitable modes are espoused in the religious tenets to assist the underprivileged.[50]

It is recognised that whilst each individual is expected to exert effort to fulfil his/her needs, there may still be situations where these needs are unmet. Therefore, charitable institutions would be required at the lower strata to help them move up the economic ladder, after which mainstream financial institution can play a better role (Gloukoviezoff, 2007). These examples are among the many possibilities towards ensuring financial inclusion of the underprivileged. Nonetheless, the integration of this form of benefit must be structured with care to avoid the classic case of Samaritan's dilemma.[51]

6. The economic underdevelopment of the Muslim world

We present the essence of the injunction on *ribā an-nasi'ah* is broadly aimed at: (i) protecting property rights, especially with regards to expropriation of assets; (ii) mandating efficient fragile free financial contracting; and (iii) enjoining the incorporation of charitable institutions to assist the economic pursuits of the underprivileged (see Table 3). With respect to protection of property rights from expropriation risk, our paper concurs with that of the well-known Islamic historian Ibn Khaldun (1967), who points to the degeneration of the Muslim world to its failure to structure institutions to protect these rights.[52] Before the

49 We recognise the impact of microfinance in improving the economic stature of the underprivileged. It should be noted however, this form of joint liability lending has had its fair share of critics (Ghatak and Guinnane, 1999; Banyan, 2010).

50 Linguistically, *zakāt* means cleansing or purity. Theologically, it means spiritual purification resulting from the giving of *zakāt*. It is an obligation on wealth of the rich for the benefit of the recipients, institutionalised in the *Qur'ān.* The aim is to uphold the principle of care that is essential in ensuring cohesiveness in communities' well-being (*Qur'ān* 9:60; Esposito, 2003). *Sadaqah* on the other hand is categorised as voluntary offering or alms from a person's wealth and is a virtue that is highly promoted in Islam. Selected *Qur'ānic* verses with specific references to charity include verses 2:43; 2:110 and 2:177.

51 Although Islam enjoins charitable deeds (eg. *Qurānic* verse 5:2), it prohibits begging as it is best for the individual to be actively employed to uplift his economic status (Sahih Al-Bukhārī Vol. 2, 24:1470-1471; Sahih Muslim Vol. 3, 12:2396, 2400 and 2404). Samaritan's dilemma highlights concern on the potential permanent reliance on aid, which is contrary to the objective of these charitable funds.

52 Its importance is reiterated by Ibn Taymiyah (1983, p.95) as follows: *"God upholds the just state even if it is unbelieving, but does not uphold the unjust state even if it is Muslim",* for the *Qur'ān* enjoins the

conception of formal markets, an informal system shaped by religious precepts and social norms were efficient in governing exchanges. However, shifting paradigms warrant the institutionalisation of rights in the shape of a formalised and independent judiciary and legal system (North, 1981; Acemoglu et al., 2005). In these Muslim states, the judiciary has not been allowed to be independent of the executive branch of their countries.[53] This creates serious ramifications on governance (Shleifer and Vishny, 1997), entrepreneurial incentives (Johnson et al., 2002; Besley and Ghatak, 2009), and resource allocation (Beck et al., 2003; Claessens and Laeven, 2003). In absentia, trading and contracting of usufruct, a core feature of any market economy (Hart and Moore, 1990; De Soto, 2000; Besley and Ghatak, 2009), will not thrive. As highlighted by Levine (2005, p.68) *"[States] with less effective investor protection laws tend to make shareholders and creditors reluctant to invest in firms, which drives down the price of corporate securities and increases the cost of capital to firms…Legal systems influence the effectiveness of property right protection and hence the ability of firms to raise capital and grow".*

Table 3: Economic perspective of the *ribā* prohibition

Category	
Ribā al-fadl **-** the hidden *ribā*	***Ribā an-nasi'ah*** **-** the evident *ribā*
Application	
Barter transactions	Pure interest-bearing debt contracts
Rationalisation	
Exchange is inefficient, as it has the potential to expropriate assets of either party in the exchange of goods.	The contract is (i) inefficient; and has the potential to (ii) expropriate assets of either lender or borrower; (iii) exacerbate financial fragility; and (iv) induce financial exclusion.
In general, the *ribā* prohibition delineates protection of rights of both contracting parties. This is retrospective of the *Shari'ah* that accords *protection of property rights* as one of the five essential elements of the objectives of the law.	

On the issue of mandating efficient and fragile free contracting, we acknowledge that prior to the development of literature on financial economics; it was difficult for those

upholding of contractual obligations and abhors those who consume other people's resources without right (*Qur'ān* 2:188; 4:29 and 161; 5:1; 16:90).

53 Historically, this has not normally been the case, as exemplified by the actions of 'Umar ibn Khattab, the successor (Caliph) of Prophet Muhammad who instigated the appointment of 'Ubāda bin Sāmit as a judge (*Qādi*) and a preacher of Syria to ensure the upholding of proper governance (Footnote 2028, Hadith No. 3852 Sahih Muslim).

untrained in this branch of social sciences, especially the religious scholars to reorient their juristic views with contemporary times. The *Shari'ah* lethargy, illustrating the infatuation with classical financial contracts that were employed in a time of imperfect financial markets of the Prophet (PBUH) and Caliphs (Waywell, 2006; Khan, 2010), has led to the employment of *hilah* (legal stratagem) to the detriment of financial development, and hence economic growth. Current time warrants incorporation of not only theological but also theoretical founding of finance and economic sciences in reforming *Shari'ah* interpretations. To move forward, Islamic financial instruments and markets must satisfy the rigours of current economic settings. Without this, innovation that just replicates economic outcomes of mainstream interest-based financing would only emit financial fragility in the financial markets and Muslim economic state. Lastly, the necessity of establishing charitable institutions brings to fore the importance of sustainable economic growth. Sustainability is secured not only through respect for property rights but also embedding charitable institutions within the system.[54] This important element is distinctly weak in the present Muslim economic world, as illustrated by Kuran (2003) and needs to be addressed.

To reiterate, we identify and connect the centuries of underdevelopment of the Muslim world to 'poverty traps' stemming from being stuck in a sequence of economic-inferior equilibria. Principally, this is attributed to: (i) obscure property rights stemming from 'extractive institutions' established and promoted by the political elites to maximise their economic rents with disregard to societal welfare; (ii) lack of true financial advancement, where *Shari'ah* pronouncements are derived in seclusion of financial and economic perspective, thus impinging the robustness of Islamic innovations; and (iii) absence of welfare-enhancing institutions for the underprivileged that support equitable opportunity across the various sectors of the Muslim economy.

7. Conclusion

Premised on the Islamic Holy Scriptures and economic theory, this study illustrates how the prohibition of *ribā an-nasi'ah* in Islamic financing promotes societal welfare. In contrast to classical *Shari'ah* scholars, we rationalise this religious injunction is to mitigate the issues of sub-optimal financial structures, expropriation of wealth, financial fragility and

54 This is rightly highlighted by Ibn Taymiyah (1951) on the contrast made in the *Qur'ān* (30:39) between *ribā* (with the attribute of expropriating wealth) and charity. He illustrates that the expropriation aspect of interest leads to antagonism in society. In contrast, charity cements the different social classes and brings about social cohesion.

financial exclusion. To illustrate the underlying rationale for the prohibition, we employ a capital structure model in rational expectations, general equilibrium setting of economic agents (entrepreneur-manager and lender) for project financing, thereby internalising the agency cost of debt.

Our findings highlight issues with pure interest-based debt (see again Table 3). First, even in a low agency cost environment, risky loans are at best economically at par or neutral to its risk free alternative, which integrates the *Pecking Order and Static Trade-off Theories* in the absence of asymmetric information and taxes. Our results point to the following: (i) subjectivity of asymmetric information and taxes as a critical element in the Pecking Order and Static Trade-off Theories; and (ii) difficulty in disentangling the impact of the two theories. This is empirically supported by other studies, such as Leary and Roberts (2010) and Fama and French (1998, 2002 and 2005). Second, with interest-based loans there is potential for financiers to expropriate wealth of the borrower if the financial commitment is incommensurate with the project returns, and vice-versa. This imbalance will, in the long-run, cause non-sustainable equilibrium. We also find elements of predatory pricing where lenders may price the loans to induce default. In the case of the borrower, she may exercise risk shifting strategies, refrain from investing in growth opportunities, or in the extreme, opt for strategic default. All three outcomes lead to sub-optimal resource allocation. Third, given the interconnectedness of credit markets, pure interest-based debt contracts tend to amplify financial market volatility, and lay waste to any attempts to fire walls that are built to mitigate financial market contagion. Given the inflexibility to deleverage, any financial or economic shocks can precipitate a chain of defaults leading to a financial contagion effect. This translates to financial instability that brings about negative repercussions on economic growth and poverty reduction. Last, there may be pockets within a society where market clearing conditions can breakdown, particularly in the presence of agency cost of debt. With the increasing financialisation of social relations, financial exclusion can negatively affect the economic potential of the underserved and unbanked. A balanced financial deepening; a key element of financial development, is thus frustrated.

Our response to the interest enigma is unique. We find Profit and Loss Sharing (PLS – pure equity) arrangement, espoused in Islamic finance literature, as weak, whilst pure

interest-based debt contract is *Shari'ah*-economically inferior solution.[55] We advocate quasi-equity contracts which exhibit *Shari'ah*-economically efficient solution, given the issue of agency cost and fragility of pure interest-based debt contracts. These contracts are also characterised by their malleability. They can be structured to meet the financial objectives of the investor, their risk preferences, as well as fulfil liquidity attributes for secondary trading. The participatory element moderates inter-temporal marginal rate of substitution associated with agency cost issues. Quasi-equity contracts can also be designed to satisfy the *Shari'ah* conditionality of financial contracts referred in Khan (2010). Where there is a breakdown in the effective functioning of the financial markets, the Holy Scriptures explicate the deployment of charitable institutions, specifically *zakāt*, *sadaqah* and other charitable modes to assist the underprivileged.

In contrast to other literature, we view the 'long divergence' in the financial and economic development of Muslim countries with that of developed economies lies in the Islamic modern states' failure to: (i) uphold the protection of property rights that is quintessence of the prohibition of *ribā an-nasi'ah*; (ii) 'push the envelope' of *ijtihad* in tandem with contemporary financial progression; and (iii) establish institutions to fund the welfare of the underprivileged. Our results corroborate studies by Inalcik (1969), Balla and Johnson (2009) and Kuran (2003). It is imperative for the Muslim world to recognise its failings and address the above issues. This requires: (i) invigorating joint *ijtihad* between financial economists, practitioners and religious scholars, as recommended by al Alwani (1991) to reconfigure instruments, institutions and markets; and (ii) establishing independence between the judiciary, legislative and executive branches of the government for protecting property rights. This is a critical precursor to unlock the latent economic prospects of assets held by economic agents and provide the much needed path to the development of the Muslim economy, without which the endowed resources of a modern Muslim state remain a mere 'dead capital' (De Soto, 2000).

Lastly, one can argue that the prohibition of *ribā an-nasi'ah* applies to any deferred commutative exchanges. Thus, it also pertains to other financial exchanges and not only to pure interest-based debt contracts as argued by Muslim jurists. Having said that our capital

55 We term pure interest-based debt contracts as *Shari'ah-economically* inferior solution for two primary reasons attributed to the potential of expropriating wealth. One, it is not a viable equilibrium in the long run if a firm or a financial intermediary's assets are being gradually depleted. Two, it creates social problems endangering the community at large (see again Ibn Taymiyah, 1951).

structure approach can also be extended to other financial exchanges such as hybrid, pure equity or leasing structures, to identify whether these contracts are fallible to the three issues highlighted above.

On a broader perspective, the negative effects of the recent financial crisis calls for a closer scrutiny on the form of financial system that best serves society's welfare.[56] Additionally, could there be possible convergence of Islamic and Western financial systems due to Western economies quantitative easing regime leading to the prevailing low policy rate. Our initial take on the matter is that the present low interest rates (i.e., in some cases converging to nearly zero rates) in Western economies are an exception rather than the norm as affected states attempt to moderate the impact of economic recession. The supporting funding by the government is still backed by elements of interest-based public debt. In contrast, the prohibition of *ribā an-nasi'ah* warrants development of financial instruments that are non-*ribāwi* whilst still satisfying the risk-reward trade off to incentivise economic activity. Nonetheless, these are indeed areas of interest for future research work.

56 See the commentary by Gross (2011) on effects of the recent financial crisis on investment incentive, sovereign debt market and overall economic growth, and Mohamad (2012) on disrepair of Western capitalism.

Chapter 3: Can an interest-free credit facility be more efficient than a usurious payday loan?

"*Many people, particularly low-to-moderate income households, do not have access to mainstream financial products such as bank accounts and low-cost loans. Other households have access to a bank account, but nevertheless rely on more costly financial service providers for a variety of reasons. In addition to paying more for basic transaction and credit financial services, these households may be more vulnerable to loss or theft and often struggle to build credit histories and achieve financial security*".

FDIC (2009, p.10)

1. Introduction

A survey by the Federal Deposit Insurance Corporation (FDIC) in 2009 carries concerns on the extent of financial rationing faced by American households.[57, 58] According to the FDIC (2009), approximately 17.9% or 21 million households who do have banking accounts subscribe to the services of alternative financial service providers. With respect to their credit needs, these households have had to frequent these service providers, including payday lenders. In a separate study, Lawrence and Elliehausen (2008) find 73% of the surveyed payday loan borrowers suffered rejection or limitation on their credit application (i.e., rationed or completely rationed out) by mainstream financiers, which is three times above the United States general population. The use of payday loans are largely for unplanned events that highlights the liquidity constrained status of this cohort.

Payday loans or cash advances, are structured to function as a short term liquidity facility to smooth inter-temporal income shocks. This involves issuance of single, small, short-term and unsecured consumer loan, ranging from $100 to $500. An average payday loan is for less than $300, with repayment period of 7 to 30 days (Lawrence and Elliehausen,

57 A version of this essay co-authored with A. Jaafar and M.S. Ebrahim has been accepted in the forthcoming Journal of Economic Organization and Behaviour (see Salleh, et al., 2013)

58 A further five million households may potentially face similar constraints but have been omitted from the above due to paucity of data on their usage of alternative financial services (FDIC, 2009).

2008). The industry has been severely criticised for its high credit cost, in combination with wider issues of predatory practices and expropriation of wealth (OFT, 2013).[59] Undergirding these criticisms is the interest servicing burden (Melzer, 2011) faced by these households who are in the moderate to low income bracket, and lack financial sophistication (Lawrence and Elliehausen, 2008). The fees reflect the industry's severe default rates (DeYoung and Phillips, 2009).[60] Interestingly, despite heavy criticisms, there is still persistent demand for the products. Thus, this highlights a pressing need to explore inexpensive financial alternatives to assuage the liquidity needs of this market segment.[61] The fact that these households have had to exhaust other credit avenues alludes to the rationed out effect and potentially non-economic efficient solution. To date, studies on payday loans have either focused on (i) credit behaviours; or (ii) welfare effect of the borrowers, without delving on economic efficient substitutes.

Recognising this shortcoming, the primary motivation of this paper is to expound an institutional design for the provision of inexpensive, short-term liquidity facility, which satisfies the latent demand of these households to smooth their inter-temporal exogenous income shocks. Specifically, our study aims to explore the following question: Can an *endogenous* interest-free payday loan circuit provide a more efficient credit solution in contrast to current payday lenders and mainstream financiers? This is achieved through integrating the two strands of literature on: (i) institutional structures related to endogenous circuits; with (ii) cultural beliefs (i.e., Islamic tenets) in particular, interest-free loans.[62, 63]

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59 Predatory lending is characterised by "*excessively high interest rates or fees, and abusive or unnecessary provisions that do not benefit the borrower*" (Carr and Kolluri, 2001, p.1).

60 The industry's default rate of 21% is extremely risky compared to the 3% rate experienced by commercial banks (DeYoung and Phillips, 2009). We find that the high cost concurs with credit literature to compensate for risk associated with these risky borrowers.

61 Although we have used the United States as the primary reference base, this does not preclude the existence of payday lending in other developed and developing economies.

62 Forms of endogenous circuits include informal institutions of Rotating Savings and Credit Associations (ROSCA) and Accumulating Savings and Credit Association (ASCRA), where members contribute periodically an amount of funds to a common pool over a specified period. In ROSCA, the assignment of the pooled funds to each member is determined either (i) on *random* basis whereby the sequence is only known ex-post to the member at the point of disbursement; (ii) through a *bidding* process to the winning member who pledges higher contribution to the pot or one-time side payment to the other members; or (iii) *fixed*/ pre-determined ex-ante by the ROSCA governing authorities. By pooling resources, it permits the mobilisation of funds that otherwise would have been kept out of circulation. Whilst ASCRA shares similar features of its nemesis, there is greater flexibility in the amount and timing of each member contribution, larger membership, allocation of the pooled funds, and its greater social function (Bouman, 1995). The motives for participating in ROSCA/ ASCRA ranges from savings mechanism to acquire durables, fund life-cycle events, self-control commitment device, insurance and investment avenue of surplus funds to either protect against social/ marital pressures or generate returns (Besley et al., 1993;

Our research motivation is consistent with that of Coase (1937) and Alchian (1950), who in their seminal papers rationalise efficient institutions as those that evolve and adapt to the environment to deliver services in a cost effective manner. Moreover, the approach taken in this paper to intertwine institutional design with culture is reflective of Acemoglu et al. (2005, p.424), who reiterate "*belief differences clearly do play a role in shaping policies and institutions*".

For the purpose of this paper, the target population are economically active households. This is consistent with the underwriting criteria of payday lenders that require borrowers to be in employment and bank account holders, as well as with the findings of the FDIC (2009) survey. Additionally, our model is based on risk neutral economic agents.[64] We illustrate the above through an institutional structure of an endogenous leverage circuit formed from member based contributions.[65] This is followed by two stepped extensions that assimilate real world elements of having fraction of borrowers within a finite life circuit, and subsequently extending the circuit as a going concern with random repetitive borrowing. The objective of the basic framework and the extensions is to solve for economic efficiency by simultaneously (i) ensuring availability of affordable credit (where credit is due); and (ii) moderating their commitment issues that promotes long-term financial security. This is showcased by mathematically modelling a short term interest-free liquidity facility circuit that moderates adverse selection and moral hazard. The beauty of the model lies in the structuring of the circuit, where members help one another to alleviate inter-temporal liquidity shocks such that the benefits of borrowing outweigh the cost of it. This draws from the 'barn raising' practices in the United States frontiers discussed in Besley et al. (1993) and

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Bouman, 1995; Dagnelie and LeMay-Boucher, 2012). Mutual and financial cooperatives are the more advanced and formal forms of these circuits.

63 Charitable concept of interest-free funding is also present in other Abrahamic faith. For example, the existence of Jewish free loan societies is linked to the obligation in Judaism for extending free loans to the poor (Lewinson, 1999). The integration of Islamic cultural beliefs in the design of this liquidity facility exemplifies its universality in 'democratisation of finance' to the masses.

64 The paper adopts a simple framework of risk neutrality to derive close form solutions. The model can be extended to risk-averse agents by incorporating higher opportunity cost of capital or discount rate 'γ' that comprises an imputed return 'r' (see equation (3) in Section 4). However, we have chosen not to incorporate risk aversion as the resultant outcome only increases the threshold that the circuit needs to observe to ensure fulfilment of economic efficiency conditions, leaving its fundamentals unaffected. Moreover, this would limit financial participation contrary to the injunction of the *Qur'ān* (verse 30:39) which prefers charity over exorbitant cost of funding especially for the underprivileged. Our approach is also consistent with Ebrahim (2009).

65 We employ a generic term 'circuit' to signify all institutions where the principal and agent are the same individual. The structure is akin to that of a non-profit institution. An administrator may be present but is not incentivised by rent-seeking motives.

captures Commons's viewpoint (1931, p.651), where he states "... *collective action is more than control and liberation of individual action-it is expansion of the will of the individual far beyond what he can do by his own puny acts*".[66]

This paper contributes to existing literature from four perspectives. First, it averts expropriation of wealth of these households through establishing an alternative recourse for liquidity funding. This is in contrast with liquidity stripping from onerous interest charges of current payday loans. It conjointly satisfies public policy call for expansion of affordable credit. Second, our framework allows for satisfaction of liquidity needs of households as solution to rationing by mainstream financiers. Third, we integrate interest-free loans in our liquidity facility. This is drawn from charitable teachings, specifically from Islamic religious tenets that are proffered as a remedy to the prohibited *ribā an-nasi'ah*. Thus, it unveils the economic potential of this antiquated financing, conceived from cultural ideals, as a financial development device. Fourth, by binding eligibility to the liquidity facility with a member's fulfilment of the periodical contributions ruling, it harnesses the commitment technology sacrosanct with endogenous leveraged circuit-based institution.[67] This effectively moderates the issue of time-inconsistent preferences closely associated with payday loan borrowers as well as shelters them from liquidity gaps arising from exogenous shocks.

The remaining of this paper is structured as follows. Section 2 details the landscape of the payday lending industry and related literature. Section 3 discusses the rationale for the prohibition of *ribā* and its contrast against charitable modes in Islamic tenets. In Section 4, we develop a simple model to illustrate the economic efficiency of endogenous interest-free payday loan circuit in addressing financial constraints of these households and its results. Finally, we conclude in Section 5.

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66 Our model reiterates the significant developmental role of endogenous circuits in the nineteenth century. These circuits permit greater latitude to grant its customers affordable credit compared to profit-oriented mainstream financiers. Recently, the economic importance of endogenous circuits in the United Kingdom was further boosted by the legislative reforms that enabled these institutions (i) greater market reach; and (ii) flexibility to determine its member incentive structures (see HM Treasury, 2012).

67 Dagnelie and LeMay-Boucher (2012) provide empirical evidence on the use of ROSCA as a commitment device that binds households' financial conduct from unnecessary spending and protect the savings against theft, losses or social pressures that dissipates the saved amount. Whilst the demand for ROSCA and ASCRA is largely for planned endogenous events, Bouman (1995) does state that members are impelled to participate in these endogenous circuits to safeguard against emergency expenses arising from illness and other misfortunes. In ASCRA, the insurance element is met through the disbursement of its accumulated loans. Unlike ROSCA and ASCRA where the member is required to make compensating payments (i.e., higher payment to compensate other members in a bidding ROSCA or interest on the loaned amount in ASCRA), our Model 3 (see Section 4) provides similar relief without the additional financial burden.

2. Landscape of payday loan industry and related literature

Payday lending emerged in early 1990s in response to increased demand for short term credit following the spatial void created by withdrawal of mainstream banks from small loans, low profit margin business segment (OFT, 2010). The convenience of fast disbursement, minimal or non-existent credit checks further adds to its attractiveness (FDIC, 2009). An indicator of its growth pace is the extensiveness of payday loan network across the United States. Payday lenders have more branch presence then McDonalds and Starbucks combined (Zinman, 2010). Based on the 2009 FDIC survey, approximately four million households have frequented payday lenders, which is now a $38.5 billion industry (FDIC, 2009; CFSA, 2011).[68]

Payday loan customers must be employed and banked to subscribe to these services and according to a survey by Lawrence and Elliehausen (2008) majority are in the moderate income bracket of $25,000 to $49,999. The subscribers are mostly young, below the age of 45, married or living with a partner and having children below the age of 18 years. They justify these households' fit the life-cycle stage where credit demand is high.

The survey by Lawrence and Elliehausen (2008) find majority are infrequent users of the payday lending facility. However, there are selected few; accounting for 22.5% of total surveyed who have 14 or more loans in the same year. These frequent users tend to rollover the outstanding loan. Generally, these loans would run for 2 weeks or less, or over a 3–4 week periods. These frequent borrowers are more likely to have exposure to more than one payday loan, exhibiting the classic case of borrowing from Peter to pay Paul, where a loan drawn on a new payday lender is often used to offset against an old one.

The primary complaint against payday lenders is the exorbitant finance charge. Fees for a $100 loan range from $15 to $30, with annual percentage rate (APR) of 20%–300%. The extremely high cost in contrast to other near credit substitutes raises criticism from consumer advocates and public agencies. According to industry players, the APR is resultant from the small loan size, given payday lenders' high default rates. Industry players argue that the $15 charge is definitely lower than the $50 flat rate returned check fees or a $25 covered overdraft (overdraft protection) by depository institutions (Morgan et al., 2012).

68 In the United Kingdom, the payday loan market is estimated to be worth at £2 billion–£2.2 billion in 2011/2012, with three players controlling 57% of the total market loan value (OFT, 2013).

Payday lending is a regulated industry. It is subjected to state and federal laws and some players also subscribe to industry standards of the Community Finance Services Association (CFSA); an industry self-regulatory organisation (Lawrence and Elliehausen, 2008).[69] The United States established a new regulatory body, the Consumer Financial Protection Bureau in July 2011 to oversee matters related to consumer protection, including market conduct of payday loan industry. This independent body is part of the financial reforms outlined in the Dodd-Frank Wall Street Reform and Consumer Protection Act 2010.[70]

Studies on payday lending have primarily centred on two aspects; namely consumer credit behaviours and welfare effects on the availability or withdrawal of this credit. Skiba and Tobacman (2008) seek to rationalise the demand for payday loans despite its excessively high fees. They find that payday loan borrowers exhibit partially naive quasi hyperbolic discounting tendencies. In that, the borrowers demonstrate overly optimistic forecast of future outcomes in respect of their own time preference, or their probability of absorbing future shocks.

In a different study, Agarwal et al. (2009) find that the sampled population choose payday loans despite having unused liquidity on their credit cards. This exemplifies existence of liquid debt puzzle, whereby individuals undervalue their financial options. This also highlights the individuals' lack of cognitive ability to discern costs across different financial products. Gathergood (2012) points persistent indebtedness to poor financial literacy and self-control problems. In such a case, individuals are more likely to succumb to impulsive consumption. The ease of credit provided by high-cost credit providers including payday loan, further exacerbates this tendency and heighten the likelihood of over-indebtedness. The study supports paternalistic approaches in regulations, i.e., preventing access to credit that pushes consumers to succumb to sub-optimal behaviour.

In regards to its welfare effects, the evidence is still debatable. Morse (2011) and Zinman (2010) to name a few, argue that accessibility to payday loan is welfare enhancing,

69 The industry is subjected to: (i) the Truth in Lending Act at the federal level that governs disclosure requirements; (ii) Fair Debt Collection Act that regulates debt collection practices; and (iii) National Bank Act that essentially allows the payday lender to enter into rent-a-bank model, which is now defunct by virtue of the stricter FDIC regulation on national chartered banks. The CFSA provides industry best practices that are essentially focused on consumer protection.

70 The governing act for payday loan in the United Kingdom is the Consumer Credit Act 1974 and the industry is presently regulated by the Office of Fair Trading (OFT).

which is in contrast to Skiba and Tobacman (2009) and Melzer (2011).[71] Using the 1996 natural disaster in California as an event that has widespread economic effect on households, Morse (2011) finds that presence of payday lenders reduces emergency distress and serious criminal incidences. Zinman (2010) finds that restricting access creates deterioration in financial position of Oregon households as opposed to those domiciled in Washington, as the control state. Households in the restricted payday loan state experienced higher unemployment and reported an overall poor future financial outlook. The negative effect of the regulatory ban on payday loan is worsened by the lack of affordable financial substitutes.[72] On the other hand, Melzer (2011) construct the presence of payday loans impairs the financial welfare of the borrowers due to the debt servicing burden associated with this type of credit.

3. Islamic prohibition of *ribā* and the contrast against charity

Salleh et al. (2012) demonstrate that Islamic prohibition of *ribā an-nasi'ah* in credit transactions is attributed to the inclination for expropriation of wealth. Using a capital structure approach, they observe inequity in pure interest-bearing debt structures that leads to two equilibrium cases. First, in the case of financial repression, where the real interest rate is negative the lender's assets are expropriated. Second, in case of negative leverage, where the real interest rate is greater than the unleveraged expected return on the asset being financed, then the borrower's assets are expropriated. In the long-run, this creates imbalances or non-sustainable equilibria. When a borrower defaults, this can create a domino effect, given the interconnectedness of credit markets. It effectively amplifies volatility within the financial system and thus precipitates financial fragility, as evidenced in the ongoing financial crisis. In extreme cases of agency costs of debt accruing to high project and default risks, this can lead to autarky or financial exclusion, with adverse impact on the underprivileged. Their study alludes to interest-based financial contracts as being non-optimal or at best it is economic-neutral to a hybrid form.

71 Similar to Skiba and Tobacman (2009), Morgan et al. (2012) find some corroborative evidence of decline in Chapter 13 bankruptcy filings post payday loan ban. However, the authors opine that this require further examination to affirm its robustness.

72 Thirty three states permit payday lending with rules on payday loan terms including maximum fees, rollovers, loan size, licensing and examination requirements as well as collection procedures for past-due loans. Seventeen states totally prohibit offering of payday loans. Contrary to the United States, the United Kingdom refrains from adopting intrusive regulatory measures, such as stringent price controls or complete ban on the services. The OFT (2010) views such controls as market disruptive.

Instead, the *Qur'ān* contrasts *ribā* with that of charity (*sadaqah*) (see verses 2:276-277, 30-39). Charity, as defined in the practice of Prophet Muhammad PBUH (*Sunnah*), is not only concerned with financial forms but also all types of good deeds (Sahih Al-Bukhārī Vol. 2, 24:144; Sahih Muslim Vol. 3, 12:2329–2330).[73] Piety through charitable deeds inculcates a sense of brotherhood and advances social welfare. As highlighted by Bremer (2004, p.7), "*Charities ...provided a source of support for institutions and interest groups independent of, and sometimes in opposition, to the state. Islamic charities have historically played an additional role in society, that of promoter of decentralized economic development. ...In this respect, they reflect the blending of religious and secular, the social and economic, that is the key characteristic of the Islamic idea*". From a moral perspective, Ibn Taymiyah (1951), the great Islamic scholar, argues the element of charity cements social cohesiveness, whilst usury factionalises society.

The *Qur'ān* censures the practice of creditors, who cumulate the amount due for every delay in settlement that leads to further financial hardship on the debtor. Instead, it calls for the creditor to grant respite to the borrower such that, if the creditor were to forfeit the amount owed, this reflects a higher order of virtuousness, and will be rightly rewarded (verse 2:280). Unsurprisingly, the prohibition of *ribā an-nasi'ah* is also enjoined in the religious books of Islam's sister religions, i.e., Judaism and Christianity (see Cornell, 2006).

Both the *Qur'ān* and *Sunnah* have specific references for assisting the underprivileged. The financial forms of charity can be broadly categorised into *zakāt* (social welfare funds), *waqf* (philanthropic foundations) coupled with *qard* (interest-free loan) or *salaf* (synonymous with interest-free loan). *Zakāt* forms one of the five pillars of Islam and is obligatory on one's wealth for the benefit of the recipients identified in the *Qur'ān* (verse 9:60). Of interest is the specific directive for financial resources to be allotted for the poor and needy. Although *waqf* (*awqāf*, plural) is not mentioned specifically in the *Qur'ān*, it plays an instrumental role in Islamic civilisation. The earliest records on the practice of *waqf* can be traced to the Ottoman Empire in the eight century (Cizakca, 2000). It is said that these philanthropic foundations were able to financially support the provision of social services in Muslim society at that time, and in turn help address economic disparity. Such practice

73 Although Islam enjoins charitable deeds, it prohibits begging, for it is best to be actively employed to uplift one's economic status (Sahih Al-Bukhārī Vol. 2, 24:1470–1471; Sahih Muslim Vol. 3, 12:2396, 2400 and 2404).

involved the endowment of privately owned properties for charitable purposes in perpetuity. The revenue generated by the *waqf* is then utilised according to its objects.

Qard signifies the extension of loan to a borrower from one's resources without expectation of gains, whereby the lender forfeits the use of his resources during the loaned period. Such is its prominence that it is ranked higher than charity and even equated as a loan to God himself (verses 2:245; 5:12; 57:11 and 18; 64:17; 73:20).[74] This benevolent loan is also synonymous with *salaf* that connotes the extension of a loan, subject to repayment at a later time (Al-Zuhayli, 2003).

From a *fiqh* (Islamic jurisprudence) perspective, jurists are divided on the rights of the lender on the terms of the loan. Two widely opposing views are that a lender has absolute rights to recall the loan at anytime; whilst others view that it is permissible for the lender to stipulate the loaned period and hence, both contracting parties should abide by it (see Al-Zuhayli, 2003 on the debate by the four major *Sunni* schools of thought). This ambiguity in the *Shari'ah* interpretation can cause adverse repercussions in current financial context that warrants property rights certainty.[75] Underdevelopment of the *fiqh* provides ammunition to critique Islamic law (see Kuran, 2011).

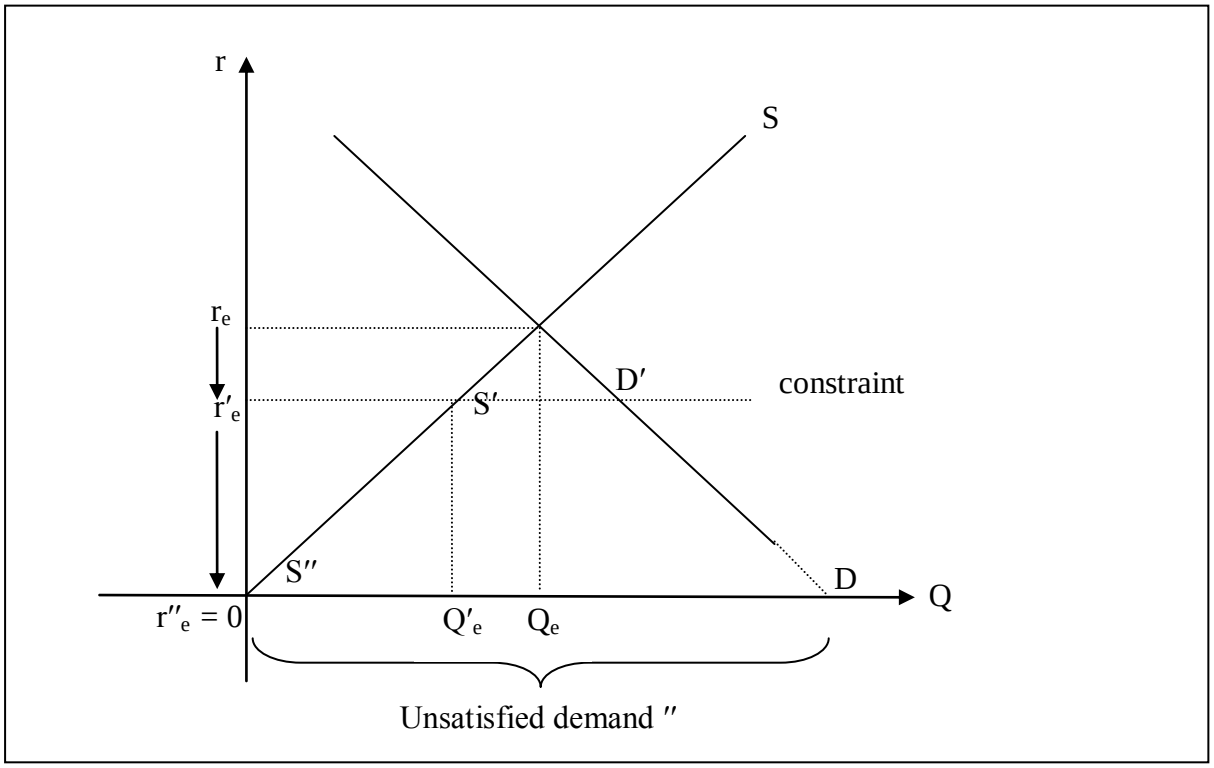
Despite these shortcomings, there is documented evidence where *qard* is deployed as a funding mechanism in modern financial dealings. Ebrahim (2009) finds the well-to-do members of clans in Oman informally granting interest-free loans (*qard*) to their destitute clan members for home purchase. In the same study, he explores the potential of formalising interest-free solutions for long-term real estate financing. Other studies on interest-free structures include Darrat and Ebrahim (1999) who focus on open market operation instrument in a partial equilibrium framework of *qard*-based Malaysian Government Investment Certificates. There are also existing practices such as the National Australia Bank (Australia) no interest loan schemes, Akhuwat (Pakistan) no interest microfinance and JAK Members Bank (Sweden).

74 Ali (2002) connotes *qard* to "*spending in the cause of God*" (footnote 710, p.245). A benevolent loan does not exempt the borrower from honouring the debt. The severity of non-repayment is highlighted in the *Sunnah* whereby even a martyr who is forgiven for every sin is still bound by his debt (Sahih Muslim Vol. 5, 33:4883–4884).

75 Earliest record on employment of *qard* by Az-Zubair also does not allude to its form and activity in which it was deployed (Sahih Al-Bukhārī Vol. 4, 57:3129).

Our model explores alternative platforms for deployment of this form of financing and augments present studies and actual practices mentioned above. Furthermore, the employment of interest-free element emphasised in our paper provides a direct contrast to current payday usurious facility. More importantly, according to religious injunction, if the expected return (r) on funds is gradually restrained to zero (moving from r_e to r'_e and finally 0), the supply of funds (S) will contract to a level where funding disappears (see Figure 6 below). This is the probable reason why scholars like Fazlur Rahman (1964) compartmentalises this form of funding to only philanthropic endeavours. However, this study demonstrates that lending is revived by embedding the interest-free credit facility within a circuit, which promotes group insurance. This is because members help each other when faced by misfortunes (exogenous liquidity shocks).

Figure 6: Supply and demand of funds with changes to the expected returns



4. Model development

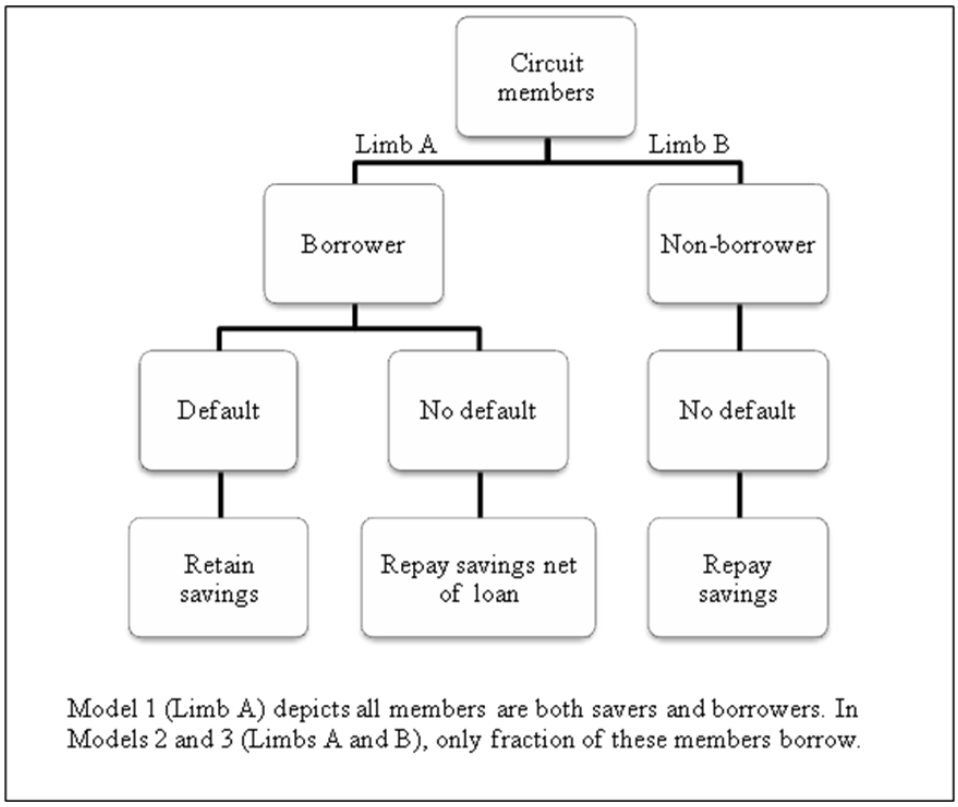
This section details the mathematical design of an *efficient interest-free* short term payday loan facility (using *endogenous* leverage) to address the inter-temporal liquidity needs of payday loan borrowers. Our endogenous leveraged circuit is founded in the works of institutional economics (Commons, 1931), and builds from the technology of ROSCA (Besley et al., 1993; Dagnelie and LeMay-Boucher, 2012), its associated hybrids; namely,

ASCRA (Bouman, 1995), and the more contemporary mutual and financial cooperative (Ebrahim, 2009). Besides liquidity transformation, the circuit features akin to an Islamic insurance (*takāful*) or mutual scheme where members guarantee each other from unexpected damage, losses or misfortune (Bouman, 1995).

Furthermore, unlike other endogenous leverage groupings, liquidity constrained members of the circuit receive short term interest-free payday loans, which are repaid at their next payday date. Our model expounds the elements that need to be observed if an interest-free loan that is enjoined in Islam is to have a profound impact in any financial development scheme. Here, we demonstrate that this endogenous interest-free payday loan circuit integrated with appropriate constraints that circumvent adverse selection and moral hazard can be economically more efficient or at least neutral to that of its competitor, i.e., payday lender and mainstream financier.

The interest-free payday loan circuit is structured as follows. Individuals are required to become members by contributing monthly to a common pool of funds, i.e., circuit members. In our model, members are risk neutral, and the demand for liquidity or payday loan is treated as exogenous. Members can only apply for the interest-free loan, i.e., borrow, after qualifying a defined period of membership. This gestation period has a two-fold effect. First, it allows the circuit to identify and assist the member in realisation of her/his financial goals. Second, it allows member to build up equity cushion through their monthly contributions. This effectively binds the member to the circuit and addresses member time-inconsistent preferences. In addition to these two covenants, other mandatory rulings to address adverse selection and moral hazard issues (i.e., default cost) include requirement for (i) direct deposit of member paycheque into the circuit; and (ii) existence of loan guarantor (see detailed explanation below). Furthermore, once a member borrows from the circuit, she/he is required to undergo financial planning program to enhance her/his financial literacy. This helps errant members to plan ahead, alleviate future liquidity crises and stay debt free.

Figure 7: Stylised depiction of the various scenarios for Models 1-3



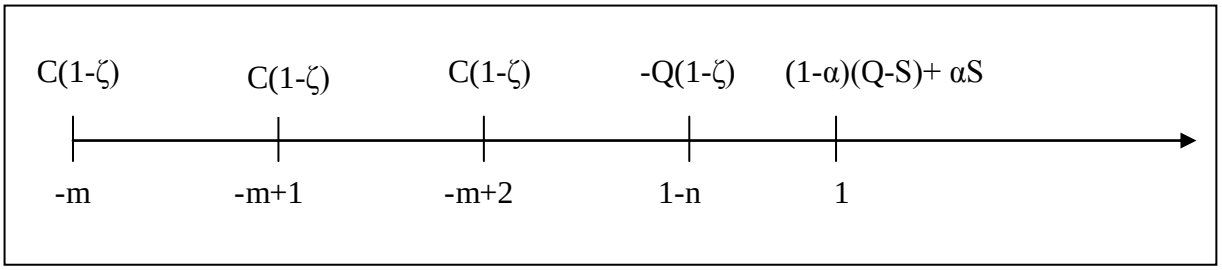
A stylised depiction of the models set up is summarised in Figure 7. This comprises of a basic institutional framework and two stepped extensions that embeds real-world practicalities. Model 1 (see Limb A of Figure 7) illustrates the basic structure of our efficient interest-free endogenous leverage circuit across a one period cycle. Here, all circuit members are savers and also liquidity constrained borrowers. This conforms to a self-insurance scheme. The extension to this basic framework is provided in Models 2 and 3 (see again Limbs A and B of Figure 7). In Model 2, we relax the simultaneity in borrowing needs. That is, only fraction of members will borrow to tide their liquidity shortfall. Model 3 further relaxes the elements whereby there is random multi-period borrowing that in the long-run approaches a steady state. As shown in Figure 7 in the case of defaulting borrowers, the circuit retains the accumulated contributions or savings of the defaulters. Otherwise, they receive their savings net of the amount loaned. On the other hand, non-borrowing members are entitled to their savings.

For all three models, we implicitly assume the existence of an information architecture, where property rights needed for the forthcoming paycheque to serve as collateral, accurate

methods of verifying or evaluating members' income and bankruptcy procedures are well established (see Levine et al., 2000). Individuals joining the circuit are assumed to have limited asset qualifying collateral and void of other alternative credit solutions, would have to subscribe to current high cost payday loan. Each of the circuit members receives an exogenous flow of income. The above assumptions are representative of the stylised facts of payday loan borrowers' demographics (see Lawrence and Elliehausen, 2008; FDIC, 2009).

4.1 Model 1: Institutional basic framework where all members are both savers and liquidity constrained borrowers

Figure 8: All members are savers and also liquidity constrained borrowers



(i) As depicted in Figure 8, each member is required to make periodic monthly contributions '*C*' into a pooled fund, from time *i = -m* (at the point of membership) to *i = 1* (the circuit terminal date). Here, we adopt monthly contributions to maintain consistency with members' income stream, i.e., paycheques are generally issued on monthly basis. By instituting periodic contribution, it (i) moderates adverse selection, as it reveals the financial status of the prospective borrower through her/his income level (especially during the gestation period) as illustrated in the income constraint (see Equations (5)-(5a) below and also Akerlof, 1970); (ii) assists in long-run accumulation of wealth that minimises exposures to exogenous income shocks; (iii) acts as an equity buffer that minimises the likelihood of the member to strategically default on her/his borrowing (see Foote et al., 2008); and (iv) most importantly, it acts as a commitment device that moderates self-control issues associated with payday loan borrowers (see Skiba and Tobacman, 2008; Dagnelie and LeMay-Boucher, 2012).

The accumulated periodic contribution, represented by '*S*', forms the capital base of this circuit and is used to meet short term financial needs of liquidity constrained

members.[76] This is given in Equation (1), where '*m*' denotes the month building up to the disbursement of the interest-free payday loan facility.

$$S = \sum_{i=-m}^{t} C = C(t + m + 1) \tag{1}$$

When $t = 1$ (as in Models 1 and 2), this culminates into

$$S = \sum_{i=-m}^{1} C = C(m + 2) \tag{1a}$$

(ii) After satisfying the minimum gestation period, liquidity constrained members qualify to draw '*Q*' interest-free payday loan from the circuit at time *i = 1-n* (see Figure 8), where '*n*' is a fraction of a month (i.e., $n < 1$ month).[77] The interest-free facility resembles a bullet loan, where total repayment of principal '*Q*' is made at terminal time *i = 1*. The loan repayment is net of the accumulated contributions '*S*'.

$$Q - S \tag{2}$$

(iii) To account for the opportunity cost of capital employed within the circuit, '*C*' and '*Q*' are discounted by 'γ'. That is, the monthly discount rate comprises of an imputed return '*r*', which is equivalent to the average cost of fund incurred in mainstream credit market.

$$\gamma = \frac{1}{1+r} < 1, \ \forall \, \mathrm{r} > 0 \tag{3}$$

(iv) We also incorporate the fractional transaction cost 'ζ' associated with administering the circuit, eg. management of members' contributions and loan processing (Kontolaimou and Tsekouras, 2010), and fraction default 'α' (Jaffee and Russell, 1976).[78, 79] It should

76 To assist in the circuit start up and reduce the lag in time to loan disbursement, the circuit may employ seed funding from charitable funds (e.g. *zakāt* and *sadaqah* funds). Ideally for long-run stability, this charitable fund should be institutionalised and performs the central role of providing liquidity relief to individual circuits that may suffer from unforeseen shocks. This is akin to the *Verband*, associative level of the German cooperative banking system (Biasin, 2010).

77 This implies members face liquidity problems before their next paycheque.

78 The institutional structure of the circuit already minimises upfront transaction costs compared to current payday lenders, as it: (i) benefits from non-profit motive management force; (ii) does not incur external funding costs; and (iii) is not bound to issue investment returns to its 'depositors'.

79 Intuitively, utility derived from an interest-free credit facility would be higher than subscribing to high cost current payday loans or face credit rationing from mainstream financier. Therefore in such situations, we foresee that the (non) pecuniary costs associated with default penalty should be significantly severe such that it impels repayment of the loan (see Skiba and Tobacman (2008) for empirical evidence on the degree of reliance of these borrowers on payday loans for their liquidity needs).

be noted that this fractional default 'α' represents the proportion of defaulters (ex-post any recoveries from respective loan guarantors) from the circuit's total population of borrowers. The circuit efficiency is contingent on minimising transaction costs and default, as they can fritter away the circuit's gains or cause erosion to its capital base (Coase, 1937; Alchian, 1950). Both outflows are moderated by presence of covenants discussed below. Additionally, the circuit also retains right of recourse on defaulting borrowers' savings 'αS'.

In line with the circuit's objectives, the discounted 'γ' contributions and interest-free loan after accounting for transaction 'ζ' costs and default 'α', coupled with net loan payoff, given by Equation (4) should at least be equal or greater than zero. [80, 81]

$$\underbrace{\left[\sum_{i=-m}^{1} C(1-\zeta)(\gamma^{i})\right]}_{\text{Receipt of member monthly contributions}} \underbrace{-Q(1-\zeta)(\gamma^{1-n})}_{\text{Disbursement of interest-free payday loan to liquidity constrained members (borrowers)}} \underbrace{+\gamma[(1-\alpha)(Q-S)}_{\text{Repayment of non-defaulting borrowers' savings net of outstanding loan}} \underbrace{+\alpha S]}_{\text{Retention of defaulting borrowers' savings}} \geq 0 \qquad (4)$$

Substituting 'S' in Equation (1) into Equation (4) gives us:

$$C(1-\zeta)(\gamma^{-m})[1+...+\gamma^{m+1}]-Q(1-\zeta)(\gamma^{1-n})+\gamma[Q(1-\alpha)+C(m+2)(2\alpha-1)]\geq 0 \qquad (4a)$$

The periodic contribution in Equation (4a) form a geometric series that can be further simplified as follows:

$$C\left[\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{m+2})}{1-\gamma}+\gamma(m+2)(2\alpha-1)\right]\geq Q[(1-\zeta)(\gamma^{1-n})-\gamma(1-\alpha)] \qquad (4b)$$

80 The circuit structure is designed to be contribution and time invariant for each member joining the pooled fund. That is, each member is required to make periodic monthly contributions to the pooled fund 'C' from the point of membership at time $i = -m$ to the circuit terminal date, $i = 1$ (in the case of Models 1 and 2) and $i = T$ (in the case of Model 3) (refer Equations (1) and (1a)). This similarly applies to the aggregated member contributions. Consequently, this does not affect the outcome of Equation (4).

81 Each term in Equation (4) signifies either a cash inflow (represented by a positive sign) or an outflow (represented by a negative sign). Each of these terms is discounted by 'γ' that comprises an imputed return 'r', which is equivalent to the average cost of fund incurred in mainstream credit market. This is a standard treatment of discounting in finance to account for the opportunity cost of capital (i.e., next best investment avenue forgone by the members). The first term thus represents the discounted value of member contributions, while the third term represents that of payback of loans disbursed (netted against their aggregate contributions) after adjusting for defaults.

$$\Rightarrow Q \le C\left[\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{m+2})}{1-\gamma}+\gamma(m+2)(2\alpha-1)\right]\left[\frac{1}{(1-\zeta)(\gamma^{1-n})-\gamma(1-\alpha)}\right] \quad (4c)$$

Potential maximum loan is,

$$Q_{\max 1} = C\left[\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{m+2})}{1-\gamma}+\gamma(m+2)(2\alpha-1)\right]\left[\frac{1}{(1-\zeta)(\gamma^{1-n})-\gamma(1-\alpha)}\right] \quad (4d)$$

To moderate the risk of adverse selection and moral hazard, it is imperative for the circuit to institute covenants as follows:

(i) *Income and loan constraint*: Each member is subjected to an after tax income test, where '*y*' is the member's income, to ascertain her/his capacity to meet her/his periodic contribution and loan obligation. This not only supports responsible lending (Carr and Kolluri, 2001), but also moderates the adverse selection issues (Jaffee and Russell, 1976). The member's financial capacity is represented by a multiple '*b*' of her/his income and loan.

(ia) Income constraint 'b_1'

Here, the income constraint 'b_1' curtails the contribution '*C*', given as follows:

$$\frac{y}{C} \ge b_1, \text{ which can be rewritten } \Rightarrow C \le \frac{y}{b_1} \quad (5)$$

$$\Rightarrow C_{\max} = \frac{y}{b_1} \quad (5a)$$

(ib) Loan constraint 'b_2'[82, 83]

Here, the loan constraint 'b_2' curtails the loan amount '*Q*', given as follows:

82 This is consistent with Ebrahim (2009).

83 The interest-free payday loan facility is strictly for managing inter-temporal liquidity shocks faced by its members. In tandem with this objective, '*Q*' should therefore be confined to a reasonable multiple of its members' monthly after tax income. This helps alleviate debt entrapment, discussed in Lawrence and Elliehausen (2008) and OFT (2013). Nonetheless, our model can still be adapted to reflect allowances for this restriction.

$\frac{y}{Q} \geq b_2$, which can be rewritten $\Rightarrow Q \leq \frac{y}{b_2}$ (6)

Here, $Q_{Binding,\ t-n} = \min\left\{\frac{y}{b_2}, Q_{\max,\ t-n}\right\}$, where $Q_{\max,\ t-n} = \min\left\{Q_{\max 1}, Q_{\max 2,\ t-n}\right\}$ (6a)

$Q_{\max 1}$ is defined in Models 1–3 (sections 4.1–4.3) respectively by Equations (4d), (7e) and (16d), while $Q_{\max 2,\ t-n}$ reflects the resource constraint of the circuit given by $Q_{\max 2,\ t-n} = C(1-\zeta)(t+m)$.

If transaction cost is low, i.e., $\frac{y}{b_2} < Q_{\max,t-n}$, then $Q_{Binding,\ t-n} = \frac{y}{b_2}$ (6b)

(ii) *Pre-commitment constraint*: Members are subjected to salary deduction to moderate time inconsistent preference tendencies (Skiba and Tobacman, 2008; Dagnelie and LeMay-Boucher, 2012) and moral hazard. With this, it partially limits the member consumption options available in the future. This seamless transfer of member income to the circuit and subsequent settlement of the interest-free payday loan has a secondary effect of lowering transaction costs of the circuit.

(iii) *Collateral constraint*: Given the potential limited ability of these households to raise asset qualifying collateral, disbursement of the interest-free payday loan is then subjected to a reputable co-signer, who provides surety upon default by the member. The co-signer, who has local information compared to the circuit, is in a preferred position to conduct ex-post monitoring and impose social sanctions (see Stiglitz, 1990).[84] This then, significantly reduces costly state verification issues, particularly in dealings with low net worth members. However, failure of the co-signer to act accordingly can have a detrimental effect on the circuit efficiency/ sustainability (see Guinanne, 1994 on demise of Irish credit union).

(iv) *Financial capability constraint*: Each member who borrows is required to undergo personal finance program (eg. money management, asset building and debt

84 The collateral covenant should not be a major participation constraint in lieu that members are required to be economically active. The co-signer can be from or outside the circuit. Where the co-signer is also a member of the circuit, co-signing incentivises peer monitoring, in view that the sustainability of the circuit ultimately affects the interest of the co-signer (Stiglitz, 1990).

management) to enhance their financial capability (Agarwal et al., 2009; Gathergood, 2012).[85] This non-pecuniary cost of borrowing is an interventionist measure that has its roots in behavioural finance, as it seeks to influence the cognitive psychology of payday borrowers with regards to their financial conduct (see Bernheim and Garrett, 2003 on the positive long-term behavioural effects of increased exposure to financial education).[86]

Proposition 1. For the circuit to be competitive, its net surplus must satisfy the efficiency condition given by Equation (4c)[87]

Equation (4c) signifies three possible states of the circuit. First, when the circuit fulfils the equality sign, the circuit is at best economic-neutral to its competitors, namely mainstream financiers.[88] Second, if the inequality sign is satisfied, the circuit is then economically more efficient to its competitors. The surplus capital signifies welfare improvement of an initially liquidity constrained group. Third, if Equation (4c) is unmet, then the circuit is economically inferior with erosion in its capital base, and its continued sustainability is doubtful. Here, its sustainability is contingent on minimising transaction costs and defaults, as both erode the circuit's gains and ultimately its capital base. Therefore, the circuit administrators must institute controls, so that both costs are reduced significantly. This is achieved through various covenants and retention of defaulting member savings as highlighted earlier.

85 Our model can accommodate the funding for the personal finance program through the transaction costs ζ in the administration of the circuit. This can also be complemented by financial education public policy programs or specific workplace schemes.

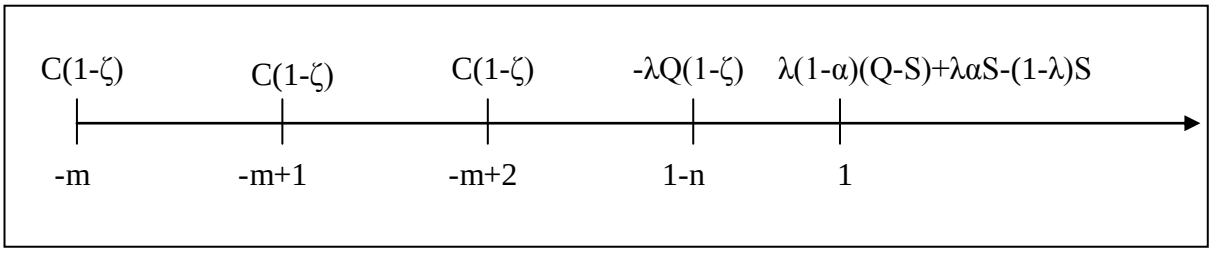
86 Other interventionist measures, which are pecuniary in nature, are to gradually: (i) decrease b_1, and (ii) increase b_2, thereby compelling erring borrowers to save and avoid debt entrapment. This can be extended in our model to incorporate real world practicalities.

87 Our analysis is rationalised based on a standard Net Present Value analysis employed in Financial Management (see Brealey et al., 2011). We have not provided a formal proof as it is a normal practice in the field to discount cash flows of alternate ways of funding a project in order to evaluate an efficient scheme. This approach is also adopted by Ebrahim (2009).

88 We can also deduce that the circuit is economically more efficient to that of contemporary payday loan, in view of the latter's high cost of funds.

4.2 Model 2: Impute real-world element by relaxing the borrowing condition in that only a fraction of members 'λ' borrow from the endogenous circuit

Figure 9: A fraction of liquidity constrained members borrow from the circuit 'λ' and supported by '1-λ' non-borrowing members



As in Model 1, members are required to contribute '*C*' on monthly basis upon entry, at *i = -m* to *i = 1* period. The following similarly hold in Model 2: (i) the circuit has a defined period, i.e., one-period cycle until *i = 1*, after which it terminates; (ii) variables defined in Equations (1), (2), (3) and (4); (iii) transaction costs and default; and (iv) the four covenants (i.e., income, pre-commitment, collateral and financial capability). However, Model 2 specification differs from previous in that it conceives the likelihood of liquidity strained members may occur at different circuit cycles. Therefore, at any one time, there is a fraction of borrowers signified by '*λ*' that are supported by '(*1- λ*)' lenders or non-borrowers (see Figure 9). This clearly depicts the 'transformation service' provided by the circuit, whereby the temporary idle funds of a proportion of members (lenders or non-borrowers) are used to provide liquidity to others who suffer from exogenous inter-temporal income shocks. This improves on "*competitive market by providing better risk sharing among people who need to consume at different random times*" (Diamond and Dybvig, 1983, p.402).

As with the previous section, observance of '*C*' entitles member a right to draw on the circuit funds if she/he faces liquidity squeeze. We find the technology of the circuit in Model 2 best resembles the practice of mutual or Islamic insurance (*takāful*), where members agree to indemnify each other against a defined loss. Based on the concept of solidarity, members of the group contribute to a specified fund that entitles each person to protection on occurrence of the loss event. The commercial implementation of this concept of mutuality can be traced to the eight century, where sea merchants would initiate a pool to protect

themselves against perils during their voyages (Alhabshi and Razak, 2011).[89] A characteristic that differentiates mutual/ Islamic insurance from the mainstream is that, in the former, each member is the insurer and also insured, which means there is risk sharing between members rather than risk shifting.

Based on the above extension (see Figure 9), total borrowings in the circuit are now signified by 'λQ'. At time $i = 1$, i.e., expiry of the circuit cycle, (a) non-defaulting borrowers are required to settle the outstanding interest-free payday loan net of their savings '$\lambda(1-\alpha)(Q-S)$'; and (b) any defaulting borrowers will have their accumulated contributions or savings retained within the circuit '$\lambda\alpha S$'. The proportion of non-borrowing members are then entitled to a payback of their accumulated contributions constituting '$(1-\lambda)S$'.[90] Equation (7) is a modification of Equation (4), as it incorporates the fraction of borrowing and non-borrowing members.

$$\underbrace{\left[\sum_{i=-m}^{1} C(1-\zeta)(\gamma^{i})\right]}_{\text{Receipt of member monthly contributions}} \underbrace{-\lambda Q(1-\zeta)(\gamma^{1-n})}_{\text{Disbursement of interest-free payday loan to liquidity constrained members (borrowers)}} + \underbrace{\gamma[\lambda(1-\alpha)(Q-S)}_{\text{Repayment of non-defaulting borrowers' savings net of outstanding loan}} \underbrace{+\lambda\alpha S}_{\text{Retention of defaulting borrowers' savings}} \underbrace{-(1-\lambda)S]}_{\text{Repayment of non-borrowers' savings}} \geq 0 \qquad (7)$$

$$\Rightarrow \left[\sum_{i=-m}^{1} C(1-\zeta)(\gamma^{i})\right] - \lambda Q(1-\zeta)(\gamma^{1-n}) + \gamma[\lambda Q - \lambda\alpha Q + S(2\lambda\alpha - 1)] \geq 0 \qquad (7a)$$

Substituting 'S' in Equation (1) into Equation (7a) gives us:

$$C(1-\zeta)(\gamma^{-m})[1+.....+\gamma^{m+1}] - \lambda Q(1-\zeta)(\gamma^{1-n}) + \gamma[\lambda Q(1-\alpha) + C(m+2)(2\lambda\alpha - 1)] \geq 0 \qquad (7b)$$

89 Although there is no direct reference to *takāful* in Islamic scriptures, the concept finds support in the *Qur'ānic* verses and *Sunnah* that call for upholding of brotherhood and solidarity in times of hardship (*Qur'ān* 5:2; Sahih Muslim Vol. 6, 45: 6585–6590, 45:6669–6674).

90 In our model, a member's primary objective in joining the circuit is to ensure access to low cost credit, i.e., maximise borrowing opportunity, in contrast to high cost credit from payday lenders or financial rationing. Given the above motivation, we have not incorporated dividends or investment returns on the accumulated contributions (savings) as these may be better served by existing financial intermediaries.

This is further simplified as follows:

$$C\left[\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{m+2})}{1-\gamma}+\gamma(m+2)(2\lambda\alpha-1)\right]\geq\lambda Q\left[(1-\zeta)(\gamma^{1-n})-\gamma(1-\alpha)\right] \quad (7c)$$

$$\Rightarrow Q\leq C\left[\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{m+2})}{1-\gamma}+\gamma(m+2)(2\lambda\alpha-1)\right]\left[\frac{1}{\lambda(1-\zeta)(\gamma^{1-n})-\gamma(1-\alpha)}\right] \quad (7d)$$

Potential maximum loan is,

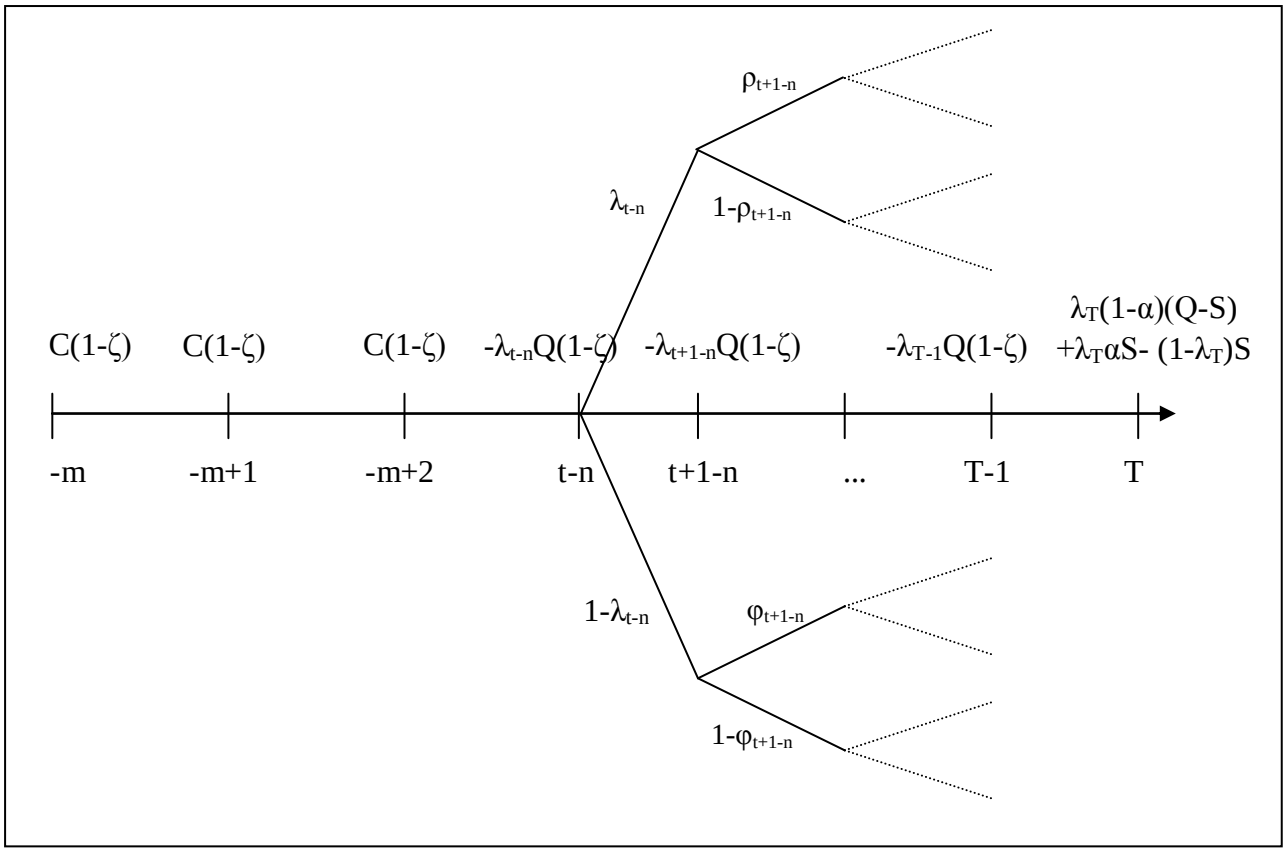
$$Q_{\max 1}=C\left[\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{m+2})}{1-\gamma}+\gamma(m+2)(2\lambda\alpha-1)\right]\left[\frac{1}{\lambda(1-\zeta)(\gamma^{1-n})-\gamma(1-\alpha)}\right] \quad (7e)$$

Proposition 2. The efficiency condition of the circuit with fraction of members who are borrowers is contingent on satisfaction of Equation (7d)

The three efficiency states described earlier in Proposition 1 apply in Proposition 2. This is even with the added complexity, where not all members will borrow during the same circuit cycle. The circuit can ensure that it satisfies the inequality sign in Equation (7d) by enhancing its predictive ability on probability of liquidity calls by its members. This is closely associated with the principle law of large numbers employed in insurance pricing. By collating sufficiently large number of exposures, the randomness in the occurrence of the exposures will statistically converge towards a defined mean with a given variance, which then allows insurers to fairly predict the frequency and severity of their exposures and price the insurance products accordingly. In the case of the circuit, it can then correctly determine the loan amount and tenure that is feasible to limit liquidity gaps at the end of the circuit cycle.

4.3 Model 3: Extends further the real-world element whereby there is random borrowing over multi-periods that in the long-run approaches a steady state

Figure 10: A fraction of liquidity constrained members borrow from the circuit 'λ' across multi-periods that in the long-run approaches a steady state



We further extend the model to allow for multi-period endogenous leverage, where members pool their endowments across time, in order to assure accessibility to short-term interest-free payday loan, in light of unexpected contingencies (see Figure 10). This brings the circuit nearer to that of contemporary financial cooperatives (Ebrahim, 2009). Here, we have a random process of member borrowing. This discrete-parameter Markov chain of $\{X_{t-n}, t>n\}$ is represented by:

$$P(X_{t+1-n} = j / X_{1-n} = i_1, X_{2-n} = i_2, ..., X_{t-n} = i_t) = P(X_{t+1-n} = j / X_{t-n} = i_t) \qquad (8)$$

Equation (8) essentially assumes a member's future borrowing behaviour is a consideration of only her/his present behaviour, and is independent of the member's past

history. The initial probability vector 'p_{t-n}' is denoted by probability of borrowing 'λ_{t-n}' and non-borrowing '1-λ_{t-n}', respectively:

$$p_{t-n} = \left[\lambda_{t-n},\ \ 1-\lambda_{t-n}\right] \tag{9}$$

We also assume during the next interval that there is a probability 'ρ_{t+1-n}' that members borrow and '1-ρ_{t+1-n}' otherwise. The two-state Markov chain transition probability matrix is illustrated below.

$$P = \begin{array}{c} \\ Borrow_{t-n} \\ NoBorrow_{t-n} \end{array} \begin{array}{c} \begin{array}{cc} Borrow_{t+1-n} & NoBorrow_{t+1-n} \end{array} \\ \begin{bmatrix} \rho_{t+1-n} & 1-\rho_{t+1-n} \\ \phi_{t+1-n} & 1-\phi_{t+1-n} \end{bmatrix} \end{array} \tag{10}$$

The above two-state transition matrix converges in steady state as follows (see Hsu, 2011).

$$P = \begin{bmatrix} \rho & 1-\rho \\ \phi & 1-\phi \end{bmatrix} \tag{10a}$$

This matrix in Equation (10a) is further simplified using the well-known Bayes' rule, as illustrated in the Appendix, where we realise $\phi = \dfrac{\lambda(1-\rho)}{1-\lambda}$, and $1-\phi = \dfrac{1-2\lambda+\rho\lambda}{1-\lambda}$.

$$\Rightarrow P = \begin{array}{c} \\ Borrow_{t-n} \\ NoBorrow_{t-n} \end{array} \begin{array}{c} \begin{array}{cc} Borrow_{t+1-n} & NoBorrow_{t+1-n} \end{array} \\ \begin{bmatrix} \rho & 1-\rho \\ \dfrac{\lambda(1-\rho)}{1-\lambda} & \dfrac{1-2\lambda+\rho\lambda}{1-\lambda} \end{bmatrix} \end{array} \tag{10b}$$

The long-run borrowing behaviour converges to a steady state '$\hat{\rho}$'. That is, there exists a stationary distribution for the Markov chain. This is found by solving

$$\hat{p}\begin{bmatrix} \rho & 1-\rho \\ \dfrac{\lambda(1-\rho)}{1-\lambda} & \dfrac{1-2\lambda+\rho\lambda}{1-\lambda} \end{bmatrix} = \hat{p} \tag{11}$$

Where, $\hat{p} = [s_1, \quad s_2]$, and $s_1 + s_2 = 1$ (12)

Equation (11) can then be rewritten as follows:

$$[s_1, \quad s_2]\begin{bmatrix} \rho & 1-\rho \\ \dfrac{\lambda(1-\rho)}{1-\lambda} & \dfrac{1-2\lambda+\rho\lambda}{1-\lambda} \end{bmatrix} = [s_1, \quad s_2] \tag{13}$$

Solving the matrix, we obtain two equations described below:

Equation 1

$$s_1\rho + s_2\frac{\lambda(1-\rho)}{1-\lambda} = s_1 \tag{14}$$

$$\Rightarrow s_1 = s_2\left(\frac{\lambda}{1-\lambda}\right), \ \forall\, \rho \neq 1 \tag{14a}$$

Equation 2

$$s_1(1-\rho) + s_2\left(\frac{1-2\lambda+\rho\lambda}{1-\lambda}\right) = s_2 \tag{15}$$

$$\Rightarrow s_1 = s_2\left(\frac{\lambda}{1-\lambda}\right), \ \forall\, \rho \neq 1 \tag{15a}$$

Thus, both Equations (14a) and (15a) lead to the same solution, implying the exogeneity of 'ρ'. By substituting 's_1' in Equation (14a) into Equation (12), we get

$$1 - s_2 = s_2\left(\frac{\lambda}{1-\lambda}\right) \tag{15b}$$

$$\Rightarrow 1 = s_2\left(\frac{1}{1-\lambda}\right)$$

$$\Rightarrow s_2 = 1-\lambda \text{, and hence } \Rightarrow s_1 = \lambda \tag{15c}$$

Thus, restating ' $\hat{p}$ ' of Equation (12) with the results derived in Equation (15c) gives us the steady state matrix as follows:

$$\hat{p} = \left[\lambda, \quad 1-\lambda\right] \tag{15d}$$

Proposition 3. A member borrowing behaviour is contingent on her/his past borrowing history.

We find member borrowing behaviour is path dependent, which corroborates the empirical evidence documented in Lawrence and Elliehausen (2008). Despite this intricate issue of path dependency, we can still determine the loans to be underwritten by exploiting the property of steady state, where a fraction 'λ' of the population borrow (irrespective of previous borrowing). For mathematical tractability and aligned with Lawrence and Elliehausen (2008), we assume borrowers who do not redeem their loans would continuously rollover their facility. Therefore, default emerges only at terminal period 'T' (see Figure 10 and Equation (16)). All other variables and covenants remain the same.

$$\underbrace{\left[\sum_{i=-m}^{T} C(1-\zeta)(\gamma^i)\right]}_{\text{Receipt of member monthly contributions}} - \underbrace{\left[\sum_{i=t-n}^{T-n} \lambda Q(1-\zeta)(\gamma^i)\right]}_{\text{Disbursement of interest-free payday loan to liquidity constrained members (borrowers) over multi-period cycle}} + \underbrace{\left[\sum_{i=t+1-n}^{T-1} \lambda Q\gamma^i\right]}_{\text{Loan settlements by borrowers over a multi-period cycle}}$$

$$+\gamma^T \underbrace{\left[\lambda(1-\alpha)(Q-S)\right]}_{\text{Repayment of non-defaulting borrowers' savings net of outstanding loan}} + \underbrace{\lambda\alpha S}_{\text{Retention of defaulting borrowers' savings}} - \underbrace{(1-\lambda)S}_{\text{Repayment of non-borrowers' savings}}\Big] \geq 0 \tag{16}$$

We substitute ' S ' from Equation (1) into Equation (16) and simplify it to derive

$$C(1-\zeta)(\gamma^{-m})\left[1+...+\gamma^{T+m}\right]-\lambda Q(1-\zeta)(\gamma^{t-n})\left[1+...+\gamma^{T-t}\right]+\lambda Q\left(\gamma^{t+1-n}\right)\left[1+...+\gamma^{T-t-2+n}\right]$$
$$+\gamma^{T}\left[\lambda Q(1-\alpha)+\lambda C(T+m+1)(2\lambda\alpha-1)\right]\geq 0 \quad (16a)$$

$$\Rightarrow C(1-\zeta)(\gamma^{-m})\left(\frac{1-\gamma^{T+m+1}}{1-\gamma}\right)-\lambda Q(1-\zeta)(\gamma^{t-n})\left(\frac{1-\gamma^{T-t+1}}{1-\gamma}\right)+\lambda Q\left(\gamma^{t+1-n}\right)\left(\frac{1-\gamma^{T-t-1+n}}{1-\gamma}\right)$$
$$+\gamma^{T}\left[\lambda Q(1-\alpha)+\lambda C(T+m+1)(2\lambda\alpha-1)\right]\geq 0 \quad (16b)$$

$$\Rightarrow Q\leq C\left[\left(\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{T+m+1})}{1-\gamma}\right)+\gamma^{T}\lambda(T+m+1)(2\lambda\alpha-1)\right]\text{X}$$
$$\left[\left(\frac{1-\gamma}{\lambda\left[(1-\zeta)(\gamma^{t-n})(1-\gamma^{T-t+1})-(\gamma^{t+1-n})(1-\gamma^{T-t-1+n})\right]}\right)-\left(\frac{1}{\gamma^{T}\lambda(1-\alpha)}\right)\right] \quad (16c)$$

Potential maximum loan is,

$$Q_{\max 1}=C\left[\left(\frac{(1-\zeta)(\gamma^{-m})(1-\gamma^{T+m+1})}{1-\gamma}\right)+\gamma^{T}\lambda(T+m+1)(2\lambda\alpha-1)\right]\text{X}$$
$$\left[\left(\frac{1-\gamma}{\lambda\left[(1-\zeta)(\gamma^{t-n})(1-\gamma^{T-t+1})-(\gamma^{t+1-n})(1-\gamma^{T-t-1+n})\right]}\right)-\left(\frac{1}{\gamma^{T}\lambda(1-\alpha)}\right)\right] \quad (16d)$$

Proposition 4. The efficiency condition of a circuit with borrowing by a fraction of members across multi-periods is contingent on satisfaction of Equation (16c)

The efficiency states detailed in Proposition 1 similarly applies for Proposition 4. We find that the circuit's efficiency can be improved in a multi-period model. A circuit that is conducted repeatedly over a series of periods will have greater latitude on its borrowing policy, as each borrower's financial conduct is fully revealed (Hosios and Peters, 1989). By instituting renewal model that is dependent on the member's financial conduct, the circuit effectively addresses conflict of interest between borrowers and non-borrowers. In this situation, each member will endeavour to undertake fewer risks, which would potentially affect access to future liquidity facility. Credible threat of sanctions in multi-period states can also reduce moral hazard (Stiglitz, 1990).

4.3.1 Numerical illustration

Using Equations (4d), (7e) and (16d), we conduct a numerical simulation using MS Excel to enumerate the breakeven level of the interest-free payday loan in each of the three models. The circuit exogenous factors encompass: (i) member income profile *y*; (ii) cost of fund prevailing in mainstream credit market *r*; (iii) transaction costs and default ζ and α; (iv) loan tenure and drawdown period *n* and *t*; (v) underwriting constraint corresponding to the income multiple b_1 and b_2; (vi) gestation period prior to loan drawdown *m*; (vii) fraction of borrowing members λ; and (viii) substantive circuit life *T*. We use the observations by Lawrence and Elliehausen (2008) and the FDIC (2010) to check the reasonableness of the exogenous parameters. Overall, the final values of the exogenous parameters are set to avoid excessive financial burden and ensure a liberal round of liquidity cycle, until member reaches financial security.

Table 4: Indicative pricing structure of the endogenous interest-free payday loan circuit

Increase in exogenous factor	Direction of change in endogenous factor		
	C_{max}	S_{max}	Q_{max}
y	+	+	+
b_1	+	+	+
b_2	uc	uc	+
r	uc	uc	+
ζ	uc	uc	–
α	–	–	–
m	+	+	+
n	uc	uc	–
λ	uc	uc	–
T	uc	uc	+

Notes: Direction of change in the endogenous values '+' increase; '–'decrease, and 'uc' unchanged.

We tabulate the efficiency scenarios, given various permutations of the endogenous parameters, which cover (i) maximum member monthly contribution: C_{max}; (ii) maximum accumulated savings: S_{max}; and (iii) potential maximum loan: Q_{max}. Table 4 illustrates the effect on the endogenous factors, given changes in the exogenous parameters. This provides an indicative pricing framework that can be emulated in the design of similar endogenous leveraged circuits. It highlights the sensitivity of each endogenous factor to the decisions that the circuit undertakes and the various levers that may be combined to enhance the circuit efficiency.

Additionally, Table 5 provides the resultant values of the endogenous parameters, which assure that the circuit satisfies the economic-efficiency propositions under Models 1–3. Model 3 further demonstrates the interplay of the loan constraint covenant between $\frac{y}{b_2}$ or Q_{max}, where Q_{max} is characterised by the lower of either Q_{max1} or $Q_{max2,\ t\text{-}n}$. Here, $Q_{Binding}$ demands balancing the twin issues of: (i) protecting the member from potential debt entrapment; and (ii) ensuring the circuit's long-run liquidity, i.e., solvency. By not pursuing aggressive loan disbursement policies, it promotes accumulation of equity buffer that would ultimately allow the circuit greater financial latitude to pursue financial policies that enhance member welfare within the reasonable risk tolerance limits, eg. relaxing the '$Q_{Binding}$' constraint and undertaking loan rehabilitation program that customises the loan repayment tenure for genuinely financially constrained member.

Table 5: Results illustrating circuit economic efficiency for each model

Model 1										
b_1	b_2	r	ζ	α	m	n	C_{max}	S_{max}	Q_{max1}	$Q_{Binding}$
100	10	12%	2%	10%	6	¼ ⅓	20	160	1,045 960	200
		15%	2%	10%	6	¼ ⅓	20	160	1,228 1,113	200
50	10	12%	2%	10%	6	¼ ⅓	40	320	2,091 1,921	200
		15%	2%	10%	6	¼ ⅓	40	320	2,456 2,226	200
Model 2										
b_1	b_2	r	ζ	α	m	n	λ	C_{max}	S_{max}	Q_{max1}	$Q_{Binding}$
100	10	12%	2%	10%	6	¼	0.2 0.3 0.4	20	160	4,044 2,794 2,170	200
						⅓	0.2 0.3 0.4	20	160	3,715 2,567 1,993	200
		15%	2%	10%	6	¼	0.2 0.3 0.4	20	160	5,026 3,444 2,652	200
						⅓	0.2 0.3 0.4	20	160	4,555 3,121 2,404	200
50	10	12%	2%	10%	6	¼	0.2 0.3 0.4	40	320	8,087 5,589 4,339	200
						⅓	0.2 0.3 0.4	40	320	7,430 5,135 3,987	200
		15%	2%	10%	6	¼	0.2 0.3 0.4	40	320	10,052 6,887 5,305	200
						⅓	0.2 0.3 0.4	40	320	9,109 6,241 4,807	200

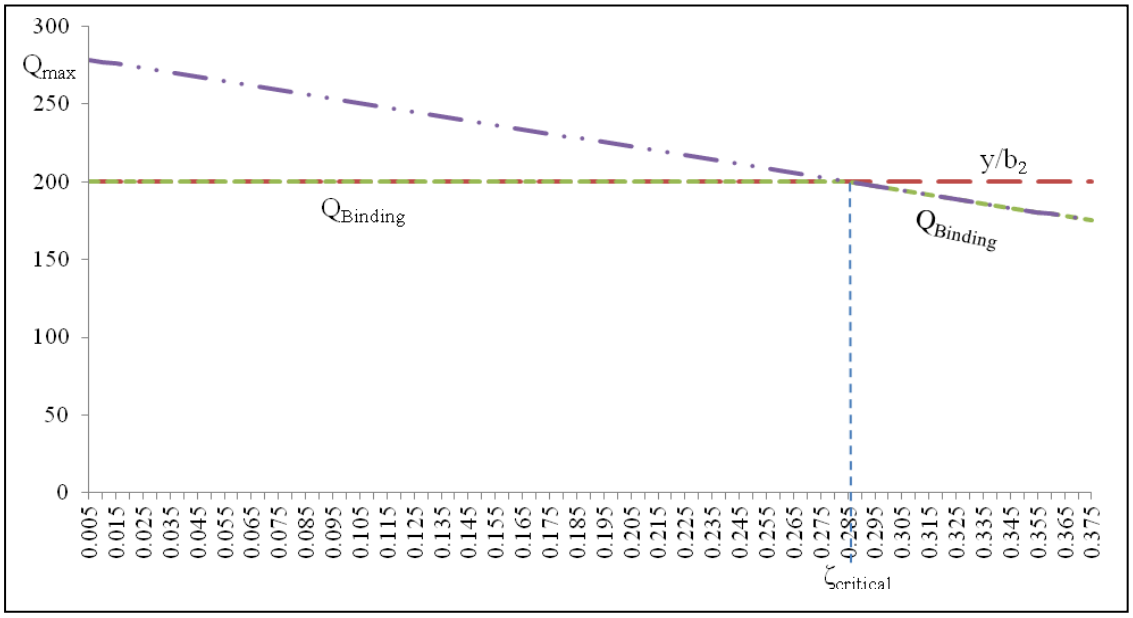
Model 3													
b_1	b_2	r	ζ	α	m	n	λ	T	C_{max}	S_{max}	Q_{max1}	Q_{max2}	$Q_{Binding}$
100	10	12%	2%	10%	6	¼	0.2 0.3 0.4	180	20	3,740	2,417 1,611 1,208	137	137
						⅓	0.2 0.3 0.4	180	20	3,740	2,394 1,596 1,197	137	137
						¼	0.2 0.3 0.4	240	20	4,940	2,417 1,611 1,208	137	137
						⅓	0.2 0.3 0.4	240	20	4,940	2,394 1,596 1,197	137	137
		15%	2%	10%	6	¼	0.2 0.3 0.4	180	20	3,740	2,279 1,520 1,140	137	137
						⅓	0.2 0.3 0.4	180	20	3,740	2,253 1,502 1,127	137	137
						¼	0.2 0.3 0.4	240	20	4,940	2,279 1,520 1,140	137	137
						⅓	0.2 0.3 0.4	240	20	4,940	2,253 1,502 1,127	137	137
50	10	12%	2%	10%	6	¼	0.2 0.3 0.4	180	40	7,480	4,833 3,222 2,417	274	200
						⅓	0.2 0.3 0.4	180	40	7,480	4,788 3,192 2,394	274	200
						¼	0.2 0.3 0.4	240	40	9,880	4,833 3,222 2,417	274	200
						⅓	0.2 0.3 0.4	240	40	9,880	4,788 3,192 2,394	274	200
		15%	2%	10%	6	¼	0.2 0.3 0.4	180	40	7,480	4,559 3,039 2,279	274	200
						⅓	0.2 0.3 0.4	180	40	7,480	4,506 3,004 2,253	274	200
						¼	0.2 0.3 0.4	240	40	9,880	4,559 3,039 2,279	274	200
						⅓	0.2 0.3 0.4	240	40	9,880	4,506 3,004 2,253	274	200

Notes: The model is solved for endogenous variables C_{max}, S_{max} and Q_{max} where C_{max} is the maximum monthly contribution, S_{max} is the maximum savings accumulated from the contributions, and Q_{max} is the potential maximum loan per period. Total loan advanced is given by $Q_{Binding} = min\ \{y/b_2, Q_{max}\}$. The values of the endogenous variables depicted in the table above signify the breakeven threshold that ensures the circuit is economic neutral. For this simulation, the exogenous parameters are: (i) member monthly after tax income: y = \$2,000; (ii) income multiplier constraint: $b_{1,1}$ = 80 times, $b_{1,2}$ = 40 times; (iii) loan multiplier constraint: b_2 = 25 times; (iv) cost of funds: r_1 = 12%, r_2 = 15%; (v) transaction and default costs: ζ = 2% and α =10%; (vi) membership gestation period: m = 6 months; (vii) fraction of borrowers in the circuit: λ_1 = 0.2, λ_2 = 0.3; λ_3 = 0.4; (viii) loan tenure: n_1 = 7 days (¼ month); n_2 = 10 days (⅓ month); (ix) loan commencement period: t = 1; and (x) circuit life: T_1 = 15 years (180 months), T_2 = 20 years (240 months).

Based on Equation (16d), we extend the simulation to illustrate the effect of transaction cost on the potential loan amount, while holding other exogenous factors constant (see Figure

11).[91] Premised on the loan covenant in Equation (6) with loan multiple of $b_2 = 10$ and monthly after tax income of $y = \$2{,}000$, $\frac{y}{b_2}$ is then fixed at \$200. On the other hand, 'Q_{max}' changes with variation in the transaction cost 'ζ', i.e., there exists an inverse relationship between 'Q_{max}' and 'ζ'. '$Q_{Binding}$' as given in Equation (6a) is the minimum of either $\frac{y}{b_2}$ or Q_{max}. As highlighted in Equation (6b), if the transaction cost is low, i.e., $\frac{y}{b_2} < Q_{Max}$, then $Q_{Binding} = \frac{y}{b_2}$. Otherwise, $Q_{Binding}$ is restrained by Q_{max}. The critical transaction load, whereby $\frac{y}{b_2} = Q_{max}$, is when $\zeta = 28.7\%$, which is signified in Figure 11 by $\zeta_{critical}$.

Figure 11: Effect of transaction cost on the circuit potential maximum loan



5. Discussion and conclusion

Payday borrowers are categorically those who suffer from poor credit history, exhibit time-inconsistent preferences and are often precluded by mainstream financiers. Given the prohibitive payday loan rates, this may potentially lead into a debt cycle if the borrower fails to observe the repayment term. Despite the unfavourable publicity against payday loans,

91 Exogenous factors are: y = \$2,000, m = 6 months, r = 15%, α = 10%, λ = 0.4, T = 180 months, and t = 1.

financially constrained households still succumb to its services. This underlines a latent need for inexpensive short term liquidity facility to bridge their liquidity needs.

Unlike previous studies on payday loans, this study undertakes to conceptualise a solution to usurious payday loans and address credit rationing in mainstream finance. It entails the design of an institutional structure that embeds the interplay of cost efficient organisations and cultural beliefs. Our model is based on risk-neutral economic agents within an endogenous leverage circuit that draws from the technology of member based institutions such as ROSCA and its hybrids, i.e., ASCRA, mutual and financial cooperative. A unique feature of this structure is that it harnesses the concept of coalition of savers and borrowers to allay inter-temporal liquidity shocks faced by its members, through the deployment of interest-free payday loan.

Our study illustrates the employment of this antiquated charitable form in contemporary financial perspective. This credit modality is chosen for its contrast with current payday loans. Furthermore, it is held esteemed in religious tenets, which specifically distinguish such deeds from usurious practices. We demonstrate that the circuit performs favourably in contrast to current usurious payday loans. First, the interest-free facility averts expropriation of wealth, an issue associated with payday loans. The periodic contribution, which features a minimal fraction of members' salary, promotes asset building which should consequently improve their financial security in the long-run. Second, our member based endogenous circuit allows credit accessibility to these households who are financially rationed by mainstream financiers. Third, we attest the economic proposition of interest-free loans expounded in religious teachings in current financial settings, whereby the circuit is able to boot strap its resources to grow endogenously. Fourth, in line with documented studies of time-inconsistent preferences of these households, the institutional design of our interest-free payday loan relies on the commitment technologies associated with circuit-based structures.

The efficiency of an endogenous leveraged circuit is contingent on observing risk control measures to constraint adverse selection and moral hazard, thus reducing default and transaction costs significantly. This builds on ensuring equitable commitment, i.e., the periodic contribution can be fulfilled without jeopardising financial interests of individual members and the circuit. This is followed through by requiring the commitment to be directly dispensed into the circuit, which would effectively pre-empt irrational consumption tendencies. This is fortified with programs that build the members' financial capability and

route them from poor credit tendencies. Next, we require existence of co-signer that acts in absence of standard collateral. Here, the co-signer's central role is in reducing costly state verification and execution of credible sanctions. The institutional design of the circuit provides upfront dilution of transaction costs that directly feeds into promoting the circuit efficiency.

Given the circuit technology that is member driven, accumulation of substantive capital base may create lag in time to loan issuance. To manage the gestation period, the circuit may rely on seed funding from *zakāt* and *sadaqah* to reinforce its initial capital base. These charitable funds can also be institutionalised to provide safety net to the circuit that defrays any long-run sustainability issues. Alternatively, the interest-free loan facility can be integrated into an already operational circuit, eg. financial cooperative. Results of our study support the policy direction of the FDIC's (2010) small-dollar loan program. That is, it promotes affordable credit, observes risk-based underwriting, maximises technology and automation, integrates savings component in combination with financial education. Last, our model sets an indicative pricing mechanism, mostly absent in charitable institutions, which in the long-run promotes self-sufficiency.

In terms of future research work, this study endows us with a framework to investigate the efficiency of *ar-rahnu* (Islamic form of pawn broking) facility in alleviating liquidity issues faced by microtraders. As with our endogenous leveraged circuit, the *ar-rahnu* facility also employs interest-free loan to the supply of funding. Here, the borrower (entrepreneur-manager) pawns his property in lieu of the interest-free loan from the lender (financial intermediary). In contrast to mainstream pawn broking practices, the intermediaries earn their revenue from the custodial services that is contingent on the collateral value and safe keeping tenure. To our knowledge, no research has been undertaken to assess the economic efficiency of *ar-rahnu* in comparison to competing mainstream pawn broking and other microfinance facilities. The outcome of such study is important in light of the public policy objective of expanding affordable credit to the masses.

Chapter 4: Reinforcing resilience of the financial architecture with default-free collateralised loan

"Older collateralised loan obligations are worrying managers as their due date approaches...Participants in the market are warning that bonds issued by the CLOs before the crisis may be getting more dangerous, as managers invest in riskier assets... ".

Foley and Stothard (2012, p.32)

1. Introduction

Collateralised loan obligations (CLO), linked to the recent financial meltdown are rearing their head again after a short impasse. In the run up to the financial crisis, a total of $97 billion were reported to have been issued in 2006 (Foley, 2012). Markets have voiced concern whether these exotic collateralised loans that are nearing maturity have the ability to fulfil their obligations (Foley and Stothard, 2012). These exotic loans were portrayed by their originators as safe-haven with low default risk given the collateral backing the instrument. Associated with collateralised funding are also controversies surrounding rehypothecation activities, the churning of collateral posted by broker-client to the broker-dealer for its own proprietary activities. Figures show approximately $1 trillion securities pledged by hedge fund players were rehypothecated or further leveraged in 2007 (Singh and Aitken, 2010).

The unfolding of the crisis highlights a pressing need for an extensive review of the issue on financial fragility, one of the economic rationales for the Islamic prohibition of *ribā an-nasi'ah* (see Salleh et al., 2012). Specifically in this essay, we highlight the import of financial fragility from the perspective of collateralised loan given its significance in the construct of present financial system. . The repercussions on the global economy accentuate the pertinence of proper pricing of collateralised loan to curb default. Particularly where the traditional forms of collateralised loan that are tied to real productive processes are increasingly being displaced by securitisation, i.e., layering of loan with loan, that is then further spun to support repo arrangements (see Gorton and Metrick, 2009). Moreover, the transitioning towards speculative and Ponzi-like financing predicted by Minsky (1992), and

the inextricable linkage of the financial sector and the real economy through the collateral channel pointed by Fisher (1933), Bernanke and Gertler (1989), Reichlin and Siconolfi (2004), underscores the criticality of this issue. Thus, there is a resounding need for the financial fraternity to address the vital issue of agency cost of debt in loan pricing rather than marketing risky loan, with the expectation that few defaults will be offset by a large non-defaulting pool. As endeared by Minsky (1992), diversification of poorly underwritten loan only perturbs vulnerability in poor states of economy.

In detangling collateralised loan pricing, the economic efficiency of collateralisation in minimising agency costs merits attention. A substantive part of this research is expended on information asymmetry issues affecting optimal loan contracts (see Leland and Pyle, 1977; Barnea et al., 1981b; Eisenhardt, 1989; Harris and Raviv, 1991; Allen, 2001). Whilst information opacity does exacerbate principal-agent conflicts (Grossman and Hart, 1983), by only addressing the former it nonetheless does not fully expunge the agency costs of (i) 'risk-shifting' or 'asset substitution'; (ii) 'underinvestment' or 'debt overhang'; and (iii) 'defaults' or 'bankruptcy' (Jensen and Meckling, 1976; Myers, 1977; Smith and Warner, 1979a,b; Barnea et al., 1981b). As mentioned by Berger et al. (2011), there is still residual friction unresolved by enhanced information architecture. Additionally, the mixed results between theoretical and empirical research points to the potential failure to endogenously account for agency cost in the analysis of collateralised loan contracts (see Table 6).

Table 6: Collateralised loan theoretical framework and empirical results

Collateral increases with:	Theoretical framework:	Empirical evidence:
Extent of agency cost	Yes: Smith and Warner (1979 a,b); Stulz and Johnson (1985); Chan and Kanatas (1985)	Yes: Archer et al. (1996); Eisdorfer (2008); Steijvers et al. (2010)
Extent of borrower riskiness in information asymmetric setting	Yes: Chan and Kanatas (1985); Bester (1987); Besanko and Thakor (1987a)*; Chan and Thakor (1987); Boot et al. (1991) – supports *incentive theory*, generally tied to moral hazard issue No: Chan and Kanatas (1985); Bester (1985; 1987); Besanko and Thakor (1987a)*; Chan and Thakor (1987) – supports *signalling theory* * *the paper discusses both theories.*	Yes: Berger and Udell (1990), Jimenez and Saurina (2004); Jimenez et al. (2006); Gottesman and Roberts (2007) No: Ono and Uesegi (2009)
Minimal lender (institutional) knowledge/ expertise	Yes: Inderst and Mueller (2007)	Yes: Jimenez and Saurina (2004); Jimenez et al. (2006)
Extent of banking relationship	Yes: Boot and Thakor (1994); Boot (2000)* – supports *hold up* theory No: Boot (2000)* – supports *soft budget constraint* theory * *the paper discusses both theories.*	Yes: Jimenez et al. (2006); Steijvers et al. (2010) No: Menkhoff et al. (2006); Ono and Uesegi (2009)
Low collateral redeployability	Yes: Shleifer and Vishny (1992); Benmelech and Bergman (2011)	Yes: Benmelech and Bergman (2011)
High transaction/ dissipative costs[92]	Yes: Barro (1976); Benjamin (1978); Boot et al. (1991); Lacker (2001); Jokivuolle and Puera (2003)	Yes: Boot et al. (1991)
Tightening of discount rate/ Risk free rate	Yes: Boot et al. (1991)	Yes: Jimenez et al. (2006)
Extent of loan size	Yes: Boot et al. (1991)	Yes: Boot et al. (1991); Jimenez et al. (2006)
Extent of loan tenure	Yes: Boot et al. (1991)	Yes: Boot et al. (1991)

92 Costs to the lender include monitoring and supervision costs, enforcement of property rights and disposal upon default.

Collateral increases with:	Theoretical framework:	Empirical evidence:
Extent of market competition	Yes: Besanko and Thakor (1987a); Chan and Thakor (1987)	No: Jimenez et al. (2006 – only in respect of short term loans)
Movement of macroeconomic factor	Yes: Bernanke and Gertler (1989 – from debt-deflation perspective); Reichlin and Siconolfi (2004) No: Benjamin (1978); Bernanke and Gertler (1989 – from asset bubble perspective); Reichlin and Siconolfi (2004 – from business cycle perspective)	Yes: Jimenez et al. (2006 – testing effect of GDP decline)
Collateralised loans profile:	Theoretical framework:	Empirical evidence:
Collateralised loans portfolio are riskier (higher default probability)		Yes: Berger and Udell (1990), John et al. (2003); Gottesman and Roberts (2007)
Collateralised loans portfolio have higher yield spread		Yes: Berger and Udell (1990); John et al. (2003); Gottesman and Roberts (2007)

The strategy adopted in this discussion paper is to provide qualitative insights on the economic efficiency of two forms of collateralised loan (i) a pragmatically default-free; and (ii) default-prone one.[93] This involves modelling a contractual financial relationship between risk-averse lender and borrower, within a framework of rational expectations and symmetric information setting.[94, 95] Consistent with Allen (2001), we treat the costs of bankruptcy as endogenous arising from conflict of interest (agency perspective). Building on this result, we expound design of an iron-clad collateralised loan structure that further improves on the agency issues. The goal is to properly price the collateralised loan such that it reduces the *in-moneyness* of the embedded put option to default. This is of utmost importance given significant default risk can prevent market formation (Allen, 1981).

The paper contributes to current literature from the following perspectives. First, it demystifies the present misconception with regards to agency cost. In particular, we demonstrate that the elements of principal-agent relationship warrant its own treatment that is not eliminated even with information symmetry. Second, this paper enriches the present literature that acknowledges the presence of conflict of interest but fails to endogenously account for it in their loan pricing models (see again Table 6). We characterise an optimal collateralised loan as one that potentially moderates the endogenous issues of agency. Our proposal is consistent with Myers (2001), and Ebrahim and Hussain (2010) who infer the efficiency of default-free collateralised loan structure as mitigating agency cost. Third, by segregating the welfare of financial contracting parties, it enumerates the conflict of interest between the two. This provides more substantive solution to that of Myers (1984b), and Strebulaev (2007) static as well as dynamic and capital structure trade off hypothesis.

93 It should be noted that our model is conceived in a framework of well-functioning financial and capital markets. Consistent with Levine et al. (2000) we assume the existence of an information architecture where property rights, foreclosure procedures needed for the underlying real assets of a firm to serve as collateral and accurate methods of valuation are well established.

94 Maddock and Carter (1982) define rational expectations as "*the application of the principle of rational behavior to the acquisition and processing of information and to the formation of expectations*" (p.41). It is *'self-fulfilling*' in the sense that the economic agents form correct expectations, given the pricing model and information (Bray, 1981).

95 The setting involving symmetric information is consistent with Biais et al. (2010) where equilibrium asset prices aggregate and reveal private information, which permit market participants to easily interpret private information held by counterparties by observing their trading patterns. We also find there are various mechanisms used in the real world to reveal the agents' profile a priori and incentivise effort ex-post (see Section 3).

Fourth, the default arising from endogeneity of agency cost in our loan pricing model differs from that of the contingent claims pricing models. In the structural-form of Black-Scholes (1973) and Merton (1974), defaults although *endogenous* arise only from agent-firm value factors. On the other hand, the reduced-form models of Jarrow-Turnbull (1995) and Duffie-Singleton (1999) default is *exogenous* and the primary focus is on calibrating the economic cost of default. Fifth, in terms of macroeconomic implication, collateralised loan pricing that controls agency cost through maximising the utilities of both lender and borrower provides restitution to fragile financial system. As commented by Fama (1978, p.272), "*...maximizing combined stockholder and bondholder wealth is the only market value consistent with a stable equilibrium*".

The ramifications of our results are profound. In the aftermath of the financial crisis, regulators are compelling banks in Europe to raise their capital. While this moderates moral hazard, it may *not* be sufficient if banks disregard the pricing of their loan facility, which endow borrowers a strategic option to default and hence transfer the risk of their venture to the banks. Regulatory authorities need to require banks to price their loan facility in a pragmatic manner stripping away the put option to default.[96] This will strengthen the financial sector and enhance its resiliency.

This essay proceeds in Section 2 with a review of collateral and its economic application in loan contracts. Section 3 attempts to demystify agency cost issues with that of asymmetric information. Majority of studies associate non-performing loans arise from the agent explicit decision to exercise the embedded default option. Given the strong preference for collateralised loan in financial contracting, we rationalise in Section 4 the economics of collateral in addressing this issue. In Section 5 we extend this view to further minimise the put option to default by the borrower by ensuring that it is not significantly in-the-money. This involves pricing the loan such that the collateral does fully expunge default (nearly risk-free debt). Thus, it maximises the welfare of both lender (principal repayment with yield) and borrower (maximise firm value). This is conducted in an agency theoretic framework consistent with Ebrahim and Hussain (2010). Section 6 concludes.

96 This can be done via insurance paid by the lender (continuous workout) – see Shiller et al. (2013).

2. Collateral taxonomy

Collateral is depicted as a lien that permits the borrower to raise the requisite financial resource externally rather than pursuing the costly option of liquidating the said asset (Igawa and Kanatas, 1990), or faced with credit rationing (Jaffee and Russell, 1976; Stiglitz and Weiss, 1981). Collateralised loans are generally non-recourse in that recovery of the defaulted loan amount is limited to the foreclosed collateral value. That is, the security indemnifies the lender from defaults that may arise and consequently discharges the borrower from any outstanding liability. In a study by Boot and Thakor (1994), they find collateralised loans ranks Pareto efficient to unsecured loan and self-financing. First, the high interest rates of unsecured loan (to compensate for credit risk) affect the borrower marginal return to effort in successful states. Second, self-financing warrants liquidation of the asset, whereas for collateralised loans this only occurs in default states.

In the context of bank lending, collateralised loan features prominently in banks' balance sheet. Reportedly 70% of commercial and industrial loans disbursed in the United States are secured (Berger and Udell, 1990), mirroring the large share reported in syndicated loans (Gottesman and Roberts, 2007). Apart from the corporate loan sector, collateralised loan also plays a key role in financing small businesses in the United States and United Kingdom (Berger and Udell, 1998; Hanley and Girma, 2006), as well as in emerging markets (Menkhoff et al., 2006).[97] Securitisation activities command a significant market in the United States. Gorton and Metrick (2009) note that mortgage-related securitisation formed the largest fixed-income market. In respect of non-mortgage related securitisation, it overshadows that of corporate debt market share during the pre-financial crisis period in 2004-2006. By pooling the loans that originates from the banks' books, securitisation process permits these loans to be used as collateral for further funding activities such as CDO and repo arrangements.[98] In the hedge fund industry, the collateral posted for margin financing, securities borrowing with the prime broker were allowed by regulations to be rehypothecated for the broker-dealer's own trading activities (Singh and Aitken, 2010).

97 Study on the Spanish credit market by Jimenez and Saurina (2004) contrasts those of the United States and United Kingdom markets. They find majority of the loan studied are unsecured and this relates to reliance on relationship banking in moderating default risk.

98 See (i) Gorton and Metrick (2009) for flow of the interconnectedness of the financial markets arising from collateralisation of banks' loan portfolio; and (ii) Singh and Aitken (2010) for the multiplier effect arising from rehypothecation activities.

Table 7: Collateral classifications

Categories	Economic role
Inside (business) collateral – asset drawn from firm existing pool of assets	Collateralised debt is economic-efficient to self-financing, since it avoids liquidation of asset and hence, loss of productive opportunity. In event of default, it does not trigger asset losses beyond that pledged by the firm. Thus, the cost of providing additional unit of collateral is the associated transaction costs related to the collateral. Collateral minimises the required financing rate compared to unsecured loan: (i) Reduces the value of put option to default in debt contracts. (ii) Minimises asset substitution that reduces firm terminal value. It is comparatively more effective than covenant due to the need to monitor compliance. (iii) Lowers enforcement cost of default - provides the secured lender absolute priority over other creditors. This 'me-first' rule delineates the collateral from the common pool of firm assets and thus accord lender legal certainty in the event of bankruptcy. (iv) The lower yield afforded by the presence of collateral moderates underinvestment as it limits wealth transfer from borrower to financier.
Personal (outside, non-traded) collateral – private assets of the equityholder that are not normally attachable to the firm Personal guarantee – provides general recourse against the private assets of the said guarantor. Unlike personal asset collateral, it is not bound to a specific lien.	It notionally expands the borrower's balance sheet. However, default triggers asset losses beyond that owned by the firm. Thus, the cost of providing additional units of collateral is basically the loss of the assets as well as the transaction costs related to the collateral. These forms of collateral: (i) Enhances secured lender property rights without affecting other creditors' claims during bankruptcy. (ii) Although the pecuniary value of this collateral is marginal to the lender, its existence amplifies borrower reservation value which in turn moderate agency issues and has the effect of lifting the limited liability veil. (iii) Moderates information asymmetry issues of adverse selection and moral hazard as it reveals borrower private information. This explains the heavy reliance of both forms of collateral in small business, family firm lending. (iv) Alleviates credit rationing since debt capacity is not entirely based on inside collateral. It ranks lesser than inside collateral due to: (i) Less restrictive controls on usage of assets backing the secured debt. (ii) Protective legislation favouring small borrowers.

Source: Benjamin (1978); Chan and Kanatas (1985); Berger and Udell (1998, 2003); Leeth and Scott (1989); Boot et al. (1991); Morellec (2001); Ono and Uesugi (2009); Stulz and Johnson (1985); Steijvers et al. (2010).

The broad purpose of collateral is to moderate costly contracting (Smith and Warner, 1979a). Its use in loan contracts signifies the cost efficacies of institution of private ordering in preserving property rights as opposed to enforcement via the court system (see Table 7). Collateral ranks higher than penalties in controlling default risk (Allen, 1981), and overcomes restrictive mandates that are negatively associated with debt based covenants (Stulz and Johnson, 1985). In a cross-country study, Qian and Strahan (2007) find firms with more tangible assets operating in secured creditors rights environment, receive favourable loan terms (i.e., longer maturity and lower interest rates) as it enhances the lenders' right of recourse over these liens. They further observe that diffusion in loan ownership (i.e., greater number of participating banks in the loan) increases the use of collateral, signalling the complementarities of collateral in reducing the cost of default.

To remain effective in mitigating default, the value of collateral required must exceed the outstanding liability throughout the financing tenure (Bester, 1987). As highlighted in Table 6, this is correlated to its recovery costs including asset specificity (Smith and Warner, 1979a; Shleifer and Vishny, 1992; Benmelech and Bergman, 2011), ease of legal enforcement (Menkhoff et al., 2006), borrower risk and the collateral value (Barro, 1976; Benjamin, 1978; Boot and Thakor, 1994).[99, 100]

Various studies have documented the looping effect of the financial system and real sector through the collateral channel. For example, Gan (2007) and Chaney et al. (2010) document the country effects of exogenous shocks on collateralised loan in Japan and the United States, respectively. Both studies find systematic shock depresses collateral values. This in turn severely limits the loan capacity of borrowers and tightening of investments. Lack of collateral also creates barriers to entry for new firms and hence, limits entrepreneurship (Black et al., 1996). The collateral damage arising from the financial system with repercussions on the government funding machinery exemplifies how poorly structured collateralised loans feed financial fragility within the system as well as into the economy (Burton, 2012).

99 Asset specificity is inversely related to collateral realisable value for it limits redeployability to other real sectors such that the maximal potential loan recovery is dependent on financial state of potential bidders within the industry (see alternative viewpoint by Morellec, (2001)).

100 Non-tradable assets (only of value to the borrower) may also be pledged as long as it increases the cost of default to the borrower. However, this puts the onus on the lender to appropriate the correct valuation perceived by the borrower (Benjamin, 1978).

3. Detangling agency cost from asymmetric information

We analyse the rich literature on collateralised loan through the theoretical and empirical lenses of (i) agency costs; and (ii) asymmetric information. This provides a precursor to the discussion in Section 4 on the economic efficiency of collateral in loan pricing.

3.1 Agency cost

"*Agency costs are real as any other costs*" (Jensen and Meckling, 1976, p.357). It is well established that asset substitution, underinvestment and bankruptcy, components of agency cost of debt is inherent in contractual relationship involving principal delegation of managerial decision to an agent. This arises from the principal-agent conflict of interest as each seeks to maximise his/her own utility, which raises the probability that the agent may not be acting in the best interest of the principal (Barnea at al., 1981b; Eisenhardt, 1989). Given rational expectations, the principal may institute mechanisms to control these conflicts, including establishing incentives coupled with monitoring activities. Alternatively, principal may require agent to undertake actions that ensure conformance, i.e., bonding costs.

Agency cost is synonymous with risky loan where default risk is positive, i.e., the actual value of the project on going concern is less than the loan nominal value. As observed by Fama (1978, p.274), "*when the firm can issue risky debt, it may be able to use its financing decisions to shift wealth from its bondholders to its stockholders or vice versa*". This is similarly echoed by Myers (2001, p.96), whereby "*if debt is totally free of default risk, debtholders have no interest in the income, value or risk of the firm. But if there is a chance of default, then shareholders can gain at the expense of debt investors*".[101] That is, with a risk-free loan, borrower bears all of the project risk. Nonetheless, when these investments are leveraged, the loan becomes a risky debt by virtue of the embedded put option to default on the firm assets (Black and Scholes, 1973; Merton, 1974; Stiglitz, 1979), which may cause the lender ultimately holding the project residual risk.

101 The Modigliani and Miller (MM – 1958, 1963) and Miller (1977) model aggregates the two adversarial claimants (debt and equity) objective functions, thereby depriving the analysis of agency issues and hence the optimal pricing parameters of debt. Furthermore, it is construed under risk neutrality (akin to a linear programming model), yielding a multitude of solutions (i.e., the well-known invariant result) in the absence of market imperfections (such as taxes), and a corner (i.e., 100% debt financing) under corporate tax deductibility of interest. The capital structure irrelevance theory relies on strong presumption that individuals resorting to MM (1958) arbitrage have the same negotiating power accruing to financiers and institutional players. Similar limitations are observed in the Miller (1977) analysis.

First, shareholder may exhibit *risk shifting* behavior to undertake riskier investments or operational strategies that maximises his/her interest to the detriment of the lender.[102] By this, the firm may be more inclined to engage in high risk projects that generate high returns in successful states whilst sheltered from full effects of such losses in poor states. The institution of limited liability clause limits the lender's potential clawback in event of bankruptcy to the firm available assets. This highlights the prominence of incentive effect in agency issues discussed in earlier studies of Jensen and Meckling (1976), Smith and Warner (1979a,b), Barnea et al. (1981b), and Stulz and Johnson (1985). It is also linked to incomplete contracting (Holmstrom, 1979) that limits the principal's ability to structure contingent contracts on all possible outcomes as agent effort cannot be fully observed.

Second, borrower may consciously opt to *underinvestment* that is to reject positive net present value projects, if the gains from these new investments wholly accrue to the lender (Myers, 1977; Bodie and Taggart, 1978; Barnea et al., 1981b). This has a distortionary effect on the efficient allocation of economic resources, i.e., suboptimal investment decision which curbs firm future growth opportunities. Third, the riskiness of debt financing is compounded by *bankruptcy* costs that create a loss on the contracting party (Barnea et al., 1981b). As seen in the aftermath of the financial crises, the securitisation process that is essentially the trading of risky debt for debt magnifies the financial fragility, as the exercise of the embedded put option to default in the originating portfolio has potentially negative knock-on effect on the appended debt contracts. Even the threat of financial distress (regardless of actual occurrence of bankruptcy) has repercussions on the loan contractual terms (Myers, 1977).

3.2 Information asymmetry

Adverse selection is ubiquitous with imperfect information. This arises where one party to contract has superior information over the other. Another feature of asymmetric information is *moral hazard* that ensues from ex-post information opacity. Both are generally held as synonymous with agency theory in the financial literature. Here, using interest rate as credit allocation mechanism may result in selection bias, given "*the terms of a credit contract may affect the average quality of loan applicants. For instance, low risk borrowers may drop out of the market if bank raise the rate of interest. Loan contracts may involve moral hazard because they influence the behaviour of the borrowers. Thus, higher*

102 Risk shifting includes wider effects of managerial pursuits with intention to appropriate firm resources for personal perquisites (see Barnea at al., 1981b; Myers, 2001).

interest payments may induce the borrower to select investment projects with a higher probability of failure" (Bester, 1987, p.887).

Costly verification of the true character or action of the borrower magnifies hazards of 'market for lemons', as expounded by Akerlof (1970). Given concerns on borrower private information on his actions and project viability, a high risk borrower, i.e., 'lemon', may be offered credit terms contrary to his risk profile. As expressed by Leland and Pyle (1977, p.371), "*Borrowers cannot be expected to be entirely straightforward about their characteristics, nor entrepreneurs about their projects, since there may be substantial rewards for exaggerating positive qualities. And verification of true characteristics by outside parties [lender/ investor] may be costly or impossible*".

In the financial sector various mechanisms have been deployed to reduce information asymmetry between lender and entrepreneur-borrower. Gompers and Lerner (2001) observe staged financing and board representation are widely used in venture capital industry, Cooper and Hayes (1987) and Hosios and Peters (1989) find trading financial claims over a multi-period horizon supports information revelation in insurance contracting, whilst Allen et al. (2000) find dividend is used as a signalling mechanism of firm quality. Similarly, sinking fund provision (Wu, 1993), and credit scoring techniques (Berger et al., 2011) are innovations arising from the industry need to enhance conduct and transparency. Even the functional existence of financial intermediaries is to enhance financial efficiency of information acquisition and monitoring in presence of costly state verification (Diamond, 1984; Townsend, 1979; Gale and Hellwig, 1985), screening for adverse selection (Broecker, 1990) and moderating moral hazard (Holmstrole and Tirole, 1997). Moral hazard too can be mitigated by underwriting iron-clad covenants in the financial contract (see Smith and Warner, 1979a; Billet et al. 2007).

4. Economic efficiency of collateral in diffusing agency cost and information asymmetry to avert loan default

Stemming from these issues, studies have sought to examine the economic role of collateral as a bonding mechanism. Stulz and Johnson (1985) find collateral increases firm value as it moderates agency cost in risky loan.

4.1 Risk shifting

Collateral moderates risk shifting given the asset title is assigned to the lender. It creates disincentives for borrower to exercise option to default since it triggers transfer of collateral to the lender (Barro, 1976; Smith and Warner, 1979b). By this it amplifies the loss of default on the borrower, i.e., it reduces the value of the embedded put option.[103] "*When more collateral is posted, it increases the borrower's loss (reduces his or her marginal payoff) in those states in which there is project failure and collateral transfers to the bank*" (Chan and Thakor, 1987, p.353). Given that the "*debt obligation is less than the net market value of the collateral backing it, the right to repay that obligation is valuable and the default rate on such obligations will be zero*" (Benjamin, 1978, p.336-337). This is empirically supported by Archer et al. (1996) in their study of the mortgage market.

Naturally, borrowers who exhibit greater risk shifting attitude will be subjected to higher collateral requirement (Chan and Kanatas, 1985; Menkhoff et al., 2006). For example, Steijvers et al. (2010) find privately owned family firms are subjected to greater collateral requirement given their loan size. This accrues to greater agency cost of debt issues, such as family altruism 'free rider' problem, ineffective entrepreneur-managers and excessive management perquisites, which increases monitoring activities of lender (principal).

On the collateral characteristics, Smith and Warner (1979a) argue 'inside collateral' is effective in reducing risk shifting since there is lesser monitoring required (see also Table 7). Morellec (2001) in his study posits this is contingent on the liquidity of inside collateral and state of the industry, measured by the level of productivity and demand volatility. Firm with highly liquid inside collateral has greater incentive for risk shifting; i.e., asset stripping, compared to a firm operating in steady-state industries (low demand uncertainty and high productivity). It is thus, more optimal for the latter to opt for collateralised loan financing to show bonding commitment since there is lesser need to retain operational flexibility by way of asset liquidation.

Additionally, collateralised loan constrains the borrower from undertaking action that reduces loan value (eg. dividend payout) and insures against volatilities of the firm's other assets, a risk that is borne by unsecured debtors (Barnea et al., 1981b). As observed above,

103 The extent of loss is dependent on divergent borrower-lender values assigned to the collateral, i.e., normally the lender's valuation of the collateral is a fraction of the value perceived by the borrower. This difference in valuation relates to its recovery costs (see Section 3).

collateral has a symmetrical function of (i) reducing default costs incurred by the lender; or (ii) making default costly for the borrower (Benjamin, 1978; Smith and Warner, 1979b; Plaut, 1985).

4.2 Underinvestment

Collateral shields secured debtors from underinvestment issues suffered by unsecured debtors. In addition, the trade off between collateral and interest rate moderates underinvestment as it limits wealth transfer from borrower to lender (Barnea et al., 1981b). Nonetheless, there may be situations where issuance of collateralised loan worsens underinvestment. For example, Stulz and Johnson (1985) argue if the firm has existing unsecured debtors, the issuance of collateralised loan will dissipate the gain that would have accrued to them (diluting the unsecured debtholders' rights over the firm assets). To compensate for the possibility of the firm exercising this strategy, the unsecured debtholders may demand higher yield, and this worsens the underinvestment issue. With regards to firm type, they argue low risk firms will favour collateralised loans given the investment hurdle rate will be comparatively less significant.

4.3 Bankruptcy

Legislative provisions that prioritises secured debtholders over other creditors further minimises bankruptcy costs of the former. Since collateralised loan mitigates costly contracting, the borrower would in return expect favourable financing terms from the lender (see also Table 7). However, this needs to be weighed against potential cramdowns where the defaulting borrower under Chapter 11 bankruptcy proceedings may (i) reduce the loan to the present market value of the collateral; (ii) reduce the contracted interest rate; (iii) extend the loan tenure; or (iv) alter the repayment schedule.

4.4 Information asymmetry

Under the context of information asymmetry, collateral is either used as a signalling or incentive mechanism. Under the signalling theory, low risk borrowers endeavour to credibly convey their true state through commitment mechanisms, such as infusing collateral into the project (Leland and Pyle, 1977). In this instance, the lender will offer separating contracts (i.e., combinations of loan rates, quantum and collateral) contingent on the expected returns, i.e. sorting-by-private information paradigm (see also Besanko and Thakor, 1987b).

By designing incentive-compatible contracts, it induces borrower to signal their project true form (Bester, 1985, 1987). Therefore, this moderates adverse selection by sorting low risk borrowers from 'lemons'. In rational expectations equilibrium, the former will trade off higher collateral given their low default risk for favourable loan rates (Bester, 1985; Chan and Kanatas, 1985; Besanko and Thakor, 1987a) subject to the availability of sufficient collateral and risk neutrality of the borrower (Bester, 1985; Besanko and Thakor, 1987a). Under the signalling effect, borrower quality and action are treated as complements that is, a low risk borrower is assumed to commit greater effort and due to the probable low default risk she/he is more willing to offer higher collateral.

The incentive theory presupposes the lender is able to observe the risk profile of the borrower ex-ante, i.e., sorting-by-observed risk-paradigm.[104] Given costly monitoring of the borrower's conduct ex-post, lender seeks to influence risky borrower effort that maximises project success. Therefore, by increasing the collateral requirement on high risk borrower, it instigates a positive incentive effect on the borrowers' project selection and effort that averts costly defaults. The economic efficiency of collateralised debt holds if information transfer is costly (Leland and Pyle, 1977; Bester, 1985; Chan and Kanatas, 1985), and the collateralised asset is of greater value to the borrower than the lender (Lacker, 2001). Under the incentive effect, borrower quality and effort are treated as substitutes since for low risk borrowers higher collateral does not generate greater marginal return to effort.

From the review of empirical studies, we observe mixed results on collateral *vis-à-vis* information asymmetry (see again Table 6). Study by Berger and Udell (1990) for the United States, Jimenez and Saurina (2004), and Jimenez et al. (2006) for the Spanish credit market support the use of collateral in respect of high risk borrowers. This is aligned with that of the incentive theory and demonstrates wider application of the 'sorting-by-observed risk-paradigm' in actual loan disbursement decisions. Nonetheless, in Jimenez et al. (2006) they find among young firms the use of collateral is lower for those borrowers who subsequently default, which they justify to the signalling theory. Given the consensus in agency theory that collateral influence default risk positively, one would expect that the presence of collateral would be required to mitigate the incidence of default.

104 Borrower past credit performance or financial position may provide an indicative point of probable default. For example, Stulz and Johnson (1985, p.519) states, "*since the value of the security provision is an increasing function of the face value of the unsecured debt, one would expect secured debt financing to be used more often if the firm has high leverage ratio*".

In respect of the inter-linkages between collateral and loan portfolio risk, Berger and Udell (1990) and John et al. (2003) observe collateralised loans are on average riskier than unsecured ones and subjected to higher yield. This is similarly observed by Gottesman and Roberts (2007) in their study of the United States syndicated loan market. Again, these results run contrary to the ideal of Smith and Warner (1979a) that collateral moderates costly contracting. The disparity in empirical results flag possible gaps to endogenously account for agency cost in collateralised debt structures. As pointed by Lacker (2001), Gottesman and Roberts (2007), and Berger et al. (2011) there is still residual risk and potential management perquisite consumption not fully absolved by the collateral coupled with the issue of recovery costs that affect loan recoveries in default state.

5. Improving the resiliency of the financial architecture

In this section, we discuss an intuitive approach of reducing the fragility of the financial architecture from an agency theoretic perspective. We argue that this can be done by stripping away the put option to default in a financial contract. We capture the contrasting effect of (i) *default-free* (i.e., *pragmatically risk-free*); and (ii) *default-prone* (i.e., *risky*) collateralised loan structure on the overall financial system resiliency. We draw from Ebrahim and Hussain (2010) who illustrate that in rational expectations equilibrium (REE) a default-free (i.e., pragmatic risk-free) collateralised loan as economic-neutral [economic efficient] with a default-prone (i.e., risky) when the cost of default are constrained [unconstrained]. These two solutions arise from the trade-off of financial claims between a risk-averse lender (financial intermediary) and borrower (entrepreneur-manager). This issue has major ramification on the theory and application of financial intermediation as discussed below.

On the theoretical front, the above result chips away at the static (as well as dynamic) trade-off hypothesis (see Myers, 1984b; Strebulaev, 2007). The rationale for the distinct result of Ebrahim and Hussain (2010) ensue by segregating the welfare of borrowers and lenders. This approach captures the agency perspective (i.e., the conflict of interest) between the two. In contrast, the static as well as dynamic trade-off theory aggregates the welfare of the two competing agents resulting in structurally unstable equilibria with endemic banking crisis.

On the application front, the result of Ebrahim and Hussain (2010) imply that regulators should reinforce the structuring of pragmatically default-free loans to mitigate fragility. This prevents frittering away public resources from the bail outs of failed financial institutions. This requires borrowers to have enough 'skin in the game' to avoid resorting to: (i) defaulting; and (ii) transferring the downside of their risky ventures to society at large. This section furthers the framework of Ebrahim and Hussain (2010) and presents literature on collateralised loan (see Section 4) by exploring the effects of the two contrasting collateralised loan structures on the asset transformation intermediation function in a financial system, through methodological review of a financial intermediary (bank) financial statement.

5.1 Bank assets: collateralised loans

We assume a two-period financial system, where an entrepreneur-manager has a positive-yielding project which requires a fixed amount of investment but nonetheless constrained by his initial wealth. This is addressed through trading non-recourse financial claims that are collateralised against project payoffs, which comprise of the net operating income (NOI) in addition to the liquidating value of the project. The trading of financial claims can either be structured on a (i) *pragmatically default-free*; or (ii) *default-prone* collateralised loan (see Figure 12). Both the NOI and asset value are positive random first-order Markov processes whose probability distribution is known to the lender and borrower.

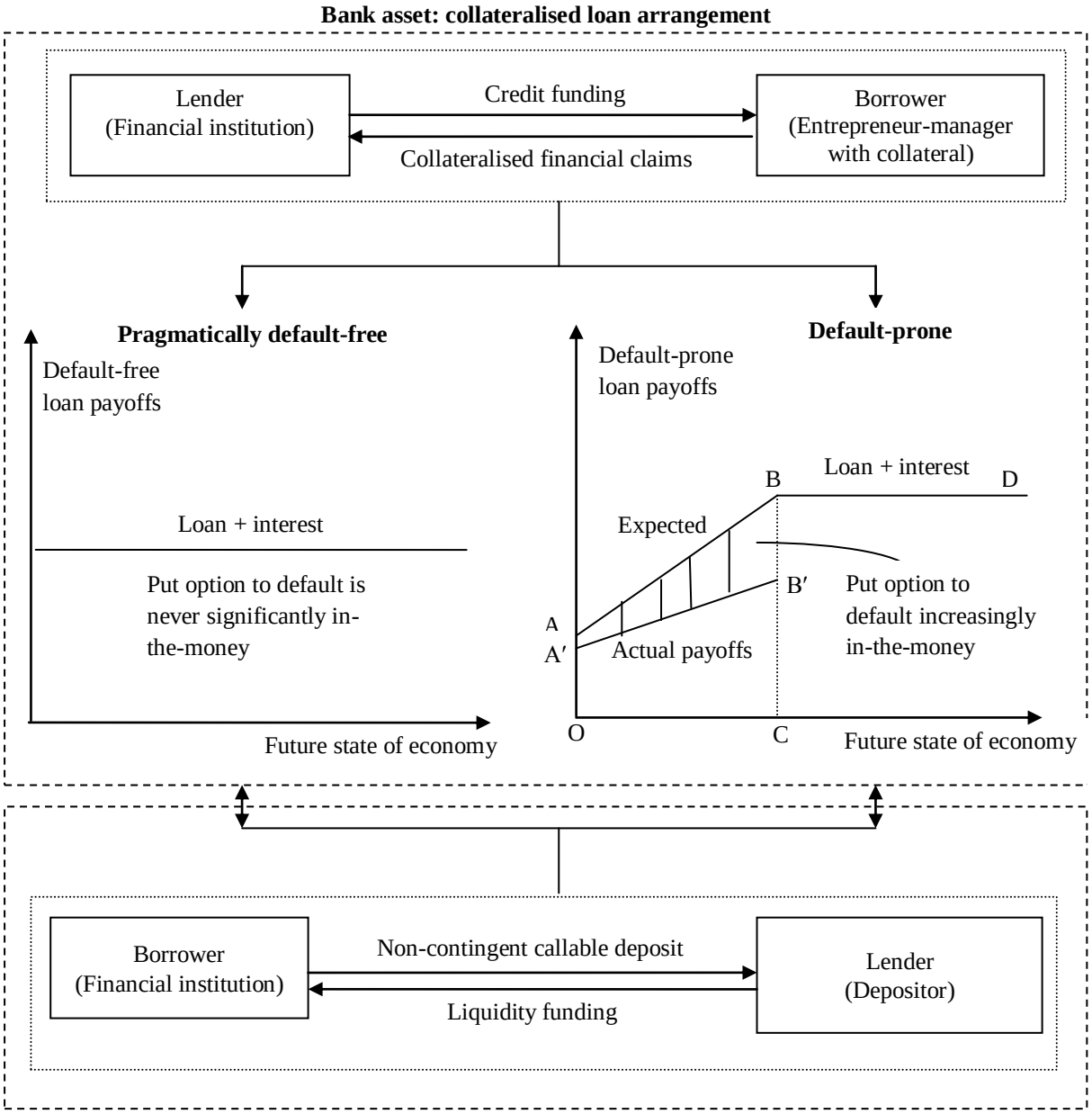
5.1.1 Pragmatically default-free loan contract

We rationalise a pragmatically default-free collateralised loan solution as one that does not allow the put option to default to be significantly in-the-money. That is, the terminal project payoffs exceed the loan balance to its tenure (over all states of the economy) with very high probability (see Figure 12). The importance of ensuring the payoffs from depreciating to a substantial negative value over the loan tenure emphasises the views of Bernanke and Gertler (1989, p.28) in that "*agency costs depend not only on current wealth but also on future expected conditions*".[105] This stresses a dynamic approach in debt pricing that endogenously account for the conflict of interest from agency perspective. On a micro-

105 Our assertions are consistent with Foote et al. (2008), and Archer and Smith (2013), who observe non-linearity in the put option to default. In that, home mortgage borrowers do not immediately default as soon as their equity goes 'underwater'. Rather, this occurs when there is substantial erosion in their home (property) equity values.

level, pragmatically default-free collateralised loan mitigates credit and liquidity risk of the financial intermediary given the put option to default is never significantly in-the-money. Furthermore, the entrepreneur-manager enjoys a favourable cost of debt given the nearly default-free financial claim. At a macro-level, it averts fragility within the financial system where a default may set off a domino effect given a leveraged-dominant financial system (Bernanke and Gertler, 1989; Minsky, 1992).

Figure 12: Bank balance sheet: schematic flow of asset transformation in financial intermediation



5.1.2 Default-prone loan contract

On the other hand, a *default-prone* solution either has *or* will have a put option to default deep in-the-money. As depicted in Figure 12, the default-prone solution suffers from potential default states prior to critical stage 'C', and normal states beyond it. Before reaching critical stage 'C', the entrepreneur-manager is technically in default as the project payoffs are less than the maturity value of the collateralised loan (including interest). In the default states of the economy, the entrepreneur-manager may not have the motivation to maintain the project's payoffs indicated in sum as 'AB' over the future states of the economy 'OC'. This may lead to a fall in the value of these payoffs to A′B′ over the defaulting states of the economy. The quadrilateral AA′BB′ thus represents the frictional cost of default serving as the proxy for the agency cost of debt.

The embedded put option to default is deep-in-the-money (valuable to the entrepreneur-manager), the greater the relative divergence of the project payoffs with the outstanding loan amount. In a foreclosure, the financial intermediary recovery rate (net default cost) is contingent on the collateral value since he loses the payoffs from the NOI given the non-recourse loan status. Where the recovery rate is stochastic, particularly in case of cramdowns, a default-prone loan is a costlier solution.[106] If the recovery rate is extremely low, risky financing is untenable leading to pragmatically default-free financing as the only viable (and economically efficient) alternative.

Given the default-prone solution involves default in states of economy, the loan pricing structure warrants higher interest rate and loan ratio than a pragmatically default-free one. Similar to Ebrahim and Hussain (2010), we find default-prone collateralised loan has a receding economic efficiency with heightened agency cost (accruing from the default risk). Even when agency cost is low, it ranks at best economic-neutral to a default-free collateralised loan as the loan pricing structure involves the lender bearing the agency cost of debt. The above may account for the disparate collateralised loan yield observed in empirical studies of Berger and Udell (1990), John et al. (2003) and Gottesman and Roberts (2007). Overall, the financial intermediary is better off with pragmatically default-free collateralised loan by sterilising the put option to default.

106 See Franks and Torous (1989) on the costly impact of Chapter 11 bankruptcy on debt pricing.

5.2 Bank liabilities: deposits[107]

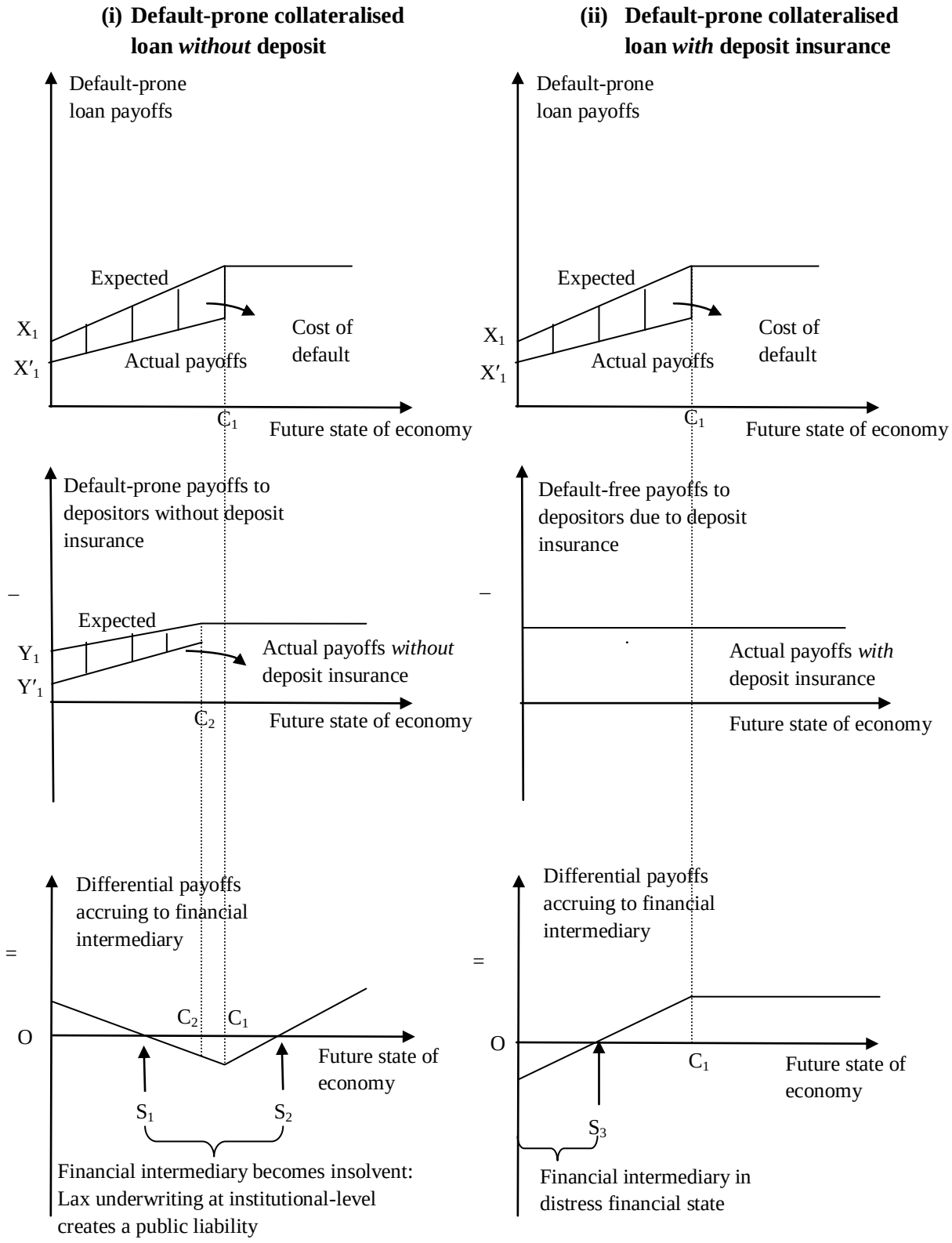
The asset transformation function entails the intermediation of the demand and supply of funds. In our model, the supply of funds is contingent on receipt of deposits, which warrants the financial intermediary to guarantee repayability of funds on demand by depositors. Whilst this liquidity funding, akin to non-contingent callable 'loan', is alternatively cheaper than internal capital, it exposes the financial intermediary to liquidity risk from potential asset-liability mismatch. Figure 12 presents a stylised linkage between collateralised loan arrangements (bank asset) with demand deposits (bank liabilities). At minimum, the intermediary will fund the project subject to satisfying his contracted cost of funds on the liability-side. We pursue this framework further by decomposing the two contrasting collateralised loan net payoffs on the financial intermediary deposit obligation.

5.3 Income statement: collateralised loan and deposit arrangement payoffs

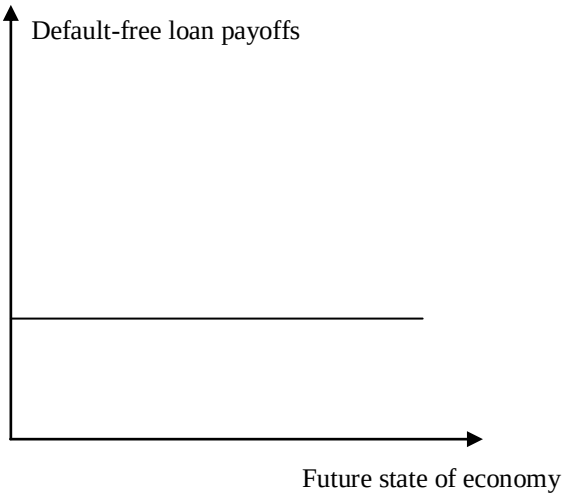
Figures 13(i)-(iii) model variations of the respective net payoffs of a default-prone and pragmatically default-free collateralised loan solution without [with] deposit insurance. We show that the net payoffs under each permutation leads to different (i) liquidity effect on the financial intermediary; and (ii) risk exposure on the deposit arrangement. The following results are fundamental given the important public deposit custodial role of an intermediary.

107 This does not preclude other forms of liquidity funding in a bank's balance sheet.

Figure 13: Pragmatically default-free and default-prone collateralised loan payoffs on financial intermediary deposit obligations



(iii) Pragmatically default-free collateralised loan *without* deposit insurance



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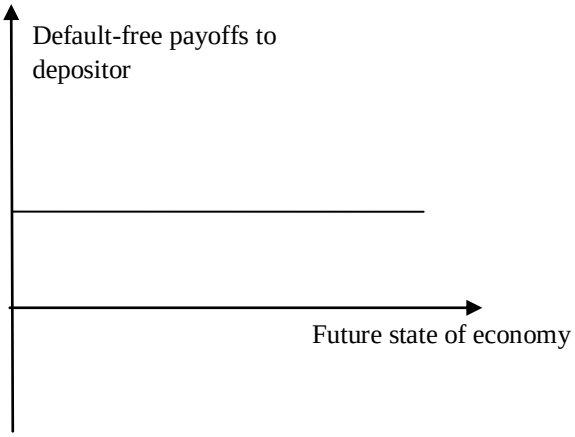

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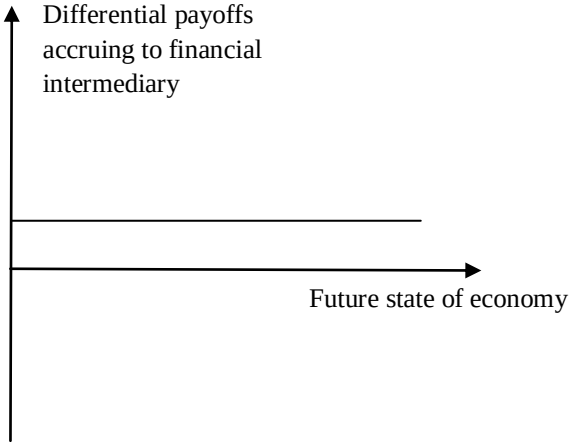


5.3.1 Default-prone collateralised loan payoffs without deposit insurance

As seen in Figure 13(i), the default-prone solution suffers from default risk up to critical stage 'C_1' and normal states thereof. The deterioration of expected payoffs from 'X_1' to 'X'_1' in the states of economy to 'C_1' exposes the intermediary to cost of default, where entrepreneur-manager shifts the project risk to the former. The put option to default for the risky solution increases in value where borrower equity is deep underwater, which signifies irrational exuberance in demand for and supply of credit.[108]

In asset price run ups, the increase in asset values induces a false sense of heightened security and parallel expansionary credit policy. Subsequent asset price collapse distorts the intermediary balance sheet and magnifies the value of put option to default by entrepreneur-manager. As equity goes deep underwater, it is thus, advantageous for the borrower to exercise the put option to limit losses. Widespread defaults in the credit market, creates debt overhang with contagion effect on intermediary's credit and liquidity risk (i.e., financial fragility).

A lower than expected performance of the default-prone collateralised loan worsens the financial intermediary capacity to meet deposit payoffs. States up to point 'C_2' in Figure 13(i) indicates the deterioration from expected payoffs of 'Y_1' to 'Y'_1'. To meet the deposit obligation, this entails drawing on the intermediary's internal capital to rebalance the inter-temporal liquidity gap. Nonetheless, due to coordination problem among depositors, any anticipation of the intermediary's difficulty in fulfilling the deposit claim is sufficient to trigger bank run. The intensity of deposit withdrawal coupled with loan defaults triggers severe liquidity crunch. In this state of economy, financial intermediary capital which forms only fraction of the estimated risk exposure is under critical strain. This sets off an adverse dynamic.

108 Archer and Smith (2013, p.373) find "*During periods when the market is strong borrowers, as expected are more willing to take on more risk, underwriter [lenders] rationalize extending that risk on the expectation of continued robust market activity and reduced costs of potential default*". Allen and Gale (2000) identify a buoyant economy feeds investor's exuberance causing formation of asset bubbles. Where the investments are debt funded, this heightens the fragility of the financial system for investors are likely to exhibit risk shifting tendencies since they are sheltered from downside risk. Similarly, Eisdorfer (2008) observes a positive link between market volatility with risk shifting, whereby there is higher incidence of overinvestment by firm in distress states. This bullish investment actually generates lesser firm value.

Foreclosure efforts to resuscitate lender balance sheet and income position are contingent on the collateral redeployability (see Shleifer and Vishny, 1992; Benmelech and Bergman, 2011). Forced collateral sale obscures recovery in illiquid markets concomitant with downward business cycle. The next best buyer might be restrained due to debt overhang, market uncertainty, or exhibit predatory buying behaviour (Benmelech and Bergman, 2011; Brunnermeir, 2008). This is worsened by liquidity freeze by other market participants given uncertainty of the intermediary's financial state. Counter actions to source liquidity from the deposit market by bidding up the rates only pushes the interest spread further that in turn sparks self-reinforcing liquidity spiral and capital erosion (see also Brunnermeir, 2008; Gorton and Metrick, 2009). 'S_1' and 'S_2' in Figure 13(i) are inflexion point of bank insolvency.[109] Depositors who are unable to secure full payoffs rank in line pursuant to the financial intermediary liquidation.

5.3.2 Default-prone collateralised loan payoffs with deposit insurance

Most financial systems have instituted deposit insurance schemes to contain bank run and maintain public confidence. With deposit insurance, deposits are insured up to the legally covered sum. Here, depositors' payoffs are invariant to the riskiness of the intermediary loan portfolio. The deposit payoffs profile in Figure 13(ii) mimics that of deposits under the default-free solution (see Figure 13(iii)). Whilst this enhances depositor protection, the deposit insurance scheme is a risk transfer mechanism to a deposit insurer it nonetheless does not absolve the downside risk of default-prone collateralised loan. Further, this safety net comes at the potential cost of moral hazard by lender. First, it curtails depositors' incentive to monitor financial intermediary's conduct. Second, the financial intermediary may exhibit risk shifting tendencies to (i) undertake riskier loans since the risk of bank run is mitigated by the deposit insurance scheme; and (ii) maintain nominal 'buffer' capital. Third, deposit insurance scheme covers a specified threshold and does not alleviate the intermediary's exposure to other creditors.[110] Thus, there could be other risk points that

109 The differential payoffs accruing to the financial intermediary is contingent on the extent of the loss given loan default and the obligations to its depositors. Figures 13(i)-(iii) only illustrate three scenarios of this potential impact. For example, the financial intermediary could potentially slide into a deeper illiquidity trough than that depicted in Figure 13(i) (i.e., $S_1 < 0$). This then would entail greater resources on the intermediary to reinstate its liquidity and solvency position.

110 In the case of Northern Rock despite the security provided by the deposit insurance scheme, there was still run on the bank as depositors were acutely aware that deposits above £2000 are not fully guaranteed (Milne and Wood, 2008). This limit has since been revised upwards to £85000 per depositor per financial intermediary (International Association of Deposit Insurers, 2012).

could trigger a liquidity crunch (see the discussion below on repurchase agreement). States prior to point 'C_1' under the net payoffs illustrate region of financial fragility. 'OS_3' is point of financial distress due to income impairment arising from poor loan portfolio.

In Figures 13(i)-(ii), the heightened value of put option to default emits financial fragility into the system arising from the financial network effect. This is even with the institution of deposit insurance coverage. Any financial intermediary bailout becomes a public liability with repercussions on social welfare.

5.3.3 Pragmatically default-free collateralised loan without deposit insurance

In Figure 13(iii) the payoffs exhibit stability over states of economy, i.e., payoffs exceed the loan balance to tenure with very high probability.[111] Supply of deposits remains unrestricted subject to the intermediary fulfilment of non-contingent callable 'loans' from its depositors irrespective of states of economy. In other words, the depositors' funds are pragmatically default-free as long as the financial intermediary maintains significant capital to back it. This in turn allows the intermediary to earn economic surplus from the margin by stripping the put option to default (via prudent pricing of the debt and maintaining sufficient capital). Thus, it assures uninterrupted liquidity and credit cycle of the trilateral intermediation contract between depositor-financial intermediary-borrower. If regulators enforce proper pricing of the loan along with sufficient capital, this minimises the option value and mitigate the moral hazard to increase risk taking on both facilities, permitting reduction of cost to society. Regulators should therefore encourage financial intermediaries to price their lending and borrowing facilities pragmatically default-free as it alleviates financial fragility and thus enhances the stability of the financial architecture.[112] This also curtails systemic risk and contagion effect. More importantly, we posit that these measures accord the same depositor protection without the need to institute a public safety net.

111 This reflects real world practicalities whereby default risk cannot be fully eliminated but substantially minimised. See Section 5.5 on pricing pragmatically default-free collateralised loan.

112 It should be noted that our discussion precludes the size of the financial intermediary. Thus, intermediary size is not important if the intermediary is able to price both lending and borrowing facilities in a default-free manner. In other words, it enhances the financial system resiliency against 'too-big-too fail' or 'too-many-to-fail' crisis intervention conundrum.

5.4 Special case of repurchase agreements (repo)

A repo is a sale of securities in conjunction with an agreement to buy them back at a later date, at a repurchase price that includes the original sales price plus interest (repo rate) over the tenure of the arrangement. It is thus equivalent to a spot sale integrated with a forward contract. These are normally of short-term nature and favoured by financial institutions, institutional investors and large firms. The seller of the security (institution owning the security) benefits from the additional liquidity received. On the other hand, the buyer (institution providing the funds) receives the right to use the security to either sell or further churn to meet other financial obligations. To reverse the repo, the buyer must redeliver the same or equivalent security at the end of the said tenure.

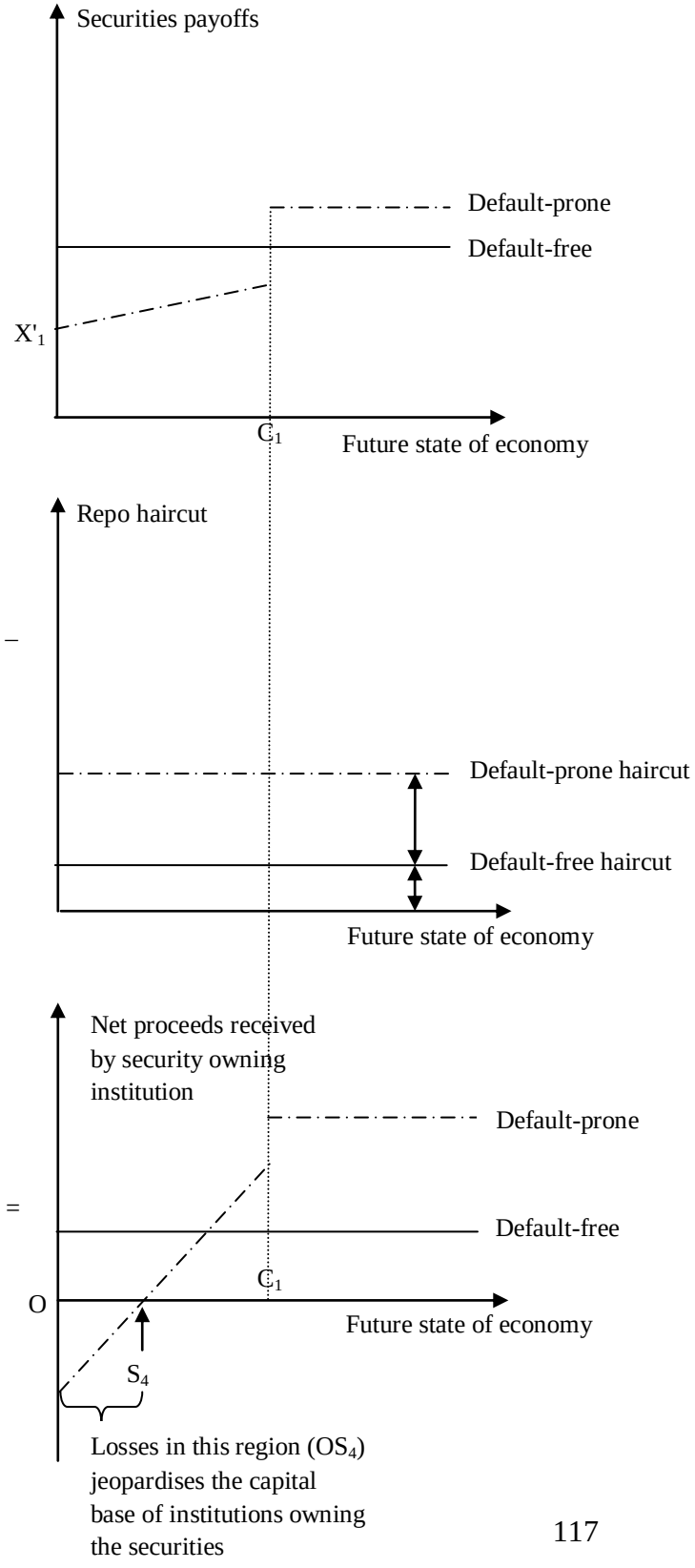
The presence of the security in repo arrangements makes it attractive to both seller and buyer. For a financial intermediary, borrowing through repo allows the institution to secure funds at a cost generally below the inter-bank deposit rates by virtue of the collateralised arrangement. Furthermore, for institutions with highly leveraged modus operandi (eg. investment banks or hedge funds) this permits borrowing at more favoured rates than in unsecured market arrangements. Lending through repo permits a lower regulatory risk charge as opposed through unsecured lending. Ownership of the security permits the intermediary to further churn the collateral. Thus, it maximises the use of the said asset without any contractual loss to the original repo arrangement. Whilst this promotes cost efficiency, the ability to rehypothecate the original transaction and its extensive use heightens the default risk on other upstream contracts (eg. securities, derivatives, inter-bank and money market).[113]

The put option to default arising from a counterparty failure to deliver the closing leg of the repo repurchase and concern on the quality of the security is mitigated to an extent by imposing haircut or initial margin, which is a fraction of the security market value. Similar to a default-prone collateralised loan, a default-prone repo has *or* will have a put option to default deep in-the-money. In a market with a downward trend, a potential default by the seller will expose the buyer holding a security that has depreciated (valued less than the original amount loaned). Consequently, the buyer will subject the seller to a significant

113 Trading debt for debt has a multiplier effect on the ultimate leverage position in the financial market that contributes to magnifying the size of the financial system disproportionately to a country's gross domestic product (GDP). See also Singh and Aitken (2010) on the extent of rehypothecation in the shadow banking system.

haircut value. On the flip side, the seller suffers a carrying cost on the default-prone repo by virtue that the institution would then need to repurchase the security at a premium value if the actual market value of the said security has significantly depreciated.

Figure 14: Pragmatically default-free and default-prone securities payoffs with repo obligations



Thus, the ability to correctly value the collateral is very important. This can be encumbered by the intangibility and information asymmetry with regards to (i) liquidity or complexity of the collateral; and (ii) seller risk profile. The degree of liquidity deteriorates as one move from a pragmatically default-free security (eg. government bonds) to default-prone one such as the CDOs and CLOs from the subprime market. Once its market value falls, the repo buyer is unable to square off his position by selling directly in the market. Furthermore, trading is impossible during a crisis as market participants are unable to correctly price these securities.[114]

Under our model, securitisation of the pragmatically default-free [default-prone] security in Figure 14 enables the owner of the said securities to expand their liquidity line not only via deposits but also from the repo market. In this case, the security owner (seller) offers the securitised pragmatically default-free [default-prone] collateralised loan as lien in return for cash funding from the repo counterpart (buyer).[115] The riskiness of the security is signified by the quantum of haircut that reflects its quality (i.e., agency cost of debt). Accordingly, a default-prone repo would incur a larger haircut quantum over a pragmatically default-free one (see Figure 14).[116]

The deterioration in the stream of payoffs of the underlying default-prone security from 'X_1' to 'X'_1' in the states of economy up to 'C_1' affects the liquidity position of the institution owning the security. Added to this, the reversal of the repo at a premium (i.e., repurchase of the security where its market value has significantly depreciated) leads to a loss on the net payoffs accruing to the seller, up to point 'C_1'. The region between 'OS_4' demonstrates losses that erode the capital base of the institution owning them. As demonstrated in the recent financial crisis, actual default by the seller profoundly affected the downstream contract of the repo buyer, causing contagion liquidity effect on the buyer's solvency position. Intuitively, the above discussions highlights any permutations of financial

114 We elaborate this further in Section 5.5.1 and see also Figure 16.

115 Prior to mid-1990s, securities in repo arrangements were confined to treasury bills and other government agency securities. Constrains in attaining sufficient high-grade securities saw the eligibility extended to include more risky debt instruments such as [non] mortgage asset backed securities, CDO and CLO.

116 We ignore the institution of margin calls in the context of our two-period model. However, in a multi-period model margin calls alleviate risk shifting. A repo buyer also earns interest on the funds lent, i.e., repo rate, paid at settlement date. We do not illustrate this outflow separately as it is already imputed in the seller repurchase price.

structures that involve an element of default-prone solution will end up destabilising the financial system (Minsky, 1992).

5.5 Pricing nearly pragmatically default-free collateralised loan

How then do we engineer a pragmatically default-free collateralised loan structure that ensures the option to default has a very low (negligible) probability? This has major ramifications on the financial system resiliency in light of the negative experience of collateralised loans in the recent financial crisis and the financial industry unabated fascination with such instruments.[117]

Models of debt pricing fail to consider the welfare of both principal-agent relationships of agency theory (see Black-Scholes (1973), Merton (1974), Jarrow-Tunrbull (1995) and Duffie-Singleton (1999)). In this section, we focus on reducing the attendant agency cost by ensuring borrower does not transfer the project risk to the lender. This is by ascertaining the put option to default will never be significantly in-the-money. This is attained by objectively pricing the endogenous loan parameters (initial loan value, loan repayments, initial deposit and loan tenure), given the underlying exogenous factors (initial asset price, its mean and volatility, safety margin, borrower income and income multiplier).[118] These parameters are discussed below.

Figures 15(i)-(iii) emulates Ebrahim (2009) to exemplify a project (venture) with initial value (P_0) funded by trading financial claims on the project payoffs with a financial intermediary. To secure financing, entrepreneur-manager places an initial deposit (ID) that is further secured by the project payoffs. Hence, the amount financed (Q_0) is the difference between the two. The initial deposit acts as a commitment device enforced on the borrower, which (i) locks in upfront equity to the lender; and (ii) reduces borrower risk shifting behaviour.

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117 For example, covered bonds are seen as an alternative form of funding to investors seeking high grade investment instruments and avenue for long term funding. Regulators, such as the Korean financial authorities, are keen to enact the requisite legislation to promote the development of this market (see Mundy, 2012).

118 Holmstrom (1979) explores the effect of principal-agent relationship in optimal debt contracts. However, his solution suggests the use of information systems, which reduces asymmetry with respect to the agent's conduct. Although imperfect, it can improve the contract economic efficiency, i.e., presumably by treating information asymmetry it absolves agency issues. Other measures to curb agency cost of debt include (i) call provisions that moderates information asymmetry and asset substitution issues; (ii) conversion rights to curb management excessive consumption; and (iii) income bonds that alleviates bankruptcy problems (Myers, 1977; Barnea et al., 1981b).

The outstanding loan balance (Q_t) is measured by the compounded initial loan value and netted off by future value of annuitised periodical payments over the loan duration. Asset prices in Ebrahim (2009) are assumed to follow a Geometric Brownian Motion, where future states are independent of past movements (see Efficient Market Hypothesis - Fama, 1970, 1991). Its asset movement is function of its value appreciation [depreciation] and risk profile across time.[119]

Figure 15(i) presents a stylised situation where the entrepreneur-manager equity (project payoff relative to outstanding loan) is 'underwater' in period 't_1' to 't_2'. While it is understood that borrowers' with positive equity will never default, not all borrowers whose equity is underwater will automatically default. Actual default occurs where the equity is significantly underwater that is borrower expectation of future asset prices and pecuniary [non-pecuniary] costs (eg. income capability, effect on borrower credit score) substantially exceeds the benefits of continuing with the loan repayments (Allen, 1981; Ambrose and Buttimer, 2000; Foote et al., 2008; Archer and Smith, 2013).

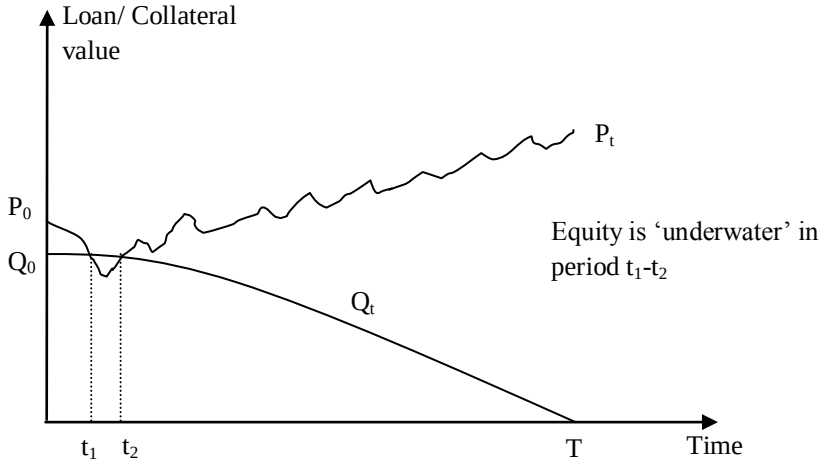
Prudent underwriting warrants satisfaction of both (i) asset; and (ii) income constraints. The loan pricing mechanism here is consistent with Baltensperger (1978) who advocates incorporation of not only the interest rate but also the loan-to-value ratio and the tenure of the facility. Archer and Smith (2013), and Foote et al. (2008) in their studies extend the parameters by including borrower income factors.[120] This satisfies a higher order risk management approach in contrast to *ad hoc* credit rationing practices (Stiglitz and Weiss, 1981; Ebrahim and Hussain, 2010), and overall loan loss rehabilitation programs (Ambrose and Buttimer, 2000; Foote et al., 2008).

119 One can also incorporate jump processes to asset prices by resorting to a Poisson distribution as suggested by Merton (1976) and adapting the methodology elaborated in Ebrahim et al. (2011).

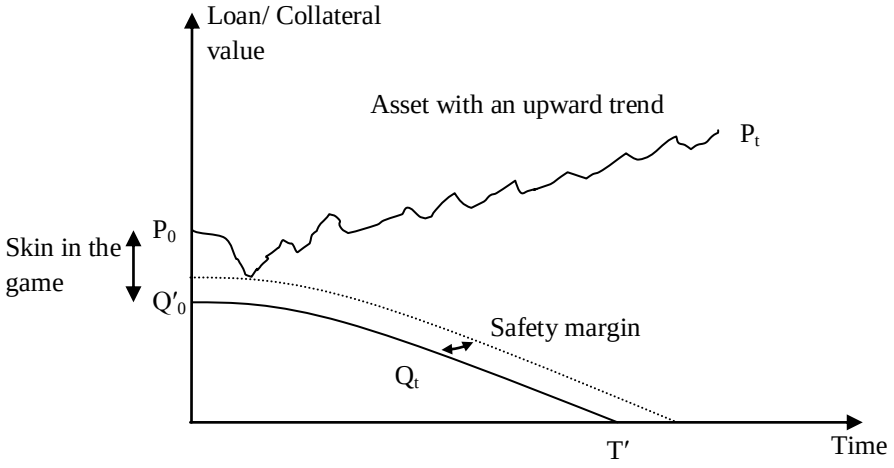
120 Archer and Smith (2013), and Foote et al. (2008) observe debt-to-income ratio and unemployment rate positively influence the put option to default.

Figure 15: Default-prone and pragmatically default-free debt structure over states of economy

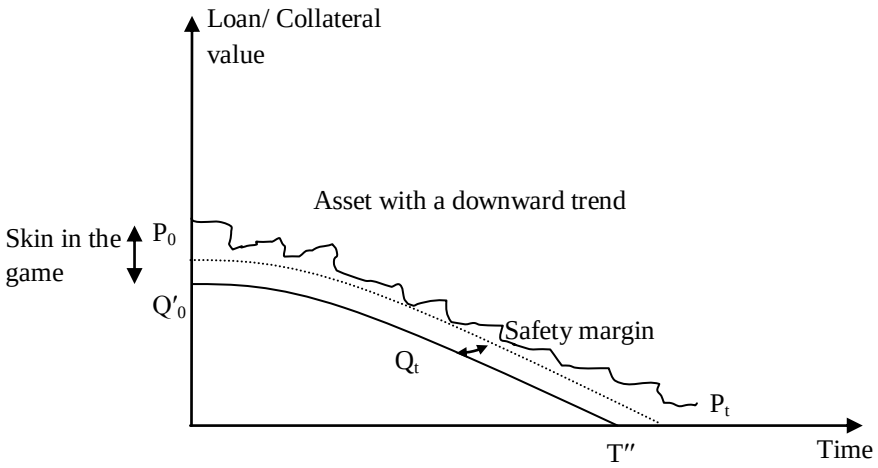
(i) Default-prone collateralised loan



(ii) Pragmatically default-free collateralised loan (with an *upward* trend asset market)



(iii) Pragmatically default-free collateralised loan (with a *downward* trend asset market)



5.5.1 Asset value constraint

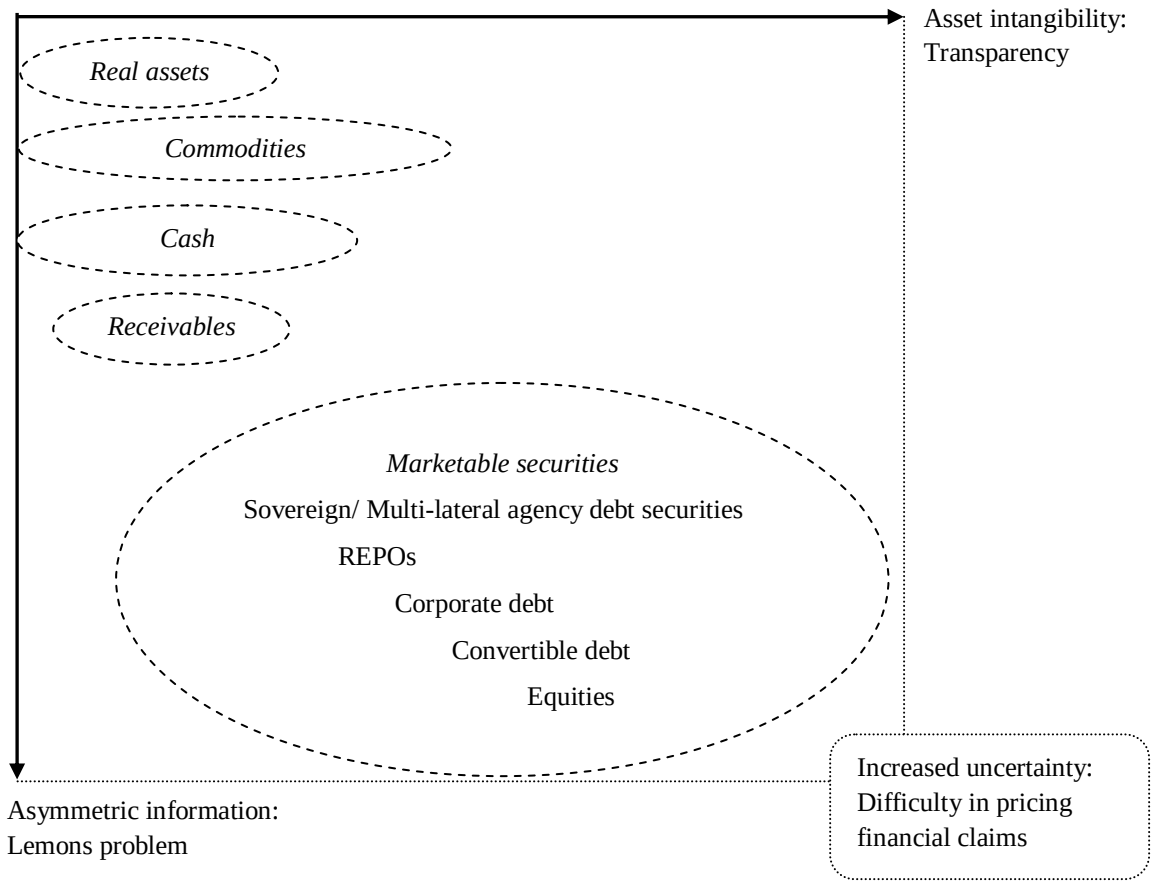
Figures 15(ii)-(iii) illustrate asset market with upward and downward trend, respectively. In contrast to its default-prone counterpart, a pragmatically default-free one is characterised by safety margin that ensures the entrepreneur-manager equity to loan value is untainted by asset market volatilities across states of economy (Bernanke and Gertler, 1989) with very high probability. This safety margin should be pre-conditioned to accommodate both an upward or downward trend asset price (see again Figures 15(ii)-(iii)). Moreover, the degree of safety margin required is contingent on specificities of the underlying project/ asset riskiness. [121] Figure 16 provides a stylised menu of collateral that are recognised under the banking capital accord. Given the endogeneity of agency issues, collateral that converges towards the extremes of the asymmetric information and asset intangibility as per Figure 16 suffers from heightened lemons problem and transparency issues. These obscurities call for stricter safety margin due to the innate difficulties in pricing such instruments (i.e., concordant with asset risk).

The safety margin is measured by a multiple 'α' of the underlying asset riskiness. Thus, the initial value of the loan is evaluated in such a way that at the optimum level, the value of the outstanding loan balance (Q_t) is always equal or lesser to the asset price reduced by the safety margin. This yields the minimal initial deposit (or 'skin in the game') as a function of the underwriting asset value constraint along with the characteristics of assets (see Ebrahim, 2009).[122]

121 The asset riskiness is influenced by its redeployability (Shleifer and Vishny, 1992; Benmelech and Bergman, 2011); transaction/ dissipative costs (Barro, 1976; Benjamin, 1978; Boot et al., 1991; Lacker, 2001; Jokivuolle and Puera, 2003), asset drift, volatility and correlation with other firm assets (Benjamin, 1978; Jokivuolle and Puera, 2003). The duration gap between loan default and repossession of the collateral should also be accounted in assessing the asset value (Ebrahim and Hussain, 2010). See also Table 7 on the broad categories of collateral and the associated economic impact.

122 It should be noted that when asset follows an upward trend, initial loan disbursed by the financial intermediary yields a corner solution in Ebrahim (2009). In contrast, an asset following a downward trend yields an interior solution.

Figure 16: Collateralised loan pricing with endogenous agency cost and heightened asset intangibility-asymmetric information



5.5.2 Income constraint

The repayability of the loan is contingent on (i) periodic annuitised payments; as well as (ii) income capability of the borrower. Prudent underwriting warrants the periodic payments to be within the entrepreneur-manager income capability. This yields optimal loan tenure as a function of income of entrepreneur-manager underwriting asset value and income constraints, exogenous interest rate along with asset characteristics (see again Ebrahim, 2009).

In summary, structuring pragmatically default-free collateralised loan involves calibrating the loan endogenous parameters (initial deposit, loan repayment, and tenure) pre-conditioned on the exogenous parameters (initial collateral value and its asset volatility including the safety margin, discount factor, borrower income capacity and its multiplier).

6. Conclusion

This study builds on the issue of financial fragility, one of the economic rationales for the Islamic prohibition of *ribā an-nasi'ah* deduced from the first essay, from the perspective of collateralised loan structures. Given established literature on risk-reducing feature of collateral in loan contracts, the spate of loan arrears and repo run in the recent financial crisis highlights the mere presence of collateral do not fully dissipate default risk. The unravelling of sophisticated securitisation and rehypothecation of debt instruments that emanates from poor loan practices emits system-wide financial fragility. Recent regulatory calls for steeper capital adequacy can boot strap liquidity risk but with an attached economic cost (Diamond and Rajan, 2005; Hammond and Masters, 2013; Masters and Hammond, 2013). We argue that this should be supplemented with upfront prudent underwriting, which is economically efficient to credit rehabilitation or bailout programs.

In this paper we rationalise an elegant way of going back to the basics of prudent underwriting, which minimises agency costs between lender and borrower. We apply an intuitive approach of contrasting this agency effect in pragmatically default-free collateralised loan with that of risky solution. The former is characterised as one that does not allow the put option to default to be significantly in-the-money, whereas the latter either has or will have a put option to default deep in-the-money. Using financial intermediary financial statement, we illustrate that default-prone (risky) collateralised loan leads to potential disintermediation, i.e., it negates intermediary's core role of (i) asset transformation, and (ii) deposit custodian functions. Subsequent churning (securitisation and rehypothecation) of a default-prone solution, as exemplified by the repo run in the recent crisis, only transfers but not absolve the default risk to other market participants.

Our findings concur with Ebrahim and Hussain (2010) in that default-prone collateralised loan has a receding economic efficiency with heightened agency cost accruing to the risk of default. This is significant where the (i) recovery rate is stochastic with cramdown actions by the borrower, or (ii) if recoveries from foreclosures are extremely low. In this situation, a pragmatically default-free loan is the only economic efficient solution. Even when agency cost is marginal, default-prone loan ranks at best economic neutral to its competing counterpart. This arises from the loan pricing that involves lender bearing the agency cost of debt. The above observations are distinct from the static and dynamic trade off results of Myers (1984b) and Strebulaev (2007) who aggregate the welfare of the

opposing agents leading to erroneous result in poor states of economy.[123] On the other hand, our approach of segregating the lender-borrower welfare in the financial contract accords recognition of the conflict of interest endogenous to principal-agent relationship.

The results also have policy implications in reinforcing the present financial architecture resiliency. Regulators should emphasise the structuring of pragmatically default-free loans to mitigate financial fragility. This warrant sterilising the put option to default through ensuring borrowers maintain adequate 'skin in the game', which minimises risk shifting tendencies over duration of the loan.[124] More importantly, by constraining the put option to default, it endows depositors' similar security to a financial system with deposit protection scheme but without the moral hazard issues associated with such guarantees. Intuitively, this should prevent systemic crisis in a highly networked financial system and minimise cost on public funds arising from bailouts of failed financial intermediaries.

Pricing pragmatically default-free collateralised loans involves calibrating the endogenous loan parameters subject to its asset and income constraints. Our approach is consistent with that of Baltensperger (1978), Foote et al. (2008), and Archer and Smith (2013). This encompass stripping the put option to default by ensuring borrower equity does not bottom into a negative region over all states of economy (i.e., in both asset market upward or downward trend). By ensuring borrower maintains adequate 'skin in the game', this makes the structure quasi-Islamic as it resolves the fragility and conflict of interest between the financial intermediary and borrower.[125] This paper addresses the need for a more dynamic method of pricing collateralised loan arrangements.

In terms of future research work, the above framework on pricing nearly pragmatically default-free collateralised loan provides us with a tool to investigate the efficiency of *ar-rahnu* (Islamic form of pawn broking facility) that is widely practised in Malaysia for funding microtraders. Here, the borrower (entrepreneur-manager) pawns his property in lieu of an interest-free loan (*qard*) from the lender (financial intermediary). Currently, gold is the only

123 Both studies aggregates the two adversarial claimants (debt and equity) objective functions, thereby depriving the analysis of supply and demand functions and hence the optimal pricing parameters of debt, particularly following periods of economic down cycle (see also Footnote 105).

124 This can be further strengthened by joining a continuous workout insurance scheme as advocated in Shiller et al. (2013), which addresses potential defaults ex-post.

125 From an Islamic perspective, all commutative transactions are permissible unless they lead to animosity and dispute (see Al-Zuhayli, 2003)

medium of collateral accepted by the intermediaries. Testing the efficiency of *ar-rahnu* in mitigating default provides an interesting case study that should contribute towards enhancing the financial policies of emerging economies.

Additionally, this study also proffers linkage to other research on the economic implication of trading of debt for debt (*bai al dayn bi al dayn*) and short selling that are currently prohibited in Islamic finance. Certainly from mainstream financial context, debt trading and short selling enhances market liquidity. However, an assessment of this prohibition by Muslim jurists would provide the substantive proof from a financial and economic perspective.

Chapter 5: Conclusion

1. Summary and policy implications

This thesis is a collection of three essays that pertain to financial development of emerging Muslim economies. In our first essay, we focus on the prohibition of *ribā an-nasi'ah* as Kuran (2005, 2009) alleges that it has hindered the progress of the Muslim world. The second essay focuses on the accessibility of financial services to financially strapped consumers by advocating an endogenous circuit structure (akin to ROSCA/ ASCRA) by employing the classic *qard* (interest-free) facility. The final essay, in contrast, presents a practical way of mitigating fragility of collateralised loans by employing a hybrid facility which resembles a pure debt interest-bearing facility with a crucial difference. That is, it allows borrower equity to go slightly underwater thus, reducing defaults and hence financial fragility. In this context, it makes the structure quasi-Islamic as it resolves financial fragility and reduces principal-agent conflict of interest.

1.1 Has the prohibition of *ribā an-nasi'ah* hindered the economic development of the Muslim world?

In the first essay we discuss this Islamic injunction in light of economics of religion literature. Other studies on the economics of Islam approach this from the perspective of historical economics (Ragab, 1980; Kuran, 2004, 2005, 2009; Rubin, 2011; Grosjean, 2011), political economy (Chapra, 2008) and economic development (Guiso et al., 2003; Noland, 2005). Given the prohibition of *ribā an-nasi'ah* entails the conduct of commutative transactions; this essay seeks to study the rationale for it through modelling trading financial claims in the business sector between a risk-averse financier and entrepreneur-manager in a general equilibrium setting (augmented with rational expectations framework). Default ensues from the agency cost of debt accruing to the conflict of interest between the two economic agents. This is consistent with Allen (2001) who underscores the endogeneity and pertinence of agency cost in financial transactions. In our pure interest-based debt structure model, we observe the religious injunction creates gain for it averts (i) sub-optimal financial structures due to agency cost of debt; (ii) expropriation of wealth of either party to contract; (iii) financial system fragility; and (iv) financial exclusion.

Expropriation of wealth by the lender occurs when the debt pricing apportions the project returns heavily to the financier (above the venture's unleveraged return). Alternatively, lender could practice predatory pricing to induce default by way of 'income-stripping' and 'equity-stripping'. On the other hand, the entrepreneur-manager could expropriate the wealth of the financier by exercising risk shifting, underinvestment strategies or ultimately strategic default that leaves the financier absorbing the project risk. All the above practices lead to non-sustainable long-run equilibria. The default risk in pure interest-based debt contract emits fragility into the financial system given the system's interconnectedness and highly leveraged nature. A system that is embedded with fragile states is sensitive to ruptures and costly to fire wall against contagion risk. Additionally, elevated agency cost of debt could result in the market clearing conditions for financing to breakdown leading to financial autarky. Where this occurs cohorts of the population are subjected to financial exclusion which delimit their economic capabilities. Each of the three issues creates drag on financial development and consequently, economic growth.

With respect to pure interest-based debt contracts, our results also show that risky debt is at best economic neutral (not economically more efficient) to a risk-free solution due to defaults in agency cost of debt. In addition, we observe the amalgamation of Pecking Order and Static Trade-off Theories in absence of asymmetric information and taxes, respectively. Thus, the ability to disentangle the primacy of either theory accruing to the above market friction from the seminal work of Myers and Majluf (1984) and Myers (1984a) is debatable.

Given the fallibilities of pure interest-based debt contracts, we discuss the economic efficiency of hybrid contracts, characterised by upside profit and downside risk sharing between financier and entrepreneur-manager. In our hybrid structure, profit sharing can be derived from equity, appreciation or income of the project in return for subsidising fraction of the project lease payment. These forms the equity kickers that alleviate risk shifting tendencies in agency cost of debt and permits financier to match risk preferences with the project value generation specificities. Furthermore, underinvestment in agency cost of debt is mitigated by the presence of collateral from the project. Unlike convertible debt, hybrid structures allow entrepreneur-manager to retain ownership and control rights over the project even in good states. The participative element in hybrid structures reduces financial fragility for it directly links the banks' asset-liability function and is preferred over specialised banking system. It also satisfies liquidity attributes as it can be structured for trading on

secondary market. We find pure equity contract is economically more efficient only when hybrid structures are infeasible due to excessive agency cost of debt. Where there is financial autarky, this warrants the deployment of charitable institutions as enjoined in the Islamic revealed sources.

From the above observations, the Islamic prohibition on *ribā an-nasi'ah* does not impede economic growth. Rather the underdevelopment of Muslim states accrues to the failure of the political elites to uphold the protection of property rights and establishment of institutions mandated to assist the underprivileged. This has policy ramifications on the criticality of the institution of independent judiciary, legislative and executive branches of the government. At the same time, the *ijtihad* by Muslim scholars has not progressed in tandem with the rigours of modern financial exchanges. As financial economics become a highly specialised field, only joint *ijtihad* between the jurists, specialist and practitioners would increase the robustness of such decisions in today's economic setting. Additionally, sustainable economic growth warrants the institution of body to govern the interests of underprivileged segment of society.

1.2 Can an interest-free credit facility be more efficient than a usurious payday loan?

The second essay provides a timely and relevant discussion on payday loan industry, an alternative financial service provider of small unsecured short term loans at high APR. Report on the payday loan industry find these borrowers, comprising moderate to low income earners still subscribe to the loan despite the high charges due to their inability to secure funding from mainstream providers to meet unplanned events. Literature on this subject is generally focused on either the credit behaviour or welfare effect of payday loans on the borrowers. To our knowledge none have ventured on studying alternative forms of funding to meet the latent financial demands of these cohorts of borrowers. Thus, this essay proffers an institutional design, in the form of endogenous leveraged interest-free payday loan circuit. In this essay, circuits are member based institutions akin to informal systems of ROSCA, ASCRA and the more formal hybrids, mutual and financial cooperatives. Members are economically active risk-neutral agents. The circuit provides short-term liquidity facility to allay its members' inter-temporal exogenous income shocks.

Our model incorporates (i) institutional economics of efficient organisation, which is characterised by its ability to adapt to the environment to deliver services in a cost effective

manner; and (ii) cultural beliefs in Islamic tenets that contrasts charity to *ribā an-nasi'ah*. The endogenous circuit is unique in that it addresses the inter-temporal liquidity shocks of its members despite funding being deployed on an interest-free basis. We employ numerical simulation to appraise the economic efficiency of our interest-free facility with that of usurious payday loans and credit rationing by mainstream financier. We find our interest-free facility is economic efficient [economic neutral] where the NPV exceeds [equals] that of competing solutions.

It also performs favourably over its competitors. The interest-free facility does not suffer from expropriation of wealth related with usurious facilities. Members' contributions that are linked to their income capacity promote asset building and long-run financial security. Furthermore, the endogenous circuit permits credit access to credit rationed cohorts. Moreover, we demonstrate the economic viability of interest-free loans by boot strapping its resources to grow endogenously rather than being relegated to only philanthropic endeavours. The circuit also addresses the time inconsistent preferences of present payday loan borrowers by instituting commitment technologies that is peculiar to circuit-based structures.

The circuit cost efficiency is contingent on reducing default and transaction costs. This involves instituting risk control measures that mitigate adverse selection and moral hazard. First, there must be equitable commitment, whereby the contributions and loan are stratified to the members' income and circuit resources without jeopardising both parties' financial interests. Second, the contributions are directly deposited into the circuit to pre-empt irrational consumption tendencies. Third, members undergo financial programs to enhance their financial capability. Fourth, a co-signer is present in absence of standard collateral to reduce moral hazard and costly verification. The structure of the circuit itself already minimises upfront transaction costs compared to current payday lenders, as it: (i) has a non-profit motive management force; (ii) benefits from internally generated funds; and (iii) is not compelled to issue investment returns to its 'depositors'.

The findings support policy objects of financial inclusion through provision of affordable credit. Furthermore, the structure: (i) incorporates risk-based underwriting from the income and loan constraints; (ii) maximises technology and automation through direct deposit of the contributions from members' income; (iii) promotes members' financial capability and asset building by means of compulsory participation in financial programs and embedded savings. Included in the essay is an indicative pricing mechanism for circuit based

structures. This illustrates the pricing parameters that are critical to maintain self-sufficiency, which is an issue with most charitable institutions.

1.3 Reinforcing resilience of the financial architecture with default-free collateralised loan

In the third essay we study the perspective of collateralised loan to transmit financial fragility, which is contrary to established literature that identifies it as a mechanism to defray default risk and an aspect endeared under the economic rationale for the prohibition of *ribā an-nasi'ah*. This is evident from the recent financial crisis where highly accredited securitised collateralised loans subsequently defaulted, which then led to a viral effect on other credit markets including repos. We illustrate the pertinence of proper pricing of collateralised debt contracts on a financial intermediary asset transformation function, i.e., deposit taking activity and credit creation role. This is done by modelling the payoffs of a pragmatically default-free solution with a default-prone one and its consequential effect on the intermediary's deposit obligations. We treat defaults as endogenous accruing to the agency cost of debt. The conflict of interest between the financial intermediary (lender) and borrower (entrepreneur-manager) is represented by segregating the welfare of both parties.

The endogeneity of agency cost in debt contracts results in potential financial disintermediation, i.e., breakdown in the asset transformation function. Financial fragility is amplified in the case where these default-prone collateralised loans are further churned in securitisation and rehypothecation activities. It is apparent that the churning of poorly structured collateralised loan only transfers but not absolve the embedded default risk arising from the agency cost of debt. This corroborates the findings of Ebrahim and Hussain (2010) in that default-prone loan is at best economic neutral (not economically more efficient) to pragmatically default-free solution due to the agency cost of debt. Its economic efficiency is particularly curtailed where the (i) recovery rate is stochastic; or (ii) salvage value from foreclosures is extremely low. In this situation, a pragmatically default-free collateralised loan is the only economically efficient solution. Our approach of segregating the welfare of interest between contracting parties is distinct from Myers (1984b) and Strebulaev (2007) who aggregates the welfare of the contracting parties. Thus, it fails to capture the conflict of interest in principal-agent arrangements, which leads to potentially misleading results in poor states of economy.

Structuring pragmatically default-free collateralised loan composes of stripping the put option to default by requiring the borrower to impute adequate equity, i.e., 'skin in the game' over all states of economy. This minimises risk shifting tendencies and is consistent with Baltensperger (1978), Foote et al. (2008), and Archer and Smith (2013).

Our findings have policy ramifications to reinforce resilience of the financial architecture. Regulatory measures should emphasise the criticality of pricing pragmatically default-free loans to moderate financial fragility. By reducing the put option to default it guarantees the integrity of deposits without the moral hazard attaching to deposit insurance scheme. Additionally, pragmatically default-free collateralised loan structures mitigate systemic ruptures of highly networked financial system and avert costly bailouts.

2. Thesis limitation and suggestions for future research

Generally, the fundamental aim of the religious injunction of *ribā an-nasi'ah* is for protection of property rights in deferred commutative exchanges between parties to contract. Thus, its scope is wider than the confines of interest-based (debt) contracts argued by Muslim jurists. Although our model in the first essay is based on pure debt contracts, our capital structure approach can also be extended to other financial exchanges such as hybrid, pure equity or leasing structures, to identify whether these contracts are fallible to the three issues highlighted above.

In the second essay on endogenous interest-free payday loan circuit, we adopt a simple framework of risk neutrality to derive close form solutions. Although the model can be extended to risk-averse agents, we consciously decided otherwise. Firstly, the circuit would need to satisfy a higher opportunity cost of fund in the economic efficiency condition. This however does not cause any fundamental effect on the objects of the circuit. Second, it limits the circuit financial reach given the need to satisfy a higher order of cost of funds. This is contrary to the Islamic injunction on *ribā an-nasi'ah* that promotes charitable teachings.

Funding for the circuit is generated from member based contributions which may require gestation period to accumulate substantive capital before it can be deployed. To mitigate the lag from contribution collection to loan issuance, the circuit (i) may rely on seed funding from *zakāt* or *sadaqah* to supplement its initial capital base; or (ii) it can be integrated into an existing operational circuit, eg. financial cooperative. The circuit may be exposed to exogenous shocks such as economic-wide slump that affects overall member

economic status. To enhance its robustness, a potential strategy is to institute safety net akin to *Verband*, associative level of German cooperative banking system that provides liquidity relief in light of unforeseen shocks.

Lastly in our endogenous interest-free payday loan model, we assume the aim of circuit members is to maximise accessibility to low cost credit in contrast to usurious payday loan or subjected to credit rationing. Thus, investment returns or dividends on the accumulated contributions (savings) are not featured in the circuit. This is best served by existing financial intermediaries.

With respect to the third essay, it is written from a mainstream perspective in order to have a more impactful effect on academics, policy makers and practitioners. Nonetheless, the essay's underlying theme of moderating financial fragility within the system is still reflective of the economic rationale for the prohibition of *ribā an-nasi'ah* deduced from our first essay. Additionally, in the third essay we emphasise the economic efficiency of structuring pragmatically default-free loan, where the project payoffs exceed the loan obligations over all states of the economy with very high probability. This recognises real world practicalities of structuring completely risk-free loan discussed in our first essay for the latter approaches agency cost issues from a theoretical perspective.

In terms of future work, the first essay currently highlights the issues with pure interest-based debt contracts from the perspective of the injunction on *ribā an-nasi'ah*. However, this Islamic injunction essentially applies to any deferred commutative exchanges. Thus, our capital structure approach can also be extended to other financial exchanges such as hybrid, pure equity or leasing structures, to identify whether these contracts are fallible to the issues of expropriation of wealth, financial fragility and financial exclusion that are observed in respect of interest-based financial contracts. The study on the prohibition of *ribā an-nasi'ah* also invokes a closer scrutiny on the form of financial system that best serves society's welfare, specifically due to the negative ramifications of the recent financial crisis. The prevailing low policy rate rates due to Western economies quantitative easing regime (i.e., in some cases converging to nearly zero rates) raises the question whether there is possible convergence of Islamic and Western financial systems.

Essays two and three endow us with a framework to investigate the efficiency of *ar-rahnu* (pawn broking) facility that is widely practised in Malaysia for funding microtraders.

Here, the borrower (entrepreneur-manager) pawns his property in lieu of an interest-free loan (*qard*) from the lender (financial intermediary). In contrast to mainstream practices, the intermediaries earn their revenue from the custodial services that is contingent on the collateral value and safe keeping tenure. Currently, gold is the only medium of collateral accepted by the intermediaries. The economic efficiency of *ar-rahnu* in comparison to competing mainstream pawn broking and other microfinance facilities provide an interesting case study that should contribute towards enhancing the financial policies of emerging economies. With respect to the third essay on collateralised debt, it provides a framework for other research on the economic implication of trading of debt for debt (*bai al dayn bi al dayn*) and short selling, issues that are debatable in Islamic finance.

In short, the PhD programme at Bangor University has given me a solid theoretical training and has broadened my horizon. This should help me to contribute towards the goals of my employer, the Central Bank of Malaysia in the financial sector policy design particularly as Malaysia transitions into a high-value, high-income economy.

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Appendix

Has the Prohibition of *Ribā An-Nasi'ah* Hindered Economic Development of the Muslim World

A. Proofs

Proof of Proposition 1:

(i) In our risk-free setting, the underlying assets of the project are of high quality and are not susceptible to severe deterioration in their payoffs. This allows the entrepreneur-manager to honour her loan obligation (with interest) in all states of the economy. This result is consistent with the prognosis of Shleifer and Vishny (1992).

(ii) Equation (10a) is derived from Equations (3a), (7a), (8) and (9).

(iii) Equation (11a) is derived from Equations (4a), (8) and (9). Q.E.D.

Proof of Proposition 2:

(i) (a) A risky loan is characterised by defaults in some state of the economy in the future; In (b) and (c), the interest rate contracted for the risky loan and its debt ratio are greater than that of the risk-free alternative, which is reflective of an upward slopping supply curve. In a risky loan setting, the entrepreneur-manager prefers a high debt ratio, while the lender (financier) seeks extra compensation for the increased risk exposure.

(ii) Equation (10b) is derived using Equations (3b), (7b), (8) and (9).

(iii) Equation (11b) is derived using Equations (4b), (8) and (9). Q.E.D.

Proof of Theorem:

The Rational Expectations Equilibrium in Propositions 1 − 2 are impacted differentially by the *endogenous* agency costs of debt.

(i) *The Amalgamation of the Pecking Order Theory with Static Trade-off Theory:*

The risky loan and asset pricing conditions (Equations (10b) and (11b)) comprise of: (i) default states of the economy (at or below the critical 'Z' state of the economy); and (ii) normal states. In the default states, the lender takes over the project to salvage the outstanding debt value. The lender's ability to full compensation is nonetheless encumbered by the presence of direct and indirect bankruptcy costs (eg. adjudication costs, value lost from asset fire sale), which limit the recovery to only a fraction (k) of the project's payoffs (as indicated by the line FG in Figure 2). This is in contrast to the normal state of the economy (as indicated by the line BH in Figure 2), where the lender receives the full contractual payments of the debt. In equilibrium, this *endogenous* agency cost of debt, arising from the transmission of project risk to lender, along with costs of default, are accounted for in the pricing of debt. This is borne by the entrepreneur-manager in the form of higher interest rates in contrast to a risk-free loan (see Equation 10b).

Any debt capacity decision is largely influenced by the liquidation value of the funded project. It thus requires the project's underlying assets to hold value that fulfils the Basic Condition of Proposition 1 of min. $(q_{1j}+P_{1j}) > 0$. Since default costs are transmitted by the lender to the entrepreneur-manager (see Equation 10b), the latter's welfare is lower with a risky debt. This ensues from the fact that risky debt is welfare reducing, as the borrower loses his prime asset (i.e., the project) in the poor states of the economy (below the critical state 'Z'). Furthermore, equilibria with risky loans are feasible only when the agency cost of debt associated with default costs (as indicated by the quadrilateral AFBG in Figure 2) are not excessive. In contrast, equilibria with risk-free loans are feasible even when those with risky loans are unfeasible. In this context, risky loan equilibria, if feasible, are at best *economic neutral* to risk-free financing facilities. This concurs with Myers (1977) who attributes agency cost of debt to *underinvestment* issue, whereby firms refrain from undertaking projects with positive net present value if the benefit of the project accrues to the lender on default.

(ii) *Embedded potential for expropriation of wealth in risky debt facilities:*

There is potential for expropriating wealth of either the lender or entrepreneur-manager if the equilibrium interest rate is outside the interval given by Equation (12) with the potential of generating non-sustainable equilibrium in the long-run. That is:

$$i < 0, \text{ or} \tag{13a}$$

$$i > r_{unleveraged} \tag{13b}$$

(iii) *Risky debt facilities imbue financial fragility:*

Low risk aversion levels and default costs lead to economic neutrality of risky loans. This instigates financial instability, whereby failure of the entrepreneur-manager to honour its financial claims causes a rippling effect of credit defaults. Its severity is dependent on the degree of interconnectedness of the financial sector (as illustrated in Figure 3).

(iv) *Financial exclusion in the credit market:*

An equilibrium entails the fulfilment of all three conditions in Propositions 1 or/and 2. In a situation where there is total breakdown of the market clearing conditions, this leads to financial autarky of the borrower. Drawing from Jensen and Meckling's (1976), the entrepreneur-manager will be left to absorb the detrimental impact of agency cost of debt.

Q.E.D.

Can an interest-free credit facility be more efficient than a usurious payday loan?

A. Proof

We employ conditional probability premised on Bayes' rule with notations B: Borrow and NB: No Borrow, respectively to derive at:

(i) $$P\left(NB_{t+1-n}/NB_{t-n}\right)=\frac{P\left(NB_{t+1-n}\cap NB_{t-n}\right)}{P\left(NB_{t-n}\right)}$$

$$=\frac{P\left[NB_{t+1-n}\cap\left(\bigcup-B_{t-n}\right)\right]}{P\left(NB_{t-n}\right)}, \text{ where } \bigcup \text{ is the universal set}$$

$$=\frac{P\left[NB_{t+1-n}\cap\bigcup\right]-P\left[NB_{t+1-n}\cap B_{t-n}\right]}{P\left(NB_{t-n}\right)}$$

$$=\frac{P\left[NB_{t+1-n}\right]-P\left[NB_{t+1-n}\cap B_{t-n}\right]}{P\left(NB_{t-n}\right)}$$

$$=\frac{\left(1-\lambda_{t+1-n}\right)-\left(1-\rho_{t+1-n}\right)\lambda_{t-n}}{1-\lambda_{t-n}}$$

Subsequent reiterations yield the following in steady state:

$$=\frac{\left(1-\lambda\right)-\left(1-\rho\right)\lambda}{1-\lambda}$$

$$=\frac{1-2\lambda+\rho\lambda}{1-\lambda}$$

(ii) $$P\left(B_{t+1-n}/NB_{t-n}\right)=1-P\left(NB_{t+1-n}/NB_{t-n}\right)$$

Subsequent reiterations yield the following in the steady state:

$$=1-\left[\frac{1-2\lambda+\rho\lambda}{1-\lambda}\right]$$

$$=\frac{1-\lambda-\left(1-2\lambda+\rho\lambda\right)}{1-\lambda}$$

$$=\frac{\lambda\left(1-\rho\right)}{1-\lambda}$$

Glossary of Arabic terms

ar-rahnu	Pawn broking
bai al dayn bi al dayn	Trading of debt for debt
bi-al-batil	Literally 'without right'. It implies expropriating people's assets unjustly.
hikmah	Rationale
hilah	Legal stratagem
ijtihad	Literally 'exertion'. It implies independent deduction of laws not self-evident from the primary sources, namely the *Qur'ān* and *Sunnah*.
'illah	Effective cause, or *ratio legis*, of a particular ruling
madrasah	Religious school
mudarabah	Passive partnership contract between capital provider and investor (entrepreneur-manager) where profits are shared on a pre-agreed ratio, whilst losses are borne by the former.
qādi	Judge
qard	Interest-free loan
Qur'ān	The holy book of Islam
ribā	An injunction protecting property rights. This is generally misinterpreted as usury *or* interest.
ribā al-fadl	This is termed as hidden *ribā*. It is an injunction to deter expropriation of assets on spot exchanges.
ribā an-nasi'ah	This is termed as evident *ribā*. It is generally an injunction to deter expropriation of assets on deferred exchanges. It also mitigates financial fragility and the exclusion of underprivileged from financial services.
sadaqah	Voluntary offering or alms from a person's wealth.
salaf	Interest-free loan over a pre-fixed duration. Also synonymous with *qard* (see above)
shari'ah	Islamic law
sunnah	The body of traditional, social and legal custom and practice of the Islamic community. Along with the *Qur'ān* and *Hadith* (recorded sayings of the Prophet Muhammad), it is a major source of *Shari'ah*, or Islamic law.
takāful	Derived from the Arabic word '*kafala*', which literally means 'to guarantee'. It denotes an agreement between parties to indemnify another on occurrence of the said event.
usūl fiqh	Encompasses the sources of Islamic law, their order of priority, and methods applied in deduction of the sources.
waqf	Philantrophic foundations (*awqāf*, plural).
zakāt	Literally 'cleansing or purity'. It implies a religious tax to be deducted from one's wealth to help the needy.