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Can Islamic Injunctions Indemnify the Structural Flaws of Securitized Debt?

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Abstract: Securitization enhances liquidity of debt contracts. However, its structural deficiency at origination has led to the freezing of its secondary market and failure of institutions holding the collateral. This paper builds on key cultural (i.e., Islamic) rulings to rectify flaws entrenched in securitized debt stemming from asymmetric information and agency issues. These injunctions help in the efficient underwriting of debt contracts across the globe to: (i) redeem its 'toxicity'; (ii) guarantee liquidity; (iii) alleviate fragility of the financial system; and (iv) promote economic growth. Finally, this study promotes a rethink of the current 'Islamic' financial system from a narrow literalist juridical perspective to one that is grounded in financial economics.

JEL Codes: D53, G10, G20, G28, O16, Z12.

Keywords: Agency cost, collateral, debt default, financial fragility, Islamic injunctions.

"*Improving the liquidity of the bond market is now the number one item on the asset management industry's agenda*"

Stephen Foley (2014b p. 13)

1. Introduction

Securitization is assailed in the recent financial crisis. The opacity caused by complex collateralisation structures and the endemic agency issues of debt securities, is believed to have instigated the crisis (Gorton and Metrick, 2012). This is despite the viability of securitization in enhancing liquidity for firms' receivables (Cohn, 1997); and facilitating banks' balance sheet restructuring, funding and other risks management activities (Loutskina, 2011).

Demyanyk and Van Hemert (2009), Heilpern et al. (2009), and Shin, (2009) assert that securitization is not entirely blamed for the crisis. The desire to increase the supply of loans is the prime reason, leading to lax underwriting standards and consequently liquidity freeze. Essentially, banks failed to efficiently price their lending facilities to be default free (Ebrahim and Mathur, 2007). Apart from accounting for the traditional repercussion of interest rate risk on demand and supply of loans, banks have ignored the effect of collateral value resilience to economic shocks.

The purpose of this paper is to elaborate on how cultural, that is values emanating from Islamic rulings can help alleviate the structural flaws behind securitization of debt, thereby mitigating the fragility of the financial system and facilitating economic growth.[1] Our goal is to coherently interpret the Islamic rulings[2] from a financial and economic perspective, and apply the doctrines to improve the resilience of the financial sector of the economy.

This paper studies the contractual relationship between risk-averse lenders and borrowers in a stylized setting. We proceed with examining the main issues in financial contracting,

1 Our paper is consistent with the views of Stulz and Williamson (2003), Li et al. (2013) and Lievenbrück and Schmid (2014), who emphasize the impact of culture (including values extracted from religious scriptures) on economic policies and institutions.

2 This is guided by the Islamic scriptures, namely the *Qur'ān* (Muslim Holy Book) and the *Sunnah* (traditions of Prophet Muhammad).

namely asymmetric information and agency costs of debt separately and offer solution to this quandary premised on techniques espoused in the established literature.[3]

A viable and economically efficient securitization option emphasized in this paper is to structure default-free loans completely collateralized by tangible assets to curtail risk-shifting, accompanied with measures to curtail underinvestment issues. Firstly, we interpret the Islamic rulings from both financial and economic perspective, and employ them in structuring securitized debt claims ensuing from tangible collateral to ensure that information asymmetry is mitigated. In other words, we conceptually model the tradeoff of financial claims of a project involving *tangible* assets. This constitutes a framework of Rational Expectations (i.e. *symmetric* information).[4] Secondly, we emulate the model of Ebrahim et al. (2014) to illustrate: (i) the economic efficiency of default-free securitization over default-prone one; and (ii) the mathematical condition yielding illiquidity for default-prone debt, as evidenced in the recent crisis. Finally, we rationalize the verses of the Qur'ān to meticulously price debt by alleviating the agency cost of debt.

Our efforts yield the following contributions to the literature. First, our approach of segregating the twin issues in financial contracting on information asymmetry and agency cost of debt differs from present literature which regards the first issue to subsume the second (Koziol and Lawrenz, 2010; Salleh et al., 2014). Second, the Arabic nomenclature contrasting tangible assets (*'ayn*) (and claims backed by them) versus intangible assets (constituting of debt/ obligation/ liability - *dayn*) (and claims backed by them) helps in alleviating information

3 Our approach is akin to published articles of scholars who focus on wealth effects of important events, in leading economics and finance journals (see Berkowitz et al. 2015). Yet, their methodology is an adaption of the event study formulated in the well-known Fama (1991) paper pertaining to the efficiency of financial markets.

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

asymmetry (*gharar*). By securitizing or ensuring the claims are backed by tangible assets, lenders would then have access to asset's historical (ex-post) risk and return, which enhances the risk exposure estimation. Adverse selection is moderated by financing the purchase of tangible assets where funds are released in the escrow process when title of the tangible asset changes hands. Moral hazard is also moderated by adhering to the Islamic rulings (Qur'ānic verse - 2:282) espousing clear, concise, complete and correct documentation of deferred claims. This facilitates the underwriting of financial facilities in a complete market setting spanning each state of the economy.

Third, we adapt the Lucas tree model (Martin, 2013) to mathematically rationalize the Islamic rulings on: (i) the prohibition of *ribā* (debilitating exchange of financial claims elaborated in Section 4); and (ii) injunction of the sale of debt (*bay' al-dayn*). These respectively forewarn against investing in toxic asset, and stem the degeneration to a default-prone debt equilibria wrought by illiquidity, as evidenced in the crisis.

Fourth, the Islamic rulings emphasizing: (i) fragile-free financial contracting (Q 2:280); (ii) risk management (Q 4:71, 102); and (iii) judicious undertaking of obligations (including that of debt, Q 5:1) help alleviate the agency cost of debt. This is because efficient pricing of facilities at origination, sterilizes the borrower's put option to default during the tenure of the credit facility. This indemnifies the facility of the risk-shifting (i.e., agency) issue and subsequently reduces the funding constraints on borrowers to mitigate the underinvestment issue. This leads to default-free financing, which maintains the value of collateral, ensures liquidity of current and future obligation, and leads to stable financial system that is beneficial to financial market participants. Thus, arresting the fragility of the financial system rejuvenates economic growth.

Finally, our study stimulates a fresh financial economic perspective from the existing narrow interpretation of Islamic scholars that is crucial in advancement of legal, informational

and financial infrastructure to alleviate the perennial underdevelopment of emerging Muslim economies.

The remainder of this paper is organised as follows. Section 2 reviews the merits and shortcomings of securitization. Section 3 discusses securitization in Muslim economies. Section 4 rationalizes the cultural perspective behind the trading of financial claims and addresses the deficiencies of securitization. This includes the mitigation of asymmetric information by securitizing only claims backed by real tangible assets, and agency cost of debt by meticulously pricing debt at origination thereby moderating both risk-shifting as well as under-investment. Finally, Section 5 concludes the paper.

2. The Merits and Shortcomings of Securitization

Securitization is the best alternative of providing liquidity to a firm's assets through transforming long term illiquid financial assets to tradable capital market instruments (Mullineux and Murinde, 2003). Borrowers (as the users of funds), financial institutions (as asset originators), and investors (as sources of funds – purchasing securitized assets) all benefit from the securitization process (Okabe, 1998). Securitization endows social benefits, described as follows: (i) borrowers secure low cost funding; (ii) originators gain from risk management, enhanced performance, inexpensive financing and balance sheet restructuring; (iii) investors reap from diversification, higher yield, and opportunity to invest in larger pools of Mortgage Backed Securities and Asset Backed Securities. Securitization thus enhances the welfare of market participants, making the financial system more efficient (Greenbaum and Thakor, 1987; Carlstrom and Samolyk, 1995; Cohn, 1998; Mullineux and Murinde, 2003; Loutskina and Strahan, 2009; Gorton and Metrick, 2012).

In contrast to the above, securitization suffers from the following ills: credit risks and illiquidity (Hirth and Uhrig-Homburg, 2010; Kara et al., 2011; Claessens et al., 2012).[5] These ensue from information asymmetry and poor underwriting process that does not cure the endemic agency cost of debt (Figure 1).[6]

[Insert Figure 1 about here]

Not only does this affect the pricing of loans at origination, but it also adversely affects investors of the securitized debt instruments by exposing them to illiquidity. This is a serious problem often overlooked. Illiquidity affects prices of the debt instruments (Nashikkar et al. 2011) and results in increased bid-ask spread (Bao, et al. 2011). Liquidity dry ups causes defaults within the financial system, affects growth of financial markets, and may even result in financial market crashes (Dick-Nielsen et al. 2012; Friewald et al., 2012).

2.1. Mitigating Information Asymmetry

The lack of information has a two way impact: both investors and markets are affected. This is due to the fact that in the presence of information asymmetry, investors have a tendency of viewing the market in a trendy momentum seeking behavior. That is, lack of information forces borrowers and lenders to 'rely on the most recent events as indicative of the future' (Archer and Smith, 2013 p. 373). Thereby, adverse markets movements are followed by lack of confidence in markets, resulting in market breakdown. Overall, investors are affected by information asymmetry due to its ex-ante (adverse selection) and ex-post (moral hazard) effects.

5 Complex securitization aggravates opacity of the securitized assets. In addition, it causes investors to overlook information provided by originators, relying entirely on ratings (BIS, 2009). Thus, these assets become Akerlof's 'lemons', leaving investors unaware of their risk exposure.

6 The practitioner literature also attributes illiquidity to a dizzying array of debt issues floated by a firm (Foley, 2014b). For instance, General Electric has 900 kinds of bonds outstanding. Our paper ignores this idiosyncrasy of financial markets.

2.1.1. Mitigating Adverse Selection

Propositions to reduce adverse selection in contracts include screening (Broecker, 1990), multi-period contracting (Hosios and Peters, 1989), and credit rationing (Baltensperger, 1978). However, credit rationing leads to increased price of the loans (Jaffee and Russell, 1976), which eventually results in financial exclusion of poor borrowers.

In Subsection 4.1, we discuss the Islamic rulings to securitize financial claims backed by tangible assets to moderate this issue.

2.1.2. Mitigating Moral Hazard

For reducing the effects of moral hazard, the literature suggests various propositions including instilling rights to protect return to both parties (Hart, 1988), credit rationing (Baltensperger, 1978), and iron-clad covenants (Smith and Warner, 1979). Also, in the securitization process, originators are required to retain the risky residual tranche as a 'first loss position' or as 'skin-in-the-game' incentive, so as to absorb any expected loss. But this induces the problem of 'selective bias' (Jobst, 2006). Originators might neglect monitoring or monitor those assets that are solely exposed to the residual tranche at the cost of other tranches.

In Subsection 4.1, we espouse employing Qur'ānic injunction (2: 282) akin to the gist of Smith and Warner (1979) encouraging the use of iron-clad covenants on claims backed by tangible assets to moderate this issue.

2.2. Mitigating Agency Cost of Debt

Securitization of assets involves a special purpose vehicle (SPV), which manages the assets and liabilities for the investors. Although the SPV's aim is to reduce the originator's moral hazard, this may instead give rise to agency cost of debt, that is, the conflict of interest between originator (principal) and SPV (agent). Here, principal and agent have different objectives as their respective welfare is contingent on the sharing of economic output ensuing

from the efforts of the agent. Hence, the SPV may be enticed to meet its own objectives first before those of the originator. The dimensions of agency cost discussed here are risk shifting and underinvestment.

Agency cost of debt can take the form of risk shifting, that is, the intentional misallocation of risk by an agent (Barnea, et al. 1981). It can also comprise of underinvestment, that is, an intentional replacement of good investment opportunities for bad ones (Barnea, et al., 1981; Myers and Majluf, 1984).

In Subsections 4.2-4.4, we espouse moderating this issue by meticulously pricing financial claims, that is controlling for both risk-shifting as well as under-investment issues in contrast to the well-known capital structure theorems of Modigliani and Miller (MM-1958, 1963) and Miller (1977).[7]

3. Securitization in Muslim Economies

Despite the strong appeal for securitization, there is a small share of structured financial contracts observed in Muslim economies. One of the reasons cited is the incoherence of Islamic rulings in the area of economic development (Ebrahim et al. 2014). This has led to allegations that Islamic law has held back the development of the Middle East (Kuran, 2011). Connected with this is the rigor applied in the interpretation of Islamic values that is necessary to support advancements in financial innovation. This is evident by the: (i) poor legal framework and accounting standards for structured finance; (ii) regulatory inflexibilities; (iii) inadequate market practice, standards of origination, trading and investor protection; in addition to (v) a

7 The capital structure theorems aggregate the two adversarial (equity and debt) claimants' objective functions. This deprives the analysis of the agency issues and thus the optimal pricing parameters of debt. Furthermore, these theorems are construed in a risk-neutral setting that is similar to a linear programming model. This yields multiple solutions (termed as the invariant result) in the absence of market imperfections such as taxes and a corner solution (0% initial equity) under the corporate tax deductibility of interest expense. The capital structure irrelevance result also relies on a strong assumption. That is, individuals resorting to the MM (1958) arbitrage have the same negotiating prowess as that accruing to financiers and institutional players. The Miller (1977) analysis also suffers from the same limitation.

feeble local institutional investor base (see Stulz and Williamson, 2003; Jobst, 2007; Li et al., 2013; and Lievenbrück and Schmid, 2014). It is thus not surprising that most of these economies have deeper bank-based, as opposed to a market-based, financial system (see Wilson, 2012).

Empirical studies on securities structured according to Islamic and mainstream finance depict differences between the two forms of securitization. One, Godlewski et al (2013) employ event study methodology to illustrate that stocks of firms issuing mainstream bonds do not depict any significant market reaction. In contrast, stocks of firms issuing *sukuk* (bond) depict a significant negative reaction. This is conducted in a purely Malaysian context, without segregating the different profiles of *sukuks*. This wealth effect is interpreted in a Myers and Majluf (1984) context as an adverse signal implying the sale of participatory contracts of lower quality companies requiring monitoring by the issuing firm. Two, their recent 2014 study, again employing the event study methodology, illustrate that the stock market reaction is positive for debt like (i.e., leasing) *sukuk* in contrast to quasi-equity or participatory forms. Furthermore, they also find that the stock market reaction is contingent on the reputation and proximity of the scholar endorsing the issuance of the *sukuk*.

Another strand of the literature differentiates the risk-return profiles of the two forms of securitization. For instance, Ramaswamy et al. (2011) study the yield and risk (in terms of duration and convexity) of the two contrasting groups of securities from a Malaysian perspective. They realize that *sukuk* are moderately riskier than government bonds while less so when compared to conventional bonds. The returns, however, are higher than government bonds but lower than mainstream bonds. Cakir and Raei (2007) employ a Value-at-Risk (VAR) framework to study the risk structure of the two facilities. They illustrate that the secondary market behaviour of *sukuk* is different from Eurobonds and that there are diversification

benefits to be gained from the former to reduce the overall risk of the portfolio. This result is corroborated by Paltrinieri et al. (2015) and Abdelsalam et al. (2015) detailed below.

The study by Paltrinieri et al. (2015) finds that *sukuk* index payoffs are positively skewed with a leptokurtic distribution, displaying characteristics similar to high yield bonds instead of corporate and developed country government bonds. They too illustrate diversification opportunities through low correlations with other asset classes. This is also confirmed in the recent subprime crisis.

The study by Abdelsalam et al. (2015) examines the impact of securitization on the stability of financial institutions at micro (i.e., individual) and macro (i.e., systemic) level. They scrutinize a global sample of Islamic and mainstream banks in 22 countries in the period 2003 to 2012, covering 4,887 bank-year observations. They illustrate that during the financial crisis, Islamic banks involved in quasi-equity (i.e., participatory) securitization displayed stronger capitalization and better asset quality. This is despite being less efficient due to high monitoring costs of participatory facilities. However, Islamic banks involved in debt *sukuk* securitization displayed identical capitalization, asset quality and efficiency when compared to their mainstream counterparts. Islamic banks were thus more immune to the 2008 financial crisis than their mainstream counterparts.

It is noted that empirical evidence on the value and wealth effects of Islamic rulings in securitization is limited due to: (i) constraints in comparing the risk and return profile of the two different forms of securitization (i.e., Islamic and mainstream) unless we have the same company (or companies with similar risk) issuing the two facilities; (ii) lack of depth in securitization data, given that structuring of Islamic papers began in early 2000; this then implies (iii) possibilities of glitches appearing attributed to lax underwriting and due diligence (see Foster, 2006).

We contend that the theoretical value and finance perspective employed in our study has the capacity to further improve the resilience of debt oriented *sukuk* and the banks which securitize them. Furthermore, it would also contribute towards addressing the incoherence in interpretation of Islamic rulings that has led the industry to employ ad hoc methods to structure Islamic papers across regions of the Muslim world. For example, Wijnbergen and Zaheer (2013) observe that the current 'asset-based' *sukuk* which is permissible by several Islamic jurists does aggravate legal risk. This provides strong support to the employment of tangible 'asset-backed' *sukuk*, meticulously configured to alleviate both asymmetric information and agency costs of debt to make it truly 'bankruptcy-remote', as promoted in our study.

4. Mitigating Financial Fragility with Islamic Injunctions

This section discusses solutions to each of the issues highlighted in Section 2 from the application of Islamic cultural values in securitization, which is presently absent in financial contracting literature.

Asymmetric information (termed as 'gharar' in the Arabic nomenclature) is addressed by resorting to securitization of assets backed by tangible assets (termed as 'ayn'). The reason behind this, as discussed in Subsection 4.1, is to imbue transparency to assets being financed in order to alleviate adverse selection. Next, we mitigate moral hazard by resorting to Qur′ānic injunction (2: 282) mandating clear, concise, complete and correct documentation of deferred claims.

This still leaves a residual toxicity emanating from agency cost of debt. This is illustrated by us via a conceptual model in Section 4.2. We adapt the well-known Lucas Asset Pricing Model, based on Rational Expectations (see Martin, 2013), to illustrate the toxicity of financial claims with endemic agency costs of debt (see Proposition, Section 4.3). This results in the inability to price such debt contracts and thus illustrates the inability of financial institutions to detoxify themselves, as observed in the recent subprime crisis. Finally, we illustrate an

algorithm developed in Ebrahim (2009) in Section 4.4 as an antidote to this endemic toxicity by structuring debt (evaluating an optimal loan to value ratio - LTV and tenure) to mitigate both risk-shifting as well as underinvestment issue of agency cost of debt.

This approach is consistent with scholars such as Berkowitz et al. (2015), who emulate Fama (1991). Our contribution, described below, is distinct in that it involves integration of the disparate techniques developed in various strands of the literature and recalibrating them to indemnify the issues with securitization.

4.1. Employing Islamic Injunctions to Alleviate Information Asymmetry

The study of cultural values advocated in this paper involves reinterpreting centuries old Islamic injunctions of *ribā*, *gharar* and that of *bai' al-dayn* (detailed below) from a financial economic perspective which departs from the literalist (narrow) approach of classical Muslim jurists.

a) *Ribā*: This is one of the most fundamental injunctions in Islam. It entails the safeguarding of property rights (Ebrahim et al., 2014).[8, 9] The rationale behind this injunction, in the realm of financial contracting, is to avoid non-sustainable equilibria, where the resources of either a lender or a borrower are being expropriated. This can ensue either under risk shifting and/or underinvestment, issues associated with agency costs of debt. This paper focuses on the moderation of the avenues of expropriation

8 This interpretation stems from the Qur'ān, which vehemently denounces expropriation of another person's assets through either spot or deferred trade (Q 2:279; 3:130; 4:161; 30:39). It should be noted that this encompasses the trading of financial claims. In contrast, the religious establishment in Islam has traditionally interpreted the term *ribā* literally from the Arabic word implying 'growth' or 'expansion' (Al-Zuhayli, 2003). They have deduced the term to imply all forms of plain vanilla debt contracting as it implies debt payment in excess of principal (Pryor, 2007). This implies that they do not have any clue on the link between expropriation and agency issues.

9 Despite the denouncement of expropriation, the Muslim world gave in to all forms of autocracy, retarding its development and growth (Ebrahim et al., 2014). The traditions of Prophet Muhammad vehemently denounce any form of market manipulation. Yet, the Muslim world ignores these to form cartels in commodity markets to expropriate assets from commodity importing countries.

(i.e., the agency issues) in Sections 4.2-4.4. This is because the cost of funding is contingent on the agency costs of debt (Koziol and Lawrenz, 2010; Hirth and Uhrig-Homburg, 2010). Ameliorating the agency issues sterilizes the 'toxicity' of risky debt as illustrated in Subsection 4.4. This in turn allows the reduction in the cost of funding, thereby facilitating the acceptance of more viable projects to boost economic growth.[10]

The *ribā* injunction has led to the development of a nomenclature in Arabic, which terms a real tangible asset as an "'*ayn*" and a non-tangible asset like a debt or liability or an obligation as a "*dayn*" (Al-Zuhayli, 2003). The rationale for this segregation conveys a crucial meaning from a finance perspective, even though it was conceptualized roughly 1400 years ago.

A tangible asset (*ayn*), such as real estate and commodities, has physical attributes and can be valued (priced) easily.[11] This allows one to evaluate its ex-post risk and return, thus giving an investor an estimate of its ex-ante risk and return. This allows lenders to alleviate adverse selection, emanating from ex-ante information asymmetry. This is accomplished by releasing funds in the escrow process, where the title of the tangible asset is exchanged for cash. Thus "'*ayn"* confers *transparency* to the ownership of tangible asset and financial claims backed by tangible assets. In other words, ownership of tangible assets and financial claims backed by these assets alleviate adverse selection.

10 The *Qur'ān* also provides guidance on deferred exchanges of financial claims, also categorized under this injunction. This includes asking lenders to give respite to borrowers (Q2: 280), implying the structuring of fragile free contracts. The final issue on *ribā* pertains to financial exclusion. It is deduced from the contrast the scripture draws between it and charity (Q 2:276-277, 30:39). This last issue is not discussed in this paper.

11 See also Hall (2012) for an empirical relationship between asset tangibility and leverage over various institutional environments.

In contrast, securitization practised in the developed world centres on cash flows emanating from claims on intangible assets, such as music royalties and credit card payments. These assets lack physical substance and are difficult to value. The risk of default endemic in debt or liability or an obligation exacerbates the difficulty in pricing of these assets, as illustrated below. This confers *opacity* to these assets and to financial claims backed by them. The opacity behind these assets and claims against them is termed in Arabic as "*gharar*", described below.

Next, we mitigate moral hazard emanating from the ex-post change in borrower's behaviour by adhering to the Qur'ānic injunction (2: 282) encouraging clear, concise, complete and correct documentation of deferred claims against tangible assets.[12] This is accomplished by mandating the following in the covenant of the credit facility: (i) minimum maintenance of the asset; (ii) payment of taxes; and (iii) adequate insurance coverage (Salleh et al. 2014).

b) *Gharar*: This involves market manipulation stemming from asymmetric information (Thomas, 1995).[13] This definition is consistent with the views of Greenbaum and Thakor (1987) and Carlstrom and Samolyk (1995). This has credence in the light of the recent market manipulating scandals involving London inter-bank offer rate (LIBOR) fixing, Gold price fixing etc.[14, 15]

12 This 'iron-clad' documentation akin to Smith and Warner (1979) facilitates the underwriting of collateralized loans in a complete market setting, where contracts spanning each state of the economy are clearly and unambiguously written. This reinforces the institutional infrastructure by enforcing property rights and providing judicial interpretation in any possible gaps in contracting. This ultimately boosts the well-functioning of financial and capital markets.

13 The definition of Thomas (1995) incorporates the views of the well-known Andalusian jurist Averroes (Ibn Rushd). The injunction is deduced from the Qur'ānic verses (2:219, 5:91) on gambling. The jurists have employed it to curtail the risk loving tendencies inherent in some economic agents.

14 Another perspective on *gharar* is provided by El-Gamal (2009), who defines it as 'trading in risk'. This view is consistent with Tavakoli (2008) and that of Claessens et al. (2012). This paper, however, finds the above definition by Thomas (1995) to be more relevant to our study.

15 See http://www.ft.com/indepth/libor-scandal, http://online.wsj.com/news/articles/SB10001424127887324077704578358381575462340.

Credit facilities or financial claims, which are inadequately collateralized by tangible assets (*ayn*) mitigate asymmetric information (*gharar*), but not the agency cost of debt. This is attributed to the risk of default. Stewart Meyers (2001, p. 96) corroborates this when he states: "*Conflicts between debt and equity investors only arise when there is a risk of default. If debt is 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*". This probably forms the basis for the injunction of sale of debt (*bay' al-dayn*), as described below. The rationale behind the injunction seems to be expropriation of assets of lenders at the hands of the borrowers (equity holders). In the Arabic terminology, this transaction constitutes as *ribawī* (i.e., contains elements of *ribā*).

In contrast, financial claims, which are inadequately collateralized by intangible assets (*dayn*) cannot mitigate both asymmetric information as well as agency cost of debt. These are akin to leveraged loans: (i) prevalent in the structure of a retail financial intermediary (i.e., banks) which invests in loans that are leveraged against deposits; or (ii) employed in the carry trade. These are classified under the nomenclature of sale of debt for debt (or offsetting of debt by debt – i.e. *Bay' al-dayn bi'l-dayn*).[16] In the Arabic terminology, this constitutes both *ribā* as well as *gharar*. This exacerbates the fragility of the financial system.[17]

c) <u>*Bay' al-dayn* (Sale of Debt)</u>: This issue is quite controversial, as the religious scholars from different regions of the Muslim world (e.g., Gulf Cooperation Council Countries versus Malaysia) are in variance with each other (Amin, 2007). This injunction stems

16 Trading debt for debt has a multiplier effect on leverage in the economy as it magnifies the size of the financial sector disproportionate to a country's gross domestic product (GDP) (Singh and Aitken, 2010).

17 We do not discuss this issue in the current paper, as it is not related to securitization. But we are ready to provide a conceptual illustration on the same upon request.

from a tradition (*'hadīth*) of Prophet Muhammad, whose authenticity is disputed (Kamali, 2000). Furthermore, the precise definition of this transaction and the forms it can take is also disputed. Finally, there is a disagreement on whether a consensus amongst jurist has materialized banning the same (Kamali, 2000). Nonetheless, from a financial economics perspective, we are of the view that the sale of an inadequately collateralized debt does not mitigate the agency cost of debt. That is, it has the capacity to lead to risk shifting and/or underinvestment, which leads to expropriation of the assets of economic agents. In other words, it is endemic of the banned *ribā*. In contrast, the offsetting (or sale) of one debt for another does not mitigate both asymmetric information as well as agency cost of debt. It is thus endemic of both *ribā* and *gharar*. We elaborate on the first issue in the subsections below. We do not focus on the second issue as it is not related to securitization. We are willing to provide more information on it upon request.

4.2. Mitigating the Agency Costs of Debt under Islamic Injunctions

This subsection along with the following two focuses on moderating agency issues endemic in plain vanilla financing. We first elaborate on our model (in Subsection 4.2.1), explain default-free, default-prone equilibria and the freezing of debt market (in Subsections 4.22/3-4.3) sequentially. We subsequently describe ways of moderating the risk-shifting and under-investment issues by meticulously pricing the loan parameters.

4.2.1. Modelling the Collateralized Debt Facility

We assume a two-period financial system, described in Ebrahim et al. (2014), where an entrepreneur-manager has access to a project, requiring a fixed amount of investment in tangible assets. This investment is constrained by his/ her initial wealth. The entrepreneur's financing is addressed through trading non-recourse financial claim (involving a credit facility) that is collateralized against the underlying project payoffs, comprising of the net operating

income (NOI) along with the liquidating value of the project.[18] The payoffs (composed of NOI and terminal asset value) follow an ergodic Markov process, whose probability distributions are known to the lender and borrower. The trading of collateralized financial claims can either be structured on a (i) *default-free*; or (ii) *default-prone* basis, as explained below (see Figure 2). In the context of our study, a default-free debt is construed as adequately collateralized, while the default-prone debt is classified as inadequately collateralized.

[Insert Figure 2 about here]

4.2.2. Default-free debt equilibrium

We define a pragmatically *default-free* collateralized debt equilibrium 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 balance of the credit facility over its tenure (in all states of the economy) with very high probability (see Figure 2). The criticality of ensuring the payoffs from depreciating to a substantial negative equity value over the tenure of the credit facility is consistent with Foote et al. (2008), and Archer and Smith (2013), who observe non-linearity in the put option to default.[19] This stresses a dynamic approach in the debt pricing mechanism to endogenously mitigate the conflict of interest between borrower and lender (i.e. agency cost of debt). On a micro-level, default-free collateralized lending alleviates credit and liquidity risk of the lender, given the put option to default is never significantly in-the-money. Furthermore, the borrower enjoys a favorable cost of debt, given the nearly default-free financial claim. At a macro-level, it deters fragility within the financial system where a default may set off a domino effect, given a leveraged-dominant financial system (Minsky, 1992).

18 Financial claims employing the 'Islamic' credit facility are generally structured as a buy-sell agreement, where a mark-up rate is employed in lieu of an interest rate. This is because the religious establishment narrowly interprets interest for the banned *ribā* (Khan, 2010).

19 Both studies observe that home mortgage borrowers do not default the moment their equity goes 'underwater'. Default, basically occurs when there is substantial erosion in their home (property) equity values.

4.2.3. Default-prone debt equilibrium

A *default-prone equilibrium*, on the other hand, is endowed with a put option to default deep in-the-money. As illustrated in Figure 2, the default-prone equilibrium suffers from potential default states prior to critical stage 'Z', and normal states beyond it. In states prior to critical stage 'Z', the entrepreneur is technically in default, as the project payoffs are less than the maturity values of the collateralized debt (including the 'profit'). In the default states of the economy, the entrepreneur does not have the incentive to maintain the project's payoffs indicated as 'AB' over the future states of the economy 'OZ'. This leads to a fall in the value of these payoffs to A′B′ over the defaulting states of the economy. The quadrilateral AA′B′B thus constitutes the frictional cost of default, which serve as a proxy for the agency cost of debt.

The greater the relative divergence of the project payoffs with the outstanding amount of the credit facility, the more is the value of the option to the entrepreneur. In the foreclosure, the lender's recovery rate (net of default cost) is contingent on the collateral value, given the non-recourse status of the credit facility. Where the recovery rate is stochastic, a default-prone debt is quite an expensive option (Franks and Torous, 1989). If the recovery rate is extremely low, default-prone financing is untenable, leading to pragmatically default-free financing as the only viable (and economically efficient) outcome.

Given the risky equilibrium involves default in states of economy, the debt pricing structure warrants higher mark-up rate and debt ratio than a default-free one. We thus find default-prone collateralized facility has an economic efficiency receding with increasing agency cost of debt (Ebrahim et al. 2014). Even when agency cost is low, it ranks (at best) economically-neutral to a default-free collateralized debt. This is attributed to the debt pricing structure, conveying the agency cost of debt to the errant borrower. This accounts for the disparate collateralized debt yield observed in empirical literature (Berger and Udell, 1990;

John et al., 2003). Overall, the lender is better off with default-free collateralized debt by immunizing the put option to default.

4.3. Illustrating the toxic effect of risky debt on its marketability

Improvement of a short term liquid instrument is extremely important for economic development. Securitization of the pragmatically default-free and default-prone securities ensuing from a credit sale (of a tangible asset) is illustrated in Figure 2. The put option to default arising from a counterparty failure to repay the facility is mitigated by imposing a haircut or initial margin illustrated in Figure 3. This is basically a fraction of the security market value and reflects the risk exposure of the buyer. This haircut, reflecting the time value of money along with the agency cost of debt, increases with the riskiness of holding the collateralized security. Thus, pragmatically default free facility commands a lower haircut in contrast to a higher one for a default-prone one (Figure 3). It also serves as a cushion against the volatility of the market value of the collateral. This may lead the lender (financial institution) to receive collateral with less value than the original amount of funds advanced during economic downturns.

[Insert Figure 3 about here]

Proposition: The prohibition of *ribā* forewarns on investing in toxic debt (with acute agency issues) as it infects the capital of investors. In addition, the injunction of sale of debt *(Bay' al-Dayn*) illustrates that there is no antidote to this infection due to the freezing of the debt market.

Proof: Please see the Appendix.

4.4. Pricing pragmatically default-free collateralized debt to alleviate agency costs

How does one pragmatically sterilize the option to default in a collateralized debt facility? This involves curing the security from its endemic agency cost of debt. This has

major repercussions on the resilience of financial sector in light of our harrowing experience with collateralized lending in the recent financial crisis.

Models of debt pricing fail to consider the welfare of both the principal and the agent from the perspective of agency theory (see Black-Scholes (1973), Merton (1974), Jarrow-Turnbull (1995) and Duffie-Singleton (1999)). In this section, we resort to the *Qur'ānic* guidance on fragile free financial contracting.[20, 21] We, thus, reinforce the undertaking of precautionary measures by alleviating the agency cost debt. This is achieved by ensuring that the borrower does not convey the project risk to the lender. That is, by ascertaining the put option to default is never in-the-money through the tenure of the contract. This is attained by meticulously pricing the *endogenous* debt parameters (initial debt value, debt repayments, initial deposit and debt tenure); given the underlying *exogenous* factors (initial asset price, its mean and volatility, safety margin, borrower income and income multiplier), as elaborated below.

Figures 4(i)-(iii) applies the Ebrahim (2009) analysis on a fully amortizing credit facility, involving a project (venture) with initial value 'P_0', funded by trading financial claims on the project payoffs with a financial intermediary.[22] To secure financing, entrepreneur places personal funds constituting of an initial deposit 'ID'. The amount financed 'Q_0' is given by '$Q_0 = P_0 - ID$'. The initial deposit is termed as a 'skin-in-the-game', as it serves as a commitment device enforced on the borrower, reducing the borrower risk shifting behavior.

20 This involves exchanging deferred financial claims (categorized under the *ribā* injunction), which gives respite to borrowers (Q 2: 280). We apply this in consort with the following recommendations: (i) suggesting the undertaking of precautions (Q 4: 71, 102); and (ii) fulfilling all obligations (Q 5:1).

21 The undertaking of precautions in the Qur'ān (Q 4: 71, 102) is recommended for special war-like situations. We have taken the interpretation literally as applying generally to all situations, in accordance with the traditions of Prophet Muhammad and his companions.

22 The assumption of a fully amortizing loan is crucial in our analysis as it yields a concave lien profile. This is in contrast to a partially amortizing loan, which has a convex lien profile.

The amount financed (Q_0) is stated as sum of the periodic debt repayments '$Q_0 = \sum_{t=1}^{T} A\gamma^t = A\gamma\left(\frac{1-\gamma^T}{1-\gamma}\right)$', where $\gamma \in (0, 1)$ is the discount factor.

The outstanding credit balance 'Q_t' is measured by the compounded initial debt value '$Q_0(1 + r)^t$' and netted off by future value of annuitized periodical payments over the tenure of the lending facility, '$Q_t = Q_0(1 + r)^t - \sum_{t=1}^{t} A\,(1 + r)^{t-1}$', where '$r$' and '$A$' signify the lender's mark-up rate and annuitized periodical payments, respectively. Asset prices are assumed to follow a Geometric Brownian Motion, where future states are independent of past movements (see Efficient Market Hypothesis - Fama, 1970). The asset dynamics is function of its value appreciation [depreciation] and risk profile across time.[23] Thus, expected asset price at time 't' is defined by, '$P_t = P_0 e^{\left(\mu - \left(\frac{\sigma^2}{2}\right)\right)t}$', where '$\mu$' and '$\sigma$' signify the mean and standard deviation of the period (monthly) appreciation [depreciation] of the asset, respectively.

Figure 4(i) presents a scenario where the entrepreneur's expected equity is 'underwater' in period 't_1' to 't_2' i.e., '$P_t < Q_t$'. We assume that rational borrowers whose equity starts to move underwater at t_1 will not automatically default. Actual default occurs where the expected equity is significantly underwater. That is, strategic default involves the borrower expectation of future asset prices and pecuniary [non-pecuniary] costs (e.g. income capability, effect on borrower credit score) substantially exceeding the benefits of continuing with the debt repayments (Foote et al., 2008; Archer and Smith, 2013).

Prudent underwriting warrants the satisfaction of both (i) loan-to-value (LTV); as well as (ii) income constraints. The debt pricing mechanism here is consistent with Baltensperger (1978) who advocates incorporation of not only the mark-up rate but also the debt-to-value

23 One can include jump processes to asset prices by adding Poisson jumps to the diffusion (Merton, 1976).

ratio and the tenure of the facility. Foote et al. (2008) and Archer and Smith (2013) extend the analysis by including borrower's income factors.[24] This meticulous pricing of debt involves a more scientific approach and is in contrast to *ad hoc* credit rationing practices and overall loan loss rehabilitation programs observed in industry (Foote et al., 2008).

[Insert Figures 4(i)-(iii) about here]

4.4.1. Alleviating Risk-Shifting by Imposing LTV Constraint

This subsection discusses the employment of precautionary measures reducing the fragility of the financial contract by curtailing the loan-to-value (LTV) ratio. This is in the form of a safety margin established by having a sufficient initial deposit (ID) to deter the default option into ever going in-the-money through the tenure of the credit facility. Figures 4(ii)-(iii) depict the asset value with upward and downward trends respectively. In contrast to its default-prone counterpart, a pragmatically default-free one is characterized by safety margin that ensures the entrepreneur's expected equity does not go underwater with very high probability. This safety margin is pre-conditioned to different economic scenarios: One with an upward and a second with a downward trend in asset price (see again Figures 4(ii)-(iii)). The degree of safety margin required is contingent on specificities of the underlying project/ asset riskiness.[25] Given the endogeneity of agency issues, collateral (that involves intangibility exacerbating opaqueness – i.e. asymmetric information or *gharar*) suffers from heightened 'lemons' problem.[26] This obscurity calls for stricter safety margin due to the innate difficulties in pricing such instruments that is in accordance with asset risk.

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

25 The asset riskiness is impacted by its redeployability (Benmelech and Bergman, 2011); transaction/ dissipative costs (Boot et al., 1991; Jokivuolle and Puera, 2003), asset drift, volatility and correlation with other firm assets (Jokivuolle and Puera, 2003). The duration gap between debt default and repossession of the collateral is also accounted for in assessing the asset value (Ebrahim et al., 2014). See also Salleh et al. (2014) on the broad categories of collateral and the associated economic impact.

26 See Coval et. al. (2009) for the effects of imprecisions in the: (i) pricing of structured products; and (ii) estimation of their default risk. Rajan et. al. (2010) links this to the Lucas critique, that is, failure to

Our safety margin is undertaken as a multiple 'α' of the underlying asset riskiness '$\sigma\sqrt{t}$'. This involves the difference in the log function of the expected asset value and the loan value (at time t) to be probabilistically greater or equal to this prudent buffer, '$\left(\ln(P_t) - \ln(Q_t)\right) \geq \alpha\sigma\sqrt{t}$'. Under this setting, the initial value of the debt (for an asset with an upward trend) is determined in such a way that at the optimum level, the value of the outstanding credit balance 'Q_t' is always less than or equal to the asset price reduced by the safety margin, '$Q_t \leq P_t\left(e^{-\alpha\sigma\sqrt{t}}\right)$'. In other words, at point '$t = 0$', the maximal debt value is capped at the underlying asset value. That is, $Q_0 \leq P_0$. This leads to a debt-to-value ratio of 100%, which aggravates moral hazard and thus financial fragility. The maximal debt amount, for an asset with an upward trend, is thus capped at '$Q_{0(\mathrm{Max})} = P_0(e^{-\alpha\sigma})$' to ensure sufficient 'skin in the game'. This yields the minimal initial deposit as a function of the underwriting asset value constraint along with the characteristics of assets '$\mathrm{ID}_{\mathrm{Min}} = P_0(1 - e^{-\alpha\sigma})$ (Ebrahim, 2009).[27]

appropriately recognize the behavior of the agent (borrower) and its impact on the underlying asset (collateral).

27 It should be noted that when asset follows an upward trend, initial amount funded by the credit facility yields a corner solution in Ebrahim (2009). In contrast, for an asset following a downward trend, we realize an interior solution (see Figure 4(iii)). This is determined by solving for the optimal t* in $Q_{t*} = P_{t*}\left(e^{-\alpha\sigma\sqrt{t*}}\right)$ and working backwards to evaluate Q_0, given its relationship with Q_{t*} and affordability (A_{Max}) (see Subsections 4.4 and 4.4.2). Once Q_0 is evaluated, one can extend the analysis to determine the tenure of the lending facility in a process similar to the one described in Subsection 4.4.2.

4.4.2. Alleviating Underinvestment by Imposing Income Constraint[28]

This subsection discusses the granting of sufficient credit (at the time of origination), facilitating its fulfilment, as elaborated earlier. The repayment of the credit facility is contingent on (i) periodic annuitized payments 'A' (refer above); along with the (ii) income capability 'y' of the borrower. Prudent underwriting necessitates that periodic payments be within the entrepreneur income capability, '$\frac{y}{A} \geq b$', where 'b' is the underwriting income multiplier. By rearranging this equation, one can restate the maximal periodic payment as, '$A_{Max} = \frac{y}{b}$'.

The net debt equation '$Q_0 = A\gamma\left(\frac{1-\gamma^T}{1-\gamma}\right)$' (from above) can thus be redefined as follows: '$Q_{0(Max)} = A_{Max}\gamma\left(\frac{1-\gamma^T}{1-\gamma}\right)$'. Equating solutions of (i) '$Q_{0(Max)}$' and (ii) 'A_{Max}' to derive the optimal debt tenure 'T_{Max}', one realizes '$P_0 e^{-\alpha\sigma} = \frac{y}{b}\left[\gamma\left(\frac{1-\gamma^T}{1-\gamma}\right)\right]$'. By taking the natural logarithm of this function, the debt tenure is evaluated as, '$T \leq T_{Max} = \left\{\frac{\ln[1-(P_0 e^{-\alpha\sigma} b(1-\gamma))/y\gamma]}{\ln[\gamma]}\right\}$'. This yields optimal debt tenure as a function of income of entrepreneur (y), underwriting asset value and income constraints (α and b), exogenous mark-up rate ($\frac{1-\gamma}{\gamma}$) along with asset characteristics (P_0, σ) (see again Ebrahim, 2009).

Given the discount factor ranges from '$0 < \gamma < 1$', the denominator on the right hand side (RHS) yields a negative number as '$\ln[\gamma] < 0$'. Thus, for 'T' to be a positive real number, the natural logarithm of the numerator in the RHS of the above equation must be a value in the interval (0, 1). That is, '$0 < \left[\frac{1-(P_0 e^{-\alpha\sigma} b(1-\gamma))}{y\gamma}\right] < 1$'. This equation links the underwriting

28 We assume no prior debt overhang to benefit from a reduction in the cost of funding (Stulz and Johnson, 1985). This is critical in attenuating the underinvestment issue.

parameters (α and b) with asset characteristics (in terms of initial price, P_0 and volatility, σ) and agent characteristics (in terms of income, y, and discount parameter, γ).

In summary, structuring pragmatically default-free collateralized credit facility involves calibrating its endogenous parameters (initial deposit, debt 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).

4.5. Recapitulation of Contract Design, Implementation and Enforcement

The enforcement of the legal rights of investors (i.e., creditors), in the case of default (of Islamic debt securities), matters more than the law enshrined in books (see Djankov et al., 2008; Bae and Goyal, 2009). This is of primary importance in cross border transactions where the issuer is located in one jurisdiction, securitizes the assets in another that is subscribed by investors across different locations. Contract litigation may also be subject to double jeopardy whereby investors may seek redress in a *Shari'āh* (Islamic) court of law on top of the common law that is generally in place. Thus, investor (or creditor) protection is of vital importance and underlays the model discussed in Subsection 4.1-4.4 above.

First, investor protection in our model goes beyond the ring-fencing of the underlying debt claims described in the literature on making the assets 'bankruptcy remote' (see Ayotte and Gaon, 2011). By recommending: (i) securitization of debt claims backed by tangible assets, and (ii) the underwriting of iron-clad covenants in the indenture of the contract, our study mitigates both ex-ante and ex-post asymmetric information (i.e., both adverse selection and moral hazard respectively). Second, by advocating the employment of a conceptual model and an algorithm developed in Ebrahim (2009) as described in Subsection 4.4, our study alleviates agency costs of debt (i.e, both risk shifting as well as the underinvestment risks). The reduction of adverse selection, moral hazard and subsequently risk-shifting decrease the borrower's cost of funding, thereby easing his/ her cash flow constraints, which in turn

alleviates underinvestment risks. Thus, our study not only diminishes the legal risk of creditors (i.e., investors) but also the investment risk of the ultimate borrowers. The model exemplifies a solution towards mitigating fragility in financial contract whereby rights of both parties, creditors and ultimate borrowers, are enhanced. This not only alleviates the risk of default at the micro-level but also makes the economy more resilient and stimulates growth at the macro-level.

5. Conclusion

The freezing of the debt market in the recent financial crisis illustrates its emasculation ensuing from information asymmetry (*gharar*) and agency issues (*ribā*) endemic in the securitization of claims backed by intangible assets. The regulatory response to this issue extended to money market funds is pathetic and is ridiculed by practitioners (Foley, 2014a). It imposes: (i) ad hoc discounting of net asset value (NAV); (ii) redemption fees; and (iii) suspension of liquidation under market dry ups (or when the fund gets in trouble). This indicates that the regulatory response is reactive and does not pre-emptively address the shortcomings of securitization.

This paper sheds light on the rationale behind liquidity dry ups and illustrates a proactive approach to ensure the continuous marketability of fixed income securities. We coherently rationalize cultural, i.e., Islamic injunctions to cure the structural flaws endemic in securitized debt. We first illustrate that the medieval classification of assets into tangible ('*ayn*) versus intangible (*dayn*) is primarily to deter opacity, i.e., to alleviate information asymmetry (*gharar*). Next, we modify the Lucas tree model (Martin, 2013) to rationalize the prohibition of *ribā* and the injunction of sale of debt (*Bay' al-dayn*) as deterring agents from investing in 'toxic' unmarketable assets. This alleviates debt markets standstills, as witnessed in the recent crisis. Thus, we rationalize the Islamic injunction of the sale of debt collateralized by intangible assets as exacerbating the agency cost of debt leading to the expropriation of agents' assets.

Furthermore, we employ the Qur'ānic advice on risk management and the prudent undertaking of obligations (such as debt) to mitigate the endogenous agency cost of debt. This is demonstrated by conceptually illustrating that the borrower's equity is never underwater. That is, by illustrating that the borrower's Put option to default is never in-the-money through the tenure of the facility. This alleviation of risk-shifting sterilizes the 'toxicity' of risky debt. This helps lower the cost of funding of an entrepreneur thus reducing the underinvestment issue. This subsequently frees the entrepreneur's cash flow constraint enabling him/ her to undertake more viable projects in the real economy thus stimulating growth. Policymakers and regulators should reinforce default-free pricing of debts collateralized by tangible assets. This endows transparency in their trading. It also leads to efficiency as it results in a complete market setting which is not only resilient to shocks, but also reduces funding constraints on businesses. This efficiency vitalizes economic growth.

Finally, this study offers a fresh perspective in the interpretation of Islamic cultural values that will contribute towards advancement of financial instruments, institutions and markets of Muslim economies.

6. Appendix

Proof of Proposition:

The prohibition of *ribā* basically cautions economic agents on investing in debt with acute agency issues as it can infect their capital. This is illustrated by: (i) the quadrilateral ABB'A', which represents the risk-shifting aspect of the agency cost of debt in Figure 2; and (ii) the region OS in Figure 3. One can also illustrate this mathematically by incorporating the agency issues in the pricing of risky debt in a Rational Expectations Equilibrium (REE). This is conducted by pricing in the: (i) demand for risky debt, emanating from the borrower; and (ii) supply of risky debt emanating from financier. These two are equated to arrive at the unique interior loan amount disbursed and the cost of funding taking into account the agency issues.

This solution is in variance with the capital structure theorems as stated in Footnote 7. The mathematical proof of this is available on request.

Redeeming oneself from this infection by expunging risky debt is not feasible due to freezing of debt markets. This is inferred from the injunction of the sale of debt as explained as follows. The pricing of a one-period security can be evaluated by amending the Lucas tree model (Martin, 2013) in an overlapping generation's economy with unequal lives. This involves a framework where the seller of a fixed income security is viewed to be an early generation, born at time t, retired at (t+β) and dead after this period. Here β is assumed to be strictly less than 1. This is in contradiction to the buyer of the security, who is viewed to be a later generation, born at (t+β), retired at (t+1) and dead after this period. We assume further that the: (i) states of the nature (default versus normal, for the risky security) are revealed only in period t+1; and (ii) securities are sold at a discount.

Pricing a Default-Prone, i.e., Risky (R) security

The offer price of a security demanded by seller (stemming from the *supply* side of funding) is incorporated in the period (t+β) consumption parameters as given below.

$$P_{t,\,R} = \gamma\, E_t\{[\frac{U'(\tilde{c}_{t+\beta})}{U'(c_t)}]\,[\tilde{P}_{(t+\beta)\text{-Ask-R}}]\} \qquad (1a)$$

Where: $c_{t+\beta,\,j} = P_{(t+\beta)\text{-Ask-R},\,j}$, contingent on state j of the economy in period (t+β). (1b)

$$c_t = e_t - P_{t,\,R} \qquad (1c)$$

In contrast, the bid price of a Risky security supplied by a buyer (stemming from the *demand* side of financing) is given by:

$$P_{(t+\beta)\text{-Bid-R},\,j} = \gamma'\, E_{(t+\beta),\,j}\{[\frac{V'(\tilde{c}'_{t+1})}{V'(c'_{t+\beta})}]\,[\tilde{\text{Payoffs}}_{t+1}]\} \forall \text{ state j of the economy in period } (t+\beta) \qquad (2a)$$

Where: $c'_{(t+1),\,k}$ = State k dependent payoffs in period (t+1) (as illustrated in Figure 3) (2b)

$$c'_{(t+\beta),\,j} = e'_{(t+\beta)} - P_{(t+\beta)\text{-Bid-R},\,j}, \text{ contingent on state j of the economy.} \qquad (2c)$$

In the above equation, U(.) and V(.) represents the strictly concave and twice differentiable (Von Neumann – Morgenstern) utility functions, γ and γ' represent the discount factors, while $c_{(t+\beta)}$ and c_t [$c'_{(t+1)}$ and $c'_{(t+\beta)}$] signify the times $(t+\beta)$ and t [(t+1) and $(t+\beta)$] consumption parameters for seller and buyer of security respectively. The economic intuition behind the security pricing functions is that of consumption smoothing. Investors defer their consumption across time from periods of high resources to low ones.

Here, the payoffs of risky debt allow us to expand Equation (2a) as given below.

$$P_{(t+\beta)\text{-Bid-R, j}} = \gamma' \int_{t}^{\infty} \left[\frac{V'(\tilde{c}'_{(t+1)\,k})}{V'(c'_{(t+\beta)\,j})}\right]\left[\tilde{\text{Payoffs}}_{(t+1)\,k}\right]dx \qquad (3a)^{29}$$

$$= \gamma' \int_{0}^{S} \left[\frac{V'(\tilde{c}'_{(t+1)\,k})}{V'(c'_{(t+\beta)\,j})}\right]\left[\tilde{\text{Payoffs}}_{(t+1)\,k}\right]dx + \gamma' \int_{S}^{Z} \left[\frac{V'(\tilde{c}'_{(t+1)\,k})}{V'(c'_{(t+\beta)\,j})}\right]\left[\tilde{\text{Payoffs}}_{(t+1)\,k}\right]dx + \gamma' \int_{Z}^{\infty} \left[\frac{V'(\tilde{c}'_{(t+1)\,k})}{V'(c'_{(t+\beta)\,j})}\right](P_{t+1})dx \qquad (3b)$$

Where: $\tilde{\text{Payoffs}}_{(t+1)\,k} \leq 0, \forall\ k \in [0, S]$

$\tilde{\text{Payoffs}}_{(t+1)\,k} \geq 0, \forall\ k \in [S, Z]$ and

$\tilde{\text{Payoffs}}_{(t+1)\,k} = P_{t+1}$ = Maturity Value of Security, $\forall\ k \in [Z, \infty)$.

Assuming no market frictions, equilibrium requires: $P_{(t+\beta),\,R,\,j} = P_{(t+\beta)\text{-Ask-R, j}} = P_{(t+\beta)\text{-Bid-R, j}}$. This is *not* feasible as the valuation of $P_{(t+\beta)\text{-Bid-R, j}}$ is not deterministic. This inability is attributed to the problems of evaluating the marginal utility and thus the inter-temporal marginal rate of

29 The variable of integration x is defined in terms of the probability density function of terminal payoffs (f(·)) as follows: $dx = f(\text{payoffs}_{(t+1)})\, d(\text{payoffs}_{(t+1)})$.

substitution $[\frac{V'(\tilde{c}'_{(t+1)\,k})}{V'(c'_{(t+\beta)\,j})}]$ in the states OS of the economy in period 1 as $c'_{(t+1),\,k} \leq 0 \;\forall\; k \;\varepsilon\; [0, S]$.

This leads to a freeze in the pricing of a risky security vindicating the injunction of sale of debt.

It should be noted that the above situation is not true in the case of a default-free credit security as the payoffs are constant and positive in all states of the economy. This leads to the deterministic values of the inter-temporal marginal rates of substitution for both the buyer and seller of the security as illustrated below.

Pricing a Default-Free (DF)) security

The offer price of a DF security demanded by seller at time (t+β) is given as follows.

$$P_{t,\,DF} = \gamma\,\{[\frac{U'(c_{t+\beta})}{U'(c_t)}]\,[P_{(t+\beta)\text{-Ask-DF}}]\} \qquad (4a)$$

Where: $c_{t+\beta} = P_{(t+\beta)\text{-Ask-DF}}$, independent of the state j of the economy in period (t+β). (4b)

$$c_t = e_t - P_{t,\,DF} \qquad (4c)$$

In contrast, the bid price of a DF security supplied by a buyer is given as follows:

$$P_{(t+\beta)\text{-Bid-DF}} = \gamma'\{[\frac{V'(c'_{t+1})}{V'(c'_{t+\beta})}]\,[P_{t+1}]\}, \text{ independent of the state j of the economy.} \qquad (5a)$$

Where: $c'_{(t+1)} = P_{t+1}$ = Maturity Value of a DF Security, independent of the state k of the economy in period (t+1). (5b)

$c'_{(t+\beta)} = e'_{(t+\beta)} - P_{(t+\beta)\text{-Bid-DF}}$, independent on state j of the economy. (5c)

Assuming no market frictions, equilibrium requires: $P_{(t+\beta),\,DF} = P_{(t+\beta)\text{-Ask-DF}} = P_{(t+\beta)\text{-Bid-DF}}$. This equilibrium is relatively easier to realize in contrast to the risky debt as the valuation of $P_{(t+\beta)\text{-DF}}$ is deterministic.

Our analysis thus illustrates that both the prohibition of *ribā* and the injunction of *Bay'al-Dayn* have credence from an economic perspective, as they have the capacity of improving the efficiency of the financial intermediation system.

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FIGURES

Figure 1: Securitization and Illiquidity

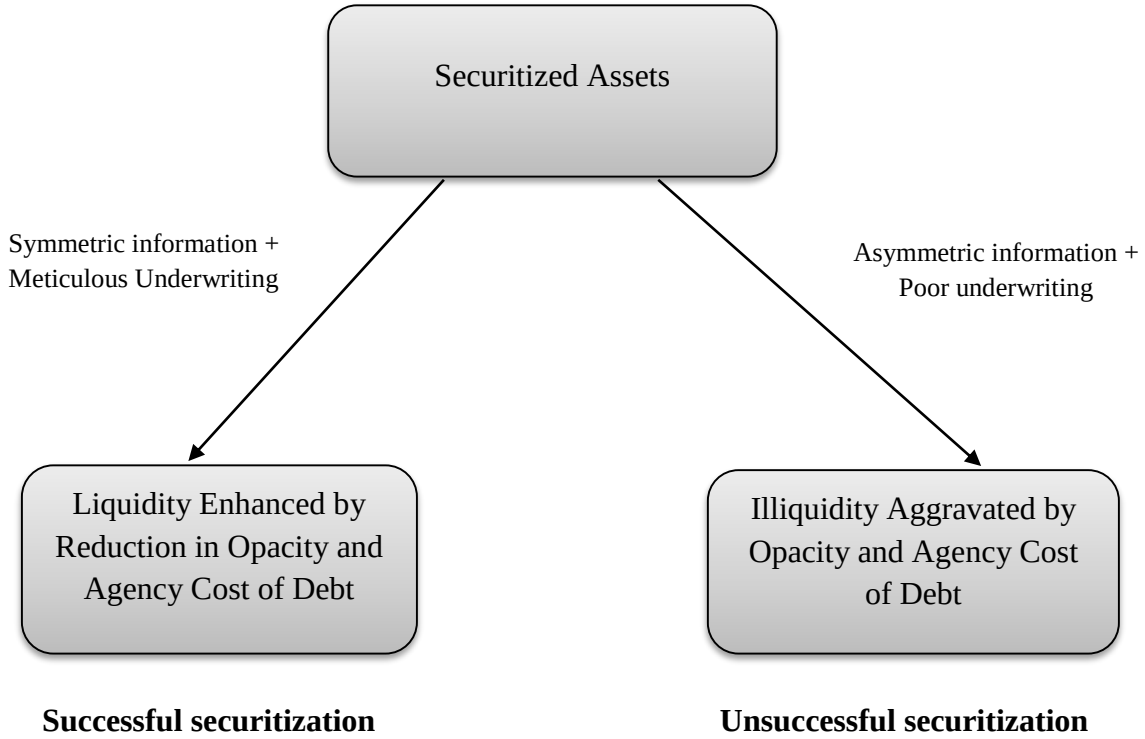
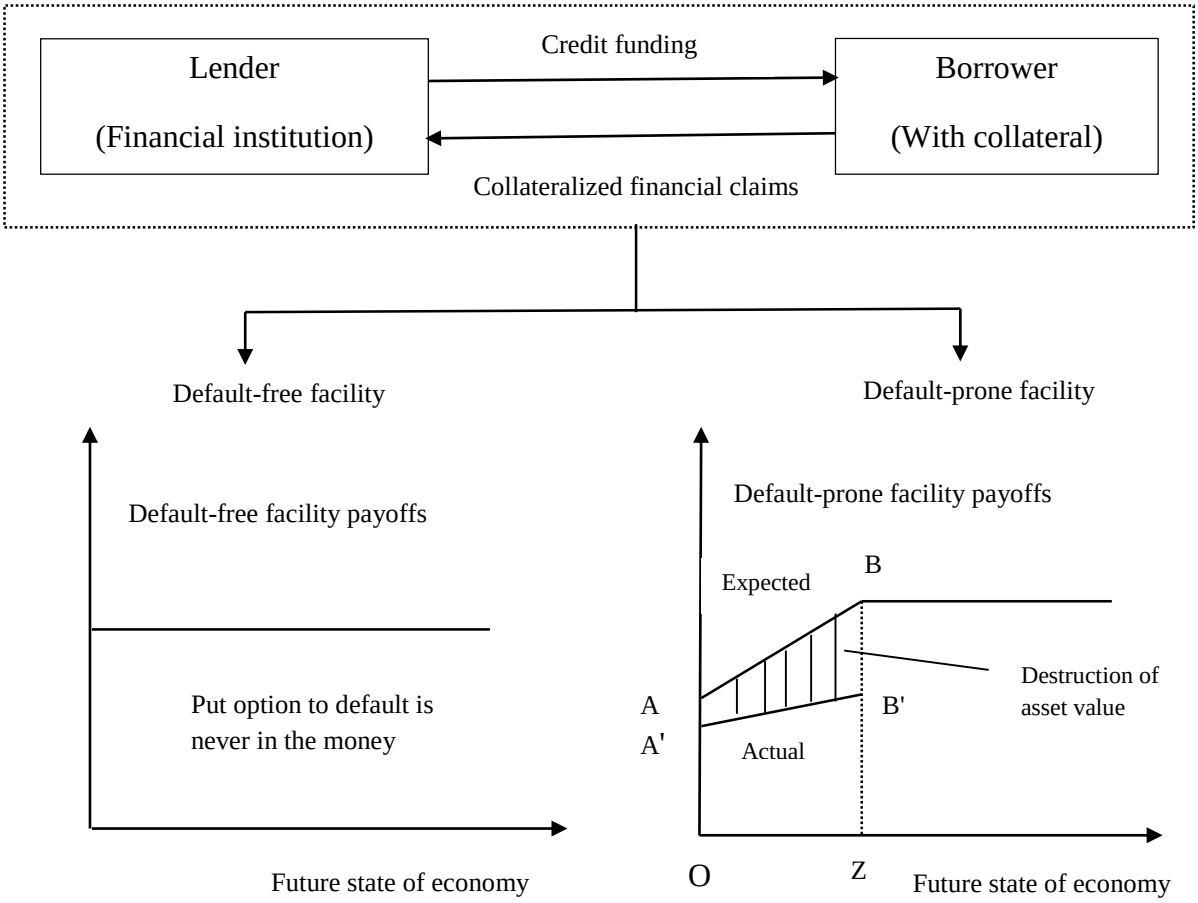


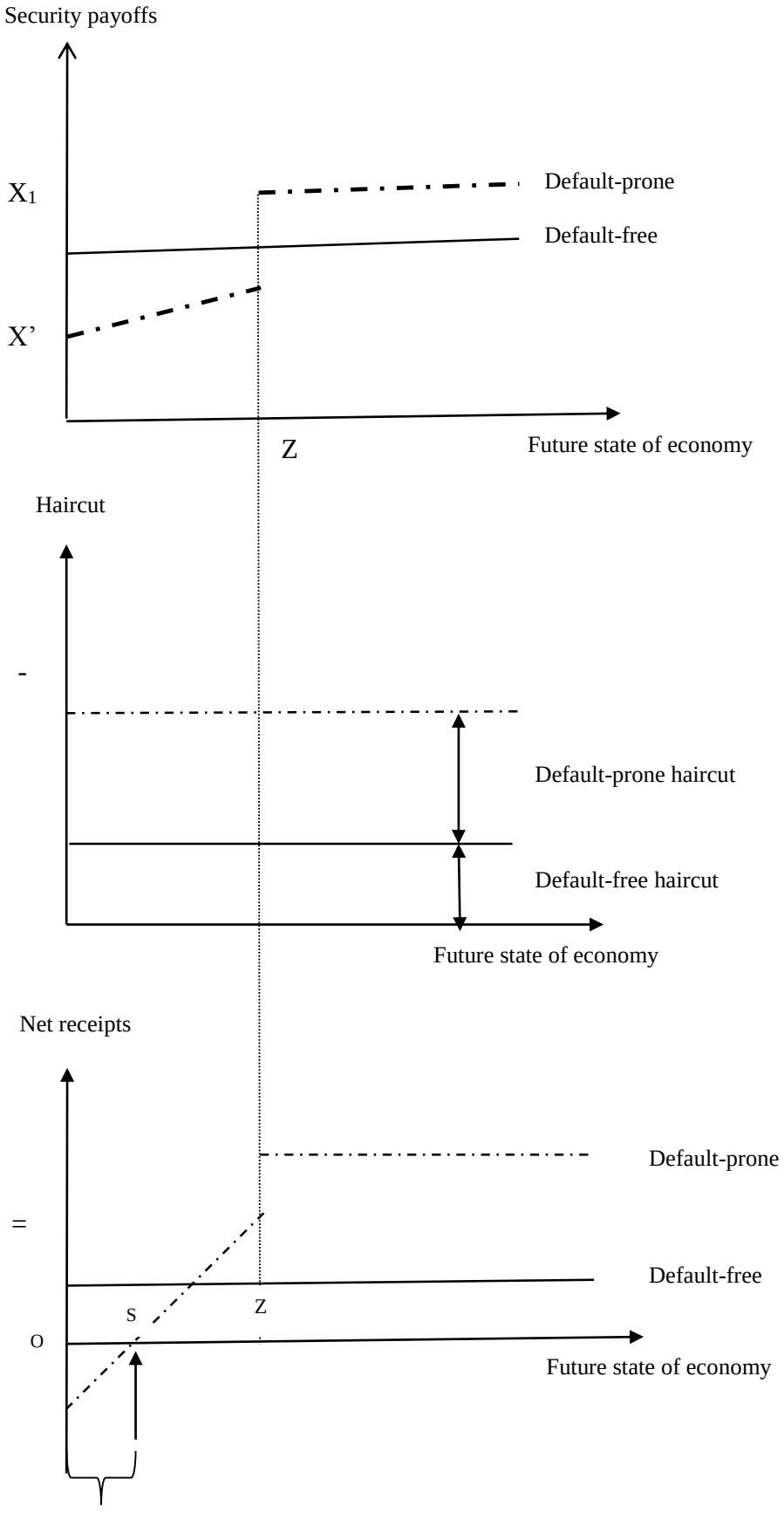
Figure 2: Asset transformation in financial institutions

Collateralized debt arrangement



Source: Ebrahim et al. (2014)

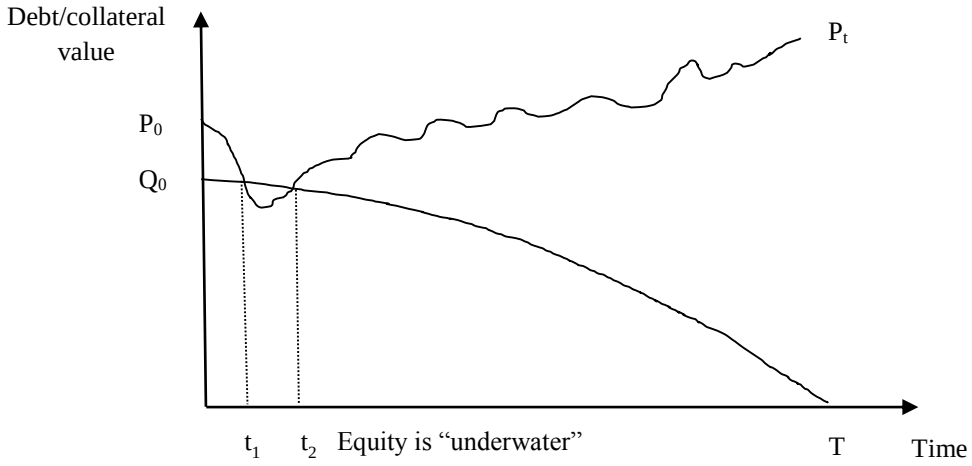
Figure 3: Default-prone and default-free collateralised debt payoffs



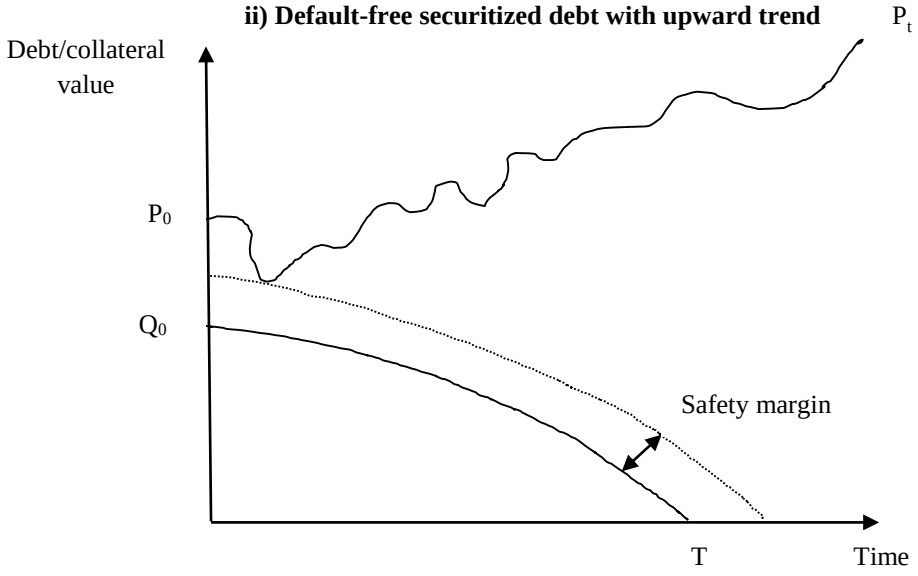
Source: Salleh et al. 2014

Figure 4: Default-prone and default-free debt structure over states of economy

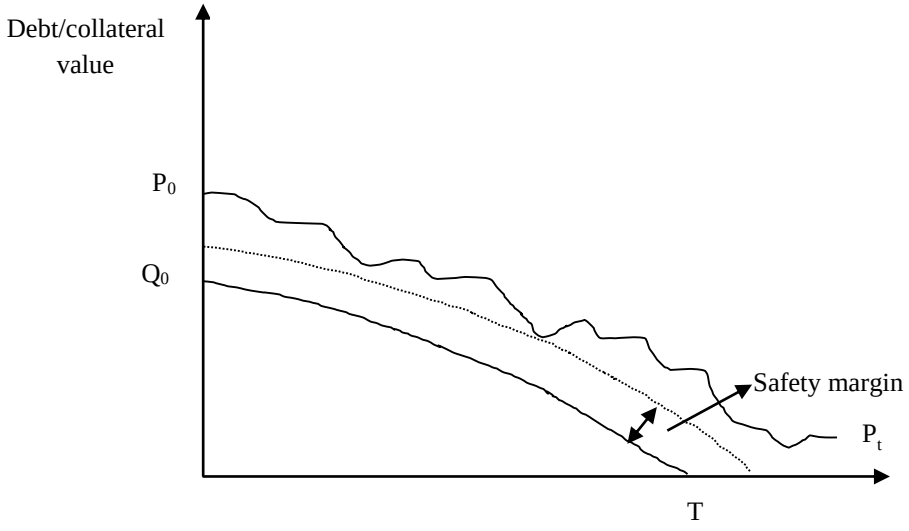
i) Default-prone securitized debt



ii) Default-free securitized debt with upward trend



iii) Default-free securitized debt with downward asset trend



Time

Source: Salleh et al. (2014)

Glossary of Arabic terms

'Ayn	Tangible Asset.
Bay'	Sale.
Bay' al-Dayn	Sale of Debt.
Bay' al-Dayn Bi'l Dayn	Offsetting of a debt by another akin to leveraged loan prevalent in the structure of a retail financial intermediary or a carry trade.
Dayn	Intangible asset like a debt or a liability or an obligation.
Gharar	This involves market manipulation stemming from asymmetric information.
'Hadīth	Tradition of Prophet Muhammad.
Qur'ān	The holy book of Islam.
Ribā	An injunction protecting property rights. This is generally misinterpreted as usury *or* interest.
Ribawī	A debilitating exchange of financial claims.
Shari'āh	Islamic law.
Sukuk	Securitized Islamic financial facility backed by tangible assets.
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.