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# Risk, Return, and Profit-Loss Shared Lending under a Zero-Interest Financial System

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**Abstract**

*Owing to its unique nature, writing a profit-loss shared lending (PLSL) contract for a Zero-Interest Financial System (ZIFS) bank is a challenge. Like venture capitalists and stock owners, a PLS lender faces some of the same risks as the borrower. However, as a lender and not as an investor (as opposed to the classical definition), it does not share in any increment or loss in the value of equity. While the share of profit going to capital may be constant, the absolute amount going to the lending bank is likely to diminish over a fixed period of time until the loan is paid. In economies where attempts to float a PLSL contract is strong, it is made worse by an abundance of adverse selection (AS) and moral hazard (MH) factors: lack of knowledge and training, errors in planning and projection, tardiness in identifying and reacting to problems, limitations of oversight, nepotism, favoritism, corruption, falsification, legal loopholes, tendency to cut corners, etc. So, despite its obvious benefits PLSL contracts are finding it difficult to take root and become established as a standard financing arrangement. This is vitiated by internal competition posed by mark-up financing. Pivotal to a viable PLSL contract, relevant equations incorporating AS and MH and related explicit and implicit costs are identified. Then risk-adjusted return to ZIFS bank, capital's share of profit, absolute income accruable to banks and relevant first order conditions are derived.*

Keywords: *Mushārakah*, *Muḍārabah*, PLS, ZIFS, Islamic Banking
JEL Classification: G10, G11

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## 1. Introduction

According to the proponents of a Zero Interest Financial System (ZIFS), its robustness hinges on profit-loss shared lending (PLSL or *Mushārakah*) operated under a silent partnership (*Muḍārabah*) designed for profit-oriented businesses. Yet it is an entity rarely seen except in the literature. The model that has in the meantime taken root, and is the much-suspected and oft-maligned, is mark-up financing (MUF or *Murābaḥah*) originally designed for service goods. Both models are supported by substantial macro-economic analysis and ethical justification. It appears that owing to a vacuum of microeconomic analysis, MUF's position is unstable and PLSL are yet to be realized. The difficulty of transition from a normative existence to a positive one for PLSL has been vitiated by a very successful, long in vogue, competing conventional interest-based banking system as well as by MUF. For PLSL to gain a part, or all, of the relevant market share in Muslim countries is the challenge.

Between the authors Khaled and Khandker, this paper is the fifth microeconomic investigation in this field. Having dealt with issues related to resource allocation between MUF and PLSL, PLSL contract formation, business plan vetting for appropriate technology and optimal operational scale, and mark-up rate determination, this paper takes into consideration adverse selection (AS) and moral hazard (MH) in order to determine the ZIFS bank's asking price for capital provided under a PLSL contract. While many reasons have been cited why PLSL is absent in reality but not in thought, AS and MH are cited as prominent culprits. So the need to understand their natures as they impact on a firm's/borrower's profit-earning capacity and declaration of its true sum to the ZIFS bank cannot be overemphasized. The limitation imposed on PLSL contract by having to follow a legalistic, classical definition of partnership (*Mushārakah*) cannot be overemphasized.

## 2. Literature Review

### 2.1. A Beginning

At first glance, all negative predictions about ZIFS appear legitimate. However, currently extant MUF is really Act I, a first generation product, even though numerous critics appear to suggest that it was DOA (Dead on Arrival). It is true that ZIFS transition from a normative status to a positive one has not been easy, but it is a work-in-progress. MUF is thriving because of its similarity to interest-based lending. That should make traditionally trained bankers a natural fit to run ZIFS operations. Traditional bankers, however, lack the knowledge, understanding and empathy for anchoring a ZIFS even as it is accused of flimsiness and obfuscation.

On the other hand, nowhere is ZIFS' success attributed to demand; depositors who are flocking in by thousands sensing a spiritual affinity. Act II is supposed to be about PLSL. For this end, the script has been long under commission, the set still unrecognizable and the actors literally absconding. In fact, Iqbal et al [1998], with data spanning from 1994 to 1996 on 10 ZIFS banks, find that only two banks hold between 13 percent and 20 percent of their portfolio in PLSL, six hold under five percent, and the remaining two hold between seven percent and nine percent. Also, Khan [1995], with data spanning from 1984 to 1991 on 12 banks from 10 countries, finds that five banks have no PLSL on their books at all, another five have five percent or less, and only two rise to double digit – in Pakistan (13 percent) and Iran (37 percent). According to Farooq [2007], PLSL is not a requirement of Islamic Jurisprudence but just a figment of the imagination of scholars honor-bound to create a *ribā*-free lending mechanism to counter the compound interest based system long in vogue worldwide. And yes, scholars expound the greatness of PLSL and how it elevates a ZIFS while the industry has actually been keeping busy with MUF.

## 2.2. Survival of the Fittest and Say's Law

It is not clear why PLSL is absent. Naqvi [2002] suggested that in the Game of Survival of the Fittest, traditional interest-based lending has bested it! So, why not move on? One wonders whether it is either a lack of demand or supply, or both, that is disallowing this particular brand of financial instrument to evolve? Naqvi continued suggesting that the pushiness of the proponents of PLSL is tantamount to expecting the Say's Law to deliver. It is a missing market problem no doubt, but there are legions of willing and waiting faithful borrowers who make up potential demand. The widespread success of MUF, despite its criticisms, really proves the point. Could it not be the other way around: pent-up elastic demand awaits viable supply?

Regardless, why should the Say's Law not ring true? Counter-examples do abound: Telephone, X-ray, Penicillin, Small Pox and Polio vaccinations, Pac Man and Cellphone, to list a handful. Their discovery and availability did cause a market to develop by bringing in buyers. In fact, Leonid Hurwicz, Eric Maskin and Roger Myerson received the 2007 Nobel Prize in Economics on Mechanism Design for essentially countering the temperament of trained economists who tend to go with the flow by seeking to explain only what they see by asking, "Why?" not questioning "Why not?" Yes, there is a way to create a thriving PLSL system and a MUF system that is not an alter ego of the interest-based banking facing minimized risk while fetching a guaranteed, fixed, periodic payment.

## 2.3. Economists or Jurists to blame?

Any notion that MUF is a failure is not entirely fair for there are beneficial differences that MUF brings to the table even in its current state. Most importantly, ZIFS banks have achieved financial stability from years of MUF business. If the PLSL problem is technically solved, they will be in a strong position to literally take the leap of faith pursuing it, risk and all. In fact, Usmani [1998] cites three reasons why ZIFS banks should be spared undue criticism. One, relative to conventional banks, ZIFS banks are small. Two, they are still in their infancy and so Islamic Jurisprudence (Sharī'ah) cannot be faulted for their inadequacies. Three, government and legal systems are not usually supportive of this system. However, in all fairness, one may say in this regard that the associated Development Economics wing of Islamic Jurisprudence (Sharī'ah), Independent Thinking and Analysis (Ijtihad) has not gone far enough. The criticism that the framework of ZIFS is legally rather than analytically driven will be discussed later in this paper. While the legal opening to this form of banking was realized when the Qur'ānic verse 2:275 (Asad) was invoked, there was little reason to keep to any other jurisprudential guideline where none existed or was ever envisioned to govern a modern financial intermediary. But again, Usmani has written:

> "A new form or procedure in *Mushārakah* cannot be rejected merely because it has no precedent in the past. In fact, every new form can be acceptable to the Sharī'ah in so far as it does not violate any basic principle laid down by the Holy Qur'an, the Sunnah, or the consensus (ed. *ijmā'*) of the Muslim jurists. Therefore, it is not necessary that *Mushārakah* be implemented only in its traditional old form."

This suggests that the problem could be with Muslim economists, not Muslim jurists. While some jurisprudentially-aware economists took the initial initiative to get MUF rolling, there was hardly any notable technical innovation behind it. Further, they have not subsequently pushed hard enough despite the fact that jurists were 100% behind them. Just as with the formulation of MUF, their independent thinking and analysis adding finesse to MUF and bringing about breakthroughs on the PLSL front would have been accepted and codified into statutes by the Jurists. Now, the momentum has shifted. It would not be a surprise if abounding vested interest surrounding ZIFS banks galvanize to maintain the status quo of the current form of MUF while continually introducing mimicking financial instruments of conventional banks and expanding into PLSL territory.

## 2.4. Classical Definition of Partnership Impedes

The procedure underpinning PLSL has a long way to go. The tentativeness is palpable. As a result its operational definition needs to evolve. Abdul-Rahman [2009] has spoken of the presence of Islamic Banking in the USA, while Khan [1996] and Farooq have reported on the work of others. Borrowing from the classical definition of 'silent partnership' meant it had to involve permanent equity ownership with the sharing of profits and losses and with no opportunity to reinvest because it would alter the ownership ratio, because one or more parties owned all of the equity while another party was its administrator or manager (*muḍārib*). Consequently, collateral requirements were mooted. While it has been promoted as the emblem of the system, Farooq correctly thinks that it is this very legalistic definition that has restricted its functionality and evolution. He also points out that owing to the "serious problem with partnership frameworks", PLSL has been "deliberately and systematically avoided" by ZIFS banks. However, as Khan points out, an easy and necessary norm-breaker has been the realization that the PLSL has to have the features of a dual silent partnership – between the depositor and the bank as the administrator, on one hand, and the bank and the firm as the administrator, on the other.

As to the matter of rigid equity, clearly it is wrong at various levels. We do not have a *qarḍ* or loan, a Qur'ānic term used in this context! With money being lent by the ZIFS bank, and not invested, PLSL cannot be an equity-financed undertaking as far as the bank is concerned for it to take a traditional equity-owning, silent partnership position in the firm. Consequently, liability should be limited to the sum loaned, especially when no gain in equity accrues to it. Also, unlike a distress loan (*qarḍ-e-ḥasanah*) where qualification conditions are moot other than manifest distress, PLSL is a business loan to a firm to exploit income earning opportunity. So, a collateral requirement from it should work as sorting and screening mechanism against AS. Thus, under a PLSL contract, the bank and the firm are partners in that they jointly share profit and loss, however they do not share in the rise and fall in value of the firm's equity. That is reserved for equity owners. That means that following a bankruptcy and liquidation, the ZIFS bank should be paid before the equity holders are paid. So, over the life of the loan, any loss borne by the bank, in any year in the life of a loan, is not necessarily a loss of principal but a loss of income.

Farooq adds other reasons why the classically defined, equity-driven form of partnership will not work. He pointed out that in the USA, partnership is the least likely (8%) of the three forms of business organization: proprietorship, partnership and corporation; rarity being proof of its inadequacy. Further, according to a survey

that Caggiano [1992] reported and Farooq quoted, about 60% of those surveyed agreed that partnership is a bad way to do business. Of the 40% who approved of partnerships, 60% said that they were in equal partnerships. The ZIFS bank's interest will be jeopardized because PLSL would be rolled out as an unequal silent partnership. Hence, ZIFS banks are not interested in moving beyond MUF. Moreover, in furthering his case against partnership, Farooq cited Inc. Magazine [2000] which had studied 500 partnerships and found that the partners had known each other long before going into business together. Presumably bankers and firms do not have a long enough relationship to produce a reliable mutually gainful liaison. No wonder PLSL partnerships are so few and far between! Quoting Stiglitz and Weiss [1981], who themselves have likely borrowed the idea from traditional development economics literature; Farooq also suggested that, much like sharecropping, an equity-financed partnership is inefficient. Whatever the manager produces as marginal product it has to be shared with the silent partner. So, the manager's marginal disutility equals his retained marginal product below his potential hence, under-production or inefficiency results.

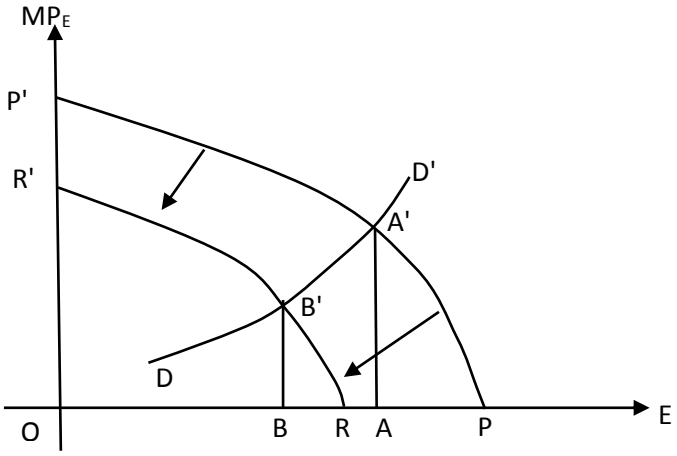
As to "virtuous" co-equal partnerships, the bank cannot worry about being entangled as a co-equal, nor would the firm want it to be so. Farooq makes the same point. Now, based on statistics cited by him, 20% of all US businesses are corporations. They function as silent partnerships, little doubt otherwise, and in aggregate, they bring in 87% of revenue and 69% of profit. So, a silent partnership is neither a failing option nor a choice-of-last-resort form of business arrangement. Also, while longitudinal relationship may act as a sound precursor to partnerships, it is moot as an argument against PLSL. In the modern banking environment, with repeated cycles of borrowing and reimbursement by an entrepreneur with the bank over an extended period of time as well as other exchanges, both parties have to maintain mutual civility and legality in their dealings. Is this not an adequate basis for a sound longitudinal relationship?

### 2.5. Inefficiency of Partnership

As to the argument about diminished retention of marginal product, it is based on a macro-economic perspective, not a micro one. After all, in spite of this "problem", sharecropping has been around for millennia. Do corporations with millions of silent partners not have this problem? Yet here they are, year after year, driving up the Dow Jones Index. Besides, since a ZIFS bank does not gain from any increase in the value of a firm's equity, the latter's disincentive to strive in the project will be largely mitigated. Finally, without the borrowed money in the first place, would the firm's marginal productivity be as high as it is after receiving the loan? Consider Figure

1.0[1] by Nicholson [1990]. Here, $MP_E$ is the marginal product of the entrepreneur's (i.e. firm's) effort, E. PP' is presumably the highest level of productivity achievable without having to borrow and share profit. With a share rate, d, RR' is the retained productivity going to the firm, RR' = (1-d)PP'. The marginal disutility curve of E is DD'. It intersects PP' and RR' at A' and B', respectively. According to the critics, the total product shrinks to the area R'B'BO, instead of being P'A'AO because effort goes down from OA to OB. This paper argues that without the loan amount, PP' would have located closer to the origin, as low as RR' or lower. Also, PP' does not take into consideration, the gain in the value of equity resulting from additional work made possible by loan-based expanded capital stock.

**Figure-1.0 Firm's Marginal Productivity with & without Loan**




2.6. Current PLSL Contract and MUF Structure Limited

So, is it possible that an inability to fully enunciate the nature of PLSL contract has kept the activities of ZIFS bank confined to MUF? Is it also possible that MUF was not well constructed to begin with and has been hindering the development of PLSL as well?

[1] The production function's position (height and shape) in the first quadrant depends on external factors such as technology, scale of operation, employee background, managerial expertise, etc. Of course, movement along the production function is facilitated by the volume of labor force and while the marginal productivity (MP) is positive, it is first increasing and then decreasing. Generally, a profit maximizing firm will operate on the segment of its production function wherein MP is decreasing. A production function and its corresponding MP curve will dominate another if it has more, better, or both of external factors. Sometimes that is facilitated by the volume of capitalization and/or access to loan.

Let us, for a moment, look at the part of ZIFS bank that is operational, the MUF. Farooq, echoing Saeed (1996), writes MUF "ensures maximum risk avoidance and a relatively high return", and this earning is also pre-determined! The point being, where is the risk? Farooq further comments "Islamically, there is nothing wrong with *Murābaḥah*, but there is nothing Islamic about it, either". But not being wrong, is that not necessary to be Islamic? It does live up to the admonition: "*wanha 'anil munkar*" (Asad; 31:17), meaning "and forbid wrong doing". Charging *ribā* or interest is a wrong doing! If it charged interest surrogate, that would be wrong. Except for insinuation and innuendo, there is little proof there is a subterfuge afoot.

The first argument above about MUF having limited risk and predetermined earning is moot since MUF by definition is a trade transaction, albeit done on a deferred payment basis (*Bay' mu'ajjal*). However, the rejoinder is likely to be thus: is that not one of the characteristics claimed about it? As to the second part of the observation, actually, there is a lot wrong with MUF, Islamically. Khaled and Khandker [2017] explore this from a microeconomic perspective. The circumvention of microeconomics has also been problematic for developing PLSL. Now, MUF's point of departure is a verse in the Qur'ān [Asad; 2:275]. It says that trade (*tejarah*) is allowed (*ḥalāl*) and interest (*ribā*) is disallowed (haram) Warde [2000]. Henceforth, it defined the modus operandi of ZIFS banks. This has meant financing service goods (car, boat, house, household durable, private plane, pleasure yacht, etc.) by first purchasing it, then reselling it back to the credit seeker at a mark-up under an extended payment plan. Two things happened along the way: MU rate determination was not elucidated. No market structure analysis followed. Under Sans microeconomics, these omissions were natural. Could the spiritually driven ethical condition have been violated? Concluding that to be the case, Khaled and Khandker [2017] made two restrictive suggestions.

First, even though Islam allows profit maximization [being against waste (*isrāf*), preferring things that are done well and are able to project thoroughness, beauty and grace (*jamaal*) thereby making efficiency par for the course], MUF profit has to be regulated using average cost (AC) pricing[2] for the MU rate (Nicholson, 1990). The

[2] In a perfectly competitive world, social surplus (consumers' surplus + producers' surplus) is maximized when Price = Average Cost = Marginal Cost (P, AC and MC, respectively). This presumably is the most efficient market structure. Therefore, it is the ideal or standard. However, in a monopoly situation under profit maximization, we get P > MC > AC with production falling short of the level that would have been achieved under Perfect Competition. This is deemed inefficient as social surplus is not maximized while a portion of consumers' surplus is transferred to the producer. In order for a natural monopoly to be licensed by the government to be the sole producer, it has to submit to government regulation which envisages a lower price than what the monopoly firm would set by itself.

cause (*illa*) that defines trade does not nearly define the trade being conducted under MUF. So, the level of latitude allowed to trade under Islamic Jurisprudence cannot be allowed to MUF. Also, during the prophetic period, any high interest rate or high secondary interest rate imposed upon those loans that had difficulty being serviced could have only arisen in a concentrated market. So, elimination of interest was a market regulatory act. Finally, the unfairness of interest, the objective (*maqsud*) of Islamic Jurisprudence being its prohibition, is not eliminated by adopting trade rituals while the bottom-line payment remains equally high as in an interest-based lending system.

Secondly, MUF should only finance service goods and not any business or part of a business with a profit flow. Even public infrastructure projects with income flow are suspect candidates for financing under it. MUF's ever-expanding market locus has been relentlessly cutting into PLSL territory. Example: *istiṣnā'* – funding of long-term for-profit (i.e., non-service) capital projects (Zarqa, 1997). Moreover, the urgent nature of problems arising from an absence of PLSL may be going unnoticed. A new financial product called *Tawarruq* has been serviced for a while by some Southeast Asian ZIFS banks, and lately by banks in the Al Jazeera region, some under the new brand name of Taysir (Bt. Ismon, 2012).

According to Ali [2017]:

> *Tawarruq*, a financial instrument involving a series of sale contracts conducted in succession — a person purchases a commodity from a seller on deferred basis and subsequently sells it to a party other than the original seller on a cash basis for the purpose of obtaining liquidity — is "the new kid on the block".

Voices can be heard in defense of faith that *ribā* has entered the market through the back door. According to Bt. Ismon:

> Nevertheless, the validity of the application of *Tawarruq* in Islamic banking is questionable either it is permissible or not. The resistance still exist on the ground from some critics who say that *Tawarruq* based financial product bear a striking resemblance to interest based product. For instance, the Islamic Fiqh

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The government has two choices for a price point, P, off the demand curve. One, P = MC, or two,. P = AC. All three being equal is not possible. So, the government will choose P = AC (i.e. AC pricing) whereby production as well as consumers' surplus are maximized. That is because under sustained increasing returns to scale, setting P = MC will cause the monopoly to incur a loss when production could be halted altogether or the project rejected at the outset since P = MC < AC.

> Academy of Rabbitah 'Alam Islami, Mecca ruled in 2003 that any product structure based on *Tawarruq* concept should be considered as Haram, or forbidden in Islamic law.

In reality, one could argue, many faithful and practicing entrepreneurs are cash short. Under MUF, they cannot obtain operational cash. They can only have their commodity needs financed for them. So, to circumvent this inconvenience, they planned a double-trade strategy combined with a mark-down or discount. As an example, through MUF, the entrepreneur acquires precious metal (gold or silver) for, say, $10.0 million (m) against a mark-up of $0.5m. Then, in the open market, it sells it all for $9.5m, thereby taking a 5% discount. The bank continues to make $0.5m as before. The entrepreneur pays a total cost $1.0m or a net charge of 10.5 percent. Now, under traditional MUF, is a sale of a house or a car by the debtor disallowed? No, because it is just another trade, and no interest was incurred. Same is the case with *Tawarruq* and no change of contract or hike in fees on the part of the ZIFS bank has resulted. Its permissibility can also fall under ruling on Urgency or Special Circumstance (*Dhuroorat*).

### 2.7. Onboarding PLSL

Now for PLSL to come onboard, as discussed earlier, it must move away from the classical definition of partnership. Also, several technical and a few specialized training issues need to be resolved. One, rules need to be established for optimal resource allocation between MUF and PLSL. Two, there must be MU rate determination because it is an organic opportunity cost marker for PLSL. Three, there must be establishing bargaining zones for PLSL contracts. Four, banks must be able to determine acceptable profit share rates accruable to capital and to the bank. Finally, ZIFS banks loan officers must be able to analyze appropriate technology and optimal operational scales in firms' proposed business plans etc.

Khaled and Khandker [2014] tackle resource allocation between MUF and PLSL. While they were able to solve it, it became a daunting mathematical exercise when they assumed a unified objective function for both segments of a ZIFS bank's business.

Khaled and Khandker [2015] separate out the objective functions by ZIFS bank's business segments, having dedicated deposits for each and allowing investible funds to be transferred at the margin from PLSL to MUF, but not vice-versa. Thus, resource allocation is exogenously determined. Therein, by identifying a viable bargaining zone and a necessary condition that states that the firm's maximum bid rate must

exceed the ZIFS banks' minimum asking rate, a practical pathway to thinking about establishing PLSL is opened up. However, to solve the problem it is assumed that both the firm and the bank use the same cumulative profit estimates over the lifetime of the loan. The monitoring cost of the bank used therein could be thought of as corresponding to at least one of two similar costs (Vetting and Intervention) identified in this paper. While the current paper squarely complements the above mentioned paper, it goes beyond trying to estimate a firm's profit flow over the lifetime of a business loan. Two parties, ZIFS bank and the borrowing firm, are claimants to this sum. Without such an estimate, the earlier paper is constrained, and the more the profit estimates of parties differ, the harder it will be to contract. While in the earlier paper the authors estimate the share of profit that goes to the two stakeholders, in this paper the share of profit that goes to invested capital, as opposed to entrepreneurship, is estimated. Incidentally, Craig (2001) addressed the multi-service European Universal Bank (EUB), which is different from non-retail banking as represented by the Italian Merchant Bank or the US Investment Bank. Khaled and Khandker [2015], in combining both operations under one roof, appear to have identified the EUB as a possible arrangement for ZIFS banks. Farooq also concludes that the universal bank resembles the ZIFS bank.

Khaled [2015] argues about the importance of vetting (through appropriate technology adoption and selection of an efficient scale of operation) to achieve a viable PLSL contract and clarifies ways about doing it. Two issues that the literature suggests are confounding the development of PLSL are AS and MH. They are problems arising, respectively, pre and post contract, [Akerlof, 1970; Spence, 1973; Tag El-Din, 1991] owing to a lack of transparency created by an imperfect market. Errors in estimation of future streams of receipts due not only to Acts of God but also due to real and engineered human factors do present a conundrum for this unique arrangement. The idea is not just to sort and rank the loan applicants by qualification but also to find ways and means for them to be (more) successful. The current paper reinforces that idea by exploring the nature of AS and MH and how they are connected. In particular, it illustrates alternative formulas with which to determine ZIFS bank's risk-adjusted negotiating price of capital during bargaining for a PLSL contract.

Now, by AS we understand of a situation wherein, owing to information asymmetry, the ZIFS bank over estimates the capacity of the entrepreneur. It fails to detect and protect against managerial incompetence and moral turpitude intruding during hiring, renting, purchasing, production, marketing, and reporting phases. It could be traced to false representation, over eagerness and optimism, or misreading of unfolding circumstance by the entrepreneur. So, overestimating profit flow, the

ZIFS bank proceeds to lend a sum of money greater than it should. On the other hand, by underestimating potential risk, it asks for a lower profit share rate on capital than it should. It leads to an inefficient decision on the part of bank and jeopardizes its own profitability. It loses money even as it is lending it.

On the other hand, MH is a problem that could arise after loan dispersal. It too depicts asymmetric information situation whereby the firm is able to take advantage of the under-informed lender by obfuscating profit-related facts. Thus, par for the course would be to under-report productivity by inflating costs (e.g. over-invoicing machinery and raw materials) or deflating revenues (or both); engaging in nepotism in hiring incompetent, favored employees and dealers; willfully cutting corners; collusion; exploiting workers; compromising quality; avoiding maintenance; allow insurance policies to lapse; bloating perquisites and shirking effort; paying bribes to remove bumps on the road; while realizing that there is only a small risk of discovery and recovery by the bank or payment of a penalty for its misbehavior. Further, it may do so not only to underpay the bank but also the government and other stakeholders via reduced tax and dividend payouts.

A failure to clarify the complex nuances of this reality precludes banks, businesses, and the community from contracting such loans and gaining from their immense benefits. Khaled [2015] points this out with Figure 3.0. This paper focuses on identifying the realized and declared profit flow due to AS and MH, respectively. The bank may decide to operate under duress or attempt to alleviate their impact albeit at a cost. Currently, most ZIFS banks are doing neither.

To counteract AS and MH, the bank may resort to pre-lending Applicant Vetting (AV) and post-lending Client Intervention (CI), respectively, albeit both at a cost to itself.

AV means adhering to multiple procedures including the following: (a) thoroughly checking the credentials of loan applicants, (b) assessing the viability of the proposed project from both a resource and a market perspective, (c) adopting appropriate technology and scales of reference and, (d) committing reasonable, immobile collateral along with the presentation of favorable credit ratings or some other means of reliability assurance.

CI similarly means adhering to multiple procedures including the following: (a) assuring legal enforceability, (b) providing managerial training and support, (c) maintaining quality guidelines, (d) upholding consumer protection, (e) instituting

periodic audits, (f) adopting fair employment practices, (g) mitigating X-Inefficiency (Hassan, 2006)[3], and (h) respecting environmental guidelines, etc.

Regardless of the choice made, practically, there are two rates that are of interest to the ZIFS bank: the rate-of-return on its investment and its offshoot, profit share rate to capital. It is argued that being able to positively impact AS and MH implies that such behaviors are inversely correlated with AV and CI.

## 3. Analytical Approach

The ZIFS bank is operating under conditions of dual *muḍārabah*. It gains no equity interest in the firm receiving a PLS loan. Lending is not done for perpetuity. The loan is repaid over the contract period. Credibility assessment and collateral deposits are the norm. So, the PLSL contract is unlike a partnership contract that establishes a firm among two or more parties. To be understood: *Mushārakah* (partnership) is an extended-life institution for certain business relations, while a *Qarḍ* (loan) is a product with a limited life. Even as it shares risk under a PLSL contract, a loan cannot be an equity investment at the same time. So, it cannot be a product of the former institution.

The problem tackled in this paper is to find means by which to anticipate and/or mitigate both AS and MH so that PLSL takes off as a portfolio item of ZIFS banks. How might incentives and penalties cause greater self-selection by the firm so that it reduces, even avoids, hiding under pretenses that create AS in the first place, or cause the firm to enhance its professionalism allowing technical and managerial capacities to match the assessment and expectation of the lending bank?

There is still another element to the ensuing exercise: treatment of inherent risk associated with potential earning under PLSL. This is achieved by comparing its risk with that of its closest competitor MUF.

So, the section following this commences with categorization tables for AS and MH. Graphs are introduced to show the conjectured nature of interactivity between AS and MH, and how they may be reduced by incurring vetting and intervention costs. Further, numerical examples of the impact of AS and MH on borrower's profit and subsequent distribution to the bank are presented. They allow one to see how the scale of operation, amount loaned, and profit share rate to capital affect the final realized rate-of-return (ROR) for banks.

[3] Even with allocative efficiency, a poor choice of deployed resources (e.g., capital input, manpower, etc.) will lead to yet another brand of inefficiency called, X-Inefficiency.

Knowing that MH could manifest through three avenues, to be explained below, allows one to ask: Is the firm's MH circumstantial or innate and unique? If it is of the former type, there is a cause-effect and so mitigation will be easier to design. But with innateness or inherent moral failure, instituting a screening and sorting mechanism at the front end during the application process could be the best means to mitigate it. As to circumstantial causes, the situation is worsened if the political and legal systems are opportunistic, avaricious, partisan, and fraught with nepotism and favoritism. A breakdown of law and order introduces players into the banking system who would typically keep their distance. This, of course, makes even standard participants more careless and opportunistic. While this issue needs addressing, it is outside the scope of this paper.

Going forward, three successive profit outcomes to the firm are specified: (a) efficient and unburdened by AS, MH, or X-Inefficiency profit outcomes, (b) compromised by AS and (c) compromised by both AS and MH. Based on profit function's third specification, share-to-capital in general is formulated. Using this formulation, share to bank is established. This is followed by calculating the rate-of-return to bank. Then, two Sharpe ratios are compared: that of rate-of-return to PLSL to that of rate-of-return to MUF. This allows the researcher to derive capital's share of profit.

The above steps are subject to two iterations producing slightly different results for capital's share of profit. In the first instance, losses due to AH and MH are acknowledged but taken as given and not subject to amelioration. Secondly, the alternative iteration, the ZIFS bank is proactive so as to mitigate AS and MH, putting into play AV and CI while incurring corresponding costs[4]. The corresponding measures of profit are higher. This section closes with derivatives for first order conditions of both formulations of capital's profit share rate. These derivatives also have similarities with those in Khaled and Khandker [2015] that refer to a bank's profit share rate, and not share rate to capital.

## 4. Model

### 4.1. Categorization and Principles of Addressing Adverse Selection and Moral Hazard Losses

Table 1.0, on Possibility of Incidence of Adverse Selection and Moral Hazard by Firm Type, states the obvious that only qualified firms are likely to spare the ZIFS

[4] There is a similarity with the cost element to bank found in Khaled and Khandker [2015].

banks from AS issues. As to MH problem, both types of firms, qualified and under/unqualified, may manifest it. The total cost/loss to the lender due to AS is measured as a percentage of maximum possible income, 'a', where $0 < a < 1$.

**Table-1.0**
**Possibility of Incidence of Adverse Selection & Moral Hazard by Firm Type**

| Problem | Qualified | Under/Unqualified |
|---|---|---|
| Adverse Selection | No | Yes |
| Moral Hazard | Yes | Yes |

Table 2.0 on Possible Avenues Leading to Moral Hazard identifies circumstantial grounds and inherent or innate elements that generate a MH problem. The total cost/loss to the lender for MH is measured as an aggregated percentage, 'h', where $0 < h < 1$. Further, regardless of firm type, societal factors ($h_s$), entrepreneur's personal ethical shortcomings ($h_p$), and indirect impact of AS ($h_a$) are likely to induce MH outcome. So, addressing AS head-on may produce dual benefits – direct and indirect, by reducing partial loss appearing as MH. We can see all of the above represented in Figures 2.0 and 2.1 below.

**Table-2.0**
**Possible Avenues Leading to Moral Hazard**

| Firm | Socio-Political, Legal & Cultural Openings | Personal Shortcoming | Impact of Adverse Selection |
|---|---|---|---|
| Qualified | Yes | Yes | No |
| Under/Unqualified | Yes | Yes | Yes |
| h = | $h_S$ | $+ h_P$ | $+ h_A$ |

**Figure-2.0**
**Adverse Selection Loss & Applicant Vetting Cost**

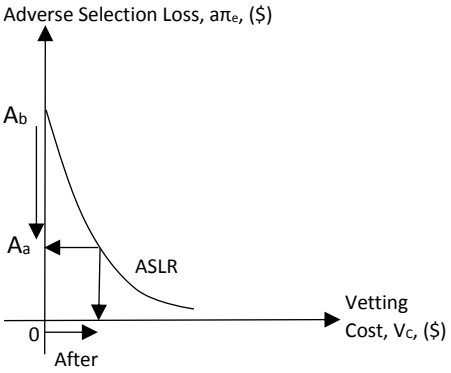
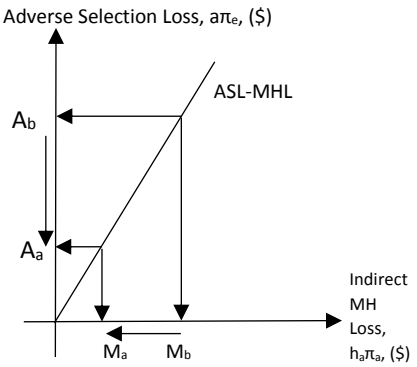



**Figure-2.1**
**Adverse Selection & Moral Hazard Losses**




Displayed in Figure 2.0, Adverse Selection Loss and Applicant Vetting Cost, owing to diminishing productivity of vetting effort, AS Loss and $V_c$ are inversely related. The negatively sloped Adverse Selection Loss Reduction Function (ASLR) represents it. Displayed in Figure 2.1, Adverse Selection and Moral Hazard Losses, is the positive relationship between AS Loss and Indirect MH Loss. To avert AS loss, vetting effort will continue until the sum of savings obtained from a reduction of AS loss and corresponding is at least equal to one.

$$\underset{(-)}{\text{Abs.}\frac{da}{dV_C}\pi_e} + \underset{(-)}{\text{Abs.}\frac{dh_a}{dV_C}\pi_a} = \underset{(-)\quad(+)\ (-)}{\text{Abs.}\left[\frac{da}{dV_C} + \frac{dh_a}{da}\frac{da}{dV_C}a\right]\pi_e} \geq 1 \qquad \text{(i)}$$

In Figure 3.0 on Moral Hazard Loss and Client Intervention Cost, owing to diminishing productivity of intervention effort, loss due to MH ($h_P$) is negatively related to intervention cost ($I_C$) directed toward reducing it. The curve is called the Moral Hazard Loss Reduction Function (MHLR). This would, according to Table 2.0 earlier, address MH arising from personal shortcoming ($h_P$). The intervention effort will continue until the marginal MH loss prevented through intervention is at least equal to one:

$$\underset{(-)}{\text{Abs.}\left[\frac{dh_P}{dI_C}\right]a\pi_e} \geq 1 \qquad \text{(ii)}$$

**Figure-3.0**
**Moral Hazard Loss and Client Intervention Cost**

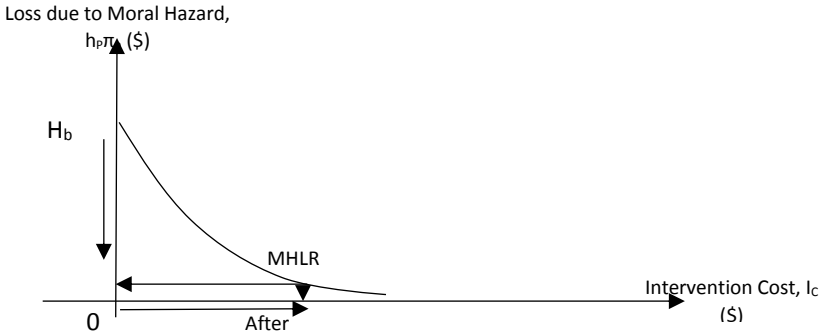



Table 3.0, Numerical Example of Losses from Adverse Selection & Moral Hazard on PLSL Contract with Economies of Scale, provides an example of a ZIFS bank that contracts two PLS loans to the tune of $100,000 and $200,000. The profit share rates are, respectively, 8% and 10%. The corresponding profit expectation of $1.0m and $2.4m indicate economies of scale. However, there are losses owing to AS and MH of 20% and 37.5%, respectively. So, the actually earned and reported profits for the two loans are, respectively, ($0.8m and $0.5m) and ($1.92m and $1.20m). Hence, the ZIFS bank instead of making expected RORs of 80% and 120% from the respective loans, actually makes RORs correspondingly of 40% and 60%. The total loss, in each case, is divided between losses suffered due to AS and MH. Clearly, with the availability of limited loanable funds, given proportionately the same AS and MH impacts, lending a larger sum to exploit economies of scale produces a greater ROR.[5]

**Table-3.0**
**Numerical Example of Losses from Adverse Selection & Moral Hazard on PLSL Contract with Economies of Scale**

| Loan Amount, L ($, K) | Bank's Contracted Profit Share Rate to Capital, c | Firm's Expected Profit, $\pi_e$ ($, m) | Bank's Expected ROR, $r_e$ (%) | Actual Profit Earned under AS, $\pi_a$ ($, m) | AS Loss ($, K) | Reported Profit under MH, $\pi_h$ ($, m) | Total Loss Given Expectation ($, K) | MH Loss ($, K) | Bank's Realized ROR, $r_r$ (%) |
|---|---|---|---|---|---|---|---|---|---|
| 100 | 0.08 | 1 | 80 | 0.8 | 16 | 0.5 | 40 | 24 | 40 |
| 200 | 0.10 | 2.4 | 120 | 1.92 | 48 | 1.20 | 120 | 72 | 60 |

Note: The ROR's are exclusive of bank's business expenses undergirding the loaned amount, L.

[5] Here, a = 0.2 and h = 0.375. Also, $\pi_h = (1 - h)\pi_a = (1 – h)(1 – a)\pi_e = 0.5\ \pi_e$. Now, $r_e = (c.\pi_e)/L$ and $r_r = (c.\pi_h)/L = [c.\{h.(a.\pi_e)\}]/L$. These notations and equations will also apply to Table 4.0.

As to $h_s$, it may be mitigated via a public good effort where the society bears the cost. It is possible MH attributed to $h_s$ is significantly large.

Table 4.0, Anticipating and Reacting to Losses from Adverse Selection & Moral Hazard on PLSL Contract by Changing Loaned Sum, Profit Share Rate, or both, gives alternatives to the first example in Table 3.0. After all, AS leads to more open and generous assessment and dealings with a borrower, i.e., advance a larger sum than would be warranted without asymmetric information and charge a more favorable lower rate that would be due only to a less risky firm. It displays what would happen under three alternative scenarios. First the amount loaned is kept the same while the profit share rate to capital is raised. Second, the amount loaned is reduced while the profit share rate to capital stays unchanged. Three, the amount loaned is reduced while the profit share rate to capital is raised. In each case, the final realized RORs (50%, 80%, and 100% respectively) exceed the 40% ROR realized in the earlier example in Table 3.0 wherein the loan amount is $100,000 and the contracted profit share rate to capital is 8%.

**Table-4.0**
**Anticipating and Reacting to Losses from Adverse Selection & Moral Hazard on PLSL Contract by Changing Loaned Sum, Profit Share Rate, or both - based on Example 1 in Table 3.0**

| Loan Amount L ($, K) | Bank's Contracted Profit Share Rate to Capital, c | Firm's Expected Profit, $\pi_e$ ($, m) | Bank's Expected ROR, $r_e$ (%) | Actual Profit Earned under AS, $\pi_a$ ($, m) | AS Loss to Bank ($, K) | Reported Profit under MH, $\pi_h$ ($, m) | Total Loss to Bank Given Expectation ($, K) | MH Loss to Bank ($, K) | Bank's Realized ROR, $r_r$ (%) |
|---|---|---|---|---|---|---|---|---|---|
| 100 | 0.10 | 1 | 100 | 0.8 | 20 | 0.5 | 50 | 30 | 50 |
| 50 | 0.08 | 1 | 160 | 0.8 | 16 | 0.5 | 40 | 24 | 80 |
| 50 | 0.10 | 1 | 200 | 0.8 | 20 | 0.5 | 50 | 30 | 100 |

Note: The ROR's are exclusive of bank's business expenses undergirding the loaned amount, L.

A. No Vetting against AS or Intervention against MH

We label, respectively, $\pi_{st}$, $\pi_{at}$, and $\pi_{ht}$ to represent profit as i) standardly maximized, ii) actually earned having been subject to percentage loss, a, due to AS, and iii) officially reported having been subject to percentage loss, h, due to MH. Here, t = 1…T (life of the loan). Using profit function $f_t(.)$ at time 't', equation (1) shows maximized profit, $\pi_{st}$, given p and w, the exogenous prices of output and inputs, respectively, and where $L^*$ and $q^*$ are optimal input and corresponding profit

maximizing output levels[6], respectively. Also, $\varepsilon_t$ is the normally distributed error term with mean, 0, and variance, $\sigma$. Hence,

$$\pi_{st} = f_t(q^*, L^*; p, w) + \varepsilon_t \quad (1.0)$$
$$\pi_{at} = (1 - a)[f_t(q^*, L^*; p, w)] + \varepsilon_t \quad (2.0)$$
$$\pi_{ht} = (1 - h)(1 - a)[f_t(q^*, L^*; p, w)] + \varepsilon_t \quad (3.0)$$

Henceforth, x = s, a, or h. Let, c be the profit share rate sought by the bank for all capital involved in the firm's project. An example of c may be simply constructed thus. Let 'e' be the share of $\pi$ that is assigned to entrepreneurship. Then, in general, $c = (1 - e)$ is the profit share rate to capital, Khaled [2015]. Also, with $K_0$ being book value of entrepreneur's total capital following borrowing '$L_0$' amount from the ZIFS bank, $[(L_0/K_0)c]$ is the share of profit accruing to the bank against the loan advanced in the first payment period. This amount, however, is diminishing as the loan is repaid. We use $(L_0/K_0)$ to determine a constant valued c. $L_0$ builds up the production capacity of the firm. This capacity neither diminishes with the sharing of profits nor the repayment of the borrowed amount over its lifecycle. Given c, the absolute level of profit possibly accruing to bank, $\pi^b_{xt}$, under regimes represented by equations (1.0), (2.0) and (3.0), respectively, would be:

$$\pi^b_{xt} = c(L_o/K_o)\pi_{xt} \quad (4.0)$$

With 'E' as the expectation operator, the corresponding rates of return to bank, $r^b_x$, given that cost incurred in lending the sum '$L_0$' is $\xi$, with 'T' being the length of the lifecycle of the loan:

$$r^b_x = TE[\pi^b_{xt}{}^*]/(L_0 + \xi)^7 \quad (5.0)$$

Assuming MUF has a rate-of-return, $r_m$, and a standard deviation of $\sigma_m$, while a zero-risk treasury or sukuk instrument has a rate-of-return, '$\tau$', then we have two comparable Sharpe ratios such that

$$\frac{(r^b_h - \tau)}{\sigma} \geq \frac{(r_m - \tau)}{\sigma_m} \quad (6.0)^8$$

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[6] Without X-inefficiency as well.

[7] An alternative way of writing this would be: $S^b_s = \Sigma(\pi^b_{st})/(L_0 + \xi)$ per Khaled and Khandker [2015].

[8] Alternatively, assuming that $r_m$ is a 100 percent assured receipt, i.e., no risk is involved with MUF, the bank will lend under PLSL only if the corresponding Sharpe ratio variant is at least positive: $\frac{(s^b_h - r_m)}{\sigma} \geq 0$. Then,

Here, $r_h^b > r_m > \tau$ and $\sigma > \sigma_m$. Using equations (6.0), (5.0), (4.0) and (3.0) we solve for c as being able to take any value over a range. With $E(\varepsilon_t) = 0$,

$$c \geq \frac{[\left\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\right\}K_0(L_0 + \xi)]}{[L_0T(1-h)(1-a)E\{f_t(q^*, L^*; p, w)\}]} \qquad (7.0)$$

Now, if $\pi_{rt}$ is the actual reported year-end profit, and $L_{bt}$ is the outstanding loan balance that year, taking the left hand side of inequality (7.0) as an equality, the year ending income accruing to the ZIFS bank will be:

$$\left(\frac{L_{bt}}{K_0}\right)c\pi_{rt} = \frac{L_{bt}\pi_{rt}[\left\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\right\}(L_0 + \xi)]}{[L_0T(1-h)(1-a)E\{f_t(q^*, L^*; p, w)\}]} \qquad (8.0)$$

On the other hand, if the bank was forced to accept a given c, it can affect $s^b_h$ in three ways: Limit its lending cost, $\xi$, by improving its efficiency and x-efficiency; and seek to increase $E[\pi^b_a]$ and $E[\pi^b_h]$. To affect the latter two variables, the bank may undertake steps to mitigate 'a' and 'h'. Reducing them through vetting or intervention, accordingly, will increase $s^b_h$. This will likely involve incurring additional costs discussed in Section B. One matter to note, in using $(L_{bt}/K_0)$, $K_0$ may have grown to, say, $K_n$, since incurring the loan $L_0$. That means $(L_{bt}/K_0) > (L_{bt}/K_n)$[9], in reality giving the bank a larger share of the profit.

B. With Vetting against AS and Intervention against MH

Earlier, Figures 2.0 and 3.0 show how 'a' and 'h' may be impacted favorably. Incidentally, there is no a priori reason to say either a > h, or vice versa.

As would be expected, both relationships depict negative correlation, exploitation of which gives desired outcome to the bank. So, we use ASLR and MHLR curves to represent the relationships. With vetting, $a^1 < a$, and with intervention, $h^1 < h$. Finally,

---

$$c \geq \frac{[r_mK_0(L_0 + \xi)]}{[L_0T(1-h)(1-a)E\{f_t(q^*, L^*; p, w)\}]}$$

And, corresponding annual income in the $t^{th}$ year,

$$\left(\frac{L_{bt}}{K_0}\right)c\pi_{rt} = \frac{r_mL_{bt}\pi_{rt}(L_0 + \xi)}{[L_0T(1-h)(1-a)E\{f_t(q^*, L^*; p, w)\}]}$$

[9] Under a classical definition of PLSL, with the bank owning a share in the borrowing entity's project for perpetuity, $K_0$ is restricted from growing since it would upset the ratio, $L_0/K_0$. This problem is moot because of how a PLSL contract is defined here.

Figure 2.1 on Adverse Selection Loss and Moral Hazard Loss refers to the indirect effect of Vetting on MH via the former's impact on AS. So, AS and MH are conjectured to be causally positively related as represented by ASL-MHL curve. Thus,

$$\pi^1_{at} = (1 - a^1)\pi_{st} + \varepsilon_t \quad (2.1)$$

$$\pi^1_{ht} = (1 - h^1)(1 - a^1)\pi^1_{st} + \varepsilon_t \quad (3.1)$$

Thus, vetting and intervention cause a change in profit levels such that $\pi^1_{xt} > \pi_{xt}$, where x = a, or h. This implies the absolute amount of profit accruing to the bank also rises. So, $\pi^{b1}_{xt} > \pi^{b}_{xt}$.

$$\pi^{b1}_{xt} = c(L_0/K_0)\pi^1_{xt} \quad (4.1)$$

The corresponding rates of return to bank, $s^{b1}_a$ and $s^{b1}_h$, given additional lending costs incurred in vetting and intervention are $\alpha$ and $\theta$, and in line with (8) and (9), respectively:

$$r^{b1}_a = TE(\pi^{b1}_{at})/(L_0 + \xi + \alpha) \quad (5.1)$$

$$r^{b1}_h = TE(\pi^{b1}_{ht})/(L_0 + \xi + \alpha + \theta) \quad (5.2)$$

The bank will do vetting before lending only if $\frac{(r_a^{b1} - \tau)}{\sigma} \geq \frac{(r_m - \tau)}{\sigma_m}$.

Also, both vetting and intervention will take place before lending only if:

$$\frac{(r_h^{b1} - \tau)}{\sigma} \geq \frac{(r_a^{b1} - \tau)}{\sigma} \geq \frac{(r_m - \tau)}{\sigma_m} \quad (6.1)$$

Using the equality version of the left-most inequality in (6.1), as well as equations (5.2), (4.1) and (3.1), we derive the relevant c. Hence,

$$c \geq \frac{[\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi + \alpha + \theta)]}{[L_0T(1 - h^1)(1 - a^1)E\{f_t(q^*, L^*; p, w)\}]} \quad (7.1)$$

Again, per equation (8.0), and with $\pi^1_{rt} > \pi_{rt}$, corresponding annual income in the $t^{th}$ year,

$$\left(\frac{L_{bt}}{K_0}\right)c\pi^1_{rt} = \frac{L_{bt}\pi^1_{rt}[\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}(L_0 + \xi + \alpha + \theta)]}{[L_0T(1 - h^1)(1 - a^1)E\{f_t(q^*, L^*; p, w)\}]} \quad (8.1)$$

The relevant first order conditions are in Appendices I and II[10].

[10] Now, elasticity, $E = \frac{dy}{dx}/\frac{y}{x}$. Since the derivatives in the appendices give the relevant marginal values, the point elasticities should easily follow.

## 5. Analysis of Results

Having categorized AS and MH (Tables 1.0 and 2.0), the paper proceeds to numerically illustrate how their presence affects a bank's profitability on loans contracted (Tables 3.0 and 4.0). Banks gain more by backing projects with economies of scale and by adjusting lending rates according to the anticipated presence of these dual problems.

Then the paper proceeds to graphically illustrate the nature of AS and MH (Figures 2.0, 2.1, and 3.0), their interaction with each other, and how they are likely respond to specific amelioration. It also formulates cost-benefit rules for undertaking such amelioration (Inequalities (i) and (ii)). Further, parsing the grounds for MH into three categories, successful amelioration effort of that problem becomes more likely (Table 2.0).

Typically, in order to receive a healthy rate-of-return on the bank's *ribā*-free loans, a PLS lender has two options with regard to firm's annual profit: (a) secure for itself a favorable share rate, regardless of the role of money in the overall scheme of things or (b) secure for the total capital invested (entrepreneur's capital plus bank's loan amount) in the enterprise a favorable share rate. Then obtain a pro-rated share of that share rate. As mentioned earlier, unlike Khaled and Khandker [2015], this paper clarifies the second option[11]. By using the limit values of inequalities (7.0) and it's variant equation (7.1). Up until now, the capital's profit share rate may have been arbitrarily determined, perhaps as a custom – with capital and entrepreneurship as co-equal, or being set equal to the fraction remaining after having paid off for entrepreneurship. However, such rates skirt around losses from AS and MH. If errors and malpractices are assigned to a firm, then the demand for a profit share rate-to-capital could exceed the co-equal figure of 50%. Further, such a rate does not take into account risk nor does it properly incorporate projected profit streams. The risk adjustment problem may be mitigated by equating the Sharpe ratio of the potential rate-of-return to the bank for PLSL with that on MUF. That means, at equilibrium, the rate-of-return on excess earned over a guaranteed return per unit of risk for both portfolios are made to be same. So, if the risk on PLSL return is 'x' times that on MUF return, the excess over the rate-of-return on the former portfolio must be 'x' times also. Thus, the minimum share of profit going to capital is given by the limit value of the left-hand-side of both listed inequalities. Having made c endogenous

[11] Incidentally, the contract rate demanded by bank in the earlier paper may utilize the rate obtained here to flesh out its actual value.

from the bank's perspective, return to entrepreneurship, e, becomes equal to (1 – c), instead of the other way around as was suggested earlier.

A. According to Khaled and Khandker [2015], once an acceptable floor value for c is determined, achieving a higher rate, albeit even this lower rate, depends on the bank's bargaining power during the contract negotiation phase. This power, in turn, is predicated upon its lending power (i.e. market concentration), scarcity of loanable funds, sector, industry, firm, the phase of the business cycle when lending is first contracted, bank's length of relationship with client and the latter's past performance, urgency of the request, novelty or innovation presented by the firm in its proposed investment project, as well as the knowledge and training of the loan officer [Khaled, 2015].
Now, with $\pi_{rt}$ as the firm's ex-post reported year-end profit for any year, the actual absolute minimum yearly earnings for the ZIFS bank is given by the lower limit value of inequality (8.0). While the share-to-capital remains constant, the bank's actual share is diminishing since the loan is being periodically repaid - ($L_{bt}/K_0$) is a diminishing ratio over the lifetime of the loan. Even so, the bank's actual income from any such loan may not diminish at the same rate from period to period depending on the robustness of $\pi_{rt}$.

B. As indicated earlier, respectively, the bank can positively impact $\pi_{at}$ and $\pi_{ht}$ through proper vetting of the potential firm and the business plan, and post-lending intervention – legal, managerial, technical, etc. Thus, with improved post-vetting and post-intervention profits ($\pi^1_{at}$ and $\pi^1_{ht}$, respectively), we are able to construct a new profit share rate to capital, given by the lower limit value of inequality (7.1). However, there are additional costs (e.g., $\alpha$, $\theta$) involved with such proactivity. In this case, with $\pi^1_{rt}$ as the firm's reported year-end profit for any year, the actual absolute minimum yearly earnings for the ZIFS bank is given by the lower limit value of inequality (8.1).

5.1. First Order Necessary Conditions

Now, in Appendices I and II, respectively, for sections A and B above, we find the first order conditions of c derived with respect to various variables. As has been noted earlier, corresponding point elasticities are easy to obtain. These measures should be of great interest and assistance to both the bank and the overseeing central bank. The confidence in the model rises because all the signs are intuitively anticipated. As to external parameters, c increases as rate-of-return under MUF ($r_m$) increases (7.0.1 and 7.1.1) but decreases as rate-of-return on zero-risk instrument ($\tau$) or standard deviation of $r_m$ ($\sigma_m$) increases (7.0.2 and 7.0.3, and 7.1.2 and 7.1.3,

respectively). Note, the first increase here is explained by the fact that the Sharpe ratio for MUF has increased. The subsequent decrease comes about because MUF's Sharpe ratio decreases. In (7.0.4) and (7.1.4), we see that c increases as the standard deviation ($\sigma$) of the expected profit flow of the firm from PLSL increases. That is because the corresponding Sharpe ratio decreases. As bank's business management costs related to lending ($\xi$) increases, so does c [(7.0.5) and (7.1.5)]. Thus, an efficient bank will demand a lower share of profit for aggregated capital.

As would be expected, an increase in anticipated losses due to AS and MH [(a and h) or ($a^1$ and $h^1$)] does increase c as, respectively, demonstrated by [(7.0.6) and (7.0.7)] and [(7.1.6) and (7.1.7)]. Also, c decreases if the duration of the loan (T) or the productivity of the borrowing firm [$f_t(.)$] increase [(7.0.8) and (7.1.8) and (7.0.9) and (7.1.9)]. In either case, such an increase makes it easier to equate the PLSL Sharpe ratio with the MUF Sharpe ratio. Now, according to [(7.0.10) and (7.1.10)], as total invested capital amount, $K_0$, increases so does c, while according to [(7.0.11) and (7.1.11)] as $L_0$ or loaned amount increases, c decreases. Since these are all partial derivatives, an increase in $K_0$ or $L_0$ means the share of the capital belonging to the firm increases or decreases, accordingly. So, the profit share rate to capital has to, respectively, increase or decrease so as to maintain the bank's revenue flow. Finally, [7.1.12) and (7.1.13)], Appendix II indicates that when either Vetting Cost ($V_C$) or Intervention Cost ($I_C$) increase, so does c.

### 5.2. One Cautionary Flag Stands Out

Using a wrong estimate of profit - one that is too high or too low, will cause c to be correspondingly too low or too high thereby hurting the bank or the firm and produce an unstable contract. That is why, given the difficulties of estimation, using its expected value is the best way to proceed. In fact Khaled and Khandker [2015] also use cumulative projected profit to best capture any fluctuation.

## 6. Conclusion

PLSL is presumably central to ZIFS. It is a normative agenda long waiting for tools toward a positive economic implementation. Even its pale shadow, MUF, designed to finance service goods without any profit flow, suffers from a failure to properly transition from a normative status to a positive one. While the heuristic elements of this agenda are largely explored, its microeconomic model has fallen well short of adequate. This paper, and its four predecessors, seeks to address this shortcoming.

The PLS lender is able to partake in the accruing of profits and is liable for any losses regarding proprietorships, stock ownerships and venture capital investments. However, unlike them and based on a less legalistic and a more practical definition of a lender locked into a double *muḍārabah* arrangement, it has no right to any gain in the value of equity and its profit earnings diminish as the loan is paid. Both MUF and PLSL are faced with AS and MH issues. These problems have plenty of potential to be sharply aggravated in the presence of absent equity ownership and shared-management rights.

The expectation of ZIFS is that it removes iniquitous and inefficient, pre-determined, unearned income under an interest-based credit system – received task-free and risk-free by capital alongside other non-entrepreneurial factors of production. Critics have claimed that the ZIFS bank's most prolific portfolio MUF mimics the interest-based system so closely that it hardly rises to that vaunted expectation. Further, ZIFS bank's financing instruments for non-profit products are also increasingly encroaching upon financing for-profit businesses. Consequently, the profitability of MUF has accelerated. This has all but faded practical interest in launching PLSL. Also, arguments say that risk and profit sharing under PLSL should have a stabilizing and equitable effect on the economy. However, ironically, a failure to understand and tackle the risk inherent to PLSL has stalled its offering.

This paper uses standard financing tools including: rate-of-return to the lender, Sharpe ratio, and profit share rate accruing to capital, to devise two alternative paths for a ZIFS bank to draw up a PLSL contract when it tables an asking price namely share of profit designated for capital input. It suggests how AS and MH may relate to each other and how they react to either vetting or intervention. For both solutions, the first order condition results are as expected and provide a sense of how the profit share rate could change when any of its determinants change. This will assist the central bank, monetary and macroeconomic policy experts.

While this paper, along with the others papers in this series, should assist in the movement toward streamlining MUF as well as establishing PLSL, more focused study of AS, MH, duration of loans, legal facilitation, legal limitation (*fiqhī*) on extending MUF to for-profit businesses, AC pricing of MU rates to contain the profitability of MUF segment, etc. would remove many of the blind spots or disincentives that have historically paralyzed the ZIFS banking community in this regard.

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## Appendix I

A. First Order Condition for Profit-Share Rate absent Vetting or Intervention:

[Equation (7.0) – $c = [\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\} K_0(L_0 + \xi)]/[L_0T(1-h)(1-a)E\{f_t^*(.)\}]]$

$$\frac{dc}{dr_m} = \frac{\frac{\sigma}{\sigma_m} K_0(L_0 + \xi)}{[L_0T(1-h)(1-a)E\{f_t^*(.)\}]} > 0 \quad (7.0.1)$$

$$\frac{dc}{d\tau} = \frac{(1 - \frac{\sigma}{\sigma_m})K_0(L_0 + \xi)}{[L_0T(1-h)(1-a)E\{f_t^*(.)\}]} < 0 \quad (7.0.2)$$

$$\frac{dc}{d\sigma_m} = -\frac{(r_m - \tau)\sigma K_0(L_0 + \xi)}{[L_0T\sigma_m^2(1-h)(1-a)E\{f_t^*(.)\}]} < 0 \quad (7.0.3)$$

$$\frac{dc}{d\sigma} = \frac{(r_m - \tau)K_0(L_0 + \xi)}{[L_0T\sigma_m(1-h)(1-a)E\{f_t^*(.)\}]} > 0 \quad (7.0.4)$$

$$\frac{\partial c}{\partial \xi} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0}{[L_0T(1-h)(1-a)E\{f_t^*(.)\}]} > 0 \quad (7.0.5)$$

$$\frac{dc}{da} = \frac{[\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi)]}{[L_0T(1-a)^2(1-h)E\{f_t^*(.)\}]} > 0 \quad (7.0.6)$$

$$\frac{dc}{dh} = \frac{[\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi)]}{[L_0T(1-h)^2(1-a)E\{f_t^*(.)\}]} > 0 \quad (7.0.7)$$

$$\frac{dc}{dT} = -\frac{[\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi)]}{[L_0T^2(1-h)(1-a)E\{f_t^*(.)\}]} < 0 \quad (7.0.8)$$

$$\frac{dc}{df_t(.)} = -\frac{[\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi)]}{[L_0T(1-h)(1-a)E\{f_t^*(.)\}^2]} < 0 \quad (7.0.9)$$

$$\frac{dc}{dK_0} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}(L_0 + \xi)}{[L_0T(1-h)(1-a)E\{f_t^*(.)\}]} > 0 \quad (7.0.10)$$

$$\frac{dc}{dL_0} = -\frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0\xi}{[L_0{}^2T(1-h)(1-a)E\{f_t^*(.)\}]} < 0 \quad (7.0.11)$$

## Appendix II

B. First Order Condition for Profit-Share Rate with AS Vetting and MH Intervention:

[Equation (7.1) $-$ c = $[\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi + \alpha + \theta)]/[L_0T(1 - h^1)(1 - a^1)E\{f_t(q^*, L^*; p, w)\}]$

$$\frac{dc}{dr_m} = \frac{\sigma K_0(L_0 + \xi + \alpha + \theta)}{[\sigma_m L_0 T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.1)$$

$$\frac{dc}{d\tau} = \frac{(1 - \frac{\sigma}{\sigma_m})K_0(L_0 + \xi + \alpha + \theta)}{[L_0T(1- h^1)(1- a^1)E\{f_t^*(.)\}]} < 0 \quad (7.1.2)$$

$$\frac{dc}{d\sigma_m} = -\frac{(r_m - \tau)\sigma K_0(L_0 + \xi + \alpha + \theta)}{[\sigma_m^2 L_0 T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} < 0 \quad (7.1.3)$$

$$\frac{dc}{d\sigma} = \frac{(r_m - \tau)K_0(L_0 + \xi + \alpha + \theta)}{[\sigma_m L_0 T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.4)$$

$$\frac{\partial c}{\partial \xi} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \alpha + \theta)}{[L_0T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.5)$$

$$\frac{dc}{da^1} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi + \alpha + \theta)}{[L_0T(1 - a^1)^2(1 - h^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.6)$$

$$\frac{dc}{dh^1} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi + \alpha + \theta)}{[L_0T(1 - h^1)^2(1 - a^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.7)$$

$$\frac{dc}{dT} = -\frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi + \alpha + \theta)}{[L_0T^2(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} < 0 \quad (7.1.8)$$

$$\frac{dc}{df_t(.)} = -\frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(L_0 + \xi + \alpha + \theta)}{[L_0T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}^2]} < 0 \quad (7.1.9)$$

$$\frac{dc}{dK_o} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}(L_0 + \xi + \alpha + \theta)}{[L_0T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.10)$$

$$\frac{dc}{dL_o} = -\frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0(\xi + \alpha + \theta)}{[L_0{}^2T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} < 0 \quad (7.1.11)$$

$$\frac{\partial c}{\partial \alpha} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0}{[L_0T(1-h^1)(1-a^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.12)$$

$$\frac{\partial c}{\partial \theta} = \frac{\{(r_m - \tau)\frac{\sigma}{\sigma_m} + \tau\}K_0}{[L_0T(1 - h^1)(1 - a^1)E\{f_t^*(.)\}]} > 0 \quad (7.1.13)$$