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The Effectiveness of Islamic Financial Intermediation Compared to Ribaoui Financial Intermediation

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Abstract

The financing systems in modern economies are primarily divided into two broad categories: Islamic financing, based on principles of profit and loss sharing, and conventional Riba-based (classical) financing, which relies on fixed income contracts. While Islamic financing emphasizes ethical considerations and risk-sharing, conventional financing typically provides fixed returns to lenders. The purpose of this study is to compare these two financing systems in terms of their economic efficiency, specifically focusing on the returns offered to investors. This study employs mathematical analysis using the principles of partial equilibrium theory, particularly for risk-averse investors. The two financing models—Islamic financing based on variable yields tied to the realized profits of a project and subject to zakat if applicable, and the Riba-based financing system with fixed income contracts—are analyzed through these frameworks. The comparison focuses on investor returns and risk-sharing dynamics, without involving animal models or preregistration numbers, as this is a theoretical economic study. The study finds that, for risk-averse investors, financing contracts based on profit and loss sharing (as in the Islamic system) yield higher returns compared to fixed income contracts common in the Riba-based (classical) financing system. The analysis shows that the risk-sharing nature of Islamic financing allows for more favorable returns in certain market conditions. The findings suggest that Islamic financing systems, with their emphasis on profit and loss sharing, offer higher returns for risk-averse investors when compared to conventional Riba-based financing. These results provide support for the economic efficiency and attractiveness of profit-sharing contracts over fixed-income models in specific investment scenarios.

Keywords: Interest Rate, Classic Bank, Islamic Bank, Profit Sharing System, Return, Speculation, Zakat, Mathematical Modeling.

JEL Classifications codes: G21, G28, P43, Z12

Introduction

Many financial intermediaries worldwide now operate intermediation subject to the requirements of Islamic jurisprudence (Honohan, 2001). As such, they neither charge interest (riba) nor receive it. Riba is mentioned and condemned in several different verses in the *Qur'an*. It is also mentioned in many *ahadith* (Abu Zahra, 1985). The word was used by the Arabs prior to Islam to refer to an "increase."

One of the most important forms of riba is that a person makes some money to another person (as a loan) in return for that money being returned plus a predefined increase. This is the same as what interest banks are doing today.

Most scholars (al-Masri, 1990; Amin, 2003; Jastina, 1995) concluded that banking interest in all its forms is one of the riba that is haraam and is forbidden by the *Qur'an* and *Sunnah* of the

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Prophet (peace and blessings of Allaah be upon him). The prohibition on interest (riba) is not the only defining feature of Islamic finance. Also precluded are recklessness or unnecessary risk (gharar), gambling (maysir), and the exploitation of ignorance (jahl). In addition, Islamic law prohibits investing in businesses that are considered unlawful or Haraam (such as businesses that sell alcohol or pork, or businesses that produce media such as gossip columns or pornography, which are contrary to Islamic values) (Mastoor, 2014).

The effectiveness of Islamic financial intermediation compared to riba-based (conventional) financial intermediation can be analyzed from various perspectives, including economic impact, social and ethical considerations, financial stability, market performance, and financial inclusion.

From an economic standpoint, Islamic financial intermediation emphasizes asset-backed transactions and risk-sharing, linking financing to tangible economic activities and promoting stability by avoiding speculative bubbles and excessive leverage. This system ensures that both lenders and borrowers share the risks and rewards of investments, reducing the likelihood of defaults. Additionally, Islamic finance promotes ethical investments by prohibiting industries such as alcohol, gambling, and tobacco, aligning with socially responsible goals. In contrast, conventional finance often relies on risk transfer and interest-based transactions, which can lead to higher financial speculation, excessive leverage, and systemic risks, as evidenced by past financial crises. Conventional systems prioritize profit maximization through interest, which may contribute to inequality and encourage unsustainable lending.

Socially and ethically, Islamic finance stands out by strictly prohibiting riba (usury), fostering equitable wealth distribution, and encouraging ethical investments that align with Islamic values. It also promotes social welfare through instruments like Zakat, ensuring wealth circulation for the benefit of the needy. On the other hand, conventional finance is more profit-driven and may not prioritize ethical considerations unless motivated by corporate social responsibility. This can result in investments that harm society or the environment, and riba-based systems may exclude poorer individuals who cannot afford interest payments, exacerbating social inequality.

In terms of financial stability, Islamic finance reduces systemic risks by promoting equity participation and prohibiting speculative practices such as short-selling and derivatives. This creates a more stable environment with transparent and fair transactions. Conventional finance, however, can lead to financial instability due to over-leveraging, speculative behavior, and a reliance on interest-based systems, which make the economy more vulnerable to crises like the 2008 financial crash. The ability of banks to accurately identify and efficiently manage risks plays a crucial role in preserving a favorable reputation, attracting a larger client base, and obtaining finance under advantageous conditions (Aysan et al., 2024). These factors all contribute to enhancing the banks' financial performance.

Market performance shows that Islamic finance has experienced significant growth globally, with a variety of products like Sukuk (Islamic bonds) and Takaful (Islamic insurance) becoming widely available. It tends to focus on long-term investments that contribute to real economic development rather than short-term speculative gains. Conventional finance, while efficient in terms of liquidity and capital allocation, often emphasizes short-term returns, which can encourage speculative behavior and increase the risk of financial instability.

Regarding financial inclusion, Islamic finance offers alternatives to interest-based loans, particularly beneficial for underserved populations in Muslim-majority regions. Its asset-backed

nature ensures more equitable access to financing, promoting financial inclusion. Conventional finance, however, tends to exclude individuals without collateral, particularly lower-income borrowers, thus leaving them outside the formal financial system. Moreover, the high-interest rates in conventional systems can escalate debt burdens, making it difficult for financially vulnerable groups to escape poverty.

Islamic financial intermediation offers several advantages, particularly in terms of ethics, risk-sharing, financial stability, and social welfare. It provides a more equitable and stable system, promoting ethical investment and long-term economic growth. However, conventional finance excels in liquidity, capital markets, and short-term efficiency. Ultimately, the effectiveness of each system depends on the specific goals, whether it's maximizing profit and liquidity (conventional finance) or fostering ethical investments and social welfare (Islamic finance).

The effectiveness of financial intermediation plays a pivotal role in shaping the stability and growth of modern economies. Within this context, two distinct systems of financial intermediation—Islamic finance and *riba*-based (conventional) finance—have gained significant attention. Islamic finance, grounded in principles that prohibit interest (*riba*) and promote risk-sharing, ethical investments, and asset-backed transactions, contrasts sharply with conventional finance, which relies heavily on interest and risk transfer mechanisms. The objective of this research is to critically compare the effectiveness of Islamic financial intermediation with that of conventional *riba*-based financial intermediation. This paper aims to contribute to the ongoing discourse by offering a comprehensive assessment of both systems, evaluating their strengths and limitations in fostering long-term sustainable economic growth. By providing a comparative analysis, this study seeks to highlight how each system aligns with contemporary financial needs and challenges, and how Islamic finance could offer a viable alternative to conventional financial models in promoting fairness, stability, and social responsibility in the global financial ecosystem.

Literature Review

Islamic finance, by its nature, is strongly aligned with the objectives of ESG, particularly in its emphasis on ethical investment, risk sharing, and social justice (Shalhoob, 2025). The fundamental principles of accountability, transparency, and social justice (*Adalah*) serve as guiding values for corporate behavior within the Islamic financial system (Buallay et al., 2020). Islamic banking governance mixes *Sharia* and financial rules (Muneer et al., 2025). Islamic banking has the same purpose as conventional banking: to make money for the banking institute by lending out capital while adhering to Islamic law except that it operates in accordance with the rules of *Shariah*. Islamic bank is an institution which receives deposits and leads all banking activities except the collection and payment of interest. Islamic bank incites all the parts with a transaction to share risk and profit-and-loss (Khaldi and Hamdouni, 2011). Muhammad Hanif (2011) present study that address the perceptual issues by identifying the similarities and differences in Islamic and conventional banking. Evidence suggest Islamic banking is very much practiced like modern conventional banking with certain restrictions imposed by *Sharia* and addresses many business requirements successfully hence perceiving Islamic banking as totally foreign to the business world is not correct. It is further found in the study that Islamic banking is not a mere copy of conventional practices rather major differences exist in the operations of Islamic Financial Institutions (IFIs) in comparison with conventional banking. IFIs have succeeded in creating trust in the eyes of depositors and receive deposits on profit and loss sharing basis, however, investment and financing options available to Islamic banks are limited

in comparison to conventional banks.

The two basic categories of financing permitted in Islam are: 1) profit-and-loss-sharing (PLS), also called participatory modes, i.e., joint venture (Musharakah) and Mudharabah (with profit sharing concept) and 2) purchase and hire of goods or assets and services on a fixed-return basis, i.e., cost plus (Murabaha), Istisna'a, Salam and leasing (Ijar), safekeeping (Wadiah),..

In accordance with the principle of sharing of profits and losses, Mudharabah is a form of passive participation treated as a limited partnership or a corporation. In Mudharabah financing, only the bank (Rab al-mal or capital provider) provides capital while the client (Mudharib or entrepreneur) manages the business. Mudharib brings its experience and expertise, manages the activity or business under and provides the labor needed to use these funds and does not guarantee the capital invested and the realization of profit. The bank cannot interfere in the day-to-day running of the business (Hanif, 2011; Khan and Mirakhor, 1994). Any profit is shared. The client is not paid a salary, and if he or she does not make a profit, the client loses all the time and effort expended on the venture and the bank absorbs losses. The distribution of profits and losses is fixed in contract (Khalidi and Hamdouni, 2011). The research presented by Khalidi and Hamdouni (2011) illustrated principles and activities that define the Islamic banking system, allowing the latter to be more efficient and more equitable. The first model is based on the Mudharabah (deposit, investment funds); the second concerns the Mudharabah for the deposit only while for the investment we need the Musharakah; The third model is based on the Mudharabah for deposits but introduces the debt and quasi-debt instruments (Murabahah, Istisna, Salam, Ijara ...); The fourth model is based on Mudharabah for deposits and Mutajarah on the assets side. Results show that the first model is more efficient than the others, particularly the third which is paradoxically largely adopted. The fourth is not recommended for its negative impact on trade.

In Musharakah (a form of active participation), both bank and client contribute capital and agree to a profit-sharing ratio (profit or loss) (Siddiqui, 1985). However, there are cases in which it is difficult to use Mudharabah and Musharakah. Other formulas can be used for the same principles as Murabaha, Istisna'a,... This is not limited to this formula, where shariah allowed a great deal of flexibility between the parties in the field of financial transactions, with the prohibition of injustice, gharar, ignorance, and riba (Khan, 1989).

The relationship between depositors and the Islamic Bank is an agency relation and the best contract is a Mudharabah contract. However, intellectuals disagreed about this relationship on the assets side as follows:

- **Mudharabah on the liability side and on the assets side**
- **Mudharabah on the Liability side and Musharakah on the Assets Side**
- **Mudharabah on the Liability side and debt and quasi-debt Instruments on the assets side (Murabahah, Istisna, Salam, Ijhara...)**
- **Mudharabah on the liability side and Mutajarah on the assets side**

Islamic banks conduct commercial operations directly, and most thinkers believe that this model is not a good model for financial intermediation.

As a result, the best form of Islamic financial intermediation is the model of Mudarabah on both sides of the balance sheet because it is the model that guarantees equity and efficiency for the

whole banking system. Mudharabah is called pure financial intermediation (Siddiqui, 1998).

Mudharabah on both sides is more efficient and fairer than Islamic financial intermediation, which depends on Mudharabah on the Liability side and debt and quasi-debt Instruments on the assets side (Murabahah, Istisna, Salam, Ijbara...) (Al-Suwailem, 1998). It is also more legitimate, more efficient and fairer than interest-based financial intermediation [7].

Many studies have shown by mathematical models that the return on savings can be higher in the Islamic system than in the interest system (Khan, 1989; Siddiqui, 1998; Ibrahim and Bashir, 1999; Haque and Mirakhor, 1989; Ibrahim, 2002; Ibrahim, 2000; Presley and Presley, 1994; Khaldi and Hamdouni, 2018). In the light of these studies, we will try to present a mathematical model that analyzes the relationship of depositors with Islamic banks, which is usually a speculative relationship (Mudharabah) based on profit sharing and comparing the return achieved from Mudharaba with the return from the riba-based loan.

Since the value of the profit attributable to the Mudharaba deposit holder in the Islamic Bank is undefined, and that the depositor may face the risk of loss, the uncertainties will arise.

In the area of financial investment, the diversification of the portfolio is among the important decisions. Many dealers do not accept risk higher than average risk, to obtain returns higher than average returns [8]. Most dealers can be considered a risk-averse person (Baily et al., 1980).

On the other hand, the financial theory recognizes in advance that risk-taking or acceptance is compensated. To obtain the highest rate of return, the investor must accept the highest level of risk (Hanna and Chen, 1997).

The investor must determine how much risk he accepts. This type of decision for the investor is important and decisive. The Normative model is the ablest to help decision-making under uncertainty, which expects utility (Schoemaker, 1982).

Most studies of optimal behavior under uncertainty, and where investor aversion to risk assumes that the expected utility must be maximized, the utility is a *function* of the argument *wealth* (Hanna and Chen, 1997). Maximizing the expected utility is the widely used approach to optimal portfolio analysis [30]. The optimal portfolio maximizes the expected utility, among the available portfolios.

Among the types of utility functions expected in the analysis of investment decisions is the utility function with *the stability* of constant *relative risk aversion* (CRRA) (Samuelson, 1990). The analysis below will be used using the partial equilibrium theory (maximizing the expected utility) for the risk-averse investor. The mathematical model was inspired by a study of Shahid and Bachir (Ibrahim and Bashir, 1999).

However, we disagreed with the researchers on several points, including:

- Inflation rate: the researchers took into consideration to find the current values for consumer utility at time $t = 1$ the discount coefficient that includes the expected inflation rate, so, the futures values have been linked to the inflation rate or to the change in the general price level (Indexation).

However, by reference to Islamic jurisprudence, the question of linking future rights and obligations to change in the general price level has been rejected. Some people legalize interest on account of inflation and decrease in purchasing power of the lent money. They say that the borrower must indemnify the lender in case of depreciation of the loan amount due to inflation.

They criticize the theory of Islamic finance as it does not accept indexation of financial liabilities with gold, baskets of goods or any stable currency. But the owners of the four schools of thought in Islam: the Maaliki, the Shafa'i, Hanbali and Hanafi agreed that the borrower must pay back dinars and dirhams, and debt liability cannot increase due to inflation. Lending in Islam is a virtuous activity since the lender must give away the lent goods/money to the borrower for the period of the loan without seeking any compensation. If the value of that loan decreases due to inflation, it is as if the lender has made a larger virtue. The Holy Qur'an encourages giving extra time to borrowers who are in difficulty or faced with financial constraint. Therefore, the Fiqh Academy of the OIC has categorically ruled out as strictly forbidden the commonly suggested solution of the indexation of a lent amount of money to the cost of living, interest rates, GNP growth rates, the price of gold or some other commodities. However, one can lend in terms of gold or any other currency which is considered not vulnerable to inflation. In this case, too, debt liability cannot increase due to inflation (Ayub, 2007).

This rule applies to the banknotes in circulation in our time because they replaced the dirhams and dinars in circulation because:

* Linkage such as usury: The fuqaha have categorically rejected the concept of linking on the basis that it contradicts the prohibition of usury in Islam (Zaman, 1985).

In case the loan or debt is linked to change in the general price level, the linkage leads to obtaining a return, even if this return is not real cash, and this is like a "*Riba al-nasi'ah*". There are also jurisprudential objections to linking transactions at prices as a kind of "*Riba al-fadhl*".

* Linking includes ignorance (Jahl or Jahala): One of the terms of the deferred payment contract according to Islamic law is the definition of the obligation at the time of the contract. If this obligation is not known, it is like "Jahala" and therefore the contract becomes voidable. In the case of linkage, the amount of the obligation is not known to be specified or confirmed only at maturity. The linking of future obligations to changes in the general price level means reserve (against inflation), and this situation may arise or not arise, and is considered as "gharar" (Zaman, 1985), which nullifies the contract.

* Linking restrain risk: Linking future liabilities to change in the general price level in a period of continuous inflation means that lenders have a profit without risk (Siddiqui, 1985). This restrains the risk of trade in favor of bank investments.

* Linking increases the severity of inflation: Over the past two decades, the linkage experience has shown that inflation remains. The main reason for this is that linkage tends to weaken resistance against inflation because it temporarily eases the troubles caused by inflation, relieving pressure on governments to pursue sound policies, and maintaining sustained inflation. Moreover, the linkage leads to the acceleration of inflation rates and does not achieve the desired purpose (Siddiqui, 1985).

* Connectivity is an unfair tool: The single index of linkage is not based on the different consumption patterns. In fact, it does not represent the consumer habits of most individuals, and here it negates the principle of social and economic justice.

- The researchers have only determined the *first conditions* to maximize the expected utility of consumption. Under these conditions, the financial asset valuation parameter can be determined, and we will add the first order conditions for maximization.

- Examining the changes in the financial asset valuation parameter according to the

- Non-binary distribution for possible profit and loss.
- We added to the model Zakat rate Z

1. Model

Consider a two-step model: $t = 0$, $t = 1$, and the allocations (wealth) for an economic trader, are W_0 , W_1 in the two periods, $t = 0$ and $t = 1$, respectively.

Rational traders try to invest part of W_0 after consuming a certain part C_0 .

Assuming that the only option available to the trader is to invest his remaining funds in the Mudharaba formula by placing his money as a deposit (Mudharaba deposit) with an Islamic bank. After investing this deposit, the Islamic Bank achieves the value P for its project in period $t = 1$, the Bank will pay to the client (in case of profit) the face value of his deposit, plus a specified and agreed percentage of the increase achieved on the basis of the lowest liquidity value. The basic conditions of the first order to maximize the expected benefit of the client determine the coefficient of valuation of the financial asset (Mudharaba deposit).

The analysis below maximizes the expected benefit of the client's wealth within his budget.

3.1. The objective function:

The agent's behavior is a maximization problem. It means making the most of his limited resources to maximize the utility expected of his wealth:

$$\max_{Q_0, C_0, C_1} \{U(C_0) + \rho U(C_{1a}) + (1 - \rho)U(C_{1b})\} \quad 0 < \rho < 1 \quad (1)$$

The budget constraints are:

$$G_1 = W_0 - Q_0 - C_0 + Z_2 (W_0 - Q_0 - C_0) = 0$$

$$G_1 = (1 + Z_2) (W_0 - Q_0 - C_0) = 0$$

$$G_1 = W_0 - Q_0 - C_0 = 0 \quad (2)$$

$$G_2 = C_{1a} - W_1 - Q_0 (1 + \delta_a \theta) + Q_0 \delta_a \theta Z_2 = 0$$

$$G_2 = C_{1a} - W_1 - Q_0 (1 + \delta_a \theta (1 - Z_2)) = 0 \quad (3)$$

$$G_3 = C_{1b} - W_1 - Q_0 (1 + \delta_b \theta (1 - Z_2)) = 0 \quad (4)$$

by assuming:

$$\delta_a > 0, \quad \delta_b < 0$$

Where: $E_0\{.\}$: expectation for period $t = 1$.

$U(.)$: utility function.

C_0 and C_1 represent the consumption of the trader in periods $t = 0$ and $t = 1$, respectively.

ρ : represents the probability of profit.

P : represent liquidity value of the project in the period $t = 1$.

P' : represent the minimum liquidity value of the project in $t = 1$.

Q_0 : The nominal value of the deposit.

W_0 and W_1 are the allocations (wealth) in periods $t = 0$ and $t = 1$, respectively.

θ : participation in increased parameters.

$\delta = \frac{p'-p}{p'}$: represent the increase in the value of the project on the minimum liquidity value.

Z_2 : Zakat rate

To solve the maximization of utility equations under the previous budget, the Lagrange function L is written as follows:

$$L = U(C_0) + \rho U(C_{1a}) + (1 - \rho) U(C_{1b}) + \lambda_1 G_1 + \lambda_2 G_2 + \lambda_3 G_3$$

Where λ_1, λ_2 and λ_3 represents Lagrange multipliers, and to solve Lagrange's function, the equation is derived based on variables C_0, Q_0, C_{1a}, C_{1b} , as follows:

Adequate conditions for maximization (*first order conditions* from the *Lagrangean*):

$$\frac{\partial L}{\partial C_0} = U'(C_0) - \lambda_1 = 0 \Rightarrow U'(C_0) = \lambda_1 \tag{5}$$

$$\frac{\partial L}{\partial C_{1a}} = \rho U'(C_{1a}) + \lambda_2 = 0 \Rightarrow -\rho U'(C_{1a}) = -\lambda_2 \tag{6}$$

$$\frac{\partial L}{\partial C_{1b}} = (1 - \rho)U'(C_{1b}) + \lambda_3 = 0 \Rightarrow -(1 - \rho)U'(C_{1b}) = -\lambda_3 \tag{7}$$

$$\begin{aligned} \frac{\partial L}{\partial Q_0} &= -\lambda_1 - \lambda_2(1 + \delta_a \theta (1 - Z_2)) - \lambda_3(1 + \delta_b \theta (1 - Z_2)) = 0 \\ \Rightarrow -U'(C_0) + \rho U'(C_{1a})(1 + \delta_a \theta (1 - Z_2)) + (1 - \rho)U'(C_{1b})(1 + \delta_b \theta (1 - Z_2)) &= 0 \end{aligned} \tag{8}$$

$$\frac{\partial L}{\partial \lambda_1} = W_0 - Q_0 - C_0 = 0 \tag{9}$$

$$\begin{aligned} \frac{\partial L}{\partial \lambda_2} &= C_{1a} - W_1 - Q_0(1 + \delta_a \theta (1 - Z_2)) \\ &= 0 \end{aligned} \tag{10}$$

$$\begin{aligned} \frac{\partial L}{\partial \lambda_3} &= C_{1b} - W_1 - Q_0(1 + \delta_b \theta (1 - Z_2)) \\ &= 0 \end{aligned} \tag{11}$$

Solution of the model:

We have reached *first order conditions* from the *Lagrangian* that:

$$-U'(C_0) + \rho U'(C_{1a})(1 + \delta_a \theta (1 - Z_2)) + (1 - \rho)U'(C_{1b})(1 + \delta_b \theta (1 - Z_2)) = 0 \quad (8)$$

When equation (9), (10) and (11) are computed in equation (8) we obtain:

$$-U'(W_0 - Q_0) + \rho(1 + (1 - Z_2)\delta_a \theta) + U'(W_1 + Q_0(1 + (1 - Z_2)\delta_a \theta)) + (1 - \rho)U'(W_1 + Q_0(1 + (1 - Z_2)\delta_b \theta))(1 + \delta_b \theta (1 - Z_2)) = 0 \quad (12)$$

By giving the exact configuration for utility function, and values for W_0 , W_1 , Q_0 , δ_a and δ_b , we obtain a value of θ from Equation (12).

3.3. Testing hypothesis through simulations:

Simulations methodology leads to a resolving model for the risk-averse investor under the following assumptions:

1 - As mentioned earlier, for risk-averse agent, Relative Risk Aversion is Constant. Relative Risk Aversion is called *constant-relative risk aversion utility functions* CRRA.

Assuming that CRRA is:

$$U_{C_i} = \left(\frac{[C_i]^{1-\alpha}}{1-\alpha} \right)$$

The derivation of this function is:

$$U'_{C_i} = \frac{1}{[C_i]^\alpha}$$

This allows us to write equation (12) as follows:

$$\frac{1}{(W_0 - P')^\alpha} = \frac{\rho(1 + (1 - Z_2)\theta\delta)}{(W_1 + P'(1 + (1 - Z_2)\delta_a \theta))^\alpha} + \frac{(1 - \rho)(1 + (1 - Z_2)\theta\delta)}{(W_1 + P'(1 + (1 - Z_2)\delta_b \theta))^\alpha} \quad (13)$$

2- In the case of interest-bearing fixed interest loan, equation (10) is written as follows:

$$\frac{1}{(W_0 - Q_0 r)^\alpha} = \frac{1+i}{(W_1 + Q_0 r(1+i))^\alpha} \quad (14)$$

3- The Bank's project offers:

- A non-binary distribution of the probability of profit or loss, where:

ρ^* Represents the probability of profit.

$(1 - \rho)^*$ Represents the probability of loss.

The solution:

- By giving values for $W_0, W_1, Q_0, \alpha, \delta_a$ and δ_b (in equation 13) and using Maple 9.5, we obtain θ values and hence the return on Mudharabah financing.

- And when compensating for the same values (W_0, W_1, Q_0, α) (in equation 14)) and using Maple 9.5, we find values for (i) and where we get the return from interest financing.

- We will study a solution with the changes in θ in terms of: W_0, Q_0, ρ , and β where β is the amount of money invested relative to the primary wealth $W_0\beta = Q_0$. We have:

$$\rho(1 + (1 - Z_2)\theta\delta_a)U'(W_1 + Q_0(1 + (1 - Z_2)\delta_a\theta)) + (1 - \rho)(1 + (1 - Z_2)\theta\delta_b)U'(W_1 + Q_0(1 + (1 - Z_2)\delta_b\theta)) - U'(W_0 - Q_0) = 0$$

(15)

Assuming:

$$\delta_a > 0, \quad \delta_b < 0$$

- The *constant-relative risk aversion utility functions* CRRA is of the form:

$$U(x) = \frac{x^{1-\alpha}}{1-\alpha} \quad 0 < \alpha, 1, x > 0$$

$$\Rightarrow U'(x) = x^{-\alpha}$$

$$\Rightarrow U''(x) = -\alpha x^{-\alpha-1}$$

$$\Rightarrow U''(x) < 0$$

Simulation No. 1: Case 1: Study change in θ in terms of Q_0

$$\theta = H(Q_0)$$

We study the derivative signal: $H'(Q_0)$ with assuming the stability of $W_0, W_1, \delta_a, \delta_b, \alpha$ and ρ . After studying the derivative signal, we find that:

θ is an increasing function for Q_0 , if: $\rho \gg \frac{-\delta_b}{\delta_a - \delta_b}$

θ is a decreasing function for Q_0 , if: $\rho \ll \frac{-\delta_b}{\delta_a - \delta_b}$

Case A: $\rho \gg \frac{-\delta_b}{\delta_a - \delta_b}$

We can obtain Figure 01 - A by assuming:

$$\alpha = 0.3, W_0 = 10, W_1 = 1, Q_0 = 1 \dots 5, \rho = 0.6, \delta_a = 0.547, \delta_b = -0.2, Z_2, \theta = 0 \dots 1$$

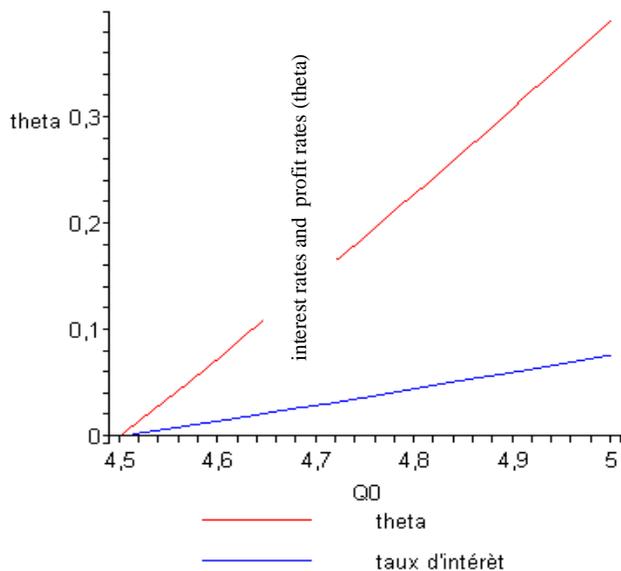


Figure 01 - A: Comparison of profit rates with interest rates in terms of invested funds in case: $\rho \gg \frac{-\delta_b}{\delta_a - \delta_b}$

Case B: $\rho \ll \frac{-\delta_b}{\delta_a - \delta_b}$

We can obtain Figure 01 - B with assuming:

$$\alpha = 0.3, W_0 = 10, W_1 = 1, Q_0 = 1 \dots 5, \rho = 0.14, \delta_a = 0.547, \delta_b = -0.2, Z_2, \theta = 0 \dots 1$$

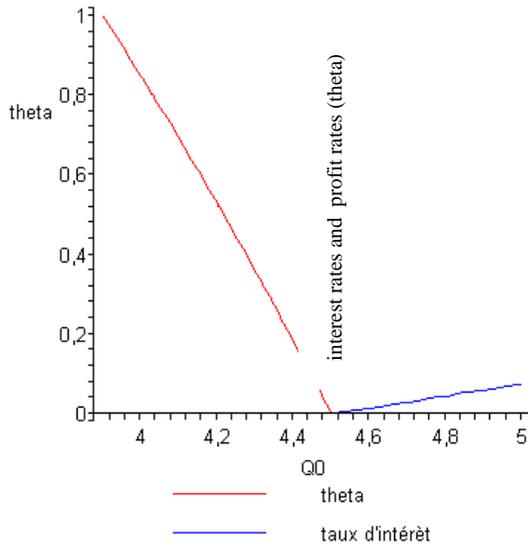


Figure 01 - B: Comparison of profit rates with interest rates in terms of invested funds in case: $\rho \ll \frac{-\delta_b}{\delta_a - \delta_b}$

Simulation No. 1: Case 2: Study change in θ in terms of W_0 :

Assuming that $Q_0, W_1, \delta_a, \delta_b, \alpha$ and ρ are constants, and after studying the derivative signal, we find that:

θ is a decreasing function for W_0 , if: $\rho \gg \frac{-\delta_b}{\delta_a - \delta_b}$

θ is an increasing function for W_0 , if: $\rho \ll \frac{-\delta_b}{\delta_a - \delta_b}$

Simulation No. 2: Case A:

We can obtain Figure 02 - A by assuming:

$$\alpha = 0.3, W_0 = 1 \dots .90, W_1 = 1, Q_0 = 2, \rho = 0.6, \delta_a = 0.547, \delta_b = -0.2, Z_2, \theta = 0 \dots .1$$

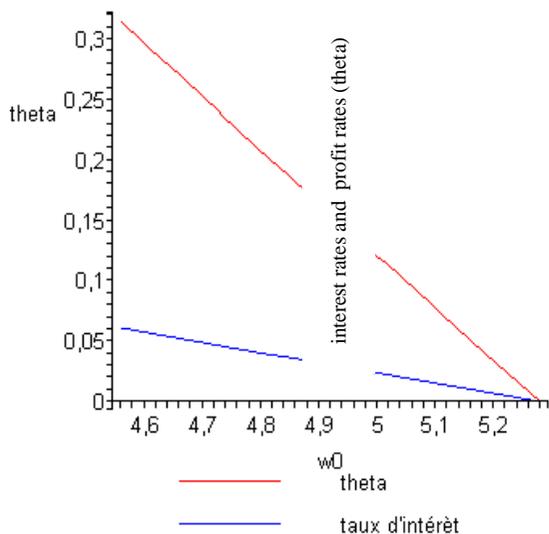


Figure 02 - A: Comparison of profit rates with interest rates in terms of Primary wealth in case: $\rho \gg \frac{-\delta_b}{\delta_a - \delta_b}$

Simulation No. 2: Case B:

We can obtain Figure 02 - B by assuming:

$$\alpha = 0.3, W_0 = 1 \dots 90, W_1 = 1, Q_0 = 2, \rho = 0.14, \delta_a = 0.547, \delta_b = -0.2, Z_2, \theta = 0 \dots 1$$

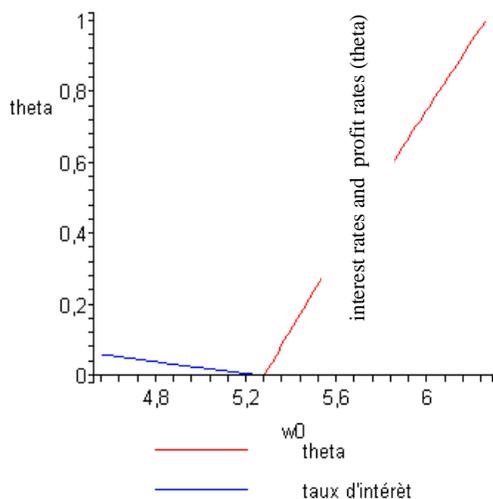


Figure 02 - B: Comparison of profit rates with interest rates in terms of Primary wealth in case: $\rho \ll \frac{-\delta_b}{\delta_a - \delta_b}$

Simulation No. 2: Case 3: Study change in θ in terms of β :

$W_0\beta = Q_0$ Where $0 < \beta < 1$ and $W_0, W_1, \delta_a, \delta_b, \alpha$ and ρ are constant and after studying the derivative signal, we find that:

θ is an increasing function for β , if: $\rho \gg \frac{-\delta_b}{\delta_a - \delta_b}$

θ is a decreasing function for β , if: $\rho \ll \frac{-\delta_b}{\delta_a - \delta_b}$

Simulation No. 3: Case A:

We can obtain Figure 03 - A by assuming:

$$\alpha = 0.3, W_0 = 10, W_1 = 1, \beta = 0 \dots 1, \rho = 0.6, \delta_a = 0.547, \delta_b = -0.2, Z_2, \theta = 0 \dots 1$$

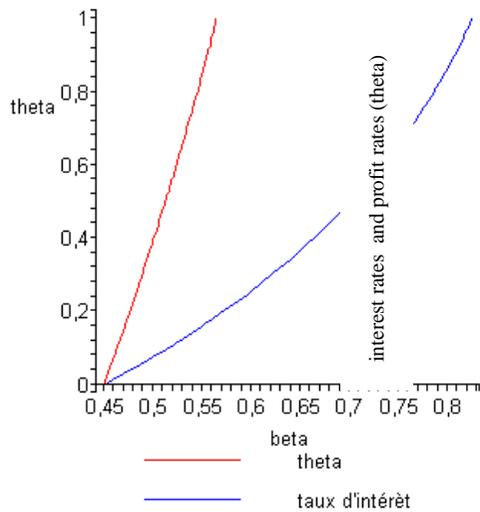


Figure 03 - A: Comparison of profit rates with interest rates in terms of percentage of invested funds to primary wealth in case:

$$\rho \gg \frac{-\delta_b}{\delta_a - \delta_b}$$

Simulation No. 3: Case B: We can obtain Figure 03 - B by assuming:

$$\alpha = 0.3, W_0 = 10, W_1 = 1, \beta = 0 \dots 1, \rho = 0.14, \delta_a = 0.547, \delta_b = -0.2, Z_2, \theta = 0 \dots 1$$

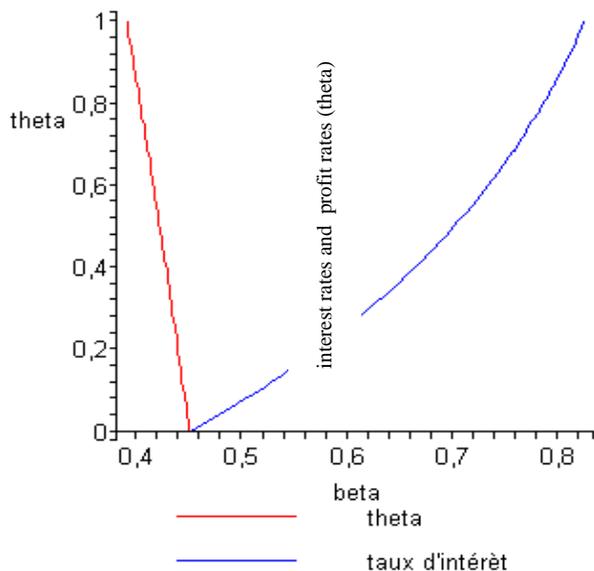


Figure 03 - B: Comparison of profit rates with interest rates in terms of percentage of invested funds to primary wealth in case:

$$\rho \ll \frac{-\delta_b}{\delta_a - \delta_b}$$

Simulation No. 4: St

$W_0, W_1, \delta_a, \delta_b, \alpha$ and Q_0 are constant. After studying the derivative signal, we find results in simulation No.4.

We can obtain Figure 04 by assuming:

$$\alpha = 0.3, W_0 = 10, W_1 = 1, \rho = 0 \dots 1, Q_0 = 5, \delta_a = 0.547, \delta_b = -0.2, Z_2, \theta = 0 \dots 1$$

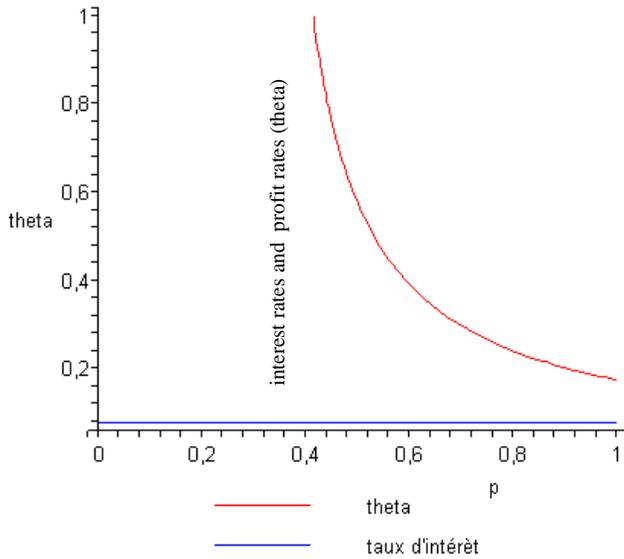


Figure 04: Comparison of profit rates with interest rates in terms of profit probability

It should be noted that the obvious turning point in all curves corresponds to low-profit potential:

$$\rho = \frac{-\delta_b}{\delta_a - \delta_b} \Rightarrow 1 - \rho = \frac{\delta_a}{\delta_a - \delta_b}$$

Meaning that the maximum probability of loss = $\rho^* \frac{\delta_a}{\delta_a - \delta_b}$

This probability is minimal if: $\delta_a - \delta_b \gg 0 \Rightarrow \delta_a \gg \delta_b$

This means that if the expected profit from the project is much higher than the expected losses, the maximum probability of loss is minimal. And this makes the Mudharaba contract more efficient as it yields greater returns and less risk.

Model Results:

- Overall, the model demonstrates the effectiveness of Islamic finance compared to interest financing. In all cases studied, the expected return from Islamic finance exceeds the return of the riba-based loan and the maximum probability of loss is minimal.
- The profit-sharing parameter θ is positively proportional to the variables: Q_0 and β and is inversely proportional to ρ and W_0 .
- There are limits to the values of both Q_0, β, ρ and W_0 . The investor should not exceed them either as a minimum or a maximum as described through simulation.

• This will help the investor to decide, giving him an idea of the θ values that will maximize his expected utility within his capabilities, which should be negotiated with the other party organizer.

Study Results and Conclusion

The previous study leads to the following results:

- The return levels of the Mudharaba contract may be greater than the return levels of the riba-based loan, which will support the ability of Islamic banks to attract more investment deposits, thereby contributing to increased levels of savings. This conclusion contradicts Priyor [33] opinion: "... the removal of the nominal interest rate will reduce savings in the Islamic economic system, assuming the stability of other factors."

- The return on financing in the Islamic system is determined based on the actual results of the project. The return is linked to production in the real sector. Thus, the correlation between the rates of return in the financial and real sectors of the Islamic system is stronger than in the interest system. This means that the cycle capacity (volatility) in different stages of the business cycle will be lower in an Islamic economy than in a capitalist economy.

- The previous observation provides self-stabilizing factors in the investment process, as demonstrated by Khan and Mirakhor (1994). It also proves that investment decisions are based on financing considerations (How the entity is funded), unlike the theory of the capital structure for Modigliani and Miller (1958).

- Treating losses of investment activity of Islamic banks as if they reflect an erosion of the nominal value of deposits, reflects the ability of the Islamic banking system to adapt to the shocks caused by banking crises and the disruption of the functioning of the State's payment system. When such a shock occurs, banks can absorb these shocks immediately by changing the nominal values of deposits held by the public at the bank. Therefore, the true values of the assets and liabilities of the Islamic Bank will be equal at every moment. But in the interest system, the nominal value of deposits is fixed (guaranteed). Such shocks can lead to a divergence between real assets and real liabilities. This recession in the interest system may lead to instability (Ayub, 2014).

- Islamic financing using Mudharaba can be very effective in development, by helping to create innovators and finding them, because it mates between those with money and those with ideas in the world of investment and development, and this is especially important in the economies based on surplus labor (Khan, 1989).

- We obtained the same results in our previous research in which we compare Islamic Financial intermediation to Ribaoui financial without Zakat (Khaldi and Hamdouni, 2018).

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