Investment Deposits, Risk-Taking and Capital Decisions in Islamic Banks

Hichem Hamza*
Zied Saadaoui

This paper examines the relationship between the volume of investment deposits (profit sharing investment accounts – PSIA) and capitalization of Islamic commercial banks in a context of asymmetric information. Unlike current accounts holders, investment accounts holders may support part or all of the losses on assets value, which could be a source of moral hazard among bank managers and shareholders. To test these assumptions, we use the system generalized method of moments (System GMM) on a dynamic panel of 59 Islamic banks observed during the period 2005-2009. After controlling for a set of variables that may influence capital level, the results show a significant negative relationship between PSIA and regulatory capital ratio. This may indicates that the specific nature of PSIA can be a source of excessive risk – taking and higher leverage in order to maximize shareholders value. This behavior is likely to threaten the solvency of Islamic banks and shows that there may exist some deficiencies in their risk management and governance system. Following these results, we suggest some recommendations to better implement the principle of profit and loss sharing and to curb excessive risk-taking in Islamic banks.

Keywords : Islamic banks, Profit and loss sharing, Investment deposits, Capital ratio, risk-taking, Displaced commercial risk.

JEL: C23, D74, G21, G32

1. Introduction

Today, Islamic finance is making progress and becoming more interesting for the international community because of its ethical dimension and its attachment to the real economy. The subprime financial crisis did not exert a significant impact on the performance of Islamic banks and their development around the world. These banks offer products in accordance with the Islamic ethics and encourage productive investment. They also have to save their credibility by ensuring the compliance of their products, financial instruments, operations and their management process with the rules of Islamic law, i.e. Sharia[1]. The originality of Islamic banks consists in the principle of profit and loss sharing (PLS) between shareholders and their partners. This notion of equitable sharing is a key element in the concept of Islamic finance as it is supposed to reflect the values of Islam. Under the rules of Sharia, no one can claim any compensation without incurring some of *ex ante* investment risks (*al-ghounm bi al-ghourm*). From this rule emerged the principle of profits and loss sharing, according to which the parties of a financial transaction must share equally the risks and returns. The PLS is the central axis of Islamic banking intermediation, because of its

* Corresponding author. University of Manouba, École Supérieure de Commerce de Tunis. Laboratoire d'Économie et Finance (ECOFI), IHEC Carthage-Présidence 2016 Tunis, [Tunisia]. Tel : (+216) 98 20 62 44. Email : hichemhamza@yahoo.fr

[1] This is the task of a supervising committee inside the bank, called Sharia Committee.

effect on the two sides of bank : the balance-sheet and the assets and liabilities, which are both subject to the condition of PLS between shareholders, entrepreneurs (borrowers) and depositors (Chong and Liu, 2009).

From the liabilities side, the principle of PLS is applied through profit sharing investment accounts (PSIA), which are specific to Islamic Banks. Unlike conventional banks' deposits, contractual relationship between Islamic banks and investment account holders (IAH), i.e. the PSIA holders, called *Mudaraba,* is based on the concept of PLS. In this scheme, IAH do not have the same rights as depositors or shareholders, but they are required to absorb any losses on assets, except the cases of negligence or misconduct by the bank. Thus, as pointed out by Archer and Karim (2009), PSIA are not insured accounts, or capital certain, they are rather treated as investment products. The fact that IAH are considered as investors and do not enjoy the same guarantees as other depositors (current accounts and savings accounts holders), or as shareholders, raises a major problem of governance that could impact negatively Islamic banks creditworthiness, through bank managers' capital and risk decisions.

This paper aims to enhance the discussion about governance and prudential regulation of Islamic banks, by examining the impact that may exert the level of PSIA on banks behavior. This problematic is interesting for three reasons. First, contrary to current accounts, PSIA can be a source of moral hazard, since the bank is not constrained, in case of bankruptcy, to repay IAH because they have to conform to the principle of PLS. Second, these accounts represent a large share of Islamic banks' liabilities. Consequently, through PSIA Islamic banks are able to invest in costly operations like *mudarabah* and *Musharakah*, which are riskier than commercial operations, but more profitable (Archer and Karim, 2009). Third, in a context of incomplete information and lack of transparency, IAH face the risk of mismanagement of *mudarabah* funds, because they are not able to monitor efficiently investment decisions done by the bank (Islamic Financial Services Board (IFSB, 2006).

This paper draws on theoretical and empirical studies on leverage, moral hazard and their impact on bank capitalization (Merton, 1977; Marcus, 1983; Shrieves and Dahl, 1992; Berger et al. 1995; Ahmad et al. 2009). Particular attention is paid to the effect exerted by PSIA on Islamic banks capitalization. Moral hazard may, indeed, arise from the liabilities side, in the case where PSIA encourage banks to take greater risks and to operate with less capital (Visser, 2009)[2]. Therefore, in a context of asymmetric information, increasing PSIA share in banks' liabilities is likely to boost leverage and give incentive to managers to undertake more risky investments decisions, which could negatively affect capitalization and increase insolvency risk. On the opposite side, increasing the share of PSIA can expose the bank to higher displaced commercial risk (DCR), i.e. rate of return risk, especially if this increase is associated with higher leverage and greater risk-taking. In this case the bank would be constrained to cover the DCR through issuing additional equity capital to be able to absorb losses immediately, as required by the guidelines of AAOIFI (1999) and IFSB (2005). Thus, one might also expect a positive relationship between the volume of PSIA and banks capitalization.

The second section of this paper presents the mechanism of PSIA. It addresses, in a first part, the concept of DCR arising from PSIA. After a brief analysis of the causes behind the DCR, we focus on its consequences on bank's capital decisions. In a second part, this section studies the influence of PSIA on Islamic banks risk-taking. This analysis is based on the assumption

[2] It is worth noting that Islamic law prohibits financial transactions involving the notion of "*Gharar*", *i.e.* moral hazard, excessive risk and excessive uncertainty.

of asymmetric information between IAH and their bank, which can give rise to a problem of moral hazard, and excessive risk-taking. Empirical methodology and results of the study are presented in the third section. The hypotheses are tested on a sample of 59 Islamic commercial banks from 17 countries. We use the dynamic panel technique and the system Generalized Method of Moments to try to highlight the central role of PSIA in Islamic banking and their impact on risk-taking and capitalization. Finally, the fourth section concludes the paper and proposes some recommendations.

2. Islamic banking intermediation and the risk-sharing principle

The principal characteristic that distinguishes commercial Islamic banks from conventional banks is the paradigm of PLS. In fact, the *mudarabah* contract allows Islamic banks to ensure a traditional intermediation function. Under this contract, the bank simultaneously plays the role of entrepreneur (*mudarib*) and capital provider (*Rab al mal*). On the liability side, as a *mudarib*, the bank manages the customer's deposit accounts. From the asset side, as a *Rab al Mal*, it should make the collected funds available to entrepreneurs (Jouini, 2008). *Mudaraba* allows the sharing of gains, while losses are borne only by the provider of capital.

In fact, Islamic assets are divided into two categories: commercial assets and profit and loss sharing assets. The first category includes mainly the instruments of *murabaha*, *istisna*, *salam* and *ijara*, through which the bank plays a commercial role rather than a traditional role of intermediation. These financing instruments are not based on the principle of PLS, but rather on a transfer of ownership of (underlying) assets from bank to customers[3].

The two main types of investment contracts, or PLS assets, are *musharakah* and *mudarabah*. A *musharaka* contracts means that the bank and the customer make partnership to finance a project or a transaction, in which they support the same risk, in proportion to their participation. *Musharaka* contracts can be a source of regular income for Islamic banks, enabling them to provide an interesting rate of return to shareholders and depositors. Under a *mudarabah* contract, a partnership is required between the investor, the Islamic bank, which provides capital (*Rab al mal*) and an entrepreneur (*mudarib*), which provides expertise. The major feature of this operation is that *Rab al mal* bears the entire risk of loss, while the losses borne by the entrepreneur is limited to his efforts, except in case of negligence or misconduct from his part. Profit distribution between the two parties is fixed *ex-ante*, after paying management fees to the contractor (the bank). Thus, the advantage of *mudarabah* is that it requires the entrepreneur to manage more carefully the project in order to increase its earnings, which in turn depends directly on the performance of the project.

From the liabilities side, this study will focus exclusively on unrestricted PSIA, because restricted PSIA are off-balance sheet operations[4]. Therefore, the bank incurs no risk in this intermediation process, since the probability of default is totally born by the customer[5]. If depositors choose to hold the unrestricted form of PSIA, then their funds will be affected into a common fund in order to be used by the bank, which means that only the bank decide how to invest unrestricted PSIA. Through investment-deposits accounts, the *ex-ante* rate of return on investment (interest rate premium) in conventional banks is replaced by an uncertain *ex-post* rate of return that must follow the principle of PLS. In fact, the unrestricted PSIA holders

[3] For example, in the case of *Murabaha*, Islamic bank acquires a tangible asset, store and transfer it to a customer and assumes a part of the legal and business risk born by this asset.
[4] Since the customers in restricted PSIA choose by themselves in what project they will invest their funds.
[5] In this case, the bank earns only a management fee.

are directly involved in the medium and long term assets funded by PSIA, but without receiving guarantees or voting rights as it is the case for shareholders and current account holders. In other words, under the *mudarabah* contract governing the relationship between Islamic banks and IAH, the profits are shared according to a predetermined rule, while losses on assets funded through PSIA, are borne only by the IAH, except in case of misconduct, or negligence from the bank[6]. This depends, however, on the modality with which unrestricted PSIA funds are invested. Indeed, these accounts can be commingled with current accounts and shareholders' equities in order to finance assets. This operation is called a *mudaraba-musharaka* operation or bilateral *mudaraba*, in which the bank can invest its own capital to the project managed by the entrepreneur. In this case, the risk of loss will be suffered also by the bank (Archer and Karim, 2009).

Therefore, it is worth asking whether the PSIA based on the *mudaraba* or bilateral *mudarabah*, can lead to distortions in the attitude of Islamic banks' managers. Indeed, it is the IAH who, to some extent, support the major part of assets default risk. But, before examining this question, we begin by a brief presentation of the most emphasized risk by the literature and regulatory institutions in relation with PSIA, i.e. the displaced commercial risk.

2.1. PSIA, competitive return and capitalization

PSIA were designed to achieve equitable sharing of risk, which is one of the principles of Islamic finance. These investment-deposits have also been created as an alternative to interest earning term-deposits, because Shariah prohibits remuneration of capital. PSIA offer a remuneration that varies with profitability of bank assets, according to a set of criteria agreed in advance with the bank[7]. Thus, Islamic banks are constrained to conform to the principles of *Shariah* and, at the same time, to face hard competition from conventional banks. They are also forced to adjust their operations and strategies to a legal and institutional environment which is often favorable to conventional financing activities. Moreover, Islamic banks often face a problem of liquidity management, given the narrowness of the interbank market through which they can lend or borrow short-term funds. Transactions on this market are very limited, which is a handicap for Islamic banks preventing them to place liquidities in riskless securities, such as short-term government bonds or other money market instruments.

Furthermore, Islamic banks do not have the possibility to manage their liquid reserves through short-term money market instruments or through interest-free borrowing from the Central Bank. Besides, given the absence of a deposit insurance system or a mechanism of lender on last resort compatible with the *Shariah* principles, Islamic banks are required to bear a greater share of the risks they face and constrained to deal with higher liquidity risks than conventional banks (Ahmad, 2008). Similarly, the absence of a large and deep secondary market for Islamic financial instruments reduces the ability of Islamic banks to effectively manage their assets and liquidities. Finally, Islamic banks also suffer from a quasi absence of risk-management techniques such as securitization, and from the underdeveloped of Islamic financial markets. All these factors are sufficient to aggravate liquidity problems for Islamic banks by preventing them from managing their cash items and improving risk diversification opportunities.

All these disadvantages make more difficult for Islamic banks to predict and to stabilize the rate of return of PSIA, which depends mainly on the level of competition between banks.

[6] This operational risk, also called fiduciary risk, must be absorbed by the banks (AAOIFI, 1999).
[7] Nevertheless, PSIA rate of return is often indexed to the market interest rate (Sundararajan, 2005).

Therefore, it is more difficult for Islamic banks to maintain their market power and to compete with conventional banks. This could ultimately make investors lose their confidence and push them to withdraw their funds. The cost due to the loss of competitiveness, caused indirectly by PSIA, is called Displaced Commercial Risk (DCR)[8]. Thus, DCR refers to unexpected losses that the bank is able to absorb to ensure that IAH are remunerated at a competitive rate (Toumi, 2010).

In order to overcome this risk, the IFSB (2005) recommended the use of Profit Equalization Reserves (PER) to smooth profit payout, and Investment Risk Reserves (IRR) to cover unexpected losses on PSIA returns. This income smoothing practice is proposed as a solution to attract IAH and to reduce the probability of bank runs. Indeed, if a bank uses unrestricted PSIA to finance *mudarabah*, *musharakah*, or other commercial assets, earning coming from these operations will be paid to IAH, only after withdrawing the sum of the PER, the shareholders' profit, the management fee and finally the IRR. Thus, during periods of economic expansion, higher profits enable Islamic banks to increase reserves in anticipation of higher DCR that could arise in period of economic recession and loss of competitiveness.
Moreover, the management fee is an important revenue source for Islamic banks, but also suffers from shortcomings that can affect profit-sharing between shareholders and IAH. In fact, the two parts share the same probability of losses, but with management fees, shareholders get higher returns (Archer and Karim, 2009). Similarly, in case of loss of competitiveness, Islamic banks can use reserves to guarantee the same level of returns to IAH. If these reserves are insufficient to cover the DCR, then the bank is constrained to lose some or its entire management fees, in order to maintain the expected level of PSIA rate of return. If both of reserves accounts and management fees fail to cover DCR, then the bank will turn to increase its equity-capital in order to preserve the confidence of IAH and avoid a massive withdrawal of investment-deposits. Reciprocally, higher volume of PSIA indicate good competitive situation and higher expected profits that should be followed by a strengthening of regulatory capital in order to cover DCR in the future. Consequently, DCR may have a direct impact on capital investment in Islamic banks (Archer and Rifaat, 2009; Grais and Kulathunga, 2007).

From a regulatory point of view, some Islamic banks are obliged to respect a minimum level of regulatory capital to cover DCR, as it is the case in Bahrain or in the United Arab Emirates. The IFSB (2005) and the AAOIFI (1999) propose to take into account the DCR in the calculation of regulatory capital ratio (Turk Ariss and Safieddine, 2007)[9]. Regulatory capital should absorb the losses on assets funded by unrestricted PSIA for three main reasons: first, these accounts share some features of equity-capital and thus must be adequately protected. Then, PSIA must be adequately covered because they are not perpetual instruments like equity shares, so they can be repaid at any time before maturity. Finally, IAH have no

[8]The AAOIFI (1999) identifies this risk as the probability of loss of competitiveness due to a greater uncertainty regarding the PSIA rate of return. The IFSB (2005) make the following definition: "Displaced Commercial Risk refers to the risk arising from assets managed on behalf of Investment Account Holders which is effectively transferred to the Islamic Financial Institutions own capital because the IFI forgoes part or all of its mudharib's share (profit) on such fund, when it considers this necessary as a result of commercial pressure in order to increase the return that would otherwise be payable to Investment Account Holder's" (2005, § 76).

[9] As under the Basel Committee on Banking Supervision guidelines, IFSB divides regulatory capital instruments as two main categories: the Tier one capital instruments (equity-capital, retained results, legal reserves) and the Tier two capital instruments (occulted reserves, loan loss provisions, long term subordinated debts, hybrid debt-capital instruments). The minimum capital ratio defined by the IFSB is equal to the sum of Tier one and Tier two divided by risk weighted assets, and it must not be lower than 8%.

governance right, like voting rights, to control investment decisions or to have good access to information, this is why they need protection.

But, in addition to these issues related to DCR, the specific nature of PSIA raises further questions about their influence on Islamic banks behavior, especially on capital and risk-taking decisions. This question will be discussed in the next section.

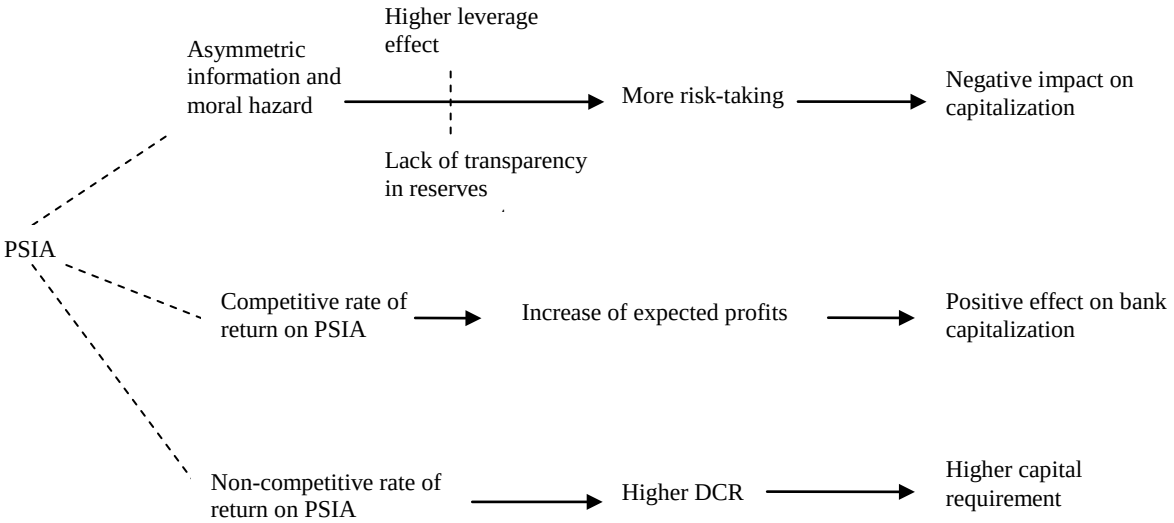
2.2. PSIA, risk-taking and capital decisions

Unlike current accounts, Islamic banks do not have to provide liquidity insurance to IAH. In the case where the bank plays the double function of capital provider (through the allocation of unrestricted PSIA) and entrepreneur, it does not support the losses on assets financed by these accounts, unless it participates to the project, through a *musharakah-mudarabah* operation. This means that, somehow, the PSIA can be compared to fully guaranteed deposit accounts in conventional banking. In other words, shareholders of Islamic banks are aware that in case of bankruptcy, they will not have to support the losses and to repay the IAH. This suggests that a bank seeking to maximize shareholders' value will try to (excessively) boost leverage by increasing the volume of PSIA. Thus, it is interesting to analyze more deeply the impact of PSIA on bank capital and insolvency risk, in a context of asymmetric information and moral hazard, where an agency problem could arise between shareholders and bank managers, on the one hand, and IAH, on the other hand. As pointed out by Merton (1977), Kareken and Wallace (1978), Gennotte and Pyle (1991) and Shrieves and Dahl (1992), this situation is able to subsidize conventional banks by allowing them to transfer risk from shareholders to depositors. It is possible to transpose this case to Islamic banks, which can be more exposed to moral hazard in a context of asymmetric information. In fact, along with an increase of PSIA share in total liabilities, shareholders' wealth will be less threatened by a risk of losses on assets value. When assets become more risky, it will be more profitable for the bank to increase the share of PSIA, reducing simultaneously its capital ratio, in order to maximize returns on equity at the detriment of its solvency.

Therefore, the nature of intermediation and the composition of liabilities in Islamic banks have important implications on the level of regulatory capital ratio (Grais and Kulathunga, 2007). Playing the role of *mudareb*, the bank does not assume the loss, but shares the profits with IAH. This may encourage them to maximize investments funded by PSIA and to attract more IAH, which can lead to riskier investment decisions in a context of asymmetric information and moral hazard that negatively affects bank capitalization (Visser, 2009; Van Greuning and Iqbal, 2008). Meanwhile, this risky behavior can lead to higher DCR, which in turn requires more capital investment.

Furthermore, by practicing income smoothing, Islamic banks have the discretion in disclosing information about the real return on assets funded by PSIA. This is another problem that can arise in a context of asymmetric information, since in this case the rate of return on PSIA will not adequately reflects the creditworthiness of the bank. This could generate also a risk of misconduct by managers (IFSB, 2005). More precisely, IRR are designed to cover the risk of a decrease in IAH earnings and to absorb losses. These reserves are deducted directly from the share of profit promised to IAH, they affect neither stock returns, nor management fees that accrue to the bank. Thus, they may originate a moral hazard problem by giving incentive to managers to engage in risky activities, to be less vigilant or to misallocate PSIA, leading ultimately to a high level of risk and undercapitalization of banks (IFSB, 2010, § 44).

Diagram 1. Impact of PSIA on Islamic banks capitalization



Thus, as synthesized by the diagram 1, PSIA may lead to an increase of insolvency risk *via* a negative effect on capital ratio in a context of asymmetric information. But this negative effect on capitalization could be offset if the risk-taking and the competitive situation of the bank requires it to allocate more capital to cover DCR. However, these two types of risk, i.e. insolvency risk and DCR, are different. In fact, the DCR is related to the competitive situation of the bank. Thus, its occurrence is independent from the problem of asymmetric information between banks and investors. While insolvency risk is the direct result of asymmetric information and moral hazard, because under these hypotheses, an agency conflict might arise between shareholders and depositors, conducting to excessive risk-taking, higher leverage and undercapitalization. This paper contributes to the literature by separating these two risks associated with PSIA and identifying, with more acuity, the impact of these accounts on capital decision in Islamic banks. We try to verify these issues using a dynamic panel technique in the following empirical study.

3. Data and methodology

The originality of this study stands in the assumption that *PSIA* may originate moral hazard and excessive risk-taking from managers. *PSIA* can also exhort banks to maintain a large volume of reserves to cover the DCR, in order to preserve the *mudarabah* commission and avoid additional charge in capital.

3.1 Sample

In this research on the impact of PSIA on the Islamic bank capital ratio, our procedure for data collection during the period 2005-2009 is based on two steps: First, we use the Bureau VanDisjk Bankscope CD-ROM database (2009) and Zawya website specialized in Islamic financial data[10]. From the sources of information mentioned above, 389 Islamic banks are

[10] http://www.zawya.com.

retained. Because we exclusively focus on commercial banks, investment banks and conventional banks with Islamic window are excluded. The Islamic windows cannot be selected because data on conventional and Islamic products are grouped into the same financial statements. After this initial screening, we obtain 123 Islamic deposit banks and Islamic subsidiaries of conventional banks (mainly in Malaysia). In a second step, and in order to increase the accuracy of our selection procedure, data were collected directly from financial reports and the Bankscope database for verification[11]. Data on PSIA are collected mainly from annual reports because they distinguish between current accounts, savings accounts and investments accounts, which Bankscope does not allow. From this second screening, we retain 59 banks from 17 countries for a total of 295 observations. This sample seems to be fairly representative because it includes the main centers of Islamic finance, namely Malaysia, Bahrain, Pakistan and Iran. Finally, we use the World Economic Outlook report (International Monetary Fund, 2010), to get the data on annual growth in real GDP of each selected country. Table (1), below, shows the selected sample.

Table 1. Sample

Countries	Number of Islamic commercial banks
Saudi Arabia	3
Bahrain	5
Bangladesh	5
Indonesia	3
Iran	3
Jordan	2
Kuwait	2
Malaysia	14
Pakistan	6
Qatar	3
South-Africa	1
Sudan	1
Syria	1
Turkey	4
United Arab Emirates	4
United Kingdom	1
Yemen	1
Total : 17 countries	Total : 59 Islamic commercial banks

3.2. Methodology

3.2.1 Model, variables and hypothesis

3.2.1.1. Partial adjustment model

To analyze the impact of *PSIA* on bank capital decisions, we use the partial adjustment model of capital. According to this model, a bank aims to achieve an optimal level of capital C* by operating a discretionary adjustment. But the existence of adjustment costs constraint the bank to partially adjust capital from one period to another, which requires the introduction of the parameter α. Consequently, for a period (t), discretionary change in capital and risk-taking for a bank (i) is explained by the difference between the target (optimal) level of regulatory capital and its lagged level (C_{t-1}) .

[11] Annual reports are available on banks' websites.

$$\Delta C_{i,t} = \alpha\,(C_{i,t}^{*} - C_{i,t-1}) + \varepsilon_{i,t} \quad (1)$$

We assume that the optimum level of capitalization C* depends linearly on group of exogenous variables which enter in the process of board of director's decision, so the equation (1) can be written as follow:

$$C_{i,t} = \alpha_0 + \alpha_1\, C_{i,t-1} + \alpha_2\, PSIA_{i,t} + \alpha \sum X_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where PSIA is the ratio of investment accounts to liabilities, *X* represents a set of explicative variables divided into two categories: bank specific variables and exogenous variables. The parameter α_1, linked to C_{t-1}, is equal to $(1 - \alpha)$. The existence of adjustment costs imply that α must be negative, so we expect a positive sign of α_1. We suppose, also, that the error term $\varepsilon_{i,t}$ can be decomposed as the sum of two independent components, a random country–specific effect μ_i and a white noise $\upsilon_{i,t}$.

3.2.1.2. Variables

- *Total capital ratio (CAR)*

The dependant variable is the total capital ratio, i.e. the *Cooke* ratio, denoted *CAR*. It is equal to the regulatory capital instruments divided by the volume of risk-weighted assets[12]. The *Cooke* ratio has some advantages since it includes in the numerator only eligible capital instruments accepted by banking authorities. This indicator measures with more accuracy the solvency of a bank, since it associates a risk-weight to every class of assets.

- *Equity capital ratio* (CAP)

In order to check the robustness of estimations, we add a second dependent variable denoted *CAP* measured by the ratio of equity capital instruments to total assets. There is two main differences between CAR and CAP ratios. The first difference is that the numerator of the equity capital ratio contains only the highest quality instruments like common stock, retained earnings, statutory reserves, etc. But not all the instruments of CAP ratio can be eligible from a regulatory view. The second difference stands in the denominator of CAP ratio which is composed of total volume of assets without risk-weights. Despite these differences, CAP ratio is also mainly used by the literature along with CAR ratio to evaluate bank solvency (Shrieves and Dahl, 1992; Bikker and Metzmakers, 2004). Moreover, CAP ratio allows us to get robust results because data are more available for equity capital ratio than for the *Cooke* ratio.

- *Investment accounts (PSIA)*

Our primary focus in this research is on the sign of the parameter α_2 related to the variable PSIA. The relation between *PSIA* and *CAR* ratio can be either positive or negative. Indeed, the

[12] Regulatory capital instruments a decomposed of the Tier 1 instruments (equity capital and reserves), the Tier 2 instruments (occulted reserves, loan loss provisions, hybrid capital-debt instruments, long term subordinated debts) and short term subordinated debt (for market risk).

higher PSIA ratio may be a sign of stronger market power and better competitiveness. In these conditions, the bank is able to increase the volume of its assets, to diversify risk and to invest in more profitable projects, inducing a positive impact on capitalization. However, the impact of the volume of PSIA on CAR ratio can be negative. In presence of asymmetric information and moral hazard problems, higher PSIA ratio may encourage bank's managers to take excessive risk through higher leverage. Thus, when PSIA dominates the liability structure, the bank can be incited to affect more PSIA in risky investment to maximize its value, which may ultimately have a negative impact on capitalization and solvency.

- *Failure risk (Z-SCORE)*

Target capital level depends also on risk-taking decisions. Bank risk-taking can be measured by the z-score, which is a proxy of failure risk widely used in the literature (Goyeau and Tarazi, 1992, Boyd and Runkle, 1993; Lepetit et *al*. 2008; Čihák and Hesse, 2007; Čihák and Hesse, 2008; Laeven and Levine, 2009). In this sense, a high risk of insolvency may be due to excessive risk-taking. Several theoretical and empirical studies have investigated the causality between the risk-taking and the capitalization of conventional banks. Different results show that the relationship between risk and capital can be either positive or negative (Shrieves and Dahl, 1992). In order to measure bank risk, we will use the variable z-score. The latter is also an indicator of financial stability, which is calculated as follows:

$$ZSCORE=\frac{\frac{Equity}{Total\ assets}+ROA}{\sigma ROA}$$

σ_{ROA} is the standard deviation of the ROA.

A high z-score indicates that the risk of failure is low and *vice-versa*. Our first assumption is a positive relationship between z-score and CAR ratio, which means a negative relationship between risk-taking and CAR ratio (Ahmad et *al*., 2008). Accordingly, an increase in z-score (a lower risk of failure) indicates an improvement in assets quality that increases the solvency of banks and thus CAR ratio, and *vice-versa*. The second assumption is a negative relationship between z-score and CAR, which means that an increase in z-score may induce the bank to under-estimate risks and to increase the volume of assets. In this case, one can observe a decrease in regulatory capital. Reciprocally, a decrease of z-score may provoke an increase in CAR ratio, reflecting a prudent behavior from banks to avoid bankruptcy and regulatory sanctions.

- *Bank profitability (ROA)*

The return on assets noted ROA, measured by the ratio of net income to total assets, is assumed to vary positively with CAR ratio, since that banks can increase their capital using retained earnings (Gropp and Heider, 2007; Jeitschko and Jeung, 2007). Then, a positive relationship is expected between ROA and CAR.

- *Bank Size (SIZE)*

We assume that the volume of assets, measured by the natural logarithm of total assets, influence the level of capitalization chosen (Shrieves and Dahl, 1992; Aggrawal and Jaques, 2001, and Heid et *al*., 2003). The higher the volume of a bank's assets (SIZE) is, the easier it is to raise the required funds offered by the capital market. Thus, large banks are expected to target a lower capital level than other banks (Shrieves and Dahl, 1992; Rime, 2001, Van Roy, 2005). The relationship between SIZE and CAR is assumed to be negative.

- *Regulatory pressure (REG)*

Regulatory pressure is among the exogenous factors that can influence the capital level. We expect that regulatory sanctions encourage less capitalized banks to strengthen their capital in order to improve their solvency. If bank Total capital ratio (*CAR*) is less than the minimal regulatory threshold (MinREG) plus one standard deviation of the bank's own Total capital ratio (σ_{CAR}), than it is very likely that, during the next period, this bank will bear regulatory sanctions. The variable REG is defined as follows:

$$REG_{i,t} = 0, \quad \text{if} \quad CAR_{i,t} > MinREG + \sigma_{CARi}$$
$$REG_{i,t} = (MinREG + \sigma_{CARi}) - CAR_{i,t}, \quad \text{if} \quad CAR_{i,t} \leq MinREG + \sigma_{CARi}$$

This Dummy variable is advantageous because it uses the volatility of bank's equity as additional information to capture regulatory pressure (Heid et *al*., 2003, Van Roy, 2005 ; Cannata and Quagliariello, 2006). This measure implicitly supposes that the increase in equity is costly for a bank. The bank prefers to hold capital in excess of the required minimum, especially if capital is quite volatile. We therefore expect a positive relationship between regulatory pressure and capital ratio.

- *Economic growth (GROWTH)*

Finally, in order to check weather macroeconomic environment can also be among the exogenous factors that can influence bank capital decisions, we introduce the economic growth in real GDP denoted GROWTH. We suppose that the improvement of economic conditions and the increase of investment opportunities should improve bank profits and strengthen their capitalization. However, a negative relationship could also be observed between GROWTH and CAR, when banks under-estimate risk during economic booms which induce them to decrease capital. During periods of recession banks become more risk-averse and adopt a more prudent behavior through strengthening capital and reducing credit supply. Thus we expect that the relationship between GROWTH and CAR can be either positive or negative (Bikker and Metzmakers, 2004; Jopkii and Milne, 2007; Stolz and Wedow, 2011).

3.2.2. Specification and estimation method

After presenting the model and the relationship between CAR ratio and the different explanatory variables, it is possible to rewrite equation (2) as follows:

$$CAR_{i,t} = \alpha_0 + \alpha_1 CAR_{i,t-1} + \alpha_2 PSIA_{i,t} + \alpha_3 ROA_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 RISK_{i,t} + \alpha_6 REG_{i,t} + \alpha_7 GROWTH_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$CAP_{i,t} = \alpha_0 + \alpha_1 CAP_{i,t-1} + \alpha_2 PSIA_{i,t} + \alpha_3 ROA_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 RISK_{i,t} + \alpha_6 REG_{i,t} + \alpha_7 GROWTH_{i,t} + \varepsilon_{i,t} \quad (4)$$

Where the indexes *i* and *t* indicate the country and the year of observation respectively. The estimation method of this dynamic panel is the system Generalized Method of Moments (system GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998). The use of panel techniques is advantageous, since it is possible to use both the individual dimension and the temporal dimension of data. Compared to OLS method, the GMM system method is more efficient to control the endogeneity of variables in the model, and between the dependent variable and the other explanatory variables. Furthermore, the lagged dependent variable in the right of equation (3) generates a correlation between specific individual effects and explanatory variables. The system GMM method overcomes these problems through the combination of a set of equations where the variables in first difference are instrumentalized by their own lagged values and expressed in levels, and a second set of equations in levels using first differences as instruments. According to Blundell and Bond (1998), this provides more efficient estimators than first-difference GMM because even if the variables are very persistent, the instruments used in the level equation adequately predict the endogenous variables in the model. According to the same authors, Monte Carlo simulations give evidence that the system GMM method is more efficient than the first-difference GMM when using a small sample size, which is the case in this study. Finally, to test the validity of the model, we use the Sargan test of over-identifying restrictions to check the validity of instruments (lagged values) and the Arellano and Bond's serial correlation test to verify if errors exhibit second order serial correlation.

4. Results

4.1 Descriptive Statistics

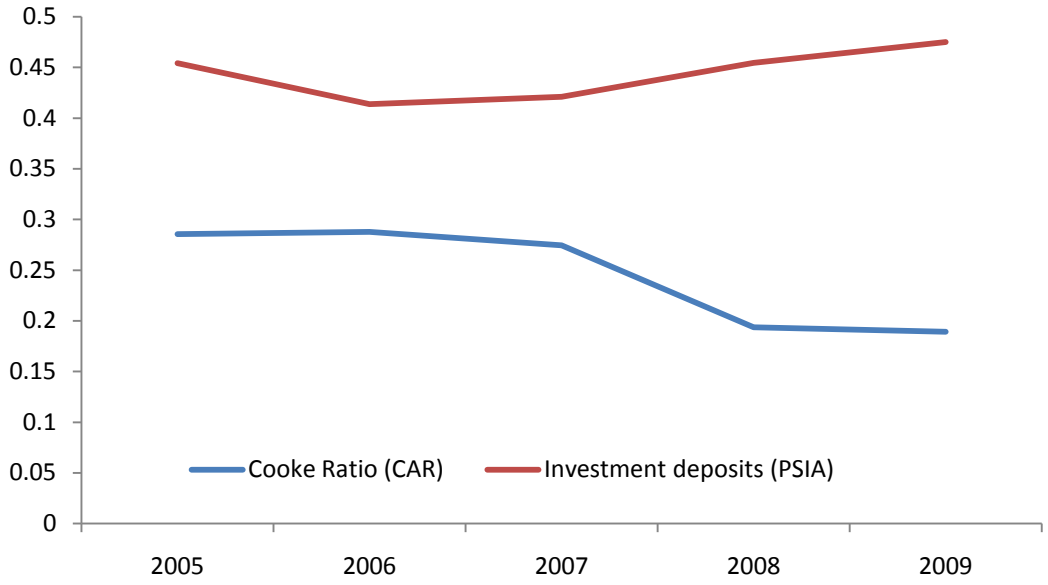
Table (3) shows that the average capital adequacy ratio for the total sample is 23.4%, with a median of 15.9% and a standard deviation of 25.1%. These high levels of regulatory capitalization show that Islamic banks succeeded to maintain financial soundness, despite strong competition from conventional banks. The statistics in table (3) highlight the importance of PSIA in total liabilities of Islamic banks. The mean and median of PSIA are respectively equal to 44,2% and 45%, with a standard deviation of 19.9%. This shows the importance to investment deposits in Islamic banking despite the DCR that they may face. Regarding the risk and profitability indicators, we note that ZSCORE is highly volatile, which explains the remarkable difference between its mean, which is around 35.496, and its median amounting to 20.661. Return on economic assets (ROA), whose average value is equal to 1.47%, is characterized by a low standard deviation of about 3.16%.

Table 3. Statistical properties of variables (total sample - 59 banks)

	Mean	Median	Standard deviation	Minimum	Maximum
CAR	0.234	0.159	0.251	-0.029	2.119
CAP	0.163	0.110	0.171	-0.017	0.999
PSIA	0.442	0.450	0.199	0. 002	0.910
ZSCORE	35.496	20.661	81.271	-2.543	1003.267
ROA	0.0147	0.013	0.0316	-0.258	0.132
SIZE (log)	7.445	7.553	1.497	2.111	10.726
GROWTH	0.057	0.058	0.043	-0.049	0.268
REG	0.054	0	0.159	0	0.874

Graphical analysis of changes in CAR and PSIA ratios during the study period provides some interesting results. Following the figure (1), below, there was a net decrease of CAR ratio for the total sample beginning from 2007, which coincide with an increase of PSIA ratio. Figures (2) and (3), available in the appendix, show the same findings for the two subsamples of the Middle East and Asian countries[13]. Between 2007 and 2008, selected banks based in the Middle East recorded a high decrease of the Cooke ratio from 30% to less than 20%. While there was a slight rise of PSIA stabilizing at 45% in 2009. For Asian banks, the decline in CAR was less marked, from 25% in 2007 to nearly 20% in 2008. However, there was a rapid increase of PSIA ratio from almost 35% in 2006 to more than 45% in 2009.

Figure 1. Change in CAR and PSIA ratios



[13] *Cf.* Table (1).

Before interpreting the estimation results, it is interesting to study the problem of multicollinearity between explanatory variables, which can lead to biased results. To detect multicollinearity, it is possible to use the correlation matrix. According to Kennedy (1992), there is a serious problem of multicollinearity if the correlation coefficient is above 80% for each pair of variables. According to Table (4), several variables are correlated but not beyond the critical threshold of multicollinearity.

Table 4. Correlation matrix

	CAR	CAP	PSIA	ZSCORE	ROA	SIZE	REG	GROWTH
CAR	1							
CAP	0.741	1						
PSIA	-0.170	-0.312	1					
ZSCORE	0.196	0.340	-0.098	1				
ROA	-0.338	-0.155	-0.063	-0.042	1			
SIZE	-0.386	-0.302	-0.028	-0.238	0.280	1		
REG	-0.076	-0.055	0.200	-0.006	-0.093	-0.190	1	
GROWTH	0.090	0.246	-0.110	0.066	0.265	-0.070	-0.093	1

Nevertheless, the correlation matrix cannot detect all the problems tied with multicollinearity (Hamilton, 2004). A better estimation of multicollinearity is achieved by regressing each variable on all other explanatory variables. Thus, we use also the Variance Inflation Factor test (VIF), which is more reliable in detecting multicollinearity. Following the literature, there is a multicollinearity problem when VIF exceed the value of 10 for each variable and the value of 6 for all variables (Chavent et *al*. 2006). Table A1 in the appendix shows the values of VIF and the tolerance level on each variable of the model. We can note that all VIF values are below the threshold applied, namely 10. In addition the average VIF, equal to 3.28, is less than 6, demonstrating the absence of a multicollinearity problem. Like it was noted above from the correlation matrix, these results confirm the inexistence of a multicollinearity problem between the explanatory variables.

Besides, table 4 shows that CAR ratio is negatively correlated with PSIA, which *a priori* confirms that there is a negative relationship between PSIA and capital probably induced by the moral hazard problem and excessive leverage. The ratio CAR is positively correlated with ZSCORE, giving evidence that a higher capitalization is associated with better solvency and a low probability of failure. The two variables SIZE and ROA are positively correlated, showing that large Islamic banks are more efficient than smaller banks, probably because of their ability to further diversify their asset-portfolio risk. There is also a positive correlation between REG and PSIA, which indicates that a high proportion of PSIA in total liability is associated with strong regulatory pressure. This may confirm the negative relationship observed between CAR and PSIA, given that a strong regulatory pressure, *i.e.* an increase in REG, shows also that there is a problem of undercapitalization. Finally, GROWTH is positively correlated with ROA, giving evidence that Islamic banks profitability is stimulated during periods of economic expansion.

4.2 Estimation results

Table 5 shows the results of the system GMM estimator, obtained using the command "xtabond2" in STATA 11. The p-values associated with over-identifying restrictions test and serial correlation test are quite high, indicating that the null hypotheses of correlation between

instrumental variables and error terms (Sargan statistic) and second order correlation (Arellano and Bond statistic) are rejected.

4.2.1. PSIA and Total capital ratio

We begin by the estimation outputs of the total capital ratio (CAR) equation then we turn to analyze the robustness of the model by analyzing the results of the equity capital ratio (CAP) equation and then by adding other explanatory variables to the CAR and CAP specification.

The introduction of the lagged value of CAR ratio on the right of equation (3) implies the existence of capital adjustment costs. According to table 5, the capital adjustment coefficient is statistically significant at 1% with a positive sign as expected. This result shows the presence of adjustment costs that impede banks to operate a complete adjustment of capital to the target level in each period. Regarding the effect of the control variables, it appears that the profitability indicator ROA is statistically significant at 10% with a positive sign, which is in accordance with our expectations. This result indicates that retaining earnings is one of the major ways for Islamic banks to improve the level of regulatory capital. The coefficient of SIZE is statistically significant at 10% and shows the expected negative sign. Therefore, large Islamic banks, probably due to their "too big to fail" status and their easier access to capital markets, target a lower level of regulatory capital than small banks does. Concerning the impact of regulatory pressure table 5 shows that contrary to our expectations there is a negative relationship between REG and CAR. But this effect is insignificant, which indicate that regulatory pressure does not seem to be a determinant of Islamic banks capital decision. Finally, the coefficient of GROWTH is significant at 1% and has a negative sign. The negative relationship between economic growth and the ratio CAR confirm our second hypothesis that capital decisions are influenced by the business cycle. During economic expansion, Islamic banks are more able to increase the volume of assets and to fund more risky projects, which can decrease CAR ratio. Inversely, during recession periods the risk appetite declines and the loss expectations increase which constraint banks to reduce the volume of assets in order to improve their capital position.

Table 5. PSIA and capitalization of Islamic banks

	Expected signs	CAR	CAP
CAR_{t-1} / CAP_{t-1}	+	0.30906***	0.43541***
		(0.000)	(0.000)
PSIA	+/-	-0.14790***	-0.20565***
		(0.007)	(0.002)
ZSCORE	+/-	-0.00072*	-0.00017*
		(0.084)	(0.091)
ROA	+	0.91247*	0.92727*
		(0.055)	(0.092)
SIZE	-	-0.02719*	-0.01611
		(0.071)	(0.154)
REG	+	-0.04035	-0.01970
		(0.473)	(0.731)
GROWTH	+/-	-0.44493**	-0.47109**
		(0.012)	(0.012)
Constante		0.42583***	0.29756**
		(0.002)	(0.017)
Observations		189	204
Statistic of Sargan (exogeneity of instrumental variables) :		41.82	22.19
p-value of Sargan statistic:		0.199	0.509
Test of Arellano-Bond AR(2) (Second order auto-correlation):		-1.00	0.02
p-value AR2:		0.319	0.983

* significatif at 10%; ** significatif at 5%; *** significatif at 1%

This table shows the estimated parameters α in equation (3). Statistic p-value in parentheses. The study period extends from 2005 to 2009. Observations were made on a sample of 59 Islamic banks from 17 countries. CAR = Cooke Ratio. PSIA = Profit Sharing Investment Accounts/Total assets. Zscore (*cf.* equation (3)). ROA = Net income / Total assets. SIZE = Ln (Total Assets). REG = (MinREG + σ_{CAR}) - CAR. GROWTH = growth rate in real GDP.

Turning now to the main focus of this study, from table 5 it appears that the coefficient of PSIA is statistically significant at 1% with a negative sign. This result is consistent with our expectation of a negative relationship between PSIA and CAR. It shows that under the hypotheses of asymmetric information and moral hazard, higher PSIA share in the liability structure is likely to increase managers' risk-taking and to boost leverage which would have a negative impact on capital and solvency. In other words, the negative effect of PSIA on capital through risk-taking is more pronounced than its positive effect through the management of the DCR. The coefficient of ZSCORE is statistically significant at 10% with a negative sign. This result demonstrates that there is a positive relationship between bank risk-taking and regulatory capital. Islamic banks tend to increase CAR ratio by strengthening regulatory capital or by improving the quality of their assets portfolio in order to avoid bankruptcy and regulatory sanctions (Shrieves and Dahl, 1992; Jacques and Nigro, 1997; Aggarwal and Jacques, 1998; Rime, 2001). Inversely, higher ZSCORE, *i.e.* lower risk-taking, may induce Islamic banks to increase the volume of assets portfolio and to under-evaluate the probability of failure, which can lead to a decrease of CAR ratio.

4.2.2. Robustness checks

As a robustness checks, we estimate the model using CAP as dependent variable. The results presented in second column of table 5 are in line with our previous findings. In the two specifications PSIA is negatively correlated with bank capitalization. Then, as showed in table 6, the sample was divided into large and small banks in order to test whether the relationship between PSIA and bank capital is affected by scale effect or not. To split the sample we used the median value of total assets as a threshold to classify banks according to their size. Consistent with the results presented in table 6, PSIA remain negatively and significantly correlated to capital in both groups of banks, even when CAP is used as dependent variable.

Table 6. Robustness checks: Large and small banks

		Large banks		Small banks	
	Expected signs	CAR	CAP	CAR	CAP
CAR_{t-1} / CAP_{t-1}	+	0.30461***	0.46414***	0.36237***	0.19239***
		(0.000)	(0.006)	(0.000)	(0.001)
PSIA	+/-	-0.11258**	-0.10660*	-0.22717*	-0.23783***
		(0.023)	(0.088)	(0.054)	(0.001)
ZSCORE	+/-	0.00003	-0.00049	-0.00059	-0.00018*
		(0.943)	(0.402)	(0.125)	(0.050)
ROA	+	1.63764***	1.13576**	0.68293	0.64465
		(0.001)	(0.035)	(0.365)	(0.170)
SIZE	-	-0.03202**	-0.02254*	-0.03910*	-0.05064***
		(0.022)	(0.096)	(0.099)	(0.002)
REG	+	-0.05038	-0.01064	-0.08974	-0.06042
		(0.621)	(0.928)	(0.255)	(0.209)
GROWTH	+/-	-0.46026***	-0.32647*	-1.32791**	-1.18748***
		(0.003)	(0.056)	(0.033)	(0.001)
Constante		0.43354***	0.31306**	0.55487***	0.61563***
		(0.001)	(0.027)	(0.001)	(0.000)
Observations		106	112	83	92
Statistic of Sargan (exogeneity of instrumental variables) : p-value of Sargan statistic:		35.96 0.423	19.34 0.681	21.28 0.773	24.80* 0.099
Test of Arellano-Bond AR(2) (Second order auto-correlation): p-value AR2:		-1.59 0.112	-0.89 0.373	0.10 0.923	0.42 0.671

* significatif at 10%; ** significatif at 5%; *** significatif at 1%

This table shows the estimated parameters α in equation (3). Statistic p-value in parentheses. The study period extends from 2005 to 2009. Observations were made on a sample of 59 Islamic banks from 17 countries. CAR = Cooke Ratio. PSIA = Profit Sharing Investment Accounts/Total assets. Zscore (*cf.* equation (3)). ROA = Net income/Total assets. SIZE = Ln (Total Assets). REG = (MinREG + σ_{CAR}) - CAR. GROWTH = growth rate in real GDP.

5. Conclusion

Focusing on the principle of PLS which is the core of Islamic banking intermediation this study concentrate on the impact of investment deposit accounts (PSIA) on capital decisions in Islamic banks. Estimation of a dynamic panel composed of 59 Islamic banks observed between 2005 and 2009, by the system GMM shows that the regulatory capital is negatively and significantly related to PSIA share in total liability. The robustness checks by using an alternative measure of bank capital and by dividing the sample into small and large banks does not alter our main findings. This means that under asymmetric information the volume of PSIA is able to influence Islamic banks' behavior and stimulate their preference toward

excessive risk. Thus, our research demonstrates that the DCR is not the only risk originated by PSIA. Increasing the share of PSIA may also boost leverage and induce a problem of moral hazard and excessive risk-taking that could threaten Islamic banks' capital position and solvency. In accordance with this result, it is appropriate to suggest some recommendations to improve the governance and prudential regulation of Islamic banks.

First, it is essential that the IFSB guidelines make more emphasis on the impact of PSIA on Islamic banks' behavior especially in a context of asymmetric information. Banking authorities should add new measures to increase transparency of decisions related to the management of PSIA and to enhance market discipline exerted by IAH. These transparency measures should focus mainly on the quality of assets funded by PSIA, as well as on the way that the IRR are being computed. Similarly, it is important to involve the IAH in the governance scheme through direct access to information and by representing them in the bank's board of directors[14].

Second, in order to contain excessive risk-taking emanating from PSIA, it would be useful for banking institutions to introduce an additional category of reserves that must be sensitive to assets risk which would be added to the other two categories of reserves, namely PER and IRR. Specifically, these "reserves for asset risk" should increase in proportion to bank's risk-taking and deduced from shareholders' returns in order to incite them to avoid excessive risk-taking, otherwise the shareholders will see their returns diminish. This reserve may also rebalance profit sharing between shareholders and IAH when there is a lack of transparency, as explained above.

Third and finally, according to Archer and Karim (2009), a strategic solution consists of separating the functions of retail banking and fund management in Islamic banks by creating an independent structure dedicated exclusively to the management of PSIA. This structure is similar to investment banks and investment companies to enforce more efficiently the principle of PLS and avoid the separation between depositors and shareholders.

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[14] Moreover, strengthening the rights of IAH can further legitimize the restriction of funds withdrawals by banks in periods of loss of competitiveness in order to reduce the DCR, and not to confine themselves to reserve management only.

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Appendix 1. Variance inflation factor

	CAR		CAP	
Variable	VIF	1/VIF	VIF	1/VIF
SIZE	7.75	0.129014	7.56	0.132321
PSIA	6.23	0.160566	6.00	0.166591
GROWTH	2.58	0.386880	2.66	0.376637
CAR_{t-1}	1.90	0.527221	2.12	0.470920
ROA	1.90	0.527485	1.72	0.581736
REG1	1.31	0.762767	1.28	0.782236
ZSCORE	1.29	0.774573	1.24	0.808913
Mean VIF	3.28		3.22	

Appendix 2. Change in CAR and PSIA ratios per region

Figure A.2.1. Change in CAR and PSIA ratio in the Middle East countries

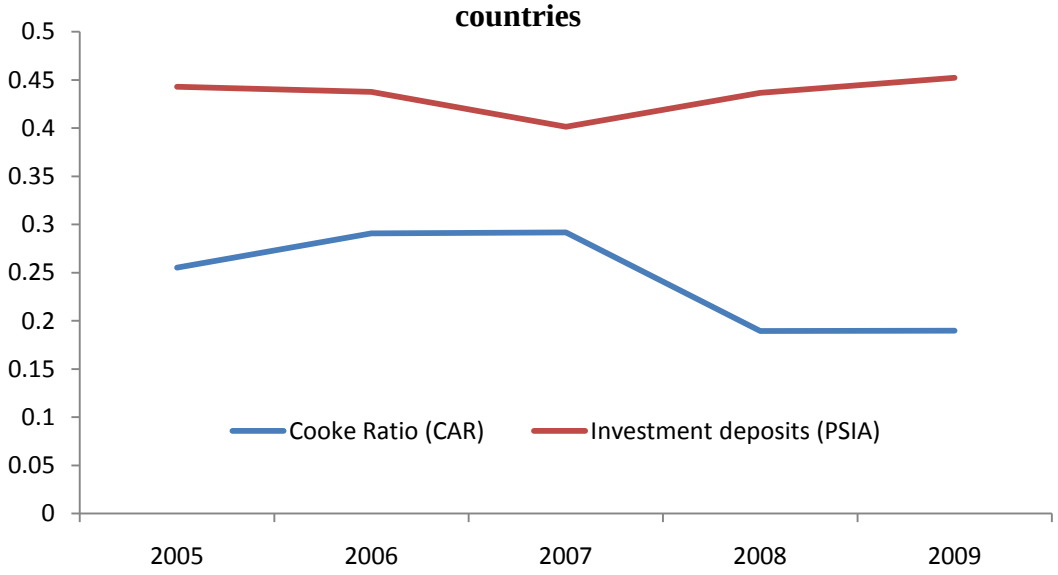

Figure A.2.2. Change in CAR and PSIA ratios in the Asian countries