



HAL
open science

Basel framework and profit-sharing contracts: Islamic banking through the lens of capital requirements

Kévin Spinassou, Leo Indra Wardhana

► **To cite this version:**

Kévin Spinassou, Leo Indra Wardhana. Basel framework and profit-sharing contracts: Islamic banking through the lens of capital requirements. 2021. hal-01674376v4

HAL Id: hal-01674376

<https://hal.science/hal-01674376v4>

Preprint submitted on 4 Feb 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Basel framework and profit-sharing contracts: Islamic banking through the lens of capital requirements

Kévin Spinassou^{a,*}, Leo Indra Wardhana^b

^a*LC2S, Université des Antilles, Schoelcher, France*

^b*Department of Economics and Business, Vocational School Universitas Gadjah Mada, Yogyakarta, Indonesia*

Abstract

This paper theoretically examines the impact of capital requirements on Islamic and “conventional” banks. Given the prevalence of profit-sharing investment accounts in Islamic banking and the recent implementation of the Basel III capital framework, we developed a simple model in which banks are able to offer profit-sharing contracts under regulations applying risk-weighted capital ratios and leverage ratio restrictions. We find that banks with high or low returns on assets prefer conventional banking, while banks with moderate returns on assets operate as Islamic banks. We would further point out that Basel II capital requirements increased the incentive to opt for Islamic banking, especially since Islamic banks benefit from a less competitive environment and from local capital requirements. In contrast, this incentive is reduced when leverage ratio restrictions are applied.

JEL Classification: G21, G28

Keywords: Islamic finance, banking capital requirements, Basel III, profit-sharing investment accounts, IFSB

*Corresponding author. *LC2S, Campus BP 7209, 97275 Schoelcher Cedex (France).*
Declarations of interest: none.

Email addresses: kevin.spinassou@univ-antilles.fr (Kévin Spinassou),
leo.wardhana@ugm.ac.id (Leo Indra Wardhana)

1. Introduction

In December 2010, as a consequence of the global financial crisis of 2007-2008, the Basel Committee on Banking Supervision (BCBS) suggested a new set of reform measures, known as Basel III. This financial turmoil put the spotlight back on the issue of capital requirements, through the importance of maintaining sufficient levels of capital to absorb losses. Consequently, Basel rules now include leverage ratio restrictions in addition to risk-weighted capital ratios¹. Such regulatory reforms aim at improving the robustness of the global banking sector, in order to meet the challenges of the fluctuating financial environment.

Another consequence of the global financial crisis is the rapid growth of a specific banking system based on the principles of non-interest-bearing deposit accounts and profit-sharing investment contracts, also known as *Islamic banking*². This growth can also be seen in non-Muslim jurisdictions (e.g. Europe and North America), implying that Islamic banks are no longer a simple response to the religious duty of Muslim economic agents but also a new offer catering to demands of new customers (and not just among Muslims³). Currently, the Basel capital framework applies in several jurisdictions where Islamic banks are present, while this set of regulatory measures is initially suggested for conventional banking institutions. In this context, such guidelines may create regulatory arbitrage opportunities for banks.

The objective of this paper is to theoretically investigate how Islamic and conventional banks react to Basel capital requirements. As profit-sharing in-

¹See Basel Committee on Banking Supervision (2010) for the original guidelines and Basel Committee on Banking Supervision (2014) for a more recent text relative to leverage ratio regulations.

²For further details regarding the growth of Islamic banking, see the Islamic Financial Services Board (2016).

³For example, *Al Rayan Bank*, the largest Islamic retail bank by assets in the United Kingdom, frequently reports that a significant part of new customers are outside the Muslim faith (see Al Rayan Bank, 2018).

vestment accounts help to decrease the overall risk faced by banks, it is interesting here to consider the loss absorbency of these contracts (mainly offered by Islamic banks), in order to examine the banks' incentives to act as Islamic or conventional banks. For this purpose, the Islamic Financial Services Board (IFSB) provides prudential standards, with prescriptions to adapt conventional capital requirements for Islamic banks. Besides, IFSB guidelines also allow national regulators to implement local adjustments relative to the Islamic banks' risk-weighted capital requirements. Consequently, roughly two out of three regulators within jurisdictions allowing Islamic banking activities choose to tailor conventional banking capital requirements before applying them to their local Islamic banks (Song and Oosthuizen, 2014). Our model therefore considers a regulatory framework in which capital requirements for conventional and Islamic banks are both suggested at an international level. Then we analyze how banks adapt their behavior when Islamic banking activities benefit from locally adjusted capital requirements.

In order to meet this objective, we also take into account various degrees of competition between conventional and Islamic banking activities. Given the religious motivations of certain Muslim customers, Islamic banks may indeed benefit from captive customers: fervent religious believers seeking *Sharia*-compliant financial products, hence, they are reluctant to opt for conventional financial products (Beck et al., 2013). At the same time, religiosity does not prevent Islamic banks from attracting customers from conventional banks and, as a consequence, Islamic banks may face less competition than conventional banks in a dual banking system (Meslier et al., 2017, Turk Ariss, 2010). This occurs especially in jurisdictions having a heavy Muslim population. An extension of our model thus aims at incorporating this potential competitive differential between conventional and Islamic banks, by assuming a higher return on assets for Islamic banking activities, driven by a relatively less competitive environment.

Accordingly, this paper contributes to the current debate on the reg-

ulation of Islamic banks. Academic literature has developed an extensive theoretical body of work on conventional banking capital requirements. The relation between risk-weighted capital requirements and bank risk-taking behavior is examined by Kim and Santomero (1988), Giammarino et al. (1993), Besanko and Kanatas (1996), Repullo and Suarez (2004), and summarized in Freixas and Rochet (2008) and Camara et al. (2013). More recently, the interest in new leverage ratio restrictions motivated certain theoretical papers to investigate how such requirements impact banking stability through conventional bank behavior. Blum (2008), Rugemintwari (2011), Kiema and Jokivuolle (2014) point out the positive impact of leverage ratio restrictions on banking stability, while Spinassou (2016) and Barth and Seckinger (2018) show that this capital regulation can increase bank risk-taking (Allahrakha et al., 2018, find similar results with an empirical study).

We also note that many recent empirical papers focus on risk-taking by Islamic banks, summarized in Hassan and Aliyu (2018). Čihák and Hesse (2010) and Abedifar et al. (2013) analyze the stability of small and large Islamic banks compared to their conventional counterparts. Hussain and Al-Ajmi (2012) and Baele et al. (2014) compare credit risk of conventional and Islamic banks in Bahrain and Pakistan, respectively. Sorwar et al. (2016) contrast the market risk of Islamic banks with conventional banks. On a broader level, a now reasonably well developed stream of the literature has provided empirical works about the impact of the global financial crisis on Islamic and conventional banks (Alandejani et al., 2017, Alqahtani et al., 2017, Asmild et al., 2018, Belanès et al., 2015, Dridi and Hassan, 2010). Nevertheless, very little theoretical work has been done on Islamic banking behavior (e.g. Aggarwal and Yousef, 2000, Bashir, 1983, Muljawan et al., 2004, Rahman, 2018), especially concerning banking regulations: to the best of our knowledge, academic literature does not provide a theoretical investigation covering Basel III capital requirements and Islamic banking.

To better understand the implications of BCBS/IFSB capital require-

ments for Islamic banking, we built a simple model in which banks can select their activity (safe or risky). This banking activity can be financed by raising deposits and offering profit-sharing investment accounts as *Shariah*-compliant financial investments based on *Mudharabah* contract principles. We find that banks do not offer such contracts without capital requirements, while banks with an intermediate return on assets use PSIA instead of interest-bearing deposits if risk-weighted capital requirements are imposed. Furthermore, as a first step, our results show that the implementation of leverage ratio restrictions lowers the expected profit of Islamic banks. Nevertheless, as a second step, the new capital requirements can lead to a higher number of Islamic banks, especially if the national regulator strongly tailors the local Islamic banks' capital requirements, if Islamic banks benefit from a relatively less competitive environment, and/or if a large number of banks benefit from moderate returns on assets.

This model is developed in Section 2. Section 3 presents our results when different capital requirements are imposed on banks having regulatory frameworks in the spirit of Basel II and Basel III. Section 4 presents an extension of our analysis, with consideration for local specificities towards dual banking systems, and Section 5 concludes the paper.

2. Model set up

Consider a banking system populated by n independent risk-neutral banks, with total assets normalized to one.

Each bank selects its type of activity: *risky* or *safe*. Safe banks have a return on assets of $R \in]0, 1[$, while the return on assets of risky banks provides the following:

$$\begin{cases} R + \Delta R & \text{with probability } p > \frac{1}{2} \\ 0 & \text{with probability } 1 - p \end{cases} \quad (1)$$

where $\Delta R \in]0, 1[$ is the extra return on assets from additional risk taking.

We assume that banks have diverse skills to manage their risky projects, leading to different values of ΔR in the banking system, given by nature with $\Delta R \in [\underline{\Delta R}; \overline{\Delta R}]$. The probability density function of ΔR is denoted by $f(X)$, with

$$1 = \int_{\underline{\Delta R}}^{\overline{\Delta R}} f(\Delta R) d\Delta R \quad (2)$$

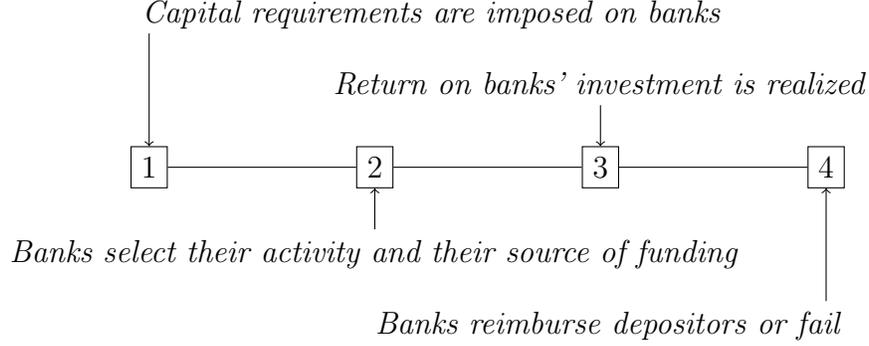
Banks can be financed by deposits (D), profit-sharing investment accounts (μ), and capital (K). Consequently, $D = 1 - K - \mu$. Deposits are guaranteed by full deposit insurance, riskless, and with a gross interest rate set to one. Capital is assumed to be the most expensive source of funding, where the cost of capital is $k \in]1, 2[$.

A profit-sharing investment account (hereinafter PSIA) is a contract between the bank and an investor, in which gains and losses are shared based on a *Mudharabah* contract. We denote *Islamic banks* (hereinafter IBs) as any bank offering PSIA instead of deposits, since interest-bearing deposits are explicitly forbidden by the rules of traditional Islamic finance. On the other hand, banks taking in deposits are hereinafter referred to as *conventional banks* (CBs). In other words, banks choose to be CBs or IBs by selecting their source of funding. The gain/loss shared with the investor is τ , thus giving the bank the share $1 - \tau$. Given the return on assets R and the specific risk of PSIA contracts, we assume that investors require a remuneration such as $\tau(1 + R) > 1$ when the bank does not fail.

If a risky bank fails (with probability $1 - p$), the bank bears losses equal to the amount of capital plus its share of the PSIA. Due to its limited liability, the amount of deposits does not appear in losses in the event of bankruptcy. Figure 1 illustrates the model timing.

Table 1 summarizes items of the banks' balance sheet. Each balance-sheet identity reduces to the following expression, relating the liability side to the

Figure 1: Model timing



asset side:

$$D + \mu + K = \text{project} = 1 \quad (3)$$

We therefore distinguish two expected profits, based on the bank's activity:

$$\pi_{noreg}^{safe} = (1 + R) - (1 - K - \mu) - \mu\tau(1 + R) - Kk \quad (4)$$

as the safe bank's profit, and

$$\begin{aligned} \pi_{noreg}^{risky} = p((1 + R + \Delta R) - (1 - K - \mu) - \mu\tau(1 + R + \Delta R) - Kk) \\ + (1 - p)(-K - (1 - \tau)\mu) \end{aligned} \quad (5)$$

as the risky bank's expected profit. Evaluating these two expected profits, we can then state:

Result 1. *Without capital requirements, both safe and risky banks prefer conventional banking: banks that do not offer PSIA and select a level of deposits equal to 1.*

When no capital requirements are applied, safe and risky banks have expected profits of:

$$\pi_{noreg}^{safe*} = R \quad (6)$$

Table 1: Banks' balance sheet

ASSETS	LIABILITIES
<i>Safe conventional bank</i>	
Safe project (certain return R)	Deposits D
	Profit-sharing investment account μ
	Capital K
<i>Risky conventional bank</i>	
Risky project (uncertain return)	Deposits D
	Profit-sharing investment account μ
	Capital K
<i>Safe Islamic bank</i>	
Safe project (certain return R)	Profit-sharing investment account μ
	Capital K
<i>Risky Islamic bank</i>	
Risky project (uncertain return)	Profit-sharing investment account μ
	Capital K

$$\pi_{noreg}^{risky*} = p(R + \Delta R) \quad (7)$$

As a result, in the absence of capital requirements, banks select risky projects if $\Delta R > \frac{R(1-p)}{p}$. On the other hand, all banks with $\Delta R < \frac{R(1-p)}{p}$ are safe banks.

3. Bank choice and capital regulation

In this section, we consider exogenous capital requirements suggested by a supranational committee that are then applied by a national regulator. Firstly, we analyze how risk-weighted capital requirements affect banking behavior. Secondly, we focus on a Basel III capital framework, by examining the implications of introducing leverage ratio restrictions together with risk-weighted capital requirements.

3.1. Solely risk-weighted capital requirements

We assume a capital ratio of $\bar{K} \in]0, 1[$ imposed on safe CBs, and $\bar{K} + \Delta K \in]0, 1[$ as the minimum capital ratio for risky CBs.

Conversely, banks with PSIA benefit from higher loss absorbency. Indeed, such contracts provide banks the capacity to pass-on losses to investors: the higher the amount of PSIA as a source of funds, the better the solvency of the bank⁴. This loss absorbency is the main motivation of *Islamic Financial Services Board* adjustments, where a reduction of capital requirements is allowed for banks holding a large share of PSIA⁵. To incorporate these lower capital requirements into our analysis, we assume a capital ratio equal to $\bar{K} + \Delta K(1 - \frac{\mu}{1-K})$ for risky banks using PSIA. In other words, this capital ratio is equal to \bar{K} (i.e. similar to the safe CBs' capital requirements) if the bank does not raise deposits, and $\bar{K} + \Delta K$ (i.e. similar to the risky CBs' capital requirements) if the bank does not use PSIA.

Profits described in equation (4) and equation (5) are decreasing functions of capital K , in that banks only hold the required capital. Safe banks' profit is then

$$\pi_{rw}^{safe} = (1 + R) - (1 - \bar{K} - \mu) - \mu\tau(1 + R) - \bar{K}k \quad (8)$$

with $\frac{\partial \pi_{rw}^{safe}}{\partial \mu} = 1 - \tau(1 + R)$, which is negative: safe banks prefer conventional banking and do not offer PSIA to investors.

$$\pi_{rw}^{safe*} = R - \bar{K}(k - 1) \quad (9)$$

The expected risky banks' profit is now:

⁴See Dalla Pellegrina (2007), Lopez-Mejia et al. (2014) and Song and Oosthuizen (2014) for further details about the regulation of Islamic banks and its future challenges.

⁵In the standard formula provided by the IFSB for the computation of risk-weighted capital requirements for IBs, even the assets financed by investment account holders are excluded.

$$\begin{aligned}
\pi_{rw}^{risky} = & p((1 + R + \Delta R) - D - \mu\tau(1 + R + \Delta R) \\
& - (\bar{K} + \Delta K(1 - \frac{\mu}{1 - \bar{K}}))k) \\
& + (1 - p)(-\bar{K} + \Delta K(1 - \frac{\mu}{1 - \bar{K}})) - (1 - \tau)\mu
\end{aligned} \tag{10}$$

where $D = 1 - (\bar{K} + \Delta K(1 - \frac{\mu}{1 - \bar{K}})) - \mu$.

An evaluation of the risky banks' newly expected profit leads to the following result:

Result 2. *When solely risk-weighted capital requirements are implemented, risky banks with $\Delta R > \rho'_{rw}$ raise deposits instead of offering PSIA contracts ($\mu = 0$), with $\rho'_{rw} = \frac{\Delta K(1 - (2 - k)p)}{p\tau(1 - \bar{K})} + \frac{\tau + 2p - 1}{p\tau} - (2 + R)$. Otherwise, risky banks are IBs and hence finance their activity through PSIA and capital (not deposits).*

We thus obtain the expected risky CBs profit:

$$\pi_{rw}^{riskyCB*} = p(R + \Delta R) - (\bar{K} + \Delta K)(1 - p(2 - k)) \tag{11}$$

and the expected risky IBs profit:

$$\pi_{rw}^{riskyIB*} = (p(2 + R + \Delta R) - 1)(1 - (1 - \bar{K})\tau) - pk\bar{K} \tag{12}$$

Similar to the previous section, we can evaluate the expected profit of safe banks and risky banks, thus obtaining:

Result 3. *There exists a threshold of $\rho''_{rw} = \frac{\bar{K}(1 - k(1 - p)) + R}{p(1 - \tau(1 - \bar{K}))} + \frac{1}{p} - (2 + R)$, with $\rho''_{rw} < \rho'_{rw}$ when p is sufficiently large, and where banks with $\Delta R > \rho''_{rw}$ select risky projects, while banks with $\Delta R < \rho''_{rw}$ select safe activity.*

The excess return on assets ΔR is clearly key to determining whether Islamic or conventional banking is preferable, as well as whether banks need

to opt for safe or risky activities. Within our profit-maximization perspective, the implementation of capital requirements now increases the number of Islamic banks, while incentives to act as Islamic banks do not exist without capital requirements. In other words, we observe that as long as the excess return on assets is larger than a given threshold, the potential advantage of the reduction of capital requirements allowed for IBs is outweighed by the fact that CBs do not share this excess return with investors. On the other hand, risky banks may be inclined to benefit from lower capital requirements by offering PSIA instead of deposits when the excess return on assets is sufficiently small.

We illustrate this result with a calibrated version of our model. Table 2 shows the parameter values. We use the St. Louis Federal Reserve database on US banks return on assets to determine the value of R : the average return on assets over the period between January 2010 and January 2020 is 1.01%. Consequently, the chosen size of the parameter τ satisfies the condition $\tau(1 + R) > 1$. Following Repullo and Suarez (2004), we assume a cost of capital k equal to 10%. We set the probability of success p equal to 99.7%, which reflects an average A rated loan portfolio (Kiema and Jokivuolle, 2014).

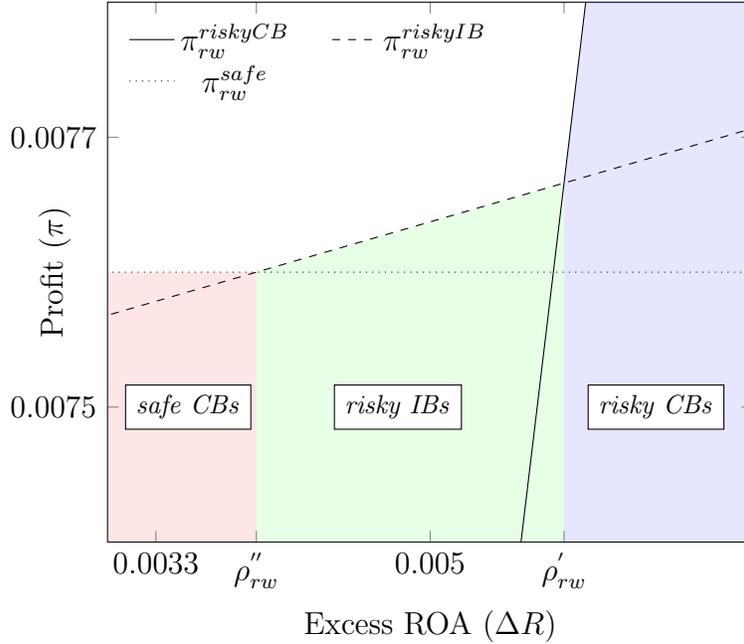
Table 2: Calibrated parameters

PARAMETER	DESCRIPTION	VALUE
R	Safe banks' return on assets	0.0101
\bar{K}	Capital ratio imposed on safe banks	0.025
k	Cost of capital	1.1
ΔK	Excess capital ratio imposed on risky banks	0.055
ρ	Probability of success	0.997
τ	Gain/loss shared with the investor	0.99001

Within a profit-maximization perspective, Figure 2 illustrates the regions where banks select conventional or Islamic banking when there are

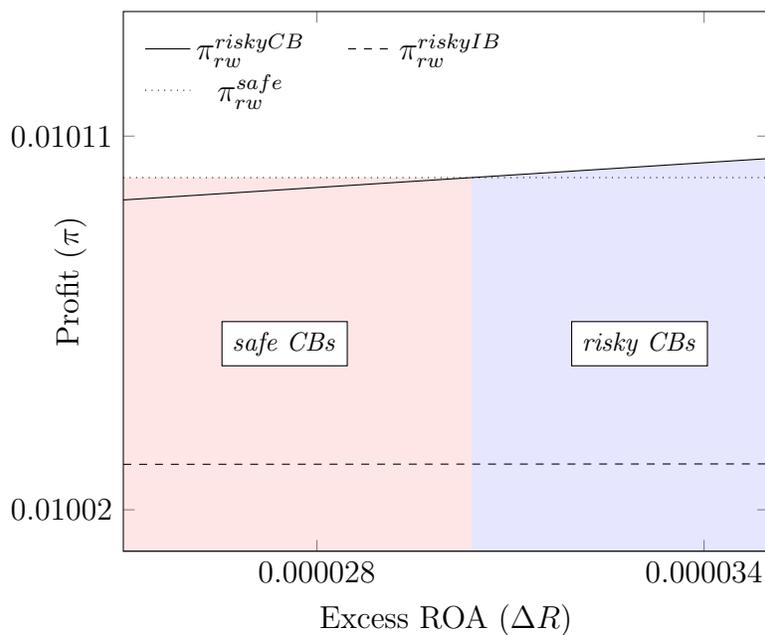
risk-weighted capital requirements in place, and Figure 3 demonstrates that banks prefer conventional banking when there is no constraint on bank capital.

Figure 2: Bank choice with risk-weighted capital requirements



We can see that a banking system with high return on assets includes a large number of CBs (i.e. having a large concentration of banks close to $\overline{\Delta R}$), while a banking system with lower return on assets incorporates a more significant number of IBs. Such differences between banking systems in terms of return on assets have been highlighted by a quite large literature investigating the determinants of bank profitability. This profitability is measured by the capacity of banks to generate profits, including the return on assets, and several authors have shown that bank profitability varies depending on the

Figure 3: Bank choice without capital requirements



region⁶. Overall, our findings are in line with the expansion of Islamic finance in several countries: the Basel II framework has been suggested in 2004 while the Islamic banking system has grown faster than the conventional banking system after the beginning of the 2000s⁷.

3.2. Leverage ratio and risk-weighted capital requirements

In this subsection, we consider a minimum leverage ratio K^{lr} , suggested by the supranational authority in addition to the previous risk-weighted cap-

⁶For example, Kohlscheen et al. (2018) report differences in terms of return on assets in emerging market economies, Beck et al. (2013) disclose a high standard deviation of return on assets for their worldwide banking system sample (with Islamic and conventional banks), and Dietrich and Wanzenried (2014) find significant differences in profitability between banks from low-income and high-income countries.

⁷See Malaysia International Islamic Financial Centre (2014) for further details.

ital ratio of $K^{lr} \in]\bar{K}, (\bar{K} + \Delta K)[$. In other words, this new regulation does not affect risky CBs because they already maintain the highest capital ratio $\bar{K} + \Delta K$. Note that the addition of this leverage ratio regulation allows us to rewrite the capital requirements relative to the amount of PSIA, as $K^{lr} + (\Delta K - \gamma) \left(1 - \frac{\mu}{1 - \bar{K}}\right)$, where $\gamma = K^{lr} - \bar{K} < \Delta K$. In a nutshell, a high value of γ represents a significant increase in regulatory stringency, with the implementation of a highly binding regulatory constraint.

We obtain the new safe bank's profit as:

$$\pi_{lr}^{safe} = (1 + R) - (1 - K^{lr} - \mu) - \mu\tau(1 + R) - K^{lr}k \quad (13)$$

with $\frac{\partial \pi_{lr}^{safe}}{\partial \mu} = 1 - \tau(1 + R) < 0$. As before, evaluation of the safe bank's profit shows that safe banks prefer conventional banking, with $\mu = 0$.

$$\pi_{lr}^{safe*} = R - K^{lr}(k - 1) \quad (14)$$

The implementation of a leverage ratio affects the risky banks expected profit as follows:

$$\begin{aligned} \pi_{lr}^{risky} = & p \left((1 + R + \Delta R) - D - \mu\tau(1 + R + \Delta R) - \right. \\ & \left. (K^{lr} + (\Delta K - \gamma) \left(1 - \frac{\mu}{1 - \bar{K}}\right))k \right) \\ & + (1 - p) \left(- (K^{lr} + (\Delta K - \gamma) \left(1 - \frac{\mu}{1 - \bar{K}}\right)) - (1 - \tau)\mu \right) \end{aligned} \quad (15)$$

with $D = (1 - (K^{lr} + (\Delta K - \gamma) \left(1 - \frac{\mu}{1 - \bar{K}}\right)) - \mu)$.

Result 4. *With the addition of leverage ratio restrictions to risk-weighted capital ratios, risky banks with $\Delta R > \rho'_{lr}$ do not offer PSIA contracts ($\mu = 0$), where $\rho'_{lr} = \frac{(\Delta K - \gamma)(1 - (2 - k)p)}{p\tau(1 - \bar{K})} + \frac{\tau + 2p - 1}{p\tau} - (2 + R) < \rho'_{rw}$. In contrast, risky banks*

with $\Delta R < \rho'_{lr}$ finance their activity with PSIA and do not raise deposits (IBs).

The risky CBs expected profit is here equal to equation (11), while the IBs expected profit is now as follows:

$$\begin{aligned} \pi_{lr}^{riskyIB*} = & (p(2 + R + \Delta R) - 1)(1 - (1 - \bar{K})\tau) \\ & - pk\bar{K} - \gamma(1 - p(2 - k)) \end{aligned} \quad (16)$$

Evaluation of equation (11), equation (14) and equation (16) is summarized in the following result.

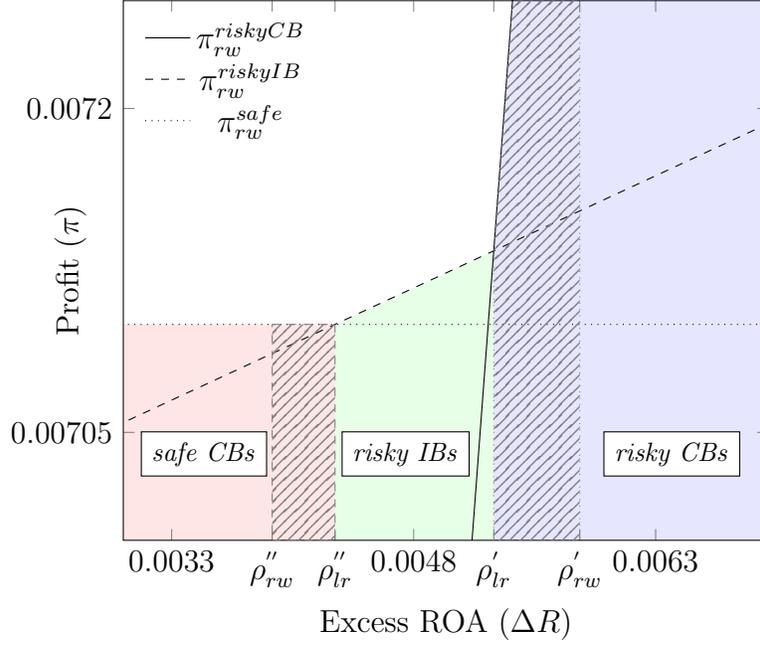
Result 5. *There exists a threshold $\rho''_{lr} = \frac{\bar{K}(1-k(1-p))+R+\gamma(2-k)(1-p)}{p(1-\tau(1-\bar{K}))} + \frac{1}{p} - (2 + R)$, where $\rho''_{rw} < \rho''_{lr} < \rho'_{lr}$, under which banks select safe activity. Conversely, if $\Delta R > \rho''_{lr}$, banks select risky activity.*

Thresholds ρ'_{rw} and ρ''_{lr} are respectively higher than ρ'_{lr} and ρ''_{rw} when p is sufficiently large, meaning that the implementation of leverage ratio restrictions increases the banks' incentives to act as CBs. In other words, when a new requirement states that Islamic and conventional banks must have the same amount K^{lr} of capital in addition to the previous risk-weighted capital ratio, the potential advantage of the lower risk-weighted requirements allowed for Islamic banks is reduced.

In order to complete the calibration values reported in Table 2, we set the parameter γ equal to 0.005. Hence, the leverage ratio is equal to 3%, as suggested by the Basel III framework. Figure 4 shows our findings under the Basel III regime. We observe that banks in hashed regions act as CBs when leverage restrictions apply, while they are IBs under the Basel II regime.

Notice that Basel III capital requirements may increase the number of IBs if $\int_{\rho'_{lr}}^{\rho'_{lr}} f(\Delta R) d\Delta R$ becomes higher than $\int_{\rho''_{rw}}^{\rho'_{lr}} f(\Delta R) d\Delta R$, concomitantly with the implementation of leverage ratio restrictions. The 2007-2008 banking crisis indeed reduced the overall returns on banking activities, as highlighted by several studies on bank profitability in Islamic and conventional

Figure 4: Bank choice under Basel III capital regulation



banking systems (Alqahtani et al., 2016, Bolt et al., 2012, Dietrich and Wanzenried, 2011, 2014, Kohlscheen et al., 2018). In view of this decrease of banks' returns on assets, one might assume that the distribution of ΔR could be more gathered at a moderate level. Such a new distribution would mitigate effects of the Basel III framework described above, which would explain that the Islamic banking is still on the rise.

4. Local regulations and degrees of competition in dual banking systems

In this section, we go one step further by providing an extension of our analysis, with assumptions relative to two local particularities of banking systems where conventional and Islamic banks operate side by side. Thus, we build a model in which banks choose to be Islamic or conventional solely

within a profit-maximization perspective, without considering the religious beliefs of the banks' *management*. Here, we take into account the religious beliefs of the banks' *customers*, by assuming that some IB customers may be reluctant to switch to CBs. This assumption concerning captive customers adhering to religious principles is represented by an excess return for IBs, denoted as ϵ : a high value of ϵ means that IBs benefit from a relative low competitive environment, hence where CBs face strong difficulties attracting IB customers. Overall, this assumption is in line with previous findings (Meslier et al., 2017, Turk Ariss, 2010) indicating that IBs can face less competition than CBs in dual banking systems.

On the other hand, the capital requirements applied in dual banking systems are currently very dissimilar, since many national regulators decide to adapt capital requirements initially suggested at an international level, before imposing them on local IBs (Song and Oosthuizen, 2014). This heterogeneity of national IB capital requirements is driven by the IFSB guideline, which leaves up to the national regulators' discretion a "factor of reduction" relative to the computation of domestic IBs risk-weighted assets (see Islamic Financial Services Board, 2013). In order to consider this point in our analysis, we assume in this section a similar factor of reduction, denoted as α , with $\alpha \in [0, 1]$. A strong value of α represents, therefore, an important reduction of IB capital requirements at the local level, compared to the CB requirements.

In summary, these new assumptions do not affect the CBs expected profits. Evaluating expected profits of IBs and CBs, we can then state:

Result 6. *There exists two thresholds, denoted as ρ''_{loc} and ρ'_{loc} , in which banks decide to operate as risky IBs $\forall \Delta R \in [\rho''_{loc}, \rho'_{loc}]$. Otherwise, banks choose to act as CBs, with safe activity $\forall \Delta R < \rho''_{loc}$ and with risky activity $\forall \Delta R > \rho'_{loc}$.*

Given the potential advantage of IBs described in the previous section, banks with intermediate returns on assets select Islamic banking, as before.

We observe here that the choice of a bank is affected by the excess return ϵ driven by the degree of competition differential, the local adjustment of capital requirements imposed on IBs α , and the extent of leverage ratio restrictions K^{lr} .

More precisely, comparative statistics for Result 6 show that ρ'_{loc} is greater the larger the factor of reduction α and the excess return ϵ . On the other hand, this threshold is smaller the greater the leverage ratio restriction K^{lr} :

$$\frac{\partial \rho'_{loc}}{\partial \alpha} = \frac{(\Delta K + K - K^{lr})(1 - p(2 - k))}{p\tau} > 0 \quad (17)$$

$$\frac{\partial \rho'_{loc}}{\partial \epsilon} = \frac{1}{\tau} - 1 > 0 \quad (18)$$

$$\frac{\partial \rho'_{loc}}{\partial K^{lr}} = -\frac{\alpha(1 - p(2 - k))}{p\tau} < 0 \quad (19)$$

In addition, we find that ρ''_{loc} is smaller the larger the factor of reduction α and the excess return ϵ . Nevertheless, the relationship between this threshold and the leverage ratio restriction K^{lr} is ambiguous:

$$\frac{\partial \rho''_{loc}}{\partial \alpha} = -\frac{(\Delta K + K - K^{lr})(1 - p(2 - k))}{p(1 - \tau)} < 0 \quad (20)$$

$$\frac{\partial \rho''_{loc}}{\partial \epsilon} = -1 \quad (21)$$

$$\frac{\partial \rho''_{loc}}{\partial K^{lr}} = -\frac{\alpha(1 - p(2 - k)) - (k - 1)}{p(1 - \tau)} \quad (22)$$

We observe that, under a Basel III capital framework, banks have more incentives to operate as IBs in local banking systems overseen by regulators making significant reductions to IB capital requirements, and where the degree of competition differential between Islamic and conventional banking activities is strong. The aforementioned potential advantage of IBs obviously becomes stronger the more substantial those local particularities of

dual banking systems. In other words, if IBs benefit from a large captive clientele and from tailored risk-weighted capital requirements, the stronger incentive to operate as conventional banks following the implementation of leverage ratio restrictions is moderated. In short, the local environment in dual banking systems relative to banking competition and capital requirement adjustments also determines the analysis of how Basel III rules affect banking behavior.

5. Concluding remarks

This study examines how Basel capital requirements and IFSB standards affect Islamic and conventional bank behavior, using a simple theoretical model. Within a profit-maximization perspective (i.e. without religious incentives), our findings show that Islamic banking becomes attractive when capital requirements apply and with an intermediate banks' return on assets. Under these conditions, banks therefore choose not to increase deposits but rather propose profit-sharing investment accounts to customers. Alternatively, banks with low or high returns on assets prefer conventional banking, and hence raise interest-bearing deposits while this source of funding is forbidden by the rules of traditional Islamic finance. Besides, in a dual banking system, where Islamic and conventional banks operate simultaneously, we find that solely risk-weighted capital requirements increase the number of Islamic banks. On the other hand, the implementation of leverage ratio restrictions in addition to a risk-weighted capital ratio tends to reduce the proportion of Islamic banks in the banking system.

Furthermore, our model takes into account the local specificities of dual banking systems in two ways. It is widely agreed that conventional banks face more difficulties in attracting Muslim customers than Islamic banks, due to the religious motivations of these customers. We thus investigate bank behavior under Basel III capital requirements when Islamic banks benefit from a less competitive environment than conventional banks. In contrast,

we assume that national regulators are able to tailor international capital requirements for local Islamic banks, as allowed by the standards of the Islamic Financial Services Board. Not surprisingly, regional differences therefore create regulatory arbitrage opportunities. Our results show that incentives to act as risky conventional banks under the Basel III regulation are lower if the degree of competition differential is high and/or if local regulatory adjustments for Islamic banks are considerable. In summary, the presence of such local particularities mitigates the decrease of Islamic banks that follows the implementation of leverage ratio restrictions in dual banking systems.

This paper highlights that the strengthening of capital requirements alter incentives to operate as Islamic banks, as these banks benefit from higher abilities to absorb losses, and thus benefit from lower capital requirements. This point provides a new explanation of the substantial growth in Islamic banking activities over the last decade, since the global banking crisis of 2007-2008 led to a reduction of banks' return on assets and to a tighter regulatory framework. Overall, this analysis stresses the need to take into account the specificities of Islamic banking within international regulatory guidelines, especially when many conventional banks nowadays decide to engage in Islamic banking activities as a response to the current financial environment.

Appendix

Proof of Result 1.

We find

$$\frac{\partial \pi_{noreg}^{safe}}{\partial K} = 1 - k < 0 \quad (\text{A.1})$$

$$\frac{\partial \pi_{noreg}^{risky}}{\partial K} = (2 - k)p - 1 < 0 \quad (\text{A.2})$$

Without capital requirements, profits of safe IBs and CBs are respectively

$$\pi_{noreg}^{safeIB} = (1 - \tau)(1 + R) \quad (\text{A.3})$$

$$\pi_{noreg}^{safeCB} = R \quad (\text{A.4})$$

with $\pi_{noreg}^{safeCB} > \pi_{noreg}^{safeIB}$ for all $\tau(1 + R) > 1$.

Expected profits of risky IBs and CBs are respectively

$$\pi_{noreg}^{riskyIB} = (1 - \tau)(p(2 + R + \Delta R) - 1) \quad (\text{A.5})$$

$$\pi_{noreg}^{riskyCB} = p(R + \Delta R) \quad (\text{A.6})$$

The profit differential $\pi_{noreg}^{riskyCB} - \pi_{noreg}^{riskyIB}$ evaluates to

$$p(\tau(2 + R + \Delta R) - 2) + (1 - \tau) \quad (\text{A.7})$$

which is positive for all $p > \frac{1}{2}$ and $\tau(1 + R) > 1$.

Proof of Result 2.

We obtain

$$\frac{\partial \pi_{rw}^{risky}}{\partial \mu} = \frac{\Delta K(1 - (2 - k)p)}{1 - \bar{K}} + (\tau + 2p - 1) - p\tau(R + \Delta R + 2) \quad (\text{A.8})$$

The bank decision depends on the excess return on assets ΔR : when ΔR is higher than $\frac{\Delta K(1 - (2 - k)p)}{(1 - \bar{K})p\tau} + \frac{\tau + 2p - 1}{p\tau} - (2 + R)$, the optimal choice for

a risky bank is collecting deposits instead PSIA contracts ($D = 1 - \bar{K} - \Delta K$ and $\mu = 0$). On the other hand, when $\Delta R < \frac{\Delta K(1-(2-k)p)}{(1-\bar{K})p\tau} + \frac{\tau+2p-1}{p\tau} - (2+R)$, the risky bank does not raise deposits in order to benefit from lower capital requirements. We find that $\rho''_{rw} < \rho'_{rw} \forall p > \tilde{p}$, with $\tilde{p} = \frac{\Delta K((K-1)\tau+1)+(K-1)(1-\tau(-(2-k)K-R+1))}{\Delta K(2-k)((K-1)\tau+1)+(K-1)(2-\tau(2-(2-k)K))} > 0$.

Proof of Result 3.

Following from equation (9), equation (11) and equation (12), we find that $\pi_{rw}^{riskyCB} < \pi_{rw}^{riskyIB} < \pi_{rw}^{safeCB}$ when $\Delta R < \frac{\bar{K}(1-k(1-p))+R}{p(1-\tau(1-\bar{K}))} + \frac{1}{p} - (2+R)$; and $\pi_{rw}^{safeCB} < \pi_{rw}^{riskyIB} < \pi_{rw}^{riskyCB}$ when $\Delta R > \frac{\Delta K(1-(2-k)p)}{p\tau(1-\bar{K})} + \frac{\tau+2p-1}{p\tau} - (2+R)$.

On the other hand, risky IBs benefit from the highest expected profit when $\frac{\bar{K}(1-k(1-p))+R}{p(1-\tau(1-\bar{K}))} + \frac{1}{p} - (2+R) < \Delta R < \frac{\Delta K(1-(2-k)p)}{p\tau(1-\bar{K})} + \frac{\tau+2p-1}{p\tau} - (2+R)$.

Proof of Result 4.

It holds that

$$\frac{\partial \pi_{lr}^{risky}}{\partial \mu} = \frac{(\Delta K - \gamma)(1 - (2 - k)p)}{1 - \bar{K}} - 1 + \tau - p(\tau(R + \Delta R + 2) - 2) \quad (\text{A.9})$$

As under Basel II capital requirements, the excess return on assets ΔR drives the bank decision: when ΔR is higher than $\frac{(\Delta K - \gamma)(1 - (2 - k)p)}{(1 - \bar{K})p\tau} + \frac{2p + \tau - 1}{p\tau} - 2 - R$, the optimal choice for a risky bank is conventional banking (with $D = 1 - \bar{K} - \Delta K$ and $\mu = 0$). In contrast, risky banks do not collect deposits when $\Delta R < \frac{(\Delta K - \gamma)(1 - (2 - k)p)}{(1 - \bar{K})p\tau} + \frac{2p + \tau - 1}{p\tau} - 2 - R$.

Proof of Result 5.

Following from equation (11), equation (14) and equation (16), we obtain $\pi_{lr}^{riskyCB} < \pi_{lr}^{riskyIB} < \pi_{lr}^{safeCB}$ when $\Delta R < \frac{\bar{K}(1-k(1-p))+R+\gamma(2-k)(1-p)}{p(1-\tau(1-\bar{K}))} + \frac{1}{p} - (2+R)$; and $\pi_{lr}^{safeCB} < \pi_{lr}^{riskyIB} < \pi_{lr}^{riskyCB}$ when $\Delta R > \frac{(\Delta K - \gamma)(1 - (2 - k)p)}{p\tau(1 - \bar{K})} + \frac{\tau + 2p - 1}{p\tau} - (2 + R)$.

In contrast, the risky IBs expected profit becomes the highest expected profit when $\frac{\bar{K}(1-k(1-p))+R+\gamma(2-k)(1-p)}{p(1-\tau(1-\bar{K}))} + \frac{1}{p} - (2+R) < \Delta R < \frac{(\Delta K - \gamma)(1 - (2 - k)p)}{p\tau(1 - \bar{K})} + \frac{\tau + 2p - 1}{p\tau} - (2 + R)$.

$$\frac{\tau+2p-1}{p\tau} - (2 + R).$$

As we saw before, $\rho'_{rw} > \rho''_{rw} \forall p > \tilde{p}$. Hence, $\rho'_{rw} - \rho''_{rw} > \rho'_{lr} - \rho''_{lr} \forall p > \tilde{p}$, implying that the incentive to opt for Islamic banking is reduced when leverage ratio restrictions are applied.

Proof of Result 6.

The IBs expected profit is then:

$$\begin{aligned} \pi_{loc}^{riskyIB*} &= (p((1 + R + \Delta R + \epsilon) - D - \mu\tau(1 + R + \Delta R + \epsilon) \\ &\quad - (K^{lr} + (\Delta K - K^{lr} + K)(1 - \alpha))k) \quad (A.10) \\ &\quad + (1 - p)(-(K^{lr} + (\Delta K - K^{lr} + K)(1 - \alpha)) - (1 - \tau)\mu) \end{aligned}$$

with $D = 1 - (K^{lr} + (\Delta K - K^{lr} + K)(1 - \alpha)) - \mu$.

As before, safe banks prefer conventional banking and do not offer PSIA to investors. We find that the risky CBs expected profit is larger than the IBs expected profit for all $\Delta R > \rho'_{loc} = \frac{\alpha(\Delta K + K - K^{lr})(1 - (2 - k)p) - (1 - \tau) + p(\epsilon + 1 - \tau)}{p\tau} - R - \epsilon$. On the other hand, the IBs expected profit is lower than the safe CBs profit for all $\Delta R < \rho''_{loc} = \frac{((1 - \alpha)(K + \Delta K) + \alpha K^{lr})(1 - p(2 - k)) - K^{lr}(k - 1) + R - \tau(1 - p)}{p(1 - \tau)} - R - \epsilon$, with $\rho''_{loc} < \rho'_{loc}$.

References

- Abedifar, P., P. Molyneux, and A. Tarazi
2013. Risk in islamic banking. *Review of Finance*, 17(6):2035–2096.
- Aggarwal, R. K. and T. Yousef
2000. Islamic banks and investment financing. *Journal of Money, Credit and Banking*, 32(1):93–120.
- Al Rayan Bank
2018. Annual report and financial statements. Technical report.

- Alandejani, M., A. M. Kutan, and N. Samargandi
2017. Do islamic banks fail more than conventional banks? *Journal of International Financial Markets, Institutions and Money*, 50:135 – 155.
- Allahrakha, M., J. Cetina, and B. Munyan
2018. Do higher capital standards always reduce bank risk? the impact of the basel leverage ratio on the u.s. triparty repo market. *Journal of Financial Intermediation*, 34:3 – 16. Assessing Banking Regulation During the Obama Era.
- Alqahtani, F., D. G. Mayes, and K. Brown
2016. Economic turmoil and islamic banking: Evidence from the gulf cooperation council. *Pacific-Basin Finance Journal*, 39:44 – 56.
- Alqahtani, F., D. G. Mayes, and K. Brown
2017. Islamic bank efficiency compared to conventional banks during the global crisis in the gcc region. *Journal of International Financial Markets, Institutions and Money*, 51:58 – 74.
- Asmild, M., D. Kronborg, T. Mahbub, and K. Matthews
2018. The efficiency patterns of islamic banks during the global financial crisis: The case of bangladesh. *The Quarterly Review of Economics and Finance*.
- Baele, L., M. Farooq, and S. Ongena
2014. Of religion and redemption: Evidence from default on islamic loans. *Journal of Banking & Finance*, 44:141 – 159.
- Barth, A. and C. Seckinger
2018. Capital regulation with heterogeneous banks – unintended consequences of a too strict leverage ratio. *Journal of Banking & Finance*, 88:455 – 465.

Basel Committee on Banking Supervision

2010. Basel 3: A global regulatory framework for more resilient banks and banking systems.

Basel Committee on Banking Supervision

2014. Basel 3 leverage ratio framework and disclosure requirements.

Bashir, B.

1983. Portfolio management of islamic banks: ‘certainty model’. *Journal of Banking & Finance*, 7(3):339 – 354.

Beck, T., A. Demirgüç-Kunt, and O. Merrouche

2013. Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking & Finance*, 37(2):433 – 447.

Belanès, A., Z. Ftiti, and R. Regaïeg

2015. What can we learn about islamic banks efficiency under the subprime crisis? evidence from gcc region. *Pacific-Basin Finance Journal*, 33:81 – 92.

Besanko, D. and G. Kanatas

1996. The regulation of bank capital: Do capital standards promote bank safety? *Journal of Financial Intermediation*, 5(2):160 – 183.

Blum, J. M.

2008. Why ‘basel 2’ may need a leverage ratio restriction. *Journal of Banking & Finance*, 32(8):1699 – 1707.

Bolt, W., L. de Haan, M. Hoeberichts, M. R. van Oordt, and J. Swank

2012. Bank profitability during recessions. *Journal of Banking & Finance*, 36(9):2552 – 2564.

Camara, B., L. Lepetit, and A. Tarazi

2013. Ex ante capital position, changes in the different components of regulatory capital and bank risk. *Applied Economics*, 45(34):4831–4856.

Čihák, M. and H. Hesse

2010. Islamic banks and financial stability: An empirical analysis. *Journal of Financial Services Research*, 38(2):95–113.

Dalla Pellegrina, L.

2007. Capital adequacy ratios, efficiency and governance: a comparison between islamic and western banks. Working Papers 20070402, Università degli Studi di Milano-Bicocca, Dipartimento di Statistica.

Dietrich, A. and G. Wanzenried

2011. Determinants of bank profitability before and during the crisis: Evidence from switzerland. *Journal of International Financial Markets, Institutions and Money*, 21(3):307 – 327.

Dietrich, A. and G. Wanzenried

2014. The determinants of commercial banking profitability in low-, middle-, and high-income countries. *The Quarterly Review of Economics and Finance*, 54(3):337 – 354.

Dridi, J. and M. Hassan

2010. The effects of the global crisis on islamic and conventional banks : A comparative study. Working Papers 10/201, International Monetary Fund.

Freixas, X. and J. Rochet

2008. *Microeconomics of Banking, 2nd Edition*, volume 1, 2 edition. The MIT Press.

Giammarino, R. M., T. R. Lewis, and D. E. M. Sappington

1993. An incentive approach to banking regulation. *The Journal of Finance*, 48(4):1523–1542.

Hassan, M. K. and S. Aliyu

2018. A contemporary survey of islamic banking literature. *Journal of Financial Stability*, 34(C):12–43.

- Hussain, H. A. and J. Al-Ajmi
2012. Risk management practices of conventional and islamic banks in bahrain. *The Journal of Risk Finance*, 13(3):215–239.
- Islamic Financial Services Board
2013. Revised capital adequacy standard for institutions offering islamic financial services excluding islamic insurance institutions and islamic collective investment schemes.
- Islamic Financial Services Board
2016. Islamic financial services industry stability report. Technical report.
- Kiema, I. and E. Jokivuolle
2014. Does a leverage ratio requirement increase bank stability? *Journal of Banking & Finance*, 39:240 – 254.
- Kim, D. and A. M. Santomero
1988. Risk in banking and capital regulation. *The Journal of Finance*, 43(5):1219–1233.
- Kohlscheen, E., A. M. Pabon, and J. Contreras
2018. Determinants of bank profitability in emerging markets. BIS Working Papers 686, Bank for International Settlements.
- Lopez-Mejia, A., S. Aljabrin, R. Awad, M. Norat, and I. Song
2014. Regulation and supervision of islamic banks. Working Papers 14/219, International Monetary Fund.
- Malaysia International Islamic Financial Centre
2014. A landmark year for the global islamic finance industry.
- Meslier, C., T. Risfandy, and A. Tarazi
2017. Dual market competition and deposit rate setting in islamic and conventional banks. *Economic Modelling*, 63:318 – 333.

- Muljawan, D., H. A. Dar, and M. J. B. Hall
2004. A capital adequacy framework for islamic banks: the need to reconcile depositors' risk aversion with managers' risk taking. *Applied Financial Economics*, 14(6):429–441.
- Rahman, M.
2018. Islamic banks with mutuality and neutrality: A balance-sheet-based theoretical framework. *The Quarterly Review of Economics and Finance*.
- Repullo, R. and J. Suarez
2004. Loan pricing under basel capital requirements. *Journal of Financial Intermediation*, 13(4):496 – 521.
- Rugemintwari, C.
2011. The Leverage Ratio as a Bank Discipline Device. *Revue Economique*, 62(3):479–490.
- Song, I. and C. Oosthuizen
2014. Islamic banking regulation and supervision: Survey results and challenges. Working Papers 14/220, International Monetary Fund.
- Sorwar, G., V. Pappas, J. Pereira, and M. Nurullah
2016. To debt or not to debt: Are islamic banks less risky than conventional banks? *Journal of Economic Behavior & Organization*, 132:113 – 126. Special issue on Islamic Finance.
- Spinassou, K.
2016. Leverage ratio a la Basel III: The Impact on the credit supply and banking stability. *Revue Economique*, 67(6):1153–1177.
- Turk Ariss, R.
2010. Competitive conditions in islamic and conventional banking: A global perspective. *Review of Financial Economics*, 19(3):101 – 108.