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RESEARCH ARTICLE

# Displaced Commercial Risk: Quantitative Measurement and Impact on Islamic Banks

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**ABSTRACT**

Islamic banks face Displaced Commercial Risk (DCR) due to assets funded by Participating Investment Accounts (PSIA) following profit and loss sharing principles. In theory, profits are shared based on predetermined ratios, with PSIA holders bearing losses except for mismanagement or contractual violations. However, in practice, commercial and regulatory pressures compel Islamic banks to absorb losses to prevent fund withdrawals. This threat necessitates sufficient capital allocation to mitigate DCR and ensure stable PSIAU returns. The paper identifies DCR and proposes a methodology using an internal bank model, Value at Risk. It identifies potential DCR exposure scenarios based on real PSIAU yield, reference yield, PER, and IRR reserves. Our findings, covering the period from 2008 to 2011, reveal a negative correlation between the required capital to mitigate DCR (as determined by parametric VaR) and the desired confidence level, while showing a positive relationship with the time horizon (T). However, from 2012 to 2022, there is a positive association between DCR, the confidence level, and the time horizon. Historical VaR analysis indicates a positive link between DCR and the time horizon, with DCR remaining relatively stable regardless of the confidence level. We also observe that the capital recommended by the IFSB is lower than the capital suggested by VaR analysis. These results underscore the importance of Islamic banks maintaining an adequate capital level to mitigate risks, thereby ensuring optimal performance, financial stability, and overall sector stability.

## 1.INTRODUCTION

Over the past decades, we have noticed many bank failures worldwide, leading to the closure of these banks by regulatory authorities. These failures have had detrimental effects on the economy, reducing credit flow and impacting the efficiency and productivity of businesses. Extensive empirical research has consistently shown that non-performing loans are the primary cause of most bank failures or banking crises. In this context, Islamic finance, based on ethical principles, sets itself apart from conventional finance by offering an alternative perspective on the value of labor and capital, emphasizing a fairer sharing of risk between lenders and borrowers.

Islamic finance has experienced rapid and sustained growth, establishing itself as a robust financial system on a global scale. This growth is evidenced by the performance of five sub-sectors: Islamic Banks (hereinafter we call them by IB), Takaful, Other Islamic Financial Institutions such as Investment Companies, Sukuk, and Islamic Funds. Islamic banks represent a significant portion of this market, with the total value of Islamic financial assets traded globally reaching 1,992 billion USD in 2019, as reported by the Islamic Financial Service Industry Stability Report 2020. Moreover, BI holds a 6% share in global Islamic banking assets, and the issuance of Sukuk amounts to 538 billion USD. The number of Islamic financial institutions worldwide, including banks, mutual funds, mortgage companies, and insurance companies, reached over 526 in 2019. Notably, the assets of BI have witnessed remarkable growth, surpassing 100 billion $ in the late 90s and reaching over 1.99

trillion$ in 2019, with a projected growth to exceed $2.44 trillion by 2024. According to the International Monetary Fund (IMF), Islamic banks represent 79% of the Islamic banking sector and remain the primary driver for the development of alternative finance to conventional banking, particularly in the Middle East, South and South-East Asia, and increasingly in Africa, Central Asia, and Europe.

The banking system, like other financial institutions, is considered a portfolio of risks, posing significant challenges for financiers and researchers. Islamic banks face a range of traditional risks common to their conventional counterparts, including market risk, credit risk, liquidity risk, and operational risk. However, due to their unique characteristics and operating methods, Islamic banks encounter additional risks specific to their operations, such as displaced commercial risk, legal risk, religious risk, and non-compliance with Charia'a (Khan & Ahmed, 2001; Sundrararajan & Errico, 2002; Grais & Kulthunga, 2007). Effectively managing these risks is crucial, and risk management lies at the core of financial institutions' activities. Adequate risk management enhances stability and profitability by reducing the risk of default, earnings volatility, and bankruptcy (Abedifar et al., 2013; Dridi et al., 2013; El-Galfy & Hegazy, 2017; Mollah et al., 2016). Risk management in Islamic banking is unique due to its specificities (Kabir & Worthington, 2016; Ullah et al., 2020). The prudential committee IFSB recommends the use of tools to identify, assess, monitor, and mitigate risks specific to Islamic banking portfolios (IFSB-17, 2015).

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Our research focuses on the management of displaced commercial risk (DCR) resulting from profit and loss sharing on Participatory Investment Accounts (PSIAU) (Archer & al., 2010, Archer and Karim, 2009, Daher & al., 2015, El- Hawary , 2007, Farook & al., 2012, Fiennes, 2007, Mejia & al., 2014, Toumi & al., 2011). IBs, acting as fund managers or Mudarib, invest the funds deposited in PSIAU based on the Mudaraba contract. According to the contractual obligations, returns are shared between the IB and the depositors according to a predetermined ratio, while losses are typically borne by the depositors, except in in cases of mismanagement, violations, or negligence of contractual conditions by the bank (AAOIFI, 2015a). DCR, in this context, refers to the risk of loss borne by the bank to ensure competitive returns for the PSIAU holders, often resulting in a reduction of the bank's profit margin. This entails a transfer of part or all of the shareholders' profits to the PSIAU holders, aiming to enhance the profits generated by these accounts. The risk is transferred theoretically, according to the Mudaraba contract, from the depositors of the funds to the shareholders, hence the term "displaced commercial risk."

Over the past decades, we have witnessed numerous bank failures worldwide, leading to the closure of many banks by regulatory authorities. These failures have had detrimental effects on the economy, reducing credit flow and impacting the efficiency and productivity of businesses. Extensive empirical research has consistently shown that non-performing loans are the primary cause of most bank failures or banking crises. In this context, Islamic finance, based on ethical principles, sets itself apart from conventional finance by offering an alternative perspective on the value of labor and capital, emphasizing a fairer sharing of risk between lenders and borrowers.

Various researchers have examined DCR in different contexts. For instance, Haron and Ahmed (2000) studied the Malaysian banking sector using an adaptive anticipation model and found a negative relationship between the conventional interest rate and the number of deposits in Islamic banks. Kaleem and Isa (2003) conducted research using Granger causality and demonstrated the impact of conventional deposit rates on Islamic bank deposits across all categories. Research in Indonesia by Sudardjat (2006), Williyanti and Hermana (2007), Kasri (2007), and Kasri and Kassim (2009) yielded similar results, highlighting the negative effect of conventional interest rates on

[1] Islamic Financial Services Board.

Islamic bank deposits. Kader and Leong (2009) examined the effects of conventional interest rate changes on Islamic finance in Malaysia. Zainol and Kassim (2010) found a possibility of DCR and a significant and negative relationship between the total volume of deposits in IBs and the interest rate of conventional banks. Using Value at Risk (VAR) and Vector Error Correction Model (VECM) methodology, the results showed that IBs in Malaysia, affected by interest rate risk, is positively related to BI financing. Furthermore, Toumi & al. (2011) analysed the specific risks related to PSIAU accounts, while Toumi & al. (2013) examined the practical and theoretical aspects of PSIAU, measuring DCR using the Value at Risk (VaR) model for a Bahraini Islamic bank. The DCR adds considerable challenges to regulators in assessing this potential risk borne by BI. Legally, frameworks for the quantification of DCR in the Islamic sphere are rare despite the efforts of the IFSB. The latter recommends a DCR measurement method for all BIs and sets a coefficient α in a ratio to calculate the adequate volume of capital to absorb the DCR (IFSB-2, 2005, IFSB-GN4,2011) without taking into account the specificities of each BI. The value of the proportion α is estimated during the holding of the PER [2]and IRR[3] reserves by the BI, hence the estimate of the minimum value of equity to absorb the DCR. This ratio called capital adequacy ratio.

$$\text{Equity ratio}=\frac{\text{capital (Tier 1+Tier2)}}{\begin{array}{l}\text{risque pondéré des actifs ( crédit+marché+opérationnel)}\\ -\text{ risques pondérés des actifs financés par CIR[4]( crédit+marché)}\\ -(1-\alpha)\text{risques pondérés des actifs financés par CINR[5]( crédit+marché)}\end{array}}$$

This article aims to investigate the specific risk faced by IBs, known as Displaced Commercial Risk (DCR), which arises from managing funds in participatory investment accounts (PSIAU). The objective is to identify the various forms and manifestations of DCR in BIs and quantify its magnitude using an internal quantitative Value at Risk (VaR) model. Additionally, we will measure the capital needed to absorb the DCR using the VaR method and compare it with the recommended capital by the Islamic Financial Services Board (IFSB). Furthermore, we will assess the impact of this risk on the stability and performance of IBs.

For our case study, we examine BIs in Bahrain that gather funds through PSIAU accounts based on Mudaraba contracts. We analyse the financial information disclosed in their annual reports to understand their exposure to DCR. Due to the limited information and transparency regarding the management of DCR, we select a single bank.

To quantify the DCR risk, we utilize two types of data. The first type is based on daily market data, where assumptions are made about the specific BI's investment portfolio and a benchmark portfolio to calculate the profit and loss series related to DCR. The second type of data is annual data provided by the IBs.

Our findings, covering the period from 2008 to 2011, reveal a negative correlation between the required capital to mitigate DCR (as determined by parametric VaR) and the desired confidence level, while showing a positive relationship with the time horizon (T). Additionally, DCR in 2011 appears more significant than in 2008. However, from 2012 to 2022, there is a positive association between DCR, the confidence level, and the time horizon.

Historical VaR analysis indicates a positive link between DCR and the time horizon, with DCR remaining relatively stable regardless of the confidence level. We also observe that the capital recommended by the IFSB is lower than the capital suggested by VaR analysis.

These results underscore the importance of Islamic banks maintaining an adequate capital level to mitigate risks, thereby ensuring optimal performance, financial stability, and overall sector stability.

Our study contributes to the literature by offering a quantitative assessment of DCR management over multiple years.

[2]Profit Equalization Reserve.

[3]Investment Risk Reserve.

[4]Restrictive Participating Investment Accounts.

[5]Non-Restrictive Participating Investment Accounts.

The article's structure is as follows: the second section presents the data and methodology, the third section discusses the results, and the fourth section concludes the paper.

## 2.DATA AND MÉTHODOLOGIE

Our choice is justified as Bahrain has long been recognized as a global leader in Islamic finance, hosting the largest concentration of Islamic financial institutions in the Middle East. It is also home to several prominent Islamic standard-setting organizations worldwide. Additionally, the growth of BI has been remarkable with total assets increasing from 1.9 billion USD in 2000 to 32.7 billion USD in July 2020, an increase of more than 17 times. The IB market share increased from 1.8% of total banking assets in 2000 to 15.3% in July 2020. This growth can be attributed to various factors, including the Bank's clear vision and approach in Central Bank of Bahrain. The CBB has introduced a separate regulatory framework and a comprehensive prudential and reporting mechanism specifically designed for the Islamic banking and insurance sector, catering to its unique concepts and needs. The IB rulebook covers several areas, such as licensing requirements, capital adequacy, risk management, business conduct, financial crime, and disclosure/reporting requirements. Since 2008, the CBB has been issuing recommendations on DCR and mandates the publication of financial information related to DCR. Furthermore, IBs are required to maintain prudential PER and IRR reserves as recommended by the IFSB and implement an internal process to monitor the adequacy of capital for absorbing potential risks. In line with the requirements of Islamic finance, IBs invest in a Charia'a-compliant investment portfolio. To meet this requirement, Islamic stock indices and Islamic portfolios have been introduced in the global financial markets.

For our case study, we consider Bahraini IBs investing in a portfolio of assets composed of Bahrain's Dow Jones Islamic Market Index (DJIM). This index was launched in Bahrain in 1999 and was the first index created by investors seeking Charia'a-compliant investments.

we focused on the annual reports of BIs in Bahrain from 2008 to 2022 and identified eight banks that are relevant to the DCR. Among these banks, only four include the retention of PER and IRR reserves recommended by the IFSB and AAOIFI in their annual reports. Therefore, our study sample is based on these banks. We also observed variations in the retention of PER and IRR reserves techniques in some banks compared to the requirements of AAOIFI and IFSB. It's worth noting that AAOIFI and IFSB recommend levying the PER reserve before allocating profits between the depositors of funds in participating investment accounts and the shareholders, while IRR is calculated after determining the Mudarib share.

After analysing the information, we found that Al Baraka Bank, an Islamic bank, adheres to the recommendations of IFSB and AAOIFI in terms of retaining reserves. Therefore, we have selected this bank as a case study for the period from 2008 to 2022, considering the different variables of our model as shown in Table 1.

**Table 1. The parameters of the model**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total investment deposits. ( DI)** | 6662 | 8168 | 10140 | 12150 | 967538 | 1118764 | 1289703 | 1244594 | 1598245 | 1474200 | 1410782 | 1436847 | 1696907 | 1865005 | 1912559 |
| **Gross income before distribution to shareholders and depositors. ( joint investment income)** | 725866 | 812647 | 808707 | 895826 | 1018482 | 7818 | 78997 | 79277 | 75890 | 90303 | 92789 | 99497 | 97754 | 98130 | 138544 |
| **return on equity of investment accounts before group's share as Mudarib** | 652499 | 709417 | 745405 | 796826 | 874470 | 68753 | 72635 | 69244 | 61137 | 71861 | 69629 | 82458 | 87437 | 82941 | 122331 |
| **group's share as a Mudarib** | 190580 | 213421 | 236627 | 236159 | 261609 | 13062 | 13849 | 17547 | 16579 | 18308 | 16477 | 9244 | 23676 | 24374 | 20297 |
| **return on equity of investment accounts holders** | 461919 | 495996 | 508778 | 560667 | 612861 | 55690 | 58785 | 51697 | 44558 | 53553 | 53152 | 73214 | 63761 | 58567 | 102034 |
| **PER t** | 223 | 227 | 195 | 234 | 803 | 544 | 573 | 574 | 558 | 551 | 572 | 115 | 229 | 411 | 411 |
| **PER acc** | 227 | 195 | 234 | 803 | 944 | 573 | 574 | 558 | 551 | 572 | 115 | 229 | 344 | 411 | 411 |
| **IRR t** | 5319 | 5837 | 6423 | 5443 | 9365 | 2604 | 2418 | 2338 | 2339 | 2339 | 1710 | 0 | 0 | 0 | 0 |
| **IRR acc** | 5837 | 6423 | 8654 | 9365 | 9842 | 2418 | 2338 | 2339 | 2339 | 1710 | 0 | 0 | 0 | 0 | 0 |
| **p: % PER = PERt/ return on equity of investment accounts before group's share as Mudarib** | 0,000307 | 0,0003 | 0,0002 | 0,00026 | 0,000788 | 0,0069582 | 0,00725 | 0,00724 | 0,00735 | 0,0061 | 0,0061645 | 0,00116 | 0,00234 | 0,00419 | 0,00297 |
| **i: % IRR = IRR t/ Depositor's share of Mudaraba income.** | 0,011515 | 0,0118 | 0,0126 | 0,00971 | 0,015281 | 0,0023276 | 0,00187 | 0,001879 | 0,00146 | 0,00159 | 0,0012121 | 0 | 0 | 0 | 0 |
| **k: Bank commission as Mudarib = Mudareb's share / Mudaraba income.** | 0,292077 | 0,3008 | 0,3174 | 0,29637 | 0,299163 | 0,1899844 | 0,19067 | 0,253408 | 0,27118 | 0,25477 | 0,2366399 | 0,11211 | 0,27078 | 0,29387 | 0,16592 |
| **f=(1-p)(1-k)(1-i)** | 0,699556 | 0,6907 | 0,6738 | 0,69661 | 0,689584 | 0,8025071 | 0,80196 | 0,739794 | 0,7224 | 0,73951 | 0,7577348 | 0,88687 | 0,72751 | 0,70317 | 0,83161 |

**Source: Author's calculation**

To quantify the risk of DCR, we used two types of data. The first type is based on daily market data, where we made assumptions about the IBs investment portfolio and the benchmark portfolio to calculate the DCR's profit and loss series. The second type of data is based on annual data from IBs.

We chose to illustrate the simplest quantitative financial method, Value at Risk (VaR), despite its criticism in the literature, for measuring DCR. The VaR provides a simple way to explain this risk and presents various statistical risk estimators (Jorion, 2001; Allen & Bali, 2007). VaR is widely used by the majority of banks to measure the capital required for absorbing potential losses from risks (Beder & Gold, 2013) and plays a crucial role in risk management due to its simplicity and ease of calculation (Arner et al., 2019).

We will apply VaR to quantify DCR and measure the maximum potential loss that BI shareholders can absorb from the transferred risk. VaR (T, α), calculated for a given time horizon T and a confidence threshold α, is determined by the following equation:

Prob(X≤ $VaR_\alpha$(X))=α

With :

$VaR_\alpha$: the maximum potential loss for a confidence threshold α and a given time horizon T.

X: the random variable designating the series of profits and losses generating PSIAU.

The PSIA is a significant source of risk within IBs. It arises when the actual rate of return on PSIAUs is lower than the benchmark rate, denoted as $r_b$. Profits distributed to the holders of these accounts ($r_r$) are calculated based on the gross results after deducting management fees known as the "mudarib share," as well as the deduction of two reserves, PER and IRR, recommended by the IFSB and AAOIFI (AAOIFI -27, IFSB-17, 2015, IFSB-2, 2005) to absorb the DCR. The DCR comes into play if the actual yields are lower than the benchmark yields, and if the cumulative PER[6] and IRR[7] reserves are insufficient to mitigate the risk.

To quantify the DCR, we follow these steps: firstly, we calculate the actual returns on PSIAU deposits; secondly, we identify various scenarios representing the bank's exposure to the DCR, and finally, we measure the necessary volume to absorb this risk using the VaR approach and the IFSB approach.

From the balance sheet identity in the annual reports, the IB invests a certain amount in a financial asset, which is rated as A. This amount is the sum of the bank's equity, rated as C, and the funds deposited in the PSIAU, rated as DI. However, we observe the following relationship:

A=C+DI. (1)

The real return is the return expected by the holders of the PSIAU when investing their funds deposited by the IB as mudarib. This return is calculated from the gross income of the rated investment $\tilde{R}_A$. The PER reserve is a part of gross income $\tilde{R}_A$. This gross income is equal to:

PER= (1-p) *$\tilde{R}_A$. ( 2)

Where p is the percentage of PER retained for the current year.

Subsequently, the gross income of the PER is divided into two parts. The first part is the profits for the shareholders and the second part is the profits going to the depositors, in proportion to their contributions to the amount invested. The distribution of the profits generated by an investment financed jointly by the holders of the PSIAU and the IB, according to the proportions agreed in

[6] PER is a deduction from the gross income of IB, set aside before profit allocation between depositors and shareholders. It serves to enhance returns for depositors, compensating for lower rates compared to reference rates.

[7] IRR is deducted from Mudaraba income allocated to PSIAU holders, following the allocation of BI's remuneration as Mudarib share. In contrast to PER, IRR exclusively benefits PSIAU holders and serves to offset losses on their investments, particularly when returns are negative.

advance by the two counterparties, is acceptable. Whereas, the AAOIFI standards recommend a proportional distribution given as follows:

$$(1\text{-p}) * \tilde{R}_A = {}^{C}/_{A} * (1\text{-p}) * \tilde{R}_A + {}^{DI}/_{A} * (1\text{-p}) * \tilde{R}_A = (1 - x_A)(1\text{-p}) * R_r + x_A(1\text{-p}) * \tilde{R}_A. \quad (3)$$

With $x_A$ is the percentage of profits going to depositors.

Then, as fund manager or even mudarib, the IB reduces a profit management commission going to depositors rated c.

The return on net deposits from the mudarib share before deduction of the IRR reserve is given by the following formula:

$$x_A(1\text{-p})\ (1\text{-c}) * \tilde{R}_A. \quad (4)$$

With c: the commission as a percentage of the profits going to the depositors.

The IRR reserve is retained in proportion i on the income generated from PSIAU deposits. This reserve is solely allocated to the account holders and is intended to absorb any potential losses on their funds.

Ultimately, the actual return on the PSIAU funds, after deducting the reserves and the commission of the BI as mudarib c, can be expressed as follows:

$$\tilde{R}_r = x_A(1\text{-p})\ (1\text{-c})\ (1\text{-i}) * \tilde{R}_A. \quad (5)$$

Even with a significant number of accumulated reserves, the profitability for depositors may still be lower than the market average. In such cases, our objective is to determine the volume of funds required to mitigate the DCR. However, it is crucial to identify the various potential scenarios of exposure to the DCR based on the reserves held (refer to Table 2).

**Table 2. The quantile of the parametric VaR of the DCR**

| Date | Confidence threshold | VaR 1 d | VaR 10 days | VaR 1 year |
|---|---|---|---|---|
| | 90% | -0.0159 | -0.0503 | -0.2527 |
| | 95% | -0.0149 | -0.0472 | -0.2369 |
| 2008 | 99% | -0.0131 | -0.0413 | -0.2073 |
| | 90% | -0.0057 | -0.0182 | -0.0912 |
| | 95% | -0.0048 | -0.0151 | -0.0756 |
| 2009 | 99% | -0.0029 | -0.0092 | -0.0464 |
| | 90% | -0.0090 | -0.0285 | -0.1429 |
| | 95% | -0.0080 | -0.0254 | -0.1277 |
| 2010 | 99% | -0.0062 | -0.0198 | -0.0991 |
| | 90% | -0.0539 | -0.1706 | -0.8564 |
| | 95% | -0.0530 | -0.1675 | -0.8406 |
| 2011 | 99% | -0.0511 | -0.1616 | -0.8111 |
| | 90% | -0.0270 | -0.0853 | -0.4280 |
| | 95% | -0.0280 | -0.0886 | -0.4446 |
| 2012 | 99% | -0.0300 | -0.0948 | -0.4759 |
| | 90% | -0.0271 | -0.0858 | -0.4309 |
| | 95% | -0.0282 | -0.0893 | -0.4483 |
| 2013 | 99% | -0.0303 | -0.0958 | -0.4810 |
| | 90% | -0.0115 | -0.0365 | -0.1832 |
| | 95% | -0.0126 | -0.0400 | -0.2006 |
| 2014 | 99% | -0.0147 | -0.0465 | -0.2333 |
| | 90% | -0.0114 | -0.0360 | -0.1806 |
| | 95% | -0.0124 | -0.0392 | -0.1968 |
| 2015 | 99% | -0.0143 | -0.0452 | -0.2270 |
| | 90% | -0.0154 | -0.0489 | -0.2452 |
| | 95% | -0.0164 | -0.0520 | -0.2609 |
| 2016 | 99% | -0.0183 | -0.0578 | -0.2902 |
| | 90% | -0.0190 | -0.0602 | -0.3022 |
| | 95% | -0.0201 | -0.0634 | -0.3183 |
| 2017 | 99% | -0.0220 | -0.0694 | -0.3486 |

| | | | | |
|---|---|---|---|---|
| | 90% | -0.0243 | -0.0769 | -0.3861 |
| | 95% | -0.0254 | -0.0803 | -0.4033 |
| 2018 | 99% | -0.0274 | -0.0868 | -0.4358 |
| | 90% | -0.0275 | -0.0870 | -0.4367 |
| | 95% | -0.0287 | -0.0908 | -0.4558 |
| 2019 | 99% | -0.0310 | -0.0979 | -0.4916 |
| | 90% | -0.0152 | -0.0480 | -0.2412 |
| | 95% | -0.0162 | -0.0514 | -0.2579 |
| 2020 | 99% | -0.0182 | -0.0576 | -0.2892 |
| | 90% | -0.0171 | -0.0541 | -0.2717 |
| | 95% | -0.0181 | -0.0573 | -0.2878 |
| 2021 | 99% | -0.0200 | -0.0634 | -0.3182 |
| | 90% | -0.0275 | -0.0870 | -0.4367 |
| | 95% | -0.0287 | -0.0908 | -0.4558 |
| 2022 | 99% | -0.0310 | -0.0979 | -0.4916 |

**Source: Author's calculation**

The extent of funds not covered by the reserve amount can be determined using the Value at Risk (VaR) method, considering a specific probability and time horizon.

$P\left(\tilde{R}_r - \tilde{R}_B + E \leq VaR_\alpha\right) = \alpha$

Where E is the portion of the cumulative amount of PER and IRR reserves allocated to depositors.

## 3. RESULTS AND INTERPRETATIONS

We measure the global DCR and the DCR of each scenario by two VaR models: Historical VaR and Parametric VaR, at different confidence levels and over different time horizons for a period from 2013 to 2020.

### 3.1 The DCR Measurement

#### 3.1.1 The Parametric Approach

The DCR risk measure by the parametric method is given by the following equation:

$VaR(T, \alpha) = \mu_t + \sigma_t z_\alpha$

With: $\mu_t$is the mean of the DCR distribution, $\sigma_t$is the standard deviation of the DCR distribution and $z_\alpha$is the quantile at threshold α.

Observations from Table n° II indicate a negative relationship between the DCR, quantile of parametric VaR, and confidence level for the period from 2008 to 2011. For instance, in 2008, the DCR for a 90% confidence threshold and a one-day time horizon was found to be 1.59% of the total number of PSIAU participatory investment accounts. Conversely, for the same time horizon but with a different confidence threshold of 99%, the DCR was determined to be 1.31%.On the other hand, for the same period (2008 to 2011) the DCR and the time horizon T are positively correlated. In other words, the capital necessary to cover the DCR in 2008 is 1.59% of the total of the PSIAU participatory investment accounts, for a holding period of one day (1d) and at the 90% confidence level. Whereas, for the same 90% confidence threshold and for the holding period of one year, it is 25.27 %.

Another noteworthy observation is that for the period from 2008 to 2011, regardless of the confidence threshold and time horizon, the DCR in 2011 was higher than that in 2008. This highlights the effect of the crisis, indicating that BIs were more exposed to DCR during the Subprime crisis.

Additionally, we find that during the post-crisis period from 2012 to 2022, and for the same confidence threshold, the DCR increases with the time horizon. For example, in 2022, the adequate capital required to cover the DCR is 2.75% for a 90% probability and a 1-day holding period, while it amounts to 43.67% for the same probability and a one-year holding period. Moreover, there is a positive relationship between the DCR and the confidence threshold.

The amount of VaR necessary to cover the DCR for different time periods and confidence levels is calculated by multiplying the quantile of parametric VaR by the value of participatory investment deposits in the bank for each year.

We observe that the capital required to cover the DCR, with a 99% confidence level and a one-year holding period, amounts to 1683.607 BD in 2008 and 940,172.921 BD in 2022 (Table 3).

**Table 3. The amount of adequate capital by the parametric VAR**

| Date | DI | Confidence threshold | VaR 1 d | VaR 10 days | VaR 1 year |
|---|---|---|---|---|---|
| | | 90% | -106.057 | -335,382 | -1683.607 |
| | | 95% | -99.431 | -314.427 | -1578.413 |
| 2008 | 6662 | 99% | -86.987 | -275.079 | -1380.883 |
| | | 90% | -46.941 | -148,439 | -745.158 |
| | | 95% | -38.919 | -123.072 | -617.818 |
| 2009 | 8168 | 99% | -23.856 | -75.439 | -378.703 |
| | | 90% | -91.283 | -288.664 | -1449.079 |
| | | 95% | -81,570 | -257.946 | -1294.879 |
| 2010 | 10140 | 99% | -63.330 | -200.266 | -1005.325 |
| | | 90% | -655.446 | -2072.704 | -10404.890 |
| | | 95% | -643,414 | -2034.652 | -10213.874 |
| 2011 | 12150 | 99% | -620.819 | -1963.201 | -9855.188 |
| | | 90% | -26086.943 | -82494.158 | -414117.388 |
| | | 95% | -27100.885 | -85700.522 | -430213.204 |
| 2012 | 967538 | 99% | -29004.841 | -91721.360 | -460437.571 |
| | | 90% | -30364.933 | -96022.350 | -482028.369 |
| | | 95% | -31593.336 | -99906.901 | -501528.661 |
| 2013 | 1118764 | 99% | -33900.004 | -107201.224 | -538145.874 |
| | | 90% | -14884.153 | -47067.824 | -236278.601 |
| | | 95% | -16297.461 | -51537.097 | -258714.172 |
| 2014 | 1289703 | 99% | -18951.340 | -59929.398 | -300843.189 |
| | | 90% | -14162.870 | -44786.927 | -224828.589 |
| | | 95% | -15425.934 | -48781.085 | -244879.105 |
| 2015 | 1244594 | 99% | -17797.687 | -56281.227 | -282529.518 |
| | | 90% | -24689.257 | -78074.287 | -391929.808 |
| | | 95% | -26264.040 | -83054.187 | -416928.710 |
| 2016 | 1598245 | 99% | -29221.132 | -92405.333 | -463871.091 |
| | | 90% | -28061.766 | -88739.094 | -445466.718 |
| | | 95% | -29561.027 | -93480.175 | -469266.755 |
| 2017 | 1474200 | 99% | -32376.307 | -102382.871 | -513957.935 |
| | | 90% | -34310.345 | -108498.838 | -544659.845 |
| | | 95% | -35844.655 | -113350.753 | -569016.262 |
| 2018 | 1410782 | 99% | -38725.749 | -122461.570 | -614752.201 |
| | | 90% | -39528.293 | -124999.438 | -627492.201 |
| | | 95% | -41253.889 | -130456.251 | -654885.185 |
| 2019 | 1436847 | 99% | -44494.174 | -140702.934 | -706323.121 |
| | | 90% | -25780.056 | -81523.695 | -409245.701 |
| | | 95% | -27565.066 | -87168.394 | -437581.863 |
| 2020 | 1696907 | 99% | -30916.919 | -97767.883 | -490790.878 |
| | | 90% | -31917.136 | -100930.846 | -506668.828 |
| | | 95% | -33817.203 | -106939.386 | -536831.458 |
| 2021 | 1865005 | 99% | -37385.107 | -118222.088 | -593470.174 |
| | | 90% | -52615.340 | -166384.313 | -835242.623 |
| | | 95% | -54912.246 | -173647.770 | -871704.889 |
| 2022 | 1912559 | 99% | -59225.327 | -187286.929 | -940172.921 |

**Source: Author's calculation**

In summary, the DCR increases over time, and the risk over one year is greater than that over one day with the same probability.

### 3.1.2 The Historical Approach

Historical VaR does not require specific assumptions, except for the condition that the price variations of the different risk factors must be stationary. It typically looks into the past performance

of the bank under consideration to measure extreme cases where the yield of Islamic indices is lower than that of the market.

Once the Historical VaR is calculated, the results recorded in Table 4 are eliminated.

**Table 4. The quantile of the historical VaR of the DCR**

| Date | Confidence threshold | VaR 1 d | VaR 10 days | VaR 1 year |
|---|---|---|---|---|
| | 0.9 | -0.0181 | -0.0572 | -0.2869 |
| | 0.95 | -0.0181 | -0.0572 | -0.2869 |
| 2008 | 0.99 | -0.0181 | -0.0572 | -0.2869 |
| | 0.9 | -0.0079 | -0.0249 | -0.1250 |
| | 0.95 | -0.0079 | -0.0249 | -0.1250 |
| 2009 | 0.99 | -0.0079 | -0.0249 | -0.1250 |
| | 0.9 | -0.0111 | -0.0350 | -0.1758 |
| | 0.95 | -0.0111 | -0.0350 | -0.1758 |
| 2010 | 0.99 | -0.0111 | -0.0350 | -0.1758 |
| | 0.9 | -0.0561 | -0.1774 | -0.8904 |
| | 0.95 | -0.0561 | -0.1774 | -0.8904 |
| 2011 | 0.99 | -0.0561 | -0.1774 | -0.8904 |
| | 0.9 | -0.0100 | -0.0317 | -0.1591 |
| | 0.95 | -0.0100 | -0.0317 | -0.1591 |
| 2012 | 0.99 | -0.0100 | -0.0317 | -0.1591 |
| | 0.9 | -0.0105 | -0.0332 | -0.1665 |
| | 0.95 | -0.0105 | -0.0332 | -0.1665 |
| 2013 | 0.99 | -0.0105 | -0.0332 | -0.1665 |
| | 0.9 | -0.0096 | -0.0302 | -0.1517 |
| | 0.95 | -0.0096 | -0.0302 | -0.1517 |
| 2014 | 0.99 | -0.0096 | -0.0302 | -0.1517 |
| | 0.9 | -0.0096 | -0.0302 | -0.1516 |
| | 0.95 | -0.0096 | -0.0302 | -0.1516 |
| 2015 | 0.99 | -0.0096 | -0.0302 | -0.1516 |
| | 0.9 | -0.0137 | -0.0432 | -0.2168 |
| | 0.95 | -0.0137 | -0.0432 | -0.2168 |
| 2016 | 0.99 | -0.0137 | -0.0432 | -0.2168 |
| | 0.9 | -0.0171 | -0.0541 | -0.2716 |
| | 0.95 | -0.0171 | -0.0541 | -0.2716 |
| 2017 | 0.99 | -0.0171 | -0.0541 | -0.2716 |
| | 0.9 | -0.0220 | -0.0696 | -0.3492 |
| | 0.95 | -0.0220 | -0.0696 | -0.3492 |
| 2018 | 0.99 | -0.0220 | -0.0696 | -0.3492 |
| | 0.9 | -0.0190 | -0.0601 | -0.3016 |
| | 0.95 | -0.0190 | -0.0601 | -0.3016 |
| 2019 | 0.99 | -0.0190 | -0.0601 | -0.3016 |
| | 0.9 | -0.0130 | -0.0411 | -0.2064 |
| | 0.95 | -0.0130 | -0.0411 | -0.2064 |
| 2020 | 0.99 | -0.0130 | -0.0411 | -0.2064 |
| | 0.9 | -0.0150 | -0.0474 | -0.2381 |
| | 0.95 | -0.0150 | -0.0474 | -0.2381 |
| 2021 | 0.99 | -0.0150 | -0.0474 | -0.2381 |
| | 0.9 | -0.0250 | -0.0791 | -0.3969 |
| | 0.95 | -0.0250 | -0.0791 | -0.3969 |
| 2022 | 0.99 | -0.0250 | -0.0791 | -0.3969 |

**Source: Author's calculation**

Al Baraka Islamic Bank consistently required a stable capital to cover the DCR in relation to the overall volume of participatory investment accounts for each holding period, regardless of the confidence threshold. For example, in 2008 and 2022, the required capital was 1.81% and 2.5% respectively for a one-day holding period. Furthermore, it showed a positive correlation with the time horizon, with values of 1.81% for one day and 28.69% for one year in 2008. Therefore, in 2022, the required capital was higher than in 2008.

The capital necessary to cover the DCR, with a 99% confidence level and a one-year holding period, amounted to BD 1,911,418 in 2008 and BD 759,023,322 in 2022 (Table 5).

**Table 5. The amount of adequate capital by historical VaR**

| Date | DI | Confidence threshold | VaR 1 d | VaR 10 days | VaR 1 year |
|---|---|---|---|---|---|
| | | 90% | -120.408 | -380.764 | -1911.418 |
| | | 95% | -120.408 | -380.764 | -1911.418 |
| 2008 | 6662 | 99% | -120.408 | -380.764 | -1911.418 |
| | | 90% | -64.312 | -203.372 | -1020.921 |
| | | 95% | -64.312 | -203.372 | -1020.921 |
| 2009 | 8168 | 99% | -64.312 | -203.372 | -1020.921 |
| | | 90% | -112.32 | -355.187 | -1783.025 |
| | | 95% | -112.32 | -355.187 | -1783.025 |
| 2010 | 10140 | 99% | -112.32 | -355.187 | -1783.025 |
| | | 90% | -681.5 | -2155.092 | -10818.477 |
| | | 95% | -681.5 | -2155.092 | -10818.477 |
| 2011 | 12150 | 99% | -681.5 | -2155.092 | -10818.477 |
| | | 90% | -30670.671 | -153965.550 | -153965.550 |
| | | 95% | -9698.918 | -30670.672 | -153965.550 |
| 2012 | 967538 | 99% | -9698.918 | -30670.672 | -153965.550 |
| | | 90% | -11733.404 | -37104.281 | -186262.014 |
| | | 95% | -11733.404 | -37104.281 | -186262.014 |
| 2013 | 1118764 | 99% | -11733.404 | -37104.281 | -186262.014 |
| | | 90% | -12323.03 | -38968.842 | -195622.037 |
| | | 95% | -12323.03 | -38968.842 | -195622.037 |
| 2014 | 1289703 | 99% | -12323.03 | -38968.842 | -195622.037 |
| | | 90% | -11887.94 | -37592.967 | -188715.197 |
| | | 95% | -11887.94 | -37592.967 | -188715.197 |
| 2015 | 1244594 | 99% | -11887.94 | -37592.967 | -188715.197 |
| | | 90% | -21824.43 | -69014.907 | -346452.086 |
| | | 95% | -21824.43 | -69014.907 | -346452.086 |
| 2016 | 1598245 | 99% | -21824.43 | -69014.907 | -346452.086 |
| | | 90% | -25226.5 | -79773.197 | -400458.273 |
| | | 95% | -25226.5 | -79773.197 | -400458.273 |
| 2017 | 1474200 | 99% | -25226.5 | -79773.197 | -400458.273 |
| | | 90% | -31037.204 | -98148.257 | -492700.339 |
| | | 95% | -31037.204 | -98148.257 | -492700.339 |
| 2018 | 1410782 | 99% | -31037.204 | -98148.257 | -492700.339 |
| | | 90% | -27300.093 | -86330.474 | -433375.541 |
| | | 95% | -27300.093 | -86330.474 | -433375.541 |
| 2019 | 1436847 | 99% | -27300.093 | -86330.474 | -433375.541 |
| | | 90% | -22059.791 | -69759.184 | -350188.326 |
| | | 95% | -22059.791 | -69759.184 | -350188.326 |
| 2020 | 1696907 | 99% | -22059.791 | -69759.184 | -350188.326 |
| | | 90% | -27975.075 | -88464.955 | -444090.548 |
| | | 95% | -27975.075 | -88464.955 | -444090.548 |
| 2021 | 1865005 | 99% | -27975.075 | -88464.955 | -444090.548 |
| | | 90% | -47813.975 | -151201.065 | -759023.322 |
| | | 95% | -47813.975 | -151201.065 | -759023.322 |
| 2022 | 1912559 | 99% | -47813.975 | -151201.065 | -759023.322 |

**Source: Author's calculation**

From these results, it can be concluded that the historical approach requires a larger volume of funds for DCR coverage, indicating that it is more stringent compared to the parametric approach.

### 3.2 Comparison with Central Bank of Bahrain (IFSB) Guidelines

The Central Bank of Bahrain has reviewed the prudential rules concerning the Islamic banking system in order to align with international standards and in particular the directives of the IFBS. It fixes a rate of 30% for the DCR (in other words alpha of order 30%). That is, BIs must bear 30% of a

risk weighted between credit risk and market risk, for assets financed by PSIAUs, to mitigate the DCR. While the remaining 70% must be borne by the investment account holders.

The data used in our calculation are taken from the annual reports of Al Baraka Islamic Bank and grouped together in table 6.

**Table 6: The data by the IFBS**

| | total credit risk-weighted assets | market risk-weighted assets | total risk-weighted assets (market risk+ credit risk) | total liabilities, investment funds and equity | investment account | total credit risk-weighted assets | market risk-weighted assets | total risk-weighted assets (market risk+ credit risk) | Investment account |
|---|---|---|---|---|---|---|---|---|---|
| 2008 | 5370 | 611 | 5981 | 10920 | 6662 | 0.610073 | 3648.848 | 1094.654 | 6662 |
| 2009 | 5627 | 862 | 6489 | 13166 | 8168 | 0.620386 | 4025.684 | 1207.705 | 8168 |
| 2010 | 7197 | 754 | 7951 | 14061 | 10140 | 0.721144 | 5733.813 | 1720,1438 | 10140 |
| 2011 | 6561 | 867 | 7428 | 592331 | 12150 | 0.020512 | 152.3645 | 45.70934 | 12150 |
| 2012 | 979442 | 74148 | 1053590 | 1418429 | 967538 | 0.682119 | 718674.2 | 215602.3 | 967538 |
| 2013 | 1079944 | 72507 | 1152451 | 1631207 | 1118765 | 0.68585 | 790409.7 | 237122.9 | 1118764 |
| 2014 | 1200405 | 72150 | 1272555 | 1835021 | 1289703 | 0.70283 | 894386.5 | 268315.9 | 1289703 |
| 2015 | 1283918 | 75213 | 1359131 | 1854573 | 1244594 | 0.67109 | 912105.5 | 273631.7 | 1244594 |
| 2016 | 1349061 | 89425 | 1438486 | 2385250 | 1598245 | 0.67005 | 963862.5 | 289158.8 | 1598245 |
| 2017 | 1519771 | 86625 | 1606396 | 2296936 | 1474200 | 0.64181 | 1031003 | 309301 | 1474200 |
| 2018 | 1442758 | 96763 | 1539521 | 2180422 | 1410782 | 0.64702 | 996104.7 | 298831.4 | 1410782 |
| 2019 | 1395370 | 105850 | 1501220 | 2214234 | 1436847 | 0.64891 | 974162.4 | 292248.7 | 1436847 |
| 2020 | 1636151 | 82188 | 1718339 | 2651975 | 1696907 | 0.63987 | 1099506 | 329851.7 | 1696907 |
| 2021 | 1865416 | 142700 | 2008116 | 2863442 | 1865005 | 0.651316 | 1307918 | 392375.3 | 1865005 |
| 2022 | 1912968 | 119014 | 2031982 | 2722601 | 1912559 | 0.702475 | 1427416 | 428224.9 | 1912559 |

**Source: Author's calculation**

The amount of capital required to mitigate the DCR is 32681,2 BD in 2008 and 9642016 BD in 2022 for example, these amounts represent respectively 20.38% and 19.83% of the investment accounts (table 7) . We also find that the amount of adequate capital increases over time. These amounts are lower than the values found according to the VaR calculations for the different holding dates and the different levels of confidence for the periods from 2008 until 2022. In other words, the IFBS approach is much more prudential than the VaR method. So our bank in question estimates the volume of capital to cover the DCR by applying the fixed and standard approach given by the IFBS.

**Table 7. The results of the IFBS approach**

| | % of total investment accounts | Total risk-weighted assets (market risk + credit risk) | Total risk-weighted assets | The required capital charge for | Capital charge required for displaced commercial |
|---|---|---|---|---|---|

| | **(liabilities+investment accounts+equity)[8]** | **financed by investment accounts) [9]** | **(market risk + credit risk)** | **the displaced commercial risk: $RCD_{\alpha}$[10]** | **risk from investment accounts** |
|---|---|---|---|---|---|
| 2008 | 0,610073 | 9803,741 | 9804,351 | 32681,2 | 0,20384828 |
| 2009 | 0,620386 | 10459,62 | 10460,24 | 34867,5 | 0,23425848 |
| 2010 | 0,721144 | 11025,54 | 11026,26 | 36754,2 | 0,27588672 |
| 2011 | 0,020512 | 362126,3 | 362126,3 | 1207088 | 0,01006555 |
| 2012 | 0,682119 | 1544583 | 1544584 | 5148612 | 0,18792211 |
| 2013 | 0,685851 | 1680323 | 1680323 | 5601078 | 0,19974103 |
| 2014 | 0,702827 | 1810622 | 1810623 | 6035410 | 0,21368936 |
| 2015 | 0,671095 | 2025245 | 2025246 | 6750819 | 0,18436194 |
| 2016 | 0,670053 | 2146823 | 2146823 | 7156078 | 0,22334091 |
| 2017 | 0,641812 | 2502909 | 2502910 | 8343033 | 0,17669833 |
| 2018 | 0,647022 | 2379393 | 2379394 | 7931314 | 0,17787495 |
| 2019 | 0,648914 | 2313435 | 2313436 | 7711453 | 0,18632637 |
| 2020 | 0,639865 | 2685470 | 2685470 | 8951567 | 0,18956535 |
| 2021 | 0,651316 | 3083168 | 3083169 | 1E+07 | 0,18146964 |
| 2022 | 0,702475 | 2892604 | 2892605 | 9642016 | 0,19835675 |

## CONCLUSION

This paper aims to identify a measure of misplaced trade risk, which is specific to the management of participatory investment accounts based on profit and loss sharing principles.

In many cases, most IBs absorb a portion of the losses that should theoretically be borne by the holders of participatory investment accounts due to commercial pressures. As a result, misplaced business risk exposure arises.

To quantify and measure the DCR, we propose two internal techniques based on Value at Risk (VaR). VaR is a simple model to apply within BIs, but it has advantages and disadvantages. It provides an estimate of the maximum potential loss for a given probability and time horizon. The two models used are parametric VaR and historical VaR. However, parametric VaR is dependent on BI's return smoothing policies, which consider factors such as the availability of PER and IRR reserves accumulated by the banks, profit and loss sharing ratios, and the bank's role as a fund manager (mudarib).

Historical VaR, on the other hand, relies on historical market index data and bank performance.

[8] % of total investment accounts ( (liabilities+investment accounts+equity)= investment account / Total of liabilities+investment accounts+equity.

[9] Total risk-weighted assets (market risk + credit risk) financed by investment accounts = Total risk-weighted assets (market risk + credit risk) /% of total investment accounts (liabilities + investment accounts + equity).

[10] The required capital charge for the displaced commercial risk: $RCD_{\alpha}$= Total asset-weighted risk (market risk + credit risk) financed by investment accounts / Alpha (α).

The volume of capital required according to parametric VaR and historical VaR is lower than the recommendations of the IFSB, which are based on a weighted risk ratio α. These recommendations have been subject to criticism as they are recommended for all banks without considering their specificities and the rates of return of each bank and their internal strategies for smoothing returns.

Effective management of DCR is crucial for ensuring the profitability and financial stability of IBs. It enables them to withstand financial crises better when compared to their conventional counterparts. The use of VaR provides a better estimation of the magnitude of DCR and determines an appropriate capital volume, taking into account the specificities of each IB to absorb the DCR. The capital estimated by VaR is lower than the fixed and arbitrary recommendations of the IFSB.

The findings of this study have important implications for IBs, regulatory boards, and the state. BIs need robust and effective risk management mechanisms to identify, assess, and manage DCR, as exposure to DCR can lead to significant financial losses and impact profitability. Furthermore, effective risk management is essential for the financial stability of IBs, as poorly managed DCR can have wider systematic consequences on the economy.

Regulatory committees such as the IFSB and the AAOIFI can take into consideration the specificities of each BI when determining the coefficient of adequate capital to absorb risks (α). They can also develop regulatory tools and strategies for risk management. The state can create specific laws and legal regulations for IBs to ensure stability and performance of these financial institutions. Future research could involve a comparative study of BIs, analysing differences in perception, management, and impact of DCR on BIs. Additionally, studying the channels through which this risk affects profitability and stability, and assessing its impact on the financial performance of BIs would be valuable. Exploring the impact of DCR on the financial stability of BIs and its potential transmission to the real economy, as well as identifying factors that amplify or mitigate this impact, and proposing monetary policy and prudential regulation measures to strengthen financial stability are potential avenues for future research.

## BIBLIOGRAPHY

AAOIFI, (1999),« Provisions and Reserves », *Financial Accounting Standard No.11*, AAOIFI, Manama, Bahrain.

AAOIFI, (2015a), Shari 'ah Standards - SS 13 on Mudharaba.

AAOIFI, (2015b), Shari 'ah Standards - SS 40 on Profit distribution in Mudarabah-based Investments Accounts.

AAOIFI, (2015c), Accounting Auditing and Governance Standards - FAS 27 on investment accounts.

Abedifar, P., Molyneux, P., et Tarazi, A., (2013), « Risk in islamic banking. »,*Review of Finance*vol. 17, pp. 2035–2096.

Al-Hawary*et al*.,(2007),« Diversity in the regulation of Islamic Financial Institutions. »,*The Quarterly Review of Economics and Finance*, vol.46, pp. 78-800.

ARCHER, S. et KARIM, R. A. A., (2006),« On capital structure, Risk Sharing and Capital adequacy in Islamic Banks. »,*International Journal of theatrical and Applied Finance,*vol.9, pp.269-280.

Archer, S. et Karim, R.A.A., (2009), « Profit-sharing investment accounts in Islamic banks: Regulatory problems and possible solutions. »,*Journal of Banking Regulation*,vol.10, pp.300–306.

ARCHER, S., KARIM, R. A. A. et SUNDARARAJAN, V., (2010),« Supervisory, regulatory ,and capital adequacy implications of profit-sharing investment accounts in Islamic finance. »*Journal of Islamic Accounting and Business Research,* vol.1, pp.10-31.

Daher, H., Masih, M., et Ibrahim, M., (2015),« The unique risk exposures of Islamic banks' capital buffers : A dynamic panel data analysis. », Journal of International Financial Markets, *Institutions and Money*, vol.36, pp.36–52.

Dridi, J., Hasan, I., et Mohieldin, M., (2013),« The Effects of the Global Crisis on Islamic and Conventional Banks : A Comparative Study. »,*Journal of International Commerce, Economics and Policy*, vol.4, N°2.

El-Galfy, A., et Hegazy, I., (2017),« The Impact of Risk Management on Financial Stability of Islamic Banks : An Empirical Study from MENA Countries. »,*Journal of Financial Regulation and Compliance*, vol. 25, N°4., pp. 546-565.

Farook, S., Hassan, M.K. et Clinch, G., (2012),« Profit distribution management by Islamic banks: *Governance and Sustainability. Emerald Group Publishing Ltd*, pp. 325–347.

Hakim, Sam (2003), *«* A Value-at-Risk Framework for Islamic Banks, »,Paper presented at International Conference on Islamic Banking, Jakarta, Sep30-Oct20.

Haron, S. et Ahmad, N.,(2000),« The Effects of Conventional Interest Rate and Rate of Profit on Funds Deposited with Islamic Banking System in Malaysia. »,*International Journal of Islamic Financial Services,* vol. 4, N°1,pp.3-9.

IFBS-15, (2013), « Revised Capital Adequacy Standard for Institutions Offering (Excluding Islamic Insurance Institutions and Islamic Collective Investment Schemes). »

IFBS-17, (2015), « Core principales for islamic finance regulation. »

IFBS-2, (2005), « Capital adequacy standard for institutions (other than insurance institutions), offering only islamic financial services ».

IFSB-GN 4, (2011),« Guidance note in connection with the IFSB capital adequacy standard: the determination of alpha in the capital adequacy ratio for institutions (other than insurance institutions), offering only islamic financial services ».

Kader, R.A. et Leong,Y. K. dan,(2009),« The Impact of Interest Rate Changes on Islamic Bank Financing. »,*International Review of Business Research Papers,*vol3, N°5, pp.189-201.

Kaleem, A.et Isa,M.,(2003),« Causal Relationship Between Islamic and Conventional Banking Instruments in Malaysia. »,*International Journal of Islamic Financial Services,* vol.4, pp.3-10.

Kaplanski, G., Levy, H., (2007),« Basel's value-at-risk capital requirement régulation : An efficiency analysis. »,*Journal of Banking and Finance*, vol. 31, pp.1887–1906.

Kasri, R.A. et Kassim,S., (2009),« Empirical Determinants of Saving in The Islamic Banks: Evidence from Indonesia. »,*J.KAU: Islamic Econ.,* vol.22, N°2, pp.3-23.

Kasri, R.A., (2007),« Displaced Commercial Risk in Islamic Banking: The Case of Indonesia. » Proceedings of the 2nd Islamic Conference, Faculty of Economics and Muamalat, Islamic Science University of Malaysia.

Mejia, A.L., Aljabrin, S., Awad, R., Norat, M. et Song, I., (2014), « Regulation and supervision ofIslamic banks », *IMF Working Papers*.

Mollah, S., Hassan, K., Al Farroque, O. et Mobarek, A., (2016),« The Governance, Risk-taking, and Performance of Islamic Banks »,*Journal of Financial Services Research,* pp. 0–29.

Saita, F., (2007),« Value at risk and bank capital management », *Academic P. ed.*

Sudardjat, I., (2006), « Analisis Faktor-faktor yang Mempengaruhi Simpanan Mudharabah pada Bank Syariah di Sumatera Utara. »,*Graduate School, Sumatera Utara University, Indonesia (in Bahasa Indonesia).*

Sundararajan, V., (2007),« Risk measurement and disclosure in Islamic finance and the implications of profit-sharing investment accounts. »,*Islamic Economics and Finance*.

Sundararajan, V., (2008), « Issues in managing profit equalization reserves and investment risk reserves in Islamic banks. »,*Journal of Islamic Economics, Banking and Finance*, pp. 1–12.

Sundararajan, V., (2011),« Profit Sharing Investment Accounts Measurement and Control of Displaced Commercial Risk (DCR) in Islamic Finance. »,*Islamic Economic Studies, vol.*19, N°1, pp. 41-62.

Taktak, N., (2011), » The nature of smoothing returns practices: the case of Islamic banks. »,*Journal of Islamic Accounting and Business Research,* vol. 2, pp.142–152.

Toumi, K, Viviani,J-L., et Belkacem, L., (2019), « Islamic banks' exposure to displaced commercial risk: Identification and measure. »,*The Quarterly Review of Economics and Finance*.

Toumi, K, Viviani,J-L., et Chayeh, Z., (2019), « Measurement of the displaced commercial risk in islamic banks. »,*The Quarterly Review of Economics and Finance*, vol.74, pp.18-31

Toumi, K. et Viviani, J.-L., (2013), « Le risque lié aux comptes d'investissement participatifs : un risque propre aux banques islamiques. », *Revue des sciences de gestion,* vol.48, pp.131–142.

Toumi, K., Louhichi, W. et Viviani, J.-L., (2012), « Alternative Financial Decision Principles: Theoretical Foundations of Islamic Banks., Capital Structure. », *Recent Developments in Alternative Finance: Empirical Assessments and Economic Implications*, vol.22, pp.157–172.

Toumi, K., Viviani, J.-L., Belkacem, L., (2011), « Actual Risk Sharing Measurement in Islamic Banks », *in: Sun, W., Louche, C., Pérez, R. (Eds.), Finance and Sustainability: Towards a New Paradigm? A Post-Crisis Agenda. Critical Studies on Corporate Responsibility, Governance and Sustainability. Emerald Group Publishing Ltd*, pp. 325–347.

Ullah, S., Hassan, A., et Ali, M., (2020), « Risk Management Practices, Islamic Ethical Standards and Financial Performance of Islamic Banks. »,*International Journal of Islamic and Middle Eastern Finance and Management*, vol. 13, N°1, pp.137-157

Williyanti, W. et Hermana, B., (2007), « Pengaruh Suku Bunga Konvensional, SBI dan SWBI terhadap Sumber dan Penggunaan Dana pada Bank Syariah. », Unpublished MSc Thesis. Gunadharma University, Indonesia (in Bahasa Indonesia).

Yamai, Y.et Yoshiba, T., (2005),« Value-at-risk versus expected shortfall: A practical perspective. », *Journal of Banking and Finance,*vol.29, pp.997–1015.

Zainol, Z. et Kassim,S.H., (2010), « An Analysis of Islamic Banks' Exposure to Rate of Return Risk. »,*Journal of Economic Cooperation and Development,* vol.1, N°31, pp. 59-84.

Zoubi, T. et Al-Khazali, O., (2007), « Empirical testing of loss provisions of banks in the GCC region. »,*Managment Financial*,vol.33, pp.500-511.