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Profitability and risk in interest-free banking industries: a dynamic panel data analysis

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Abstract

Purpose – The purpose of this paper is to examine whether Islamic finance could replace or complement the traditional financial system and could guarantee stability in times of crisis.

Design/methodology/approach – To achieve the aim, the authors examined both risk-taking and profitability of 94 Islamic banks (IBs) operating in 18 countries observed during the 2006-2013 financial crisis period. A series of bank-specific and other country-specific indicators are combined to explain profitability of IBs as measured by return on assets and return on equity, and risk divided into credit risk measured by impaired loans/gross loans and total equity/net loans, and insolvency risk measured by Z-score. Indeed, a bank is stronger than another if it is stable with a higher capacity to absorb risks, on the one hand, and increased performance on the other.

Findings – Using dynamic panel data econometrics (generalized moment method system), the authors estimated five regressions and found the following results: bank capital is found to be the main indicator that contributes to maximizing profitability and stability of IBs and reducing their credit risk. However, the study of liquidity and asset quality determinants often leads to inconclusive results. Nevertheless, they found that Gulf region-operating IBs are more profitable, more solvent and less risky than those operating in the South East Asian region. At the macroeconomic level, the authors could not find a significant relationship between inflation rate and IBs profitability. However, unlike for IBs in Southeast Asia, the authors found that inflation rate improves IBs stability and reduces their credit risk level.

Practical implications – The results of this study have numerous implications for bank management and the different stakeholders (investors, customers). This study identified several factors that may help bank managers to improve their financial outlook by controlling risk level and profitability. These factors could as well help to understand how macroeconomic indicators affect both banking risk and profitability, in particular Islamic banking. Likewise, portfolio managers can use these results to support their decisions to include IBs in their assets portfolios to mitigate potential risk.

Originality/value – This study contributes to the existing literature in two ways. First, this paper provides fresh data and recent information on Islamic banking in Gulf Cooperation Council and South East Asian countries. Second, the obtained results helped us to conclude that the Islamic financial system cannot replace but rather supplements the traditional system. This result may be explained by the fact that Muslims look for Islamic banking products, which conventional banks are not offering.

Keywords Islamic banks, Profitability, GMM system, Liquidity risk

Paper type Research paper

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1. Introduction

In recent years, frequency of banking crises has increased. A case in point is the recent international financial crisis, which has been shaking the world since 2008.

Two lessons can be drawn from this crisis. First, it pointed figures to the limits of the traditional financial system. Second, it revealed some form of resistance and an operational ability of the Islamic financial system during this financial turmoil (Trabelsi, 2011). Worth noting is that during the very crisis, all financial institutions experienced crises, while economic growth crippled; an exception to this trend is financial institutions operating with the Islamic financial system, which showed signs of robustness, efficiency and stability (Ftiti *et al.*, 2013; Mat Rahim and Zakaria, 2013; Fakhfekh *et al.*, 2016; Olson and Zobi, 2016). Naturally, resistance of these banks attracted the attention of all observers. Indeed, some argued that the current financial crisis could have been avoided if Islamic finance was the norm instead of traditional finance (Choong *et al.*, 2012; Beck *et al.*, 2013). Ability of Islamic finance to overcome these adverse events encouraged several stakeholders to propose Islamic finance as a solution to financial deficiencies and a potential alternative to the current banking system (Trabelsi, 2011; Bourkhis and Nabi, 2013; Rosman *et al.*, 2014). For them, ensuring the efficient functioning of the global financial system needs a remedy because of the weaknesses of traditional finance. Alternatively, Islamic finance promises a better future for humanity and could bring sustainable development all over the globe.

Responsibility of banks in such conditions has been and still is the subject of several studies, international meetings and discussions (Fakhfekh *et al.*, 2016; Ducassy and Guyot, 2017). The supporters of Islamic finance argued that an interest-free Islamic bank (IB) is not only fair and transparent but also more solid and stable with a higher capacity to absorb shocks than a conventional bank (CB) (Zehri and Al-Herch, 2013; Ftiti *et al.*, 2013; Mat Rahim and Zakaria, 2013). Nevertheless, another line of thinking has questioned the efficiency and strength of Islamic finance by arguing for its limited shock absorption capacity (Arrif *et al.*, 2008; Said, 2012).

Today, with the trust crisis that is currently prevailing the world of finance, the need for reforming the international financial system and for better managing risk is seen as a safety hatch against the reoccurrence of such crises. Moreover, because IBs are now integrated into the international financial system and the global economy, they are concerned by this need for reform. Accordingly, banking crises and Islamic finance are more than ever at the center of the discussion. Disagreements on the robustness of these specific financial institutions incite us to further study the issue. Then, pursuing this aim, we conducted a study in which we examine IBs' financial risks. Ultimately, we try to establish whether Islamic finance could reliably replace or complement the conventional financial system in view of protecting against potential crises and prevent new risks.

To this end, we combine a series of micro and macro variables and test their impact on both risk-taking and profitability (Indicators of banking robustness) of 94 IBs in 18 countries (Table I) over the 2006-2013 period, alternatively known as the 2007-2008 global financial crisis. We used the generalized moment method (GMM).

The rest of the paper is structured as follows. Section 2 briefly reviews the literature. Section 3 describes the data and methodology. Section 4 presents and discusses the results. Finally, Section 5 concludes the paper and presents the study's implications.

2. Banking risk: a literature review

The two important objectives of efficiently managing risk and increasing profitability invited several researchers, regulators and bank managers to further study the factors that

Country	IBs
Bahreïn	21
UAE	9
Kuwait	7
Saudi Arabia	5
Qatar	4
Oman	1
Malaysia	15
Singapore	1
Thailand	1
Philippines	1
Brunei	3
Indonesia	3
Jordan	3
Pakistan	6
Bangladesh	4
Turkey	4
Liban	3
Yemen	3
Total	94

Table I.
The sample

determine banking robustness. The aim behind such a focus will help them to understand and suggest a complete risk and profitability management framework. Indeed, the literature that have examined both risk and profitability of the banking sector is abundant (Mat Rahim and Zakaria, 2013; Rajhi and Hassairi 2013; Bourkhis and Nabi, 2013; Kabir *et al.*, 2015; Misman *et al.*, 2015; Fakhfekh *et al.*, 2016; Li, 2017). To that end, the relevant studies used different statistical techniques such as stress testing, the CAMEL model, regression analysis and ratio analysis. In line with this stream of research, in this section, we present a brief review of the literature on bank-specific, financial and macroeconomic determinants of banking profitability and financial risk.

Numerous studies pointed to the significance of several micro and macro-economic factors in determining bank profitability. For example, Zeitoun (2012) examined the performance of IBs and CBs operating in the Gulf Cooperation Council (GCC) countries over the 2002-2009 period. The author found that bank size has a positive significant impact on IBs' performance as measured by ROE. Moreover, the author found that gross domestic product (GDP) and inflation significantly relate to banking performance. More recently, Rashid and Jabeen (2016) have shown that the impact of GDP and lending interest rate on performance is negative for both types of banks.

Risk-taking-wise, Misman *et al.* (2015) examined the factors that determine the credit risk of 17 Malaysian IBs observed from 2000 to 2013, using a panel data technique. The results indicate that a few bank-specific variables do significantly affect the credit risk of Malaysian IBs. Moreover, the results also indicate that financing quality and capital ratio show consistent results regardless of the used measurement models. At the macro-economic level, Rajhi and Hassairi (2013) found that bank size, higher liquidity and GDP growth increase bank stability. Consumer price inflation and the official exchange rates led to financial instability. Nevertheless, Ashraf *et al.* (2016) concluded that GDP growth had no significant impact on the financial stability of 133 IBs in 30 regions observed over the 2000-2013 period. Studying comparatively 20 GCC IBs (before and after the crisis), Zarrouk (2012) found

that bank-specific indicators have negatively affected banking risk and excessive risk-taking of IBs in UAE during and after the crisis compared to other countries.

To obtain more robust results on the financial stability of IBs, some researchers opted for studying Islamic and CBs in a comparative design. Indeed, comparing them in time and space, Fakhfekh *et al.* (2016) studied volatility of CBs and IBs operating in the GCC countries during stable and crisis periods. Using the FIEGARCH model, these authors found that bad news strongly affects CBs volatility than that of IBs. They also discovered that following a shock, volatility is more persistent in CBs than in IBs. Therefore, the authors concluded that IBs are more resilient than CBs, but their resilience degree is somehow heterogeneous and sensitive to sample selection. The authors thus concluded that while this may call for regulating CBs in line with IBs' guidelines, it is worth noting that IBs in Saudi Arabia seem to be the most resilient. Similarly, Beck *et al.* (2013) compared 88 IBs to 422 CBs in 22 countries where both types of banks coexist over the 1995-2009 period. Their results indicate that IBs are better capitalized and have better asset quality and an ability to take risks. In the same context, Kabir *et al.* (2015) examined the key factors influencing the credit risk of a group of IBs and CBs during the 2000-2012 period. The authors note that IBs have significantly lower DC-based credit risk than CBs, but this relationship is reversed when credit risk is measured by NLP and Z-score ratios. Similarly, Ahmad and Ahmad (2004) also studied the relationship between financial indicators and credit risk of Malaysian IBs. They used a data set of six CBs, one fully fledged IB and six Islamic windows during the 1996-2002 period. These results indicate that management efficiency, risk-weighted assets and size significantly affect Malaysian IBs' credit risk. They also found similarities and differences between the factors that determine credit risk for IBs and CBs. They suggest that IBs should have a complete risk management system and a suitable information disclosure platform on how financing assets and risks are concentrated, like in CBs' banking reports. At the macroeconomic level, Rashid and Jabeen (2016) also show that the impact of GDP and lending interest rate on performance is negative for both types of banks.

In the same line of thinking, How *et al.* (2005) studied IBs' risk-taking of 23 Malaysian commercial banks during the 1988-1996 period. They concluded that banks offering Islamic financing modules have significantly less credit risk than banks that do not. They also found that size does significantly influence the credit risk of both IBs and CBs. Using these same ratios as stability indicators, Mat Rahim and Zakaria (2013) found that Malaysian IBs are more resistant during crises than CBs during the 2005-2010 period. These findings are consistent with those of Onakoya and Onakoya (2013) and Zehri and Al-Herch (2013) who concluded that IBs are more profitable and stable during the 2007-2008 crisis owing to *sharia* guidelines. Nevertheless, these findings are not conclusive. For example, Fayed (2013) showed the superiority of six CBs over three IBs in Egypt during the 2008-2010 period, in terms of liquidity, credit risk management, solvency and profitability. Ouerghi (2014) set to examine whether IBs are more resilient than CBs during the financial crisis. The author concluded that these latter were more profitable, less exposed to credit risk and more efficient than IBs during the post-crisis period. Chenguel (2014) found similar results. More recently, Louhichi and Boujelban (2016) used two complementary methods (one-step GMM analysis and panel vector autoregressive) to explain differences in credit risk exposure between the two types of banks. The results of the one-step GMM indicate that all factors explain credit risk and that *non-performing loans* increase with greater provisions, higher capitalization and almost

better quality management. However, toxic loans tend to increase with higher credit levels, larger bank size and improved profitability in a developing economy (i.e. higher GDP growth rate). They also note that interest-free banks differ from interest-charging banks because they share profits with investors (Profit and Loss Sharing principle). The bank is, therefore, not liable for losses, but depositors bear part of the banking credit risk. Consequently, it is generally argued that IBs dispose of inferior credit risk levels. Nevertheless, because of insufficient credit risk (often to comply with *sharia* guidelines), these banks often tend to mimic practices of interest-charging banks, and therefore, they tend to manage this risk in the same way CBs do. Using a panel vector autoregressive models (VAR), a study found that under a positive shock to GDP growth, capitalization and profitability improves loan portfolio quality, which in turn results in lower credit risk. Moreover, a higher inflation rate tends to decrease loan portfolio quality in the long run.

In light of these arguments, we test the following three hypotheses:

H1. Profitability of IBs significantly affects internal and external indicators.

H2. Credit risk of IBs significantly affects internal and external indicators.

H3. Insolvency risk of IBs significantly affects internal and external indicators.

3. Empirical study

3.1 Sample selection and data sources

In this study, to identify the determinants of IBs' risk and profitability, we examine a sample of 94 IBs operating in 18 countries, including the Gulf and Southeast Asian countries (Table I), during the 2006-2013 period, a period known by an economic recession following the 2007-2008 subprime crisis. The sample is large enough to provide reliable results. Bank data are taken from the Bank scope base. Macroeconomic data are collected from the World Development Indicators (WDI: 2006-2013).

3.2 Definition and selection of variables

To operationalize our financial and banking variables, we selected risk-taking and profitability indicators as dependent variables. In times of crises, a bank is said to be stronger than another if it is stable with a higher risk absorption capacity, on the one hand, and an increased performance, on the other.

Profitability of banks can be measured by different ratios, including the two financial ratios that have already been adopted in previous studies (Fayed, 2013; Jawadi *et al.*, 2014; Olson and Zobi, 2016). These are return on assets (*ROA*) and return on equity (*ROE*). Profitability ratios are used to measure the ability of a bank to generate earnings in the presence of expenses and other costs during a specific period. Therefore, higher profitability ratios are associated with better performance.

As for risk-taking, in addition to specific risk, like CBs, IBs' are exposed to credit and insolvency risks. Insolvency risk, which is when the bank is unable to repay its debts and financial obligations because of bankruptcy, is measured by *Z-score*. To measure credit risk, we will use the total equity/net loans (*EQL*) or impaired loans/gross loans (*IMLGL*) ratio. These financial ratios are considered to be the main measures to identify signs of increased financial vulnerability and assess banks' resilience against financial shocks. All these dependent variables are described in Table II.

As for control variables (Table III), financial ratios, calculated from capitalization, liquidity, assets quality and bank size, will be used to determine both risk and profitability. We will also add to these bank-specific internal indicators three country-specific external indicators, namely, GDP, inflation rate and official exchange rates as independent variables. The choice of these ratios aims at determining an instrument that would assess the soundness of IBs.

Description of the dependent variables and the independent variables[1] (bank characteristics and the macro-economic context) is given in Tables II and III.

3.3 The estimation models

To measure the robustness of IBs, we use panel data. We made recourse to two measurement instruments. The first provides a direct insight into the bank's stability in generating profits. The second determines the bank's ability to manage and mitigate incurred risk. To measure banking stability, we use the z-score ratio, which is known to be a popular measure of banking soundness. A high z-score ratio indicates that banks are more stable and implies that insolvency risk is very low (Cihák and Hesse, 2008; Ouerghi, 2014). In terms of credit risk, to determine a bank's capacity to manage and reduce incurred credit

Types of variables	Variables		Abbreviations	Definitions and retained measures	Sources
Bank-specific variables	Profitability-based indicators		ROA	Net returns/total assets	Bank-scope
			ROE	Net returns/equity	
	Risk-based indicators	Insolvency risk	ZSCORE	(Returns on assets + capital ratio)/returns on assets standard deviation	
		Credit risk	EQL	Total equity/net loans	
			IMLGL	Impaired loans/gross loans	

Table II. Definitions and measurement of the dependent variables

Types of variables	Variables	Abbreviations	Definitions and retained measures	Sources
Micro-economic variables	Bank size-based indicators	SZBQ	Napierian logarithm of total assets for each bank	Bank-scope
	Capitalization-based indicators	CTA	Capital/total assets	
	Liquidity-based indicators	NLTA	Net loans/total assets	
		NLDSF	Net Loans/deposits and short-term financing rate	
	Assets-based indicators	LLRGL	Loan loss reserves/gross loans	
		LLPNII	Loan loss provision/net interest income	
Macro-economic variables	GDP growth	GDP	GDP growth rate (%)	World Bank
	Inflation rate	INF	Inflation rate (en %)	
Dummy variables	Country dummy variables	CD	Equal 1 if Gulf Country and 0 if South East Asian Country	

Table III. Definitions and measurement of the independent variables

risks, we use the two indicators of IMLGL and EQL. A set of financial indicators will be used to ensure the robustness of our results. Applying each ratio on profitability and risk, five multiple linear models will be estimated:

3.3.1 Profitability equation.

$$\text{Panel. A.}\quad RENTABILITE_{j,i,t} = \alpha + \beta_1 \sum \beta_{jit} + \beta_2 \sum M_{jit} + \beta_3 CD + \varepsilon_{jit}$$

$$\text{Panel.a.1.}\quad ROA_{j,i,t} = \alpha + \beta_1 \sum \beta_{jit} + \beta_2 \sum M_{jit} + \beta_3 CD + \varepsilon_{jit}$$

$$\text{Panel.a.2.}\quad ROE_{j,i,t} = \alpha + \beta_1 \sum \beta_{jit} + \beta_2 \sum M_{jit} + \beta_3 CD + \varepsilon_{jit}$$

3.3.2 Risk equation.

$$\text{Panel. B.}\quad RISQUE_{j,i,t} = \alpha + \beta_1 \sum \beta_{jit} + \beta_2 \sum M_{jit} + \beta_3 CD + \varepsilon_{jit}$$

3.3.3 Insolvency risk.

$$\text{Panel.b.1.}\quad ZSCORE_{j,i,t} = \alpha + \beta_1 \sum \beta_{jit} + \beta_2 \sum M_{jit} + \beta_3 CD + \varepsilon_{jit}$$

3.3.4 Credit risk.

$$\text{Panel.b.2.}\quad EQL_{j,i,t} = \alpha + \beta_1 \sum \beta_{jit} + \beta_2 \sum M_{jit} + \beta_3 CD + \varepsilon_{jit}$$

$$\text{Panel.b.3.}\quad IMLGL_{j,i,t} = \alpha + \beta_1 \sum \beta_{jit} + \beta_2 \sum M_{jit} + \beta_3 CD + \varepsilon_{jit}$$

where i, j and t indicate successively banks (i = 1, 2, 3,. . .,94), countries (j = 1, 2,3,. . .,18) and time (t = 2006, 2005, . . ., 2013);

β = denotes the to-be-estimated model's parameters;
$\Sigma\beta_{jit}$ = denotes a vector of microeconomic variables;
ΣM_{jit} = denotes a vector of macroeconomic variables;
CD = denotes country dummy; and
εjit = denotes the random or error term.

3.4 The generalized moment method

Unlike a dynamic panel GMM, the traditional econometric methods (ordinary least squares (OLS), fixed effect and generalized effect) cannot overcome the endogeneity problem arising because of a causal relationship between the independent and dependent variables due to lagged dependent variables. To resolve this problem, we will use the GMM as a generic method to estimate our model's parameters. GMM was proposed by Arellano and Bond (1991) and developed by Arellano and Bover (1995) and Blundell and Bond (1998) to solve the endogeneity problem in the independent variables using a series of instrumental

variables generated by lagged variables (simultaneity bias problem of reverse causality and possible omitted variables).

4. Results and interpretation

4.1 Descriptive statistics

Examining the descriptive statistics (Table IV), we found that during the study period, the means of IBs' profitability ratios are significant. These institutions also have low credit and insolvency risks. On the micro level, IBs possess an important level of liquidity, capital and quality assets. Like the macro-economic variables, INF and GDP, respectively, show means of 4.29 per cent; 4.62 per cent for all the studied countries. However, liquidity superiority of GCC IBs is observable. Indeed, the net loans/total assets (NLTA) and net loans/deposits and short-term financing rate (NLDSF) ratios are, respectively, 44.56 and 62.09 per cent for these countries, compared with 58.28 and 68.12 per cent, respectively, for the South-East Asian IBs (Table IV). The same is true for capitalization, which can be explained by oil revenues. Indeed, capital/total assets (CTA) of GCC IBs is 28.94 against 22.71 for the South-East Asian IBs (Table IV).

On the macroeconomic level, GDP growth (Table IV) of all countries is on average high (4.62), while it remains slightly higher for the GCC countries (5.005) than for the South-East Asian countries (4.4). This high level of wealth production may result in households' savings deposits and thus will result in a stable liquidity.

4.2 Models estimation results

Estimating the multiple regression models requires the absence of multicollinearity between the variables. A multicollinearity problem arises when two independent variables are highly correlated. Kervin (1992) states that a serious multicollinearity problem arises when it exceeds the limit of 0.7. Referring to Kervin (1992), the obtained correlation coefficients are all below 0.7. We conclude to the absence of multicollinearity in all our defined models.

The results of the five models are reported in Table V. The null hypothesis *H0* about the validity of the instruments is not rejected (probabilities of the Hansan statistic are greater than 5 per cent, indicating that the instruments are exogenous). In addition, there is no order two serial autocorrelation (probabilities of Arellano & Bond test AR (2) are greater than 5 per cent). This indicates that the GMM model is relevant and specifies well our instruments without heteroscedasticity or autocorrelation problems.

The results of our study (Table V) indicate that CTA positively and very significantly affects profitability of the IBs of all countries (0.097) and sub-samples (respectively 0.0202 and 0.0772). The same is true for insolvency risk. The higher the capital, the more stable IBs of the different samples. In terms of credit risk, we found that IBs' capital positively and significantly correlates with the EQL ratio but negatively with the IMLGL ratio. An exception is the IMLGL ratio of the GCC IBs, which is positive (0.0977). This indicates that IBs' low exposure to credit risk results from their held capital.

All the results corroborate those of Beck *et al.* (2013), Mat Rahim and Zakaria (2013) and Trad *et al.* (2017) who concluded that maintaining an important capitalization is the main reason for the increased profitability and resilience of IBs during times of crisis and during adverse events.

Table IV.
Descriptive statistics

Variables	Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum
	Gulf countries				South East Asian countries				All countries			
ROA	2.159	8.088	−38.9	44.37	−0.91	13.996	−174.3	8.93	1.052	9.23	−174	44.37
ROE	6.166	20.28	−127	73.179	4.31	37.601	−367.2	28.162	6.466	24.67	−367	73.18
ZSCORE	42.47	39.65	−2.23	222.88	50.91	51.324	−3.749	234.3503	40.94	42.77	−92	234.4
EQL	44.18	35.08	5.482	163.58	27.87	34.860	−2.062	189.276	37.33	37.97	−166	189.3
IMLGL	20.96	38.8	0	295.4	7.61	10.270	0.07	88.845	14.56	29.2	0	295.4
CTA	28.94	27.57	1.227	151.76	22.71	24.729	−2.22	149.7953	23.45	25.47	−97.5	151.8
LLPNII	20.11	33	−98.4	145.86	21.06	27.827	−86.36	165.315	20.64	29.18	−98.4	165.3
LLRGL	9.358	15.6	−15.7	100	3.89	4.6292	0.15	29.28	7.364	12.83	−15.7	100
NLTA	44.561	26.993	0.417	98.917	58.28	21.576	4.3	160.2276	49.13	25.31	0.417	160.2
NLDSF	62.09	37.96	1.34	187.33	68.12	27.156	2.365	173.402	62.31	33.38	1.34	187.3
SZBQ	14.34	2.119	5.628	18.128	14.016	2.1243	6.4033	17.21325	13.69	2.638	3.738	18.33
INF	3.504	3.296	−4.86	15.05	3.00	2.3568	−0.846	13.10942	4.292	3.814	−4.86	20.29
GDP	5.005	4.506	−7.08	26.17	4.4	2.9059	−1.94	15.24038	4.628	3.981	−15.1	26.17

Table V. The results

Variables	ROA	ROE	All countries ZSCORE	EQL	IMLGL	ROA	Gulf countries ROE	ZSCORE
Lag of dependent variable	0.37703*** (0.004)	0.68072*** (0.010)	0.2398*** (0.021)	0.59376*** (0.014)	0.6083*** (0.003)	0.36031*** (0.013)	0.29103*** (0.015)	0.5054*** (0.028)
CTA	0.0202*** (0.007)	0.2804*** (0.050)	0.1808*** (0.051)	0.2917*** (0.032)	−0.010 (0.015)	0.0772*** (0.011)	0.1436*** (0.027)	0.1436*** (0.027)
LLPNII	−0.0065*** (0.002)	0.0235** (0.010)	0.015 (0.021)	0.006 (0.005)	0.004 (0.004)	0.0069** (0.003)	0.0464*** (0.011)	0.0464*** (0.011)
LLRGL	0.0326*** (0.006)	−0.395*** (0.032)	−0.1684** (0.076)	0.3034*** (0.019)	0.2528*** (0.012)	−0.0243** (0.010)	−0.2943*** (0.058)	−0.2943*** (0.058)
NLTA	−0.1274*** (0.009)	0.2640*** (0.036)	−0.046 (0.077)	−0.2395*** (0.033)	−0.0384** (0.018)	0.1903*** (0.021)	0.055 (0.037)	0.055 (0.037)
NLDSF	0.05353*** (0.006)	−0.1145*** (0.018)	0.0965*** (0.028)	−0.0556*** (0.013)	−0.055*** (0.009)	−0.0614*** (0.007)	−0.0700*** (0.017)	−0.0700*** (0.017)
SZBQ	3.28092*** (0.140)	−2.6751*** (0.655)	0.408 (0.809)	0.388 (0.335)	−0.764*** (0.182)	−0.6057** (0.249)	3.74143*** (0.686)	3.74143*** (0.686)
INF	0.05656*** (0.020)	−0.5625*** (0.137)	0.014 (0.147)	0.1446** (0.069)	−0.044 (0.032)	−0.018 (0.044)	0.001 (0.128)	0.001 (0.128)
GDP	0.13729*** (0.015)	0.3164*** (0.060)	−0.3299** (0.131)	−0.013 (0.053)	−0.217*** (0.039)	0.1879*** (0.026	0.8089*** (0.076)	0.8089*** (0.076)
CONSTANT	−43.481*** (2.246)	29.965*** (10.010)	16.871 (13.456)	14.759*** (5.088)	20.315*** (2.815)	1.510) (3.528)	−55.434*** (10.307)	−55.434*** (10.307)
AR (1)	−1.68	−3	−4.59	−2.99	−1.92	−2.13	−2.48	−3.69
P-val. Ar (1)	0.093	0.003	0	0.003	0.055	0.033	0.013	0
AR (2)	−2.1	−0.99	−1.38	0.77	0.71	−1.38	−1.17	−1.29
P-val. Ar (2)	0.036	0.321	0.168	0.439	0.476	0.167	0.243	0.197
Hansan	75.97	66.38	60.77	71.51	59.28	37.53	40.61	41.83
P .v. Hansan	0.109	0.329	0.52	0.191	0.574	0.994	0.984	0.977

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, Standard errors in parentheses

(continued)

Table V.

Variables	Gulf countries EQL	IMLGL	South East Asian countries ROA	ROE	ZSCORE	EQL	IMLGL
Lag of dependent variable	0.55427*** (0.014)	0.56879*** (0.004)	0.300 (0.024)	0.8944*** (0.034)	0.1688*** (0.083)	0.72150*** (0.021)	0.41675*** (0.035)
CTA	0.0655*** (0.023)	0.0977*** (0.020)	0.097 (0.057)	0.046 (0.127)	0.3905** (0.175)	0.3999*** (0.027)	−0.0716*** (0.015)
LLPNII	0.0507*** (0.007)	0.0172*** (0.004)	0.006 (0.007)	0.0640** (0.030)	−0.100*** (0.023)	−0.0368*** (0.010)	0.005 (0.003)
LLRGL	0.1788*** (0.026)	0.3808*** (0.015)	−0.401*** (0.107)	−3.362*** (0.655)	−0.635 (0.628)	0.084 (0.070)	1.0425*** (0.089)
NLTA	−0.3793*** (0.034)	−0.3659*** (0.034)	−0.0889** (0.034)	−0.069 (0.125)	−0.046 (0.212)	0.023 (0.026)	0.019 (0.021)
NLDSF	−0.0489*** (0.013)	0.02944** (0.014)	0.04699** (0.017)	−0.096 (0.118)	0.070 (0.192)	−0.0289** (0.012)	−0.0437*** (0.012)
SZBQ	2.44593*** (0.546)	2.2078*** (0.571)	1.9297*** (0.679)	−1.198 (0.794)	−3.964 (3.689)	0.333 (0.487)	−0.60938** (0.226)
INF	0.2999** (0.128)	−0.047 (0.060)	−0.6662** (0.281)	−0.806** (0.296)	−1.414 (1.344)	−1.1618*** (0.291)	0.6485*** (0.117)
GDP	0.2860*** (0.094)	−0.3290*** (0.091)	0.037 (0.089)	−0.573** (0.241)	2.0001*** (0.496)	0.128 (0.121)	−0.090 (0.136)
CONSTANT	−5.246 (8.816)	−14.034* (7.307)	−24.460** (11.544)	41.348** (15.571)	83.062 (51.386)	−3.496 (7.420)	11.4719*** (3.721)
AR (1)	−2.03	−1.79	−1.08	−1.37	−2.15	−1.93	−1.02
P-val. Ar (1)	0.043	0.074	0.28	0.171	0.031	0.054	0.306
AR (2)	0.78	0.66	−1.13	−0.06	−0.61	−0.49	−1.13
P-val. Ar (2)	0.436	0.51	0.258	0.949	0.545	0.621	0.258
Hansan	39.87	41.73	7.22	17.14	15.95	16.14	18.67
P .v. Hansan	0.987	0.978	1	1	1	1	1

As
for

the relationship between the two asset quality measures and the two profitability ratios, we were unable to find a significant relationship. The same is true for insolvency or credit risk of the IBs of all studied countries. The indicators yielded inconclusive results. Moreover, these results corroborate those of Kosmidou *et al.* (2005), Beck *et al.* (2013) and Ftiti *et al.* (2013), who found that LLPNII positively affects ROA, pointing to a high level of profitability. However, the relationship becomes negative when it comes to ROE. In addition, the Z-score of IBs positively correlates with LLPNII but negatively with LLRGL.

Liquidity is also one of the main measures adopted by the Basel Banking Supervision Committee to strengthen the banking sector. Indeed, under Principle 9, the Islamic Financial Services Board[2] requires that banks have a liquidity reserve to cope with a long period of liquidity shortage. Our results found are mixed for either profitability or risk.

NLTA affects negatively and significantly ROA but positively ROE for all countries. The ratio is reversed when we adopt NLDSF as a measurement unit.

The same signs can be found for insolvency and credit risks. Consequently, we cannot be conclusive about IBs' risk-profitability axiom.

Zeitoun (2012), Beck *et al.* (2013) and Rajhi and Hassairi (2013) already found that liquidity and Z-score of IBs are positively associated. Nevertheless, a geographical comparison shows that in the Gulf region, IBs are more profitable and less risky than those in the South East Asian region. For example, NLTA positively affects the two profitability measures (0.1903 and 0.055, respectively) and the Z-score (0.055) of GCC IBs, but negatively affects those of the South East Asian IBs (−0.0889, −0.069 and −0.046, respectively). A positive sign indicates that banks with more liquidity tend to have a high profitability and lower financial risks than banks with less liquidity. The higher the liquidity, the more efficient and stable IBs are. The higher levels of profitability and stability of GCC IBs over South-East Asian IBs can be attributed to the large revenues generated from oil.

Bank size is another internal indicator that can also affect profitability. Unlike GCC IBs, we found that bank size positively and very significantly affects profitability of IBs of all countries (3.28092) and South East Asian countries (1.9297), as measured by ROA. The higher the total assets of the bank increase, the more profitable the bank becomes.

Some researchers like Hasan and Dridi (2010), Zeitoun (2012), Muda *et al.* (2013), Rashid and Jabeen (2016) and Trad *et al.* (2017) found that size and profitability of IBs positively and significantly correlate.

As for the risk variable, we found that bank size acts positively and very significantly on the Z-score of IBs of all countries and those of the Gulf countries, which is not the case in South East Asia. The higher the total assets of IBs, the more stable IBs are, in particular GCC IBs. Similarly, Fayed (2013) and Rajhi and Hassairi (2013) found that an increase in total assets of IBs strengthens their stability. Except for the GCC IBs, SZBQ is significantly positive under the IMLGL ratio (2.2078), unlike the other countries where the relationship is negative, which implies a low credit risk. This can be explained by the fact that the operational focus of IBs on different activities facilitates the supervision of their credit risk and leads to a better diversification and absorption of risks.

At the macroeconomic level, we have not been able to find a significant relationship between inflation rate and profitability of IBs. The impact on the two ROA and ROE ratios is not conclusive: sometimes it is positive and sometimes it is negative. For risk and unlike

the South East Asian IBs, we found that inflation rate improves IBs' stability in all the studied countries (including those of the Gulf region) and reduces their credit risk level. We conclude then that the GCC IBs are more conservative and more cautious, while the South East Asian IBs are uncertain. GDP growth also plays an important role in the performance of financial institutions, including IBs. Except for the ROE ratio of the South East Asian IBs, GDP growth positively and significantly affects profitability of IBs in all countries, in particular those in the Gulf region. This means that an increase in a country's GDP improves the performance of banks operating in that country. This corroborates the results of Wasiuzzaman and Tarmizi (2010), Choong *et al.* (2012), Zeitoun (2012) and Muda *et al.* (2013).

As for the risk variable, our results corroborate those of Fayed (2013), Rajhi and Hassairi (2013) and Mat Rahim and Zakaria (2013). Indeed, the Z-score of the IBs from the GCC and the South East Asia is positively associated with GDP (0.8089 and 2.001, respectively), indicating a high level of stability in these regions.

5. Conclusion and implications

Risk management and profitability have attracted the attention of many authors in several regions. In this paper, we tried to examine these two issues in two leading Islamic finance regions: the GCC and the Southeast Asian regions. The main purpose of our study is to determine the factors that could explain both risk-taking and profitability in an interest-free banking system. Ultimately, this will allow us to examine whether this financial system could replace or complement the traditional financial system.

The results indicate that not only bank-specific factors but also macro-economic factors affect IBs' risk and profitability. In particular, we found the following results: bank capital is the main indicator that contributes to maximizing IBs' profitability and stability and reducing their credit risk. Nevertheless, liquidity and asset quality measures often lead to inconclusive findings. We noted the higher profitability, solvency and risk management of the GCC IBs over the South East Asian IBs because of liquidity indicators. Indeed, the reduced insolvency risk and credit risk of the GCC IBs results from a high liquidity ratio. This can be explained by investments coming from sovereign funds obtained from oil earnings.

At the macroeconomic level, we have not been able to find a significant relationship between inflation rate and IBs' profitability. However and unlike the South East Asian IBs, we found that inflation rate improves IBs' stability in all countries (including the Gulf countries) and reduces their credit risk. Except for the Z-score of IBs in the entire sample and ROE of the GCC IBs, the results indicate that GDP growth maximizes IBs' profitability and stability in the different country samples and minimizes their credit risk.

These findings lead us to conclude that the Islamic financial system cannot replace the traditional system. It is only a financial complement, which is still in its infancy and has a long way to go. This result may be explained by the fact that Muslims look for Islamic banking products, which CBs are not offering.

The results of our study have numerous implications for bank managers and the different stakeholders (investors, customers). This study identified several factors that may help bank managers to improve their financial outlook by controlling risk level and profitability. These factors could as well help to understand how macroeconomic indicators affect both banking risk and profitability, in particular Islamic banking. Finally, portfolio managers may use these results to support their decisions to include IBs in their asset portfolios to mitigate potential risks.

Notes

1. All bank-specific data are converted into US million dollars.
2. Guiding principles on liquidity risk management for institutions offering Islamic Financial Services, 2012.

References

Ahmad, N.H. and Ahmad, S.N. (2004), "Key factors influencing credit risk of Islamic bank: a Malaysian case", *The Journal of Muamalat and Islamic Finance Research*, Vol. 1 No. 1, pp. 65-80.

Arellano, M. and Bond, S. (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations", *Review of Economic Studies*, Vol. 58 No. 2, pp. 277-297.

Arellano, M. and Bover, O. (1995), "Another look at the instrumental variable estimation of error-component models", *Journal of Econometrics*, Vol. 68 No. 1, pp. 29-51.

Ariff, M., Bader, M., Shamsher, M. and Hassan, T. (2008), "Cost, revenue, and profit efficiency of Islamic versus conventional banks: international evidence using data envelopment analysis", *Islamic Economic Studies*, Vol. 15 No. 2, pp. 23-76.

Ashraf, D., Rizwan, M. and L'Huillier, B. (2016), "Net stable funding ratio for Islamic banks and its impact on financial stability: an international investigation", *Journal of Financial Stability*, Vol. 25, pp. 47-57.

Beck, T., Demirgüç-Kunt, A. and Merrouche, O. (2013), "Islamic vs conventional banking: business model, efficiency and stability", *Journal of Banking & Finance*, Vol. 37 No. 2, pp. 433-447.

Blundell, R. and Bond, S. (1998), "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, Vol. 87 No. 1, pp. 115-143.

Bourkhis, K. and Nabi, M.S. (2013), "Islamic and conventional banks' soundness during the 2007-2008 financial crisis", *Review of Financial Economics*, Vol. 22 No. 2, pp. 68-77.

Chenguel, M.B. (2014), "Islamic banking and the last financial crisis", *International Journal of Research in Applied Sciences*, Vol. 3, pp. 29-34.

Choong, Y.V., Thim, C.K. and Kyzy, B.T. (2012), "Performance of Islamic commercial banks in Malaysia: an empirical study", *Journal of Islamic Economics Banking and Finance*, Vol. 8 No. 2, pp. 67-80.

Cihák, M. and Hesse, H. (2008), "Islamic banks and financial stability: an empirical analysis", *International Monetary Fund*, Vol. 38 No. 2, pp. 1-31.

Ducassy, I. and Guyot, A. (2017), "Complex ownership structures, corporate governance and firm performance: the French context", *Research in International Business and Finance*, Vol. 39 (Part A), pp. 291-306.

Fakhfekh, M., Hachicha, N., Jawadi, F., Selmi, N. and Idi Cheffou, A. (2016), "Measuring volatility persistence for conventional and Islamic banks: an FI-EGARCH approach", *Elsevier-Emerging Markets Review*, Vol. 27, pp. 84-99.

Fayed, M.E. (2013), "Comparative performance study of conventional and Islamic banking in Egypt", *Journal of Applied Finance & Banking*, Vol. 3 No. 2, pp. 1-14.

Ftiti, Z., Nafti, O. and Srairi, S. (2013), "Efficiency of Islamic banks during subprime crisis: evidence of GCC countries", *Journal of Applied Business Research*, Vol. 29 No. 1, pp. 285-304.

Hasan, M. and Dridi, J. (2010), "The effects of the global crisis on Islamic and conventional bank: a comparative study", *International Monetary Fund*, Vol. 10 No. 201, pp. 1-47.

How, J.C.Y., Karim, M.A. and Verhoeven, P. (2005), "Islamic financing and bank risks: the case of Malaysia", *Thunderbird International Business Review*, Vol. 47 No. 1, pp. 75-94.

Jawadi, F., Jawadi, N. and Louhichi, W. (2014), "Conventional and Islamic stock price performance: an empirical investigation", *International Economics*, Vol. 137, pp. 73-87.

Kabir, M.D.N., Worthington, A. and Gupta, R. (2015), "Comparative credit risk in Islamic and conventional bank", *Pacific-Basin Finance Journal*, Vol. 34, pp. 327-353.

Kervin, J.B. (1992), *Methods for Business Research*, Harpet Collins, New York, NY.

Kosmidou, K., Tanna, S. and Pasioures, F. (2005), "Determinants of profitability of domestic UK commercial bank: panel evidence from 1995-2002", *Money Macro and Finance MMF Research Group Conference*, pp. 1-27.

Li, J. (2017), "Accounting for banks, capital regulation and risk-taking", *Journal of Banking and Finance*, Vol. 74, pp. 102-121.

Louhichi, A. and Boujelban, Y. (2016), "Credit risk, managerial behaviour and macroeconomic equilibrium within dual banking systems: interest-free vs interest-based banking industries", *Research in International Business and Finance*, Vol. 38, pp. 104-121.

Mat Rahim, S.R. and Zakaria, R.H. (2013), "Comparison on stability between islamic and conventional banks in malaysia", *Journal of Islamic Economics, Banking and Finance*, Vol. 9 No. 3, pp. 131-149.

Misman, F.N., Bhatti, I., Lou, W., Samsudin, S. and Abd Rahman, N. (2015), "Islamic banks credit risk: a panel study", *Procedia Economics and Finance*, Vol. 31 No. 1, pp. 75-82.

Muda, M., Shaharuddin, A. and Embaya, A. (2013), "Comparative analysis of profitability determinants of domestic and foreign Islamic banks in Malaysia", *International Journal of Economics and Financial Issues*, Vol. 3, pp. 559-569.

Olson, D. and Zobi, T. (2016), "Convergence in bank performance for commercial and Islamic banks during and after the global financial crisis", *The Quarterly Review of Economics and Finance*, Vol. 1, pp. 1-17.

Onakoya, A.B. and Onakoya, A.O. (2013), "The performance of conventional and Islamic banks in the United Kingdom: a comparative analysis", *Journal of Research in Economics and International Finance*, Vol. 2, pp. 29-38.

Ouerghi, F. (2014), "Are Islamic banks more resilient to global financial crisis than conventional banks?", *Asian Economic and Financial Review*, Vol. 4 No. 7, pp. 941-955.

Rajhi, W. and Hassairi, S.A. (2013), "Islamic banks and financial stability: a comparative empirical analysis between Mena and Southeast Asian countries", *Région Et Développement*, Vol. 37, pp. 149-177.

Rashid, A. and Jabeen, S. (2016), "Analyzing performance determinants: conventional versus islamic banks in Pakistan", *Borsa Istanbul Review*, Vol. 16 No. 2, pp. 92-107.

Rosman, R., Abd Wahab, N. and Zainol, Z. (2014), "Efficiency of Islamic banks during the financial crisis: an analysis of Middle Eastern and Asian countries", *Pacific-Basin Finance Journal*, Vol. 28, pp. 1-15.

Said, A. (2012), "Efficiency in Islamic banking during a financial crisis-an empirical analysis of forty-seven banks", *Journal of Applied Finance & Banking*, Vol. 2, pp. 163-197.

Trabelsi, M.A. (2011), "The impact of the financial crisis on the global economy: can the Islamic financial system help?", *Journal of Risk Finance*, Vol. 12 No. 1, pp. 15-25.

Trad, N., Trabelsi, M.A. and Goux, J.F. (2017), "Risk and profitability of Islamic banks: a religious deception or an alternative solution?", *European Research on Management and Business Economics*, Vol. 23 No. 1, pp. 40-45.

Wasiuzzaman, S. and Tarmizi, H.A.B.A. (2010), "Profitability of Islamic banks in Malysia: an empirical analysis", *Journal of Islamic Economic Banking and Finance*, Vol. 6, pp. 53-68.

Zarrouk, H. (2012), "Does financial crisis reduce Islamic banks' performance? Evidence from GCC countries", *Journal of Islamic Finance and Business Research*, Vol. 1, pp. 1-16.

Zehri, F. and Al-Herch, N. (2013), "The impact of the global financial crisis on the financial institutions: a comparison between Islamic banks and conventional banks", *Journal of Islamic Economics, Banking and Finance*, Vol. 9 No. 3, pp. 69-88.

Zeitoun, R. (2012), "Determinants of Islamic and conventional banks performance in GCC countries using panel data analysis", *Global Economy and Finance Journal*, Vol. 5, pp. 53-72.

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