

Maturity Transformation Risk and Profitability of Islamic Banks – An International Evidence

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Abstract

This study aims to analyze the impact of IFSBs' proposed new structural measure of liquidity on financial performance of Islamic banking sector. We apply a 2-step system GMM technique for the period covering 2006 –2015. We demonstrate that profitability persists and there exists a significant and negative relationship between maturity transformation risk and Islamic banks' profitability. Our findings reveal that the inclusion of NSFR leads to a better financial performance of Islamic banks, thus providing support for the adoption of new liquidity regulation. In addition, we find bank capital, market concentration and gross domestic product as significant contributors to the increased profitability of Islamic banks. Whereas, bank size, management efficiency, asset quality and inflation are the restraints to the Islamic banks' profitability. Our results remain consistent after applying for alternative profitability measure and estimation technique.

Key Words: IFSB, maturity transformation risk, profitability, GMM, Islamic banking

1.0 Introduction

Islamic banking system is based on the principle of risk sharing (profit and loss) on both financing and deposits and posits that all transactions must involve tangible assets (Hassan & Lewis, 2009; Iqbal & Mirakhor, 2011). The guidelines of Islamic finance stem from the *Shari'ah*, the unique and global legislation for Muslims with the *Quran*, *Hadith* (Sunnah), *Ijma* (consensus) and *Qiyas* (deduction of juridical principles from Quran and Sunnah) as its main sources. *Shari'ah* compliant financing does not allow to charge *riba* (interest payments) - as only physical commodities and services are assumed to hold a value, *gharar* (uncertainty), *mayser* (speculation or gambling) and all such transactions that involve trade of illegitimate goods and services like weapons, drugs, etc.

Though, contributing to a small share in global financial system, the superior financial performance and resilience shown by Islamic banking sector, as compared to its conventional counterpart, during the recent 2007-09 global financial crisis (GFC), has made its existence as an important player in the global financial system (Hasan & Dridi, 2011). The latest statistics estimates the managed asset value of Islamic financial institutes (IFIs) between US\$ 1.816 to 2.1 trillion as at year end 2014, with the five years compound annual growth rate of around 17%, to which Islamic banks hold more than 80 percent share with a growth rate of 14%, from year 2009 to 2014 (ICD & REUTERS, 2015).

Similar to their conventional counterparts, Islamic banks perform their prime role of liquidity creation by transforming relatively short-term liquid liabilities (fund deposits) to relatively long-term illiquid assets (financing). Although, such transformation offers the underlying principle for the existence of the banks, this prime role is also attributed to the intrinsic maturity transformation risk, such as mismatch of maturities in bank's assets and liabilities (Berger & Bouwman, 2009).

The maturity transformation risk is highlighted as among the leading causes of GFC and has drawn substantial attention of the regulators towards the need of improved bank liquidity management practices, across the globe. To provide a revised liquidity framework, the Islamic Financial Services Board (IFSB), the standards setting body for IFIs, in unification with the Basel III new liquidity management framework, has proposed the implementation of the net stable funding ratio (NSFR) for Islamic banks. The IFSB has issued Guidance Note No. 6 for the proposed criteria to calculate the NSFR, taking into account the unique balance sheet structure of Islamic banks.¹

Considering the importance of liquidity management for the growth and resilience of the Islamic banking industry, this study aims to investigate the impact of the IFSB's proposed NSFR on financial performance of Islamic banks. Utilizing a dataset of 55 fully-fledged Islamic banks from 11 countries, between 2006 and 2015, we find empirical evidence of positive influence of NSFR on profitability of Islamic banks. Our findings remain robust after using an alternative profitability measure and utilizing an alternative estimation technique.

Our work contributes to the existing empirical literature on Islamic banks' profitability, in several ways. First, our work offers a novel perspective in understanding the impact of new liquidity regulatory requirements on bank performance. Earlier studies on profitability of Islamic banks, mainly used the accounting ratios to measure the liquidity risk, such as financing to deposit ratio (Haron, 2004), loan to total assets (Asutay & Izhar, 2007; Chowdhury & Rasid, 2015), liquid assets to total assets (Mirzaei, 2011; Rachdi & Mokni, 2014; Srairi, 2009) and liquid asset to customer and short-term funding (Ariffin, 2012). Moreover, prior studies which utilized NSFR to determine its influence on conventional banks' profitability, mainly focused on the US and the European markets (Chiaromonte, 2015; Giordana & Schumacher, 2017; King, 2013). To the best of our knowledge, this is the first study which attempted to investigate the influence of maturity transformation risk on Islamic banks' profitability, using the new structural measure of liquidity as proposed by IFSB.

Second, we used hand-collected granular data obtained from publicly available banks' annual reports, to calculate the NSFR, following the IFSB GN-6 guidelines. Hence, this study could be useful for regulators, practitioners and investors, who can use a similar methodology for the analysis of banks' positioning in terms of meeting the new liquidity requirements.

Third, this study attempts to provide deep insights on understanding the maturity transformation risk – profitability nexus, thus enabling Islamic banking policymakers and regulators to improve the liquidity regulatory framework and to avoid potential systematic risk in future. In addition, to the best of our knowledge, this is the pioneer study that utilizes state of the art two-step system GMM dynamic panel data technique to address the issues of heteroscedasticity, serial correlation and potential endogeneity, while investigating the impact of NSFR on Islamic banks' profitability. The dynamic specification is important to understand the persistence magnitude of profitability as well as to account for the past effects of explanatory variables on financial performance of Islamic banks.

The rest of this paper is organized as follows. Section 2 discusses the existing empirical literature on relationship between liquidity and profitability of Islamic banks. Section 3 describes the research

¹ Guidance Note 6 on quantitative measures for liquidity risk management in institutions offering Islamic financial services [excluding Islamic insurance (takāful) institutions and Islamic collective investment schemes] issued by Islamic Financial Services Board in 2015. Online: <https://www.ifsb.org>.

methodology, data and sample selection. Section 4 discusses the empirical results, followed by a series of robustness checks. Section 5 summarises and concludes.

2.0 Empirical literature on liquidity and Islamic banks' profitability

Very few studies have explicitly examined the influence of liquidity on banks' profitability, in case of Islamic banks. Besides, the previous literature provides mixed evidence on liquidity – profitability relationship and mainly depends on liquidity measure used in the study. Haron (2004) explains the influence of various internal and external factors on profitability of 14 Islamic banks. The author finds that financing to deposit ratio, as a measure of bank liquidity, is significant in explaining the increased profitability, in the sample Islamic banks. In the similar vein, Srairi (2009) examines the influence of several factors at bank, industry and country level on the profitability of Islamic banks in GCC region. The study finds a significant negative relationship between liquidity and Islamic banks' profitability. The author argued that the possible reason of this negative association could be the high opportunity cost associated with holding excessive liquid assets. The findings of Asutay and Izhar (2007) also reveal a significant negative relationship between liquidity and Islamic bank's profitability. Similarly, Rachdi and Mokni (2014) analysed the factors affecting conventional and Islamic banks' profitability in the MENA region using a sample of 15 conventional and 15 Islamic banks from 2002 to 2009. The authors employed a generalized method of moment estimation technique and found that liquidity risk and ownership status are significant and positively associated with profitability of Islamic banks, while bank capital is significant in determining conventional banks' profitability. The results also reveal a negative management efficiency – profitability relationship, in case of Islamic banks. On the contrary, using a sample of 16 Islamic banks in Malaysia, during 2005 and 2008, Wasiuzzaman and Tarmizi (2010) find a significant and positive influence of liquidity and management efficiency on Islamic banks' profitability. Whereas, bank capital and asset quality are negatively associated with the profitability. Besides, Islamic banks' profitability is positively influenced by the gross domestic product and inflation, during the study period.

Whereas, the study of Idris et al. (2011) could not find any significant relationship between liquidity and profitability in 9 Malaysian Islamic banks, during a period from 2007 to 2009. More recently, Chowdhury and Rasid (2015) employed ordinary least squares method using 2013 annual data of 44 Islamic banks from Asian and African region. The results also find no empirical evidence of association between liquidity and profitability in sample Islamic banks. Additionally, the study of Mirzaei (2011) finds a mixed empirical evidence on the influence of liquidity on Islamic banks' profitability. Using an unbalanced dataset of 175 Islamic and conventional banks from 12 Middle Eastern countries from 1999 to 2008, the authors find that liquid assets ratio is significantly and negatively associated the return on assets of Islamic banks, whereas return on equity of Islamic banks shows significant improvement with the increase in liquid assets.

Based on the literature discussed previously, the findings concerning maturity transformation risk and banks' profitability are mixed. For example, Srairi (2009) and Rachdi and Mokni (2014) among others reveal a negative and significant relationship between liquidity and Islamic banks' profitability. In contrast, Haron (2004) and Wasiuzzaman and Tarmizi (2010) reveal the significant positive relationship between liquidity and profitability of Islamic banks. Besides, studies of Idris et al. (2011) and Chowdhury and Rasid (2015) could not find any empirical evidence of bank liquidity – profitability relationship. Moreover, to the best of our knowledge, there is no study till date, which has examined the influence of IFSB's new liquidity measure (NSFR) on Islamic banks' profitability. Therefore, we can

conclude that the impact of banks' liquidity transformation function on financial performance remains ambiguous and further research is required.

2.1 Measuring the Net Stable Funding Ratio

The IFSB, while endorsing the Basel III new liquidity management framework, has issued the GN- 6 for the proposed criteria to calculate the NSFR, taking into account the distinctive nature of assets and liabilities of Islamic banks. Similar to the Basel III liquidity framework, the NSFR requirements under IFSB's guidelines is the ratio of available amount of stable funding (ASF) to the required amount of stable funding (RSF). However, the computation of ASF and RSF is different because of the unique characteristics of Islamic banks' balance sheet components.

The net stable funding ratio is calculated as:

$$NSFR = \frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} > 100\% \quad (1)$$

Following Mahmood, Gan, and Nguyen (2018), we compute the ASF and RSF for Islamic banks as follows:

$$NSFR = \frac{[0.5 * (\text{dem_deposit} + \text{st_market debt} + \text{other st_liab}) + 0.90 * (\text{dep} < 1 \text{ year}) + 0.95 * (\text{dep} > 1 \text{ year}) + 1 * (\text{lt_market liabilities} + \text{reg_cap})]}{[0.05 * (\text{gov_sec} + \text{OBS}) + 0.5 * (\text{lt_marketable assets} + \text{fin_FIs} < 1 \text{ year}) + 0.65 * (\text{Real Estate} > 1 \text{ year}) + 0.85 * (\text{constant loans} < 1 \text{ year}) + 1 * (\text{constant loans} > 1 \text{ year} + \text{other loans} + \text{other assets} + \text{fixed assets})]} \quad (2)$$

3.0 Methodology

3.1 Model Specifications

In the quest to ascertain the effect of maturity transformation risk on banks performance, the following linear model is specified based on the previous literature (Abduh & Idrees, 2013; Athanasoglou, Brissimis, & Delis, 2008; Dietrich & Wanzenried, 2014) and is given by equation (3).

$$P_{it} = \alpha_0 + \partial P_{i,t-1} + \delta_1 NSFR_{it} + \sum_{b=1}^B \vartheta_b \Pi_{it}^b + \sum_{l=1}^L \phi_l \Pi_{jt}^l + \sum_{m=1}^M \lambda_m \Pi_{jt}^m + \varepsilon_{it} \quad (3)$$

Where (P_{it}) denotes the dependent variable as a measure of profitability, and is estimated by return on average assets (ROAA) or return on average equity (ROAE). j represents a country in which bank i operates at time t , with $i = 1, \dots, N$ and $t = 1, \dots, T$. N represents the number of banks and T is the length of the sample period. Further the model consists of a constant term α and a vector of $k \times 1$ parameters ($\partial, \delta, \vartheta, \phi, \lambda$) that estimate the sign and slope of the regressors. The explanatory variables are grouped into bank-specific Π_{it}^b , industry-specific Π_{jt}^l and macroeconomic variables Π_{jt}^m . Finally,

ε_{it} refers to the stochastic error component capturing unobserved heterogeneity (fixed-effect) μ_i and an independent idiosyncratic effect v_{it} , and is assumed to be identically and independently distributed with mean 0 and variance σ_ε^2 .

Previous studies have provided empirical evidence that bank profitability shows a tendency to persist over time (Athanasoglou et al., 2008; Berger, Bonime, Covitz, & Hancock, 2000; Dietrich & Wanzenried, 2011; Goddard, Liu, Molyneux, & Wilson, 2011). Following the literature, our study also adopts a dynamic characteristic of the model by including a one-period lagged dependent variable $P_{i,t-1}$ of bank i at time t among the explanatory variables. The coefficient of the one-period lagged dependent variable δ measures the adjustment speed of banks' profitability to equilibrium. A value of the coefficient between 0 and 1 reflects the persistence of profits over the time which will eventually return to the equilibrium level. Athanasoglou et al. (2008) explain that the coefficient value near 0 implies a fairly competitive market structure with high speed of adjustment and a value near 1 reflects a less competitive industry with low speed of adjustment.

3.2 Variables Selection and Hypotheses Development

3.2.1 Bank profitability measures

There is a wide range of empirical literature which uses return on assets (ROA), return on equity (ROE) and net interest margins (NIM) as the accounting measures of banks' performance (Abduh & Idrees, 2013; Alexiou & Sofoklis, 2009; Athanasoglou et al., 2008; Dietrich & Wanzenried, 2014).

In this study, we use the return on average assets (ROAA) as our main measure of bank profitability. The ROAA is defined as the ratio of net income to average total assets expressed as a percentage. As an alternative profitability measure, we use the return on average equity (ROAE), which is the ratio of net profits to average equity expressed as a percentage.

The ROAA is the most commonly used performance measure in the literature which reflects the ability of a bank's management to generate profits from the bank's assets (Golin & Delhaise, 2013). It shows the profits earned per dollar of assets and indicates how effectively the bank's management utilize its assets to generate profits. To capture changes in assets during the financial year, our study relies on the average assets value. The other measure of profitability is the return on average equity (ROAE), defined as the return to shareholders on their equity. According to (Flamini, Schumacher, & McDonald, 2009) ROA is preferred over ROE as a measure of banks' performance because an analysis on ROE neglects higher risk associated to the higher level of financial leverage and the effect of regulation on leverage.

Thus, we consider the ROAA as the better measure of profitability and use it as the main dependent variable, although we also report the results for the ROAE to check the robustness of our main results.

3.2.2 Net stable funding ratio

This study focuses on the sensitivity of Islamic banks' profitability to their degree of exposure to maturity transformation risk. To address this issue, the IFSB's proposed NSFR, as a structural measure of maturity transformation risk, is included in our empirical analysis. Many previous studies have shown a mixed empirical evidence on the effect of liquidity on bank's performance. The higher proportion of available amount of stable funding may result in low yield on banking assets leading to

an overall less profitability (Curak, Poposki, & Pepur, 2012; Li, 2007; Naceur & Kandil, 2009). On the other hand, the banks with less available liquid assets are mainly reliant on external funding sources which is associated with higher cost, consequently reducing the overall profitability of the banks (Bourke, 1989; Goddard et al., 2011; Kosmidou, 2008; Olagunju, David, & Samuel, 2012). Moreover, the study of Bordeleau and Graham (2010) reveal a non-linear relationship between bank liquidity and profitability. The authors assert that the profitability increases with an increase in bank's liquid asset holdings, however it shows an inverse relationship when the opportunity cost outweighed the benefits of holding liquid assets. *Based on the above arguments, we hypothesize that:*

H1. Maturity transformation risk is negatively associated with the profitability of Islamic banks.

3.2.3 Other control variables

Well-capitalized banks are considered relatively safe during financial distress (Chen, Shen, Kao, & Yeh, 2018). Besides, banks' expected profits may increase with the increase in capital due to the lower bankruptcy cost, which reduces their cost of funding because of less dependence on external funding sources (Abreu & Mendes, 2001; Li, 2007). Thus, we hypothesize that:

H2. Profitability of Islamic banks increases with increased level of bank capital.

Banks with diversified activities are more stable (Köhler, 2013) and have low funding costs (Deng, Elyasiani, & Mao, 2007) thus benefiting from their increased market share price and lower costs of debt. Moreover, non-financing income has a strong positive effect on risk adjusted returns of Islamic banks which are less involved in diversified activities (Molyneux & Yip, 2013). Hence, we assumed:

H3. A positive relationship between income diversity and bank profitability.

We measure SIZE as the natural log of bank's total assets. Large banks tend to be more cost effective in raising capital and thus appear more profitable (Athanasoglou et al., 2008; Berger, Hanweck, & Humphrey, 1987). Similarly, Haron (1996), Haron (2004) and Smaoui and Salah (2012) in a cross-country context, reveal that profitability of Islamic banks is proportionate to their growing assets size. On the contrary, Kosmidou, Tanna, and Pasiouras (2005), Pasiouras and Kosmidou (2007) and Sufian and Habibullah (2009) find the evidence of diseconomies of scale for larger banks in their studies. Whereas, a non-linear relationship between size and bank profitability is found by Eichengreen and Gibson (2001) and argued that scale diseconomies caused by lower yields associated with increased diversification activities or bureaucratic management style. Given that the Islamic banking industry is relatively new and majority of the banks are in growing phase, it is expected the profitability will increase with the increase in bank size. Therefore, we hypothesize that:

H4. Profitability of Islamic banks increases with an increase in bank size.

For a banking institute, loans are the primary source of revenue generation. However, these loans are also considered as the major source of credit risk. A higher credit risk reflects poor asset quality of a bank. In other words, banks with increased proportion of high risk loans have the higher propensity of loan defaults which conversely effects their performance (Cooper, Jackson, & Patterson, 2003). Following Beck, Demirgüç-Kunt, and Merrouche (2013), we used loan loss reserves scaled by gross loans as proxies to measure the asset quality. A higher ratio reflects a poor asset quality. Based on the above arguments, we hypothesize that:

H5. Profitability of Islamic banks decreases with an increase in credit risk.

We also included cost to income ratio (CIR) to measure cost efficiency. It provides information on banks' improvements in communication, information and financial technologies (Almazari, 2014). A lower cost to income ratio reflects better management efficiency which leads to increased profitability (Kosmidou et al., 2005) and increasing operational expenses impede bank's profitability (Sufian, 2011). However, a positive relationship between staff expense and bank's profitability was highlighted by Molyneux and Thornton (1992), where the authors reason higher payroll expenditures paid to more productive human capital, for the higher profits earned by the firms. Given that improved management of operational expenses will increase efficiency which is associated with higher profitability, we hypothesize that:

H6. Cost to income ratio is negatively associated with the profitability of Islamic banks.

The degree of concentration or level of competition as an indicator of banking industry structure is commonly used in recent studies to determine profitability (Athanasoglou et al., 2008; Dietrich & Wanzenried, 2011, 2014; Djalilov & Piesse, 2016; Mirzaei, Moore, & Liu, 2013). We take assets of the three largest banks scaled on the total assets of the industry (3_CONC), as a measure of market concentration. Both structure conduct performance (SCP) hypothesis and efficient structure (ES) hypothesis assume a positive relationship between concentration and banks profitability. This implies that banks in a concentrated market are more efficient and thus more profitable. Based on the above arguments, we assumed:

H7. A positive relationship between market concentration and banks' profitability.

The economic upswings encourage banks to increase their lending activity, charge higher margins and improve their asset quality, consequently increase their profits (Athanasoglou et al., 2008; Kosmidou, 2008). Conversely, the loan demand is expected to decrease along with an increase in the credit risk due to deteriorated loan quality and high market volatility during the economic downturns, thus leading to a fall in banks' profitability (Bolt, De Haan, Hoeberichts, Van Oordt, & Swank, 2012). Thus, we hypothesize that:

H8. Profitability of Islamic banks is positively influenced by accelerated economic growth.

Inflation may effect profitability of banks either directly (in terms of wages and other operating expenses) or indirectly (through changes in interest rates and asset prices (Staikouras & Wood, 2011)). However, the effect of inflation on bank performance depends on how well the inflation rate is anticipated by managers (Perry, 1992). In case if inflation is fully anticipated, banks profitability increases through appropriate adjustment of their interest rates which results in increase in their revenues faster than costs. On the other hand, if inflation is unanticipated, it adversely effects banks' profitability as banks may be slow in adjusting their interest rates which results in a faster increase in their costs relative to their revenues. The relationship between inflation rate and bank profitability is yet inconclusive as evident from the previous empirical literature. Most studies have found positive and significant relationship between inflation and profitability of Islamic as well as conventional banks (see for example, Asutay & Izhar, 2007; Athanasoglou et al., 2008; Bashir, 2003; Demirgüç-Kunt & Huizinga, 1999; Haron, 2004; Wasiuzzaman & Tarmizi, 2010). However, Kosmidou (2008) and Khrawish (2011) found a negative relationship in Greece and Jordan respectively. Whereas, Saad and El-

Moussawi (2012) and Naceur (2003) have not found any significant relationship between inflation and net interest margin.

Table 1 defines all the selected variables included in our specified regression model (Eq. (3)) along with their expected signs.

Table 1. Definition of Variables

Variables	Acronym	Description/ Calculation	Exp. Sign
Dependent Variables			
Return on Average Asset	<i>ROAA</i>	Ratio of net income to average total assets.	
Return on Average Equity	<i>ROAE</i>	Ratio of net income to average total equity.	
Independent Variables			
<i>Bank-specific</i>			
Maturity Transformation Risk	<i>NSFR</i>	Net stable funding ratio is defined as the ratio of available amount of stable funding to required amount of stable funding	-
Solvency	<i>CAP</i>	Ratio of total regulatory capital to total assets.	+
Income Diversity	<i>NONII_TA</i>	Non-interest income scaled to total assets	+
SIZE	<i>ln_TA</i>	Natural log of total assets	+
Asset Quality	<i>LLR_TL</i>	Ratio of loan loss reserves to total loans.	-
Cost Efficiency	<i>CIR</i>	Cost to income ratio	-
<i>Industry-Specific</i>			
Market Concentration	<i>3_CONC</i>	Ratio of assets of three largest banks to total banking industry assets	+
<i>Macroeconomic</i>			
Economic Growth	<i>GDPG</i>	Annual percentage growth in GDP	+
Inflation	<i>CPI</i>	Year-on-year change in consumer price index	?

Source: Author's calculations, Bloomberg (2006 – 2015), banks' annual reports, World Bank's World Development Indicators.

The regression Eq. (3) is extended to reflect the explanatory variables, as discussed in most studies on Islamic banking performance (see for example, Abduh & Idrees, 2013; Alharbi, 2017; Hassan & Bashir, 2003). The selected variables are included in Eq. (3) to estimate the effect of maturity transformation risk on Islamic banks' profitability while controlling for other internal and external variables.

$$Profitability_{ijt} = \vartheta_1 Profitability_{it-1} + \delta_1 NSFR_{it} + \vartheta_1 CAP_{it} + \vartheta_2 NONII_TA_{it} + \vartheta_3 SIZE_{it} + \vartheta_4 LLR_TL_{it} + \vartheta_5 CIR_{it} + \phi_1 3_CONC_{jt} + \lambda_1 GDPG_t + \lambda_2 CPI_t + \varepsilon_{it} \quad (4)$$

3.2.4 Data and Sample Selection

To test our hypotheses, we build a sample of 468 bank-year observations from 55 fully fledged Islamic banks operating in 11 different countries from GCC region and Asia, during the period 2006 – 2015. We start with a total of 73 Islamic banks available on Bloomberg. We exclude banks that fail to have at least three years financial information during the study period, and those for which the required information to calculate the NSFR is largely missing. The filtering process results in a final sample of 55 publicly traded Islamic banks, which represents about 52% of the total assets of the total Islamic banking sector at the end of 2015 (IFSB, 2017). Bank-specific financial information is mainly extracted from Bloomberg database and cross-validated with publically available annual reports of the sample banks, where required. The data for the economic indicators (i.e. GDP growth rate and year-on-year change in CPI) are extracted from World Development Indicators².

Table 2 shows the name of the countries and the number of Islamic banks and yearly observations from each country included in this study.

Table 2. Sample of Banks and Observations

No.	Country	Bank number	Observations
1	Bahrain	6	60
2	Bangladesh	7	50
3	Egypt	3	30
4	Indonesia	6	43
5	Kuwait	5	44
6	Malaysia	8	64
7	Pakistan	4	35
8	Qatar	4	34
9	Saudi Arabia	4	37
10	Turkey	3	27
11	UAE	5	46
Total		55	468

Source: Author's own computation based on Bloomberg database (2006 – 2015) and banks annual reports.

4.0 Empirical Analysis

4.1 Initial Data Analysis – Descriptive Statistics

Table 3 reports the summary statistics of the dependent and independent variables used in the regression models to address the research objectives.

² Please refer to <http://data.worldbank.org/indicator> for data on macroeconomic variables of each country.

4.1.1 Dependent Variables

ROAA, which is used as the main dependent variable in the regression Eq. (4) exhibits a mean value of 1.13% in our sample Islamic banks, with a standard deviation of 2.15% and a minimum and maximum value of -9.79% and a maximum of 13.21%, respectively. The average ROAA value shows that Islamic banks remain profitable during the sample period, however, the large gap between the minimum and maximum values for ROAA also reveals that there is a large difference in profitability among these banks. The mean value of alternative profitability measure (ROAE) is 8.56%, and also shows a large dispersion of 19.64% that ranges from the highest value of 58.72% to the lowest of -173.51% during the study period.

4.1.2 Explanatory Variables

NSFR with a mean value of 1.45 reveals that on average, the Islamic banks maintain a minimum liquidity requirement under the new IFSB regulations (i.e., > 1) during the sample period. Besides, a minimum value of 0.81 shows that there are few banks which still need some balance sheet adjustments in meeting these new regulatory requirements. Among the other explanatory variables, the average CAP value of 14.01% shows that Islamic banks are well capitalized. However, the high standard deviation value of 10.22% and a minimum value of 3.28% in particular, shows excessive reliance of some Islamic banks on more unstable sources of funding. The credit risk measured as loan loss reserves (LLRTL) of the sample banks is 3.83% of total loans on average, with a minimum and maximum value of 0% and 57.79% respectively, and exhibit a high variation of 6.29% in these banks during the study period. The mean value of Bank size (\ln_TA) is 8.46 represents a small dispersion in data with a standard deviation of 1.43% and a minimum and maximum values of 2.84 and 11.80 respectively.

Table 3: Summary Statistics of Dependent and Explanatory Variables

Categories	Variables	MEAN	MEDIAN	SD	MAX	MIN
<i>Dependent Variables</i>						
	$ROAA_{it}$	1.1255	1.0644	2.1472	13.2118	-9.7998
	$ROAE_{it}$	8.5615	11.0308	19.6388	58.72	-173.51
<i>Explanatory Variables</i>						
	$NSFR_{it}$	1.4496	1.2718	0.4863	3.8674	0.8086
	CAP_{it}	14.0083	11.2299	10.219	93.1355	3.2792
	$LLRTL_{it}$	3.8312	2.1689	6.2964	57.7954	0.0000
	\ln_TA_{it}	8.4594	8.5803	1.4276	11.8041	2.8418
	NII_TA_{it}	1.2434	1.0301	1.6649	13.6373	-4.4050
	EFF_{it}	55.3373	47.5873	31.0231	264.9046	15.8123
	$CONC_3_{it}$	62.0631	57.6500	19.1603	98.9900	28.4800
	$GDPG_t$	4.9589	4.9688	3.778	26.1703	-7.0761
	INF_t	5.3207	4.4964	3.9573	20.2861	-4.8633

Source: Author's calculations using Stata (v 14.0) software.

All variables are defined in Table 1.

The average share of the Non-interest income is 1.24% of total assets of the banks during the sample period with a standard deviation of 1.66% and varies from -4.40% to a maximum of 13.64%. This low share of non-interest income shows that Islamic banks generate income from the traditional banking

activities. Besides, the high average value of EFF (55.34%) suggests that the sample Islamic banks are not managing their overhead costs efficiently in generating revenues during the study period.

Moving on to the industry specific variables, the high mean value of CONS_3 (62.06%) also shows the banking industry in the sample countries is more concentrated and few large banks hold a majority of banking assets in these economies. Moreover, the macroeconomic indicators record an average yearly economic growth (GDPG) of 4.95% during the sample period and an average annual increase in consumer price index (INF) of 5.32%.

4.1.3 Trend Analysis of Profitability in Islamic Banks

Figure 1 and 2 also show a sharp decline in profitability (both ROAA and ROAE, respectively) of our sample Islamic banks during the 2007-2009 global financial crises period, which reached to its lowest level in the year 2009. However, from 2010 onwards, these banks show gradual improvements in their profitability levels.

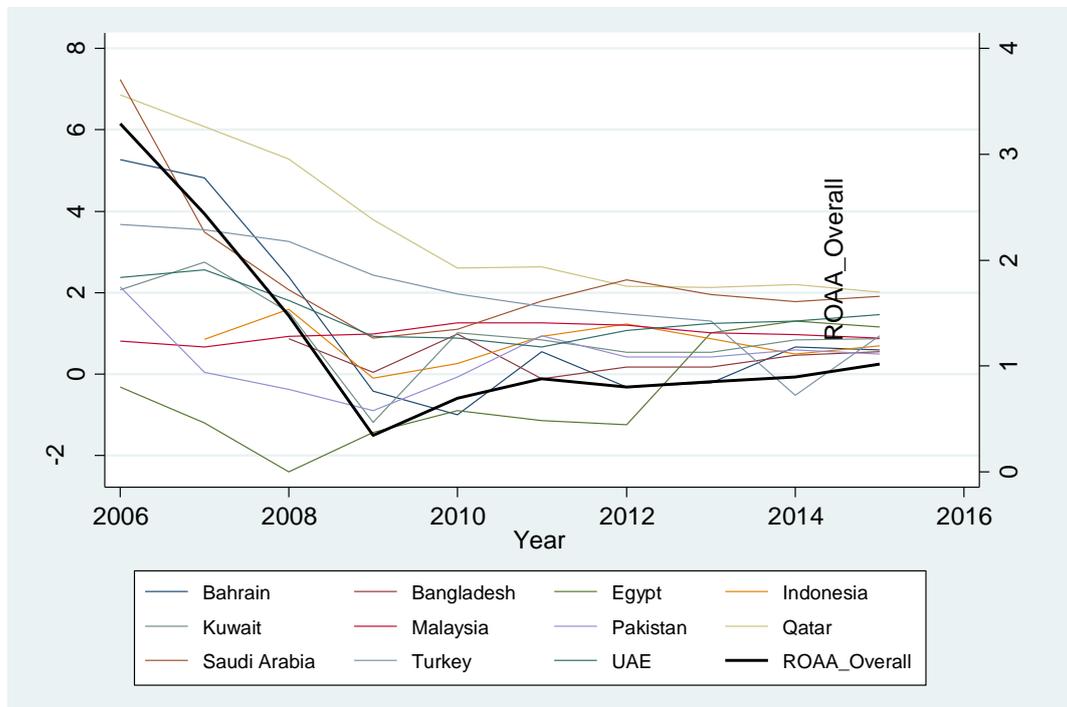


Figure 1: The 10 Year Trend of Overall Return on Average Assets (ROAA) in Islamic Banks

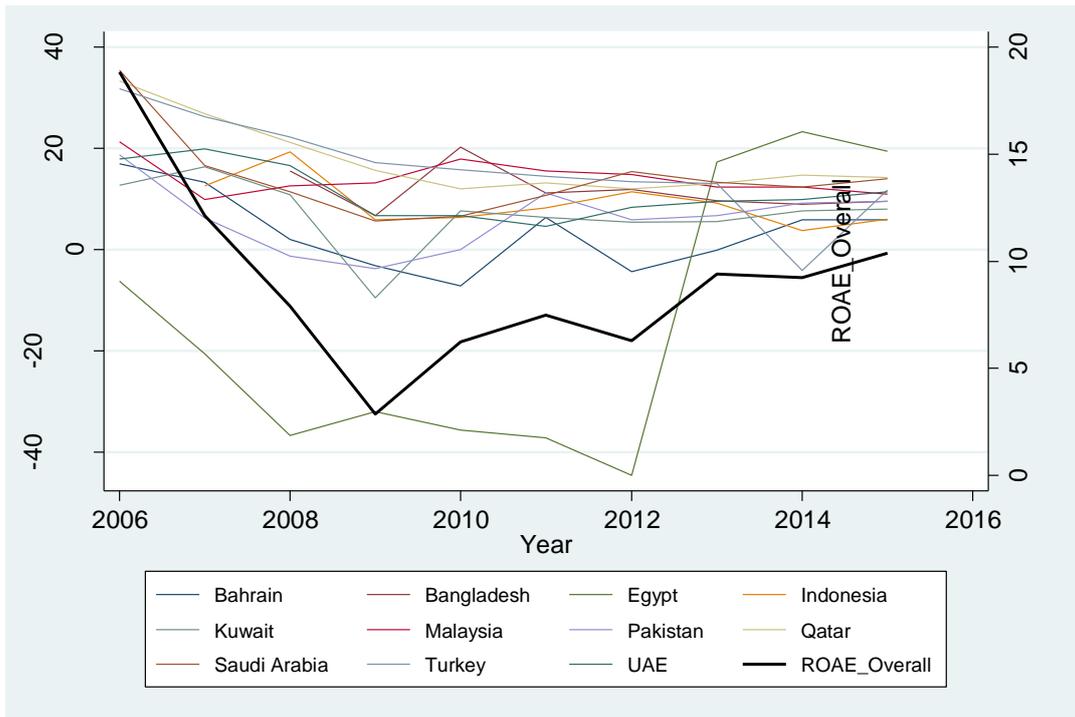


Figure 2: The 10 Year Trend of Overall Return on Average Equity (ROAE) in Islamic Banks

4.2 Pre-estimation Diagnostic Tests and Selection of Estimation Technique

We utilized the Fisher-type Augmented Dickey-Fuller (ADF) test to check for the presence of unit root in our dataset, which can produce spurious regression results. The results in Appendix Table A.1 show that there is no unit root problem in the data set, implying that the mean and variance does not depend on time, hence the regression analysis can produce meaningful results (Gujarati, 2009). The Pearson pair-wise correlation test results in Appendix Table A.2 show that there is a significant correlation among the explanatory variables included in the regression model, which prompts further empirical investigation. Besides, the results indicate that no correlation among the regressors exceeds the value of 0.80, suggesting the non-existence of multicollinearity among the selected variables (Gujarati, 2009). The individual fixed effects are confirmed, as the Hausman test p -value remains at a significance level of less than 5%.³ Moreover, the results of Breusch-Pagan test for heteroscedasticity and Wooldridge test for serial-correlation reported in Table 4, also confirm that residuals are not identically distributed and are also correlated with the explanatory variables. Also, the dynamic nature of the regression model is confirmed by introducing lagged dependent variable in pooled OLS.⁴ However, the inclusion of lagged dependent variable causes simultaneity problem, in which case the results obtained through pooled OLS and or fixed effects estimation techniques will not be consistent and efficient. To address the issues of heteroscedasticity, serial correlation and potential endogeneity, this study has utilized the two-step system GMM dynamic panel data estimation technique, as proposed by Arellano and Bover (1995) and Blundell and Bond (1998). We applied the Windmeijer's

³ Hausman Test $\chi^2(9) = 38.06$, Prob $>\chi^2 = 0.0000$

⁴ The value of R-square is significantly increased when lagged dependent variables are introduced in individual POLS regression model. For brevity, test results are not presented, since this is not the scope of the present study. However, the results can be made available upon request.

finite-sample correction to resolve the issue of downward bias of standard errors and report robust standard errors for two-step GMM estimators (Windmeijer, 2005).

Table 4: Tests for heteroscedasticity and autocorrelation

Breusch-Pagan / Cook Weisberg Modified	ROAA	ROAE
Wald test Statistics for Group-wise Heteroskedasticity	$\chi^2 = 18160.20$	$\chi^2 = 15173.64$
	Prob $>\chi^2 = 0.0000$	Prob $>\chi^2 = 0.0000$
Wooldridge Test for Autocorrelation	F stats = 49.477	F stats = 29.515
	Prob $> F = 0.0000$	Prob $> F = 0.0000$

4.3 Estimation Results – Maturity Transformation Risk and Islamic Banks’ Profitability Model

Table 5 presents the two-step System GMM dynamic panel data estimation results of “Maturity Transformation Risk and Islamic Banks’ Profitability” model using return on average assets (ROAA) as the dependent variable.

Table 5. Two-step System GMM estimations (Return on Average Assets (ROAA_{it}) as dependent variable)

	(A)	(B)	(C)
ROAA _{it-1}	0.5484 *** (0.1764)	0.8088 *** (0.1329)	0.7823 *** (0.1045)
NSFR _{it}	0.3972 ** (0.1965)	0.5538 ** (0.2751)	0.5048 ** (0.2274)
SIZE _{it}	0.0465 (0.0599)	-0.209 ** (0.0923)	-0.2548 ** (0.0996)
CAP _{it}	0.0626 * (0.0359)	0.1087 *** (0.031)	0.1075 *** (0.0223)
NONII_TA _{it}	0.0579 (0.1161)	0.1132 (0.106)	0.1322 (0.0821)
EFF _{it}	-0.0174 *** (0.0065)	-0.0091 (0.007)	-0.0097 * (0.0051)
LLRTL _{it}	-0.0219 ** (0.0086)	-0.0485 *** (0.0132)	-0.0411 *** (0.012)
3_CONC _{it}		0.0126 *** (0.0044)	0.0110 ** (0.0043)

GDP _{jt}			0.0462 *** (0.012)
INF _{jt}			-0.0471 * (0.0251)
cons.	1.9658 (1.0736)	2.2834 * (1.2633)	2.8684 ** (1.0835)
<i>Model Specification Tests</i>			
F-Statistics	45.70 $p > z = 0.000$	45.51 $p > z = 0.000$	52.10 $p > z = 0.000$
AR(1) test stat	-1.99 $p > z = 0.046$	-1.95 $p > z = 0.051$	-1.86 $p > z = 0.062$
AR(2) test stat	0.78 $p > z = 0.438$	0.97 $p > z = 0.332$	1.44 $p > z = 0.150$
Hansen J-stat	2.26 $p > z = 0.812$	1.63 $p > z = 0.897$	2.88 $p > z = 0.824$
No. of Instruments	13	14	17
No. of Banks	55	55	55
Observations	412	412	412

Equations (A), (B) and (C) are the three specifications of regression model (Eq. (4)), where equation (A) estimates the bank-specific variables only, while industry specific and macroeconomic variables are included in equation (B) and (C), respectively. All explanatory variables are defined in Table 1.

Robust standard errors are in parenthesis. ***, ** and * indicates statistical significance at 1%, 5% and 10%, respectively.

Source: Authors' calculations using Stata (v 14.0) software.

We applied three specifications to our regression model (Eq. (4)). Equation (A) in Table 4.7 shows the effect of maturity transformation risk and other bank-specific variables on profitability of Islamic banks. We also control for the industry-specific effects on Islamic banks' profitability in equation (B). The model is re-estimated after controlling for the macroeconomic factors in addition to the bank-specific and industry-specific explanatory variables, the results are presented in equation (C).

The lagged profitability variable (ROAA_{it-1}) remains highly significant in all the three specifications, which confirms the dynamic character of our model. The coefficient ∂_1 takes the values of 0.55, 0.81 and 0.78 in equations (A), (B) and (C), respectively, which indicate a moderate persistence of profitability over time in the sample Islamic banks. Since the value of ∂_1 is near 1, this implies that the sample Islamic banks operate in a relatively less competitive market structure. The significant coefficient values of lagged dependent variable in all specifications also confirm that one should consider temporal effects of profit persistence when explaining banks' profitability. The recent banking literature also find evidence of profit persistence in Islamic banks (Mirzaei, 2011; Trad, Trabelsi, & Goux, 2017; Zarrouk, Jedidia, & Moualhi, 2016) as well as in conventional banks (Athanasoglou et al., 2008; Dietrich & Wanzenried, 2014; Djalilov & Piesse, 2016; Goddard et al., 2011).

According to Table 5, for all the regression specifications, the net stable funding ratio (NSFR) coefficient is statistically significant at 5% level with values of 0.39, 0.55 and 0.50 in equation (A), (B)

and (C), respectively. The positive sign of the coefficient in all sets of models are also in accordance with our expectation, which confirms our hypothesis. Moreover, the results show that the effect of net stable funding ratio on profitability increases after controlling for industry-specific and macroeconomic factors. Specifically, a one standard deviation increase in net stable funding ratio is associated with 17.16% - 23.92% increase in bank profitability as measured by ROAA.⁵ Since maturity transformation risk decreases with the increase in net stable funding ratio, the regression results reveal an inverse relationship between exposure of maturity transformation risk and profitability in Islamic banks, especially during the study sample period. For this reason, we find evidence that the introduction of this new IFSB liquidity regulation can significantly increase the profitability of Islamic banks. Our results are consistent with the previous studies, for example Bourke (1989), Kosmidou (2008), Goddard et al. (2011), and Olagunju et al. (2012) where the authors find banks with high liquidity levels show better profitability. One possible reason for this could be that banks holding more liquid assets are less reliant on expensive market funding, which reduces their cost of borrowing and consequently are more profitable. However, our results are contradictory to Li (2007), Curak et al. (2012) and Naceur and Kandil (2009) among others, who contested that the banks' profitability can be significantly reduced by holding more liquid assets because of low yield.

Among the other explanatory variables, the coefficients of the bank-specific factors are mostly in line with the expected signs providing the empirical evidence of our stated hypotheses. Capitalization (CAP) shows a positive and significant impact on Islamic banks' profitability in all regression specifications, which confirms our hypothesis. The coefficient of capitalization is around 0.062 – 0.108, implying a 1% increase in equity ratio increases the return on average assets by 0.06 – 0.11%. The positive impact of capitalization on bank profitability can be influenced by a number of reasons. Because of profit and loss sharing (PLS) principle, Islamic banks with high bank capital are more prudent in their lending, which reduces their credit risk and consequently achieving increased profitability. However, banks with sound capital position can more effectively pursue business opportunities and gain higher returns. Our results are consistent with the findings of Zarrouk et al. (2016), Alharbi (2017) and Trad et al. (2017), where the authors argued that higher equity proportion reduces overall risk and funding cost that leads to increased profitability in Islamic banks. The idea that well capitalized banks are less risky, have lower cost of borrowing and consequently are more profitable, is also supported by Athanasoglou et al. (2008), Lee and Hsieh (2013) and Dietrich and Wanzenried (2014) in the case of conventional banking system.

We also find a significant association between management efficiency measured by cost to income ratio (CIR) and Islamic banks' profitability in regression models (A) and (C). However, the coefficient of CIR becomes insignificant when we control for the industry specific variable in equation (B). Besides, in all the three specifications, the direction of the relationship remains negative, which implies that the profitability of Islamic banks deteriorates with an increase in cost to income ratio. This result confirms our hypothesis that CIR is inversely related to the bank's profitability. This negative impact reflects the management's inefficiency in controlling overhead costs because of the limited experience

⁵ The mean value for *ROAA* in our sample is 1.1255. The NSFR coefficient of NSFR is equal to 0.3972, 0.5538, and 0.5048, in regression equation (A), (B) and (C) respectively, while standard deviation for *NSFR* is equal to 0.4863. A one standard deviation of NSFR is associated with a 17.16% ($0.3927 * 0.4863 / 1.1255$); 23.92% ($0.5538 * 0.4863 / 1.1255$); and 21.81A% ($0.5048 * 0.4863 / 1.1255$) increase in *ROAA*.

of Islamic banks and the lack of qualified staff. Almazari (2014), Zarrouk et al. (2016) and Alharbi (2017) among others, also find similar results of negative impact on management inefficiency in terms of increased cost to income ratio on Islamic banks' profitability.

The coefficient of loan loss reserves to total assets (LLRTL) also shows an inverse significant relationship with the dependent variable ROAA in all models, which implies that a higher credit risk adversely affects Islamic banks' performance, during the study period. The results show coefficient estimates as -0.02, -0.05 and -0.04 in panel (A), (B) and (C) respectively, suggesting that a 1% increase in loan loss reserves ratio will deteriorate the return on average assets by 0.02 – 0.05%. This result confirms our expectation that an increase in the loan delinquency requires a bank to allocate a significant portion of its earnings to cover expected credit losses and consequently profitability will fall. Though lending is the prime source of revenue generation for banks, this is also the major cause of credit risk when they invest in poor quality assets. In this case, monitoring expenses will rise that will adversely affect bank's profits. Our results also find support from the empirical work of Wasiuzzaman and Tarmizi (2010), Almazari (2014) and Alharbi (2017), where the authors reveal that high profitability of Islamic banks tend to be associated with better asset quality.

In contrast to our expected positive size – profitability relationship, bank size (SIZE) shows an inverse and statistically significant relationship with profitability (ROAA) of Islamic banks during the study period, after controlling for industry-specific and macroeconomic factors in equation (B) and (C), respectively. The results reveal that larger Islamic banks are less profitable than small banks, signifying economies of scale and scope for small Islamic banks and diseconomies of scale for larger institutions. One possible reason of this negative association may be due to the increase in diversified activities, as larger banks tend to diversify more, which is linked with volatile returns. The other reason could be management inefficiency because of bureaucratic management style in larger Islamic banks. Our results also suggest that growing banks may face diminishing marginal returns so average profits would decline with size. Akhtar, Ali, and Sadaqat (2011) and Almazari (2014) also find similar results while analysing the factors influencing the profitability of Islamic banks in Pakistan. Similar results are reported for conventional banks by Kosmidou et al. (2005), Pasiouras and Kosmidou (2007) and Sufian and Habibullah (2009), where the authors find an inverse relationship between size and bank's profitability.

Our result did not show any significant effect of income diversification on Islamic banks' profitability. Besides the coefficient of non-interest income scaled to total assets (NONII_TA) remains positive in all three specifications. This shows that, although insignificant, income diversification fosters banks profitability. Since the Islamic banking industry is relatively new and majority of the banks are in growing stage, it is expected that Islamic banks rely more on traditional lending activities as their prime source of revenue generation and are less involved in fee and commission income, income from sale of investment securities and other non-financing income. Therefore the income diversification does not significantly improve the profitability of Islamic banks.

Moving on to industry-specific factors, we measure the level of banks' competition by three largest banks concentration (3_CONC) ratio. As expected, the results show that the coefficient of 3_CONC is positive and significantly associated with the profitability of Islamic banks at a significance level of 1% and 5 % level, in our regression model in panel (B) and (C), respectively. Our results find empirical evidence to support the structure conduct performance (SCP) theory, that the profitability of Islamic

banks is enhanced in a less competitive market structure, especially during the study period. Previously, Ben Khediri and Ben-Khedhiri (2009), Karim, Sami, and Hichem (2010) and Hassan and Bashir (2003) also find similar results and concluded that Islamic banks earn more profits in concentrated markets. Moreover, Haron (1996) in his seminal paper also argued that Islamic banks which operate in less competitive markets are more profitable, but at a cost of depositors' welfare.

Among the macroeconomic variables, the empirical results reveal that both economic growth and inflation are significant in explaining the profitability of Islamic banks. The coefficient of Gross Domestic Product growth rate (GDPG) shows a positive and highly significant impact on banks' profits at 1% level, implying that economic growth could help the banks to construct better operations strategies, hence increase their profits. Generally, economic upswings encourage banks to increase their lending activity, charge higher margins and improve their asset quality, thus become more profitable. Our results are consistent with the findings of Bashir (2003), Wasiuzzaman and Tarmizi (2010), Muda, Shaharuddin, and Embaya (2013) and Zarrouk et al. (2016), who explain a positive correlation between the GDP growth and profitability of Islamic banks.

The coefficient of inflation measured in terms of CPI shows a significant negative relationship with Islamic banks' profitability. The results reveal that Islamic banks face much difficulty in adjusting their profit rates with respect to the changes in the real economic activities. This negative relationship can be explained by the fact that inflation is not well anticipated by the bank managers and the Islamic banks are slow in adjusting their interest rates which results in a faster increase in their costs relative to their revenues. Our results are similar to the finding of Zarrouk et al. (2016), where the authors contested that rapid inflation growth, in case of MENA region, impedes the profitability of Islamic banks. However, Asutay and Izhar (2007) and Wasiuzzaman and Tarmizi (2010) find the contrary results in explaining the impact of inflation on Islamic bank's profitability in Indonesia and Malaysia, respectively. They argue that inflation is well anticipated in both markets and the Islamic banks achieve high profitability with increased inflation.

4.3.1 Robustness Check

We re estimate our regression model (Eq. (4)) using the analogous dataset with return on average equity ROAE as an alternative measure of Islamic banks' profitability, to ascertain that our main findings are consistent. The similar three specifications are applied and the estimation results for ROAE as a profitability measure using 2-step system GMM dynamic panel data approach are reported in Table 6. Regression equation (A1) presents the results of the relationship of maturity transformation risk and other bank-specific factors, in explaining Islamic bank's profitability. Additionally, industry-specific and macroeconomic variables are also included along with the bank-specific explanatory variables in our regression model. The results are reported in equation (B1) and (C1), respectively. The estimates obtained in all three sets of regression model are largely consistent with previously results in our initial analyses, in terms of the relationship and statistical significance and thus verifying the robustness of our main findings.

Table 6. Two-step System GMM estimations (Return on Average Equity (ROAE_{it}) as dependent variable)

	(A1)	(B1)	(C1)
ROAE _{it-1}	0.4167 *** (0.1258)	0.4066 *** (0.1231)	0.436 *** (0.0918)

NSFR _{it}	10.094 * (5.5046)	10.1731 * (5.7409)	7.3738 * (3.9906)
SIZE _{it}	0.4138 (0.9359)	-0.2794 (0.8276)	-0.6004 (1.0304)
CAP _{it}	0.6543 *** (0.2289)	0.8429 *** (0.3112)	0.6497 *** (0.2366)
NONII_TA _{it}	1.9965 * (1.0311)	2.3464 ** (1.1722)	1.8226 ** (0.84)
EFF _{it}	-0.1296 *** (0.0464)	-0.1409 *** (0.0473)	-0.1518 *** (0.0436)
LLRTL _{it}	-1.975 ** (0.7725)	-1.915 ** (0.7358)	-1.5063 *** (0.536)
3_CONS _{it}		0.1271 * (0.0682)	0.1027 ** (0.0405)
GDP _i			0.1407 (0.1465)
INF _i			-0.2532 (0.3893)
Cons.	8.0753 (12.9828)	8.559 (14.1266)	14.2214 (14.0122)
<i>Model Specification Tests</i>			
F-Statistics	45.70 $p = 0.000$	45.51 $p = 0.000$	52.10 $p = 0.000$
AR(1) test stat	-1.99 $p > z = 0.046$	-1.95 $p > z = 0.051$	-1.86 $p > z = 0.062$
AR(2) test stat	0.78 $p > z = 0.438$	0.97 $p > z = 0.332$	1.44 $p > z = 0.150$
Hansen J-stat	2.26 $p > z = 0.812$	1.63 $p > z = 0.897$	2.88 $p > z = 0.824$
No. of Instruments	13	14	17
No. of Banks	55	55	55
Observations	412	412	412

Equation (A1), (B1) and (C1) are the three specifications of our proposed model in equation (4), where equation (A1) estimates the bank-specific variables only, while industry specific and macroeconomic variables are included in equation (B1) and (C1), respectively. All explanatory variables are defined in Table 1.

Robust standard errors are in parenthesis. ***, ** and * indicates statistical significance at 1%, 5% and 10%, respectively.

Source: Authors' calculations using Stata (v 14.0) software.

The highly significant positive coefficient of the lagged dependent variable confirms the dynamic nature of our model and also validates our argument to consider the profit persistence while explaining Islamic banks' profitability. Moreover, the coefficient of NSFR remain significant and positive in all of the regression models which also validates our empirical finding of inverse relationship between maturity transformation risk and profitability of Islamic banks. Specifically, a one standard deviation increase in net stable funding ratio is associated with 318.60% - 436.13% increase

in bank profitability as measured by ROAE. Among the other bank specific explanatory variables, bank capital (CAP), noninterest income (NONII), management efficiency (CIR) and credit risk (LLRTL) are the significant factors in explaining Islamic bank's profitability, when used ROAE as a dependent variable. We obtain similar results to our initial analysis in terms of the relationship between bank capital and profitability as the coefficient of CAP reveals a positive significant relationship with ROAE in all the three specification. We further find that NONII becomes significant determinant of Islamic banks' profitability when we used ROAE as a profitability measure. Moreover, both CIR and LLRTL show similar negative and statistically significant relationship in all specifications with Islamic bank's profitability in terms of ROAE. Although the direction of the relationship between bank size and profitability is similar to our main findings, however, the SIZE variable loses its significance in explaining Islamic banks' profitability, in terms of ROAE. Similar to our results of the initial estimates, the coefficient of concentration ratio (3_CONC) shows a positive and significant relationship with the dependent variable. This positive effect of concentration validates our argument on SCP theory that Islamic banks charge monopolistic rents in less competitive markets, thus achieve higher profits. Besides, both GDP growth rate and CPI as macroeconomic determinants of profitability become insignificant when Islamic banks' profitability is measured as ROAE.

4.3.2 Alternative Estimation Technique

We also applied two stage least square (2SLS) estimation technique to confirm our main results obtained by using 2-step System GMM. The results for ROAA and ROAE as dependent variables of Islamic banks' profitability, using 2SLS estimation technique are presented in Table 7. The estimates obtained by 2SLS are mainly in consistent with our previous findings. The coefficient of maturity transformation risk variable (NSFR) remains statistically significant and positive in explaining Islamic banks' profitability, when measured as ROAA and ROAE, an in all three specifications. This reveals the significance of new IFSB liquidity ratio in determining the profitability of Islamic banks. The other bank-specific explanatory variables also show the similar results as obtained by 2-step System GMM estimation. Moreover, the coefficient of bank concentration (3-CONC) also exhibit the similar results, both in terms of significance and direction, confirming that Islamic banks tend to charge monopolistic rents in less competitive environment. In case of macroeconomic variables, the impact of economic growth in explaining Islamic banks' profitability remains inconclusive as the coefficient of GDPG shows a positive and significant effect on profitability when measured as ROAA, however, is insignificant in explaining profitability in terms of ROAE. Besides, the inflation variable CPI remains insignificant in determining the profitability of Islamic banks during the sample period.

Table 7. Two Stage Least Square (2SLS) estimation results – Maturity Transformation Risk and Islamic Banks' Profitability Model

VARIABLES	ROAA			ROAE		
	(1)	(2)	(3)	(4)	(5)	(6)
ROAA _{it-1}	0.363*** (0.113)	0.469*** (0.112)	0.457*** (0.115)			
ROAE _{it-1}				0.460*** (0.131)	0.451*** (0.130)	0.448*** (0.128)
NSFR _{it}	0.773** (0.360)	0.567* (0.330)	0.576* (0.332)	8.711** (4.095)	8.455** (4.027)	8.729** (4.176)
CAP _{it}	0.0528** (0.0206)	0.0803*** (0.0243)	0.0770*** (0.0239)	0.346* (0.207)	0.397* (0.215)	0.374* (0.221)
ln_TA _{it}	-0.106	-0.355*	-0.395**	-3.248**	-4.704**	-4.698**

	(0.151)	(0.196)	(0.197)	(1.647)	(1.929)	(2.109)
NONII_TA _{it}	0.298**	0.201*	0.210*	0.117	0.282	0.287
	(0.126)	(0.117)	(0.117)	(0.840)	(0.827)	(0.817)
EFF _{it}	-0.0212***	-0.0210***	-0.0206***	-0.234***	-0.231***	-0.232***
	(0.00521)	(0.00497)	(0.00493)	(0.0505)	(0.0496)	(0.0500)
LLRTL _{it}	-0.0359	-0.0245	-0.0252	-1.125**	-1.161**	-1.168**
	(0.0273)	(0.0267)	(0.0266)	(0.568)	(0.563)	(0.565)
3_CONC _{it}		0.00649*	0.00833**		0.128***	0.125***
		(0.00392)	(0.00422)		(0.0424)	(0.0427)
GDP _t			0.0331**			-0.0293
			(0.0154)			(0.159)
INF _t			0.00108			0.0639
			(0.0190)			(0.181)
R-squared	0.577	0.554	0.563	0.474	0.484	0.486
Hansen J statistics	4.589	4.448	4.570	6.932	8.308	8.727
	p = 0.3321	p = 0.4869	p = 0.4706	p = 0.2729	p = 0.3062	p = 0.2729
Number of Banks	55	55	55	55	55	55
Observations	412	412	412	412	412	412

Robust standard errors in parentheses. . ***, ** and * indicates statistical significance at 1%, 5% and 10%, respectively.

Source: Authors' calculations using Stata (v 14.0) software.

5.0 Conclusions

The aim of this study is to analyze the impact of IFSBs' proposed new liquidity regulation on financial performance of Islamic banking sector. More specifically, we adopt ISFB Guidance Note No. 6, to measure the modified NSFR, to account for the sector's unique requirements. We applied dynamic panel data technique on a sample of 55 full-fledged Islamic banks.

This study reports a significant, negative relationship between maturity transformation risk and profitability, which implies that the inclusion of NSFR leads to a better financial performance of Islamic banks. Our findings are important to the regulators and bank managers in several ways. For example, the Islamic banks, which maintain the minimum regulatory requirement of NSFR, either generate funds from more stable sources or hold enough liquid assets to meet the liquidity demands of their customers. While doing so, such banks are less reliant on expensive market funding and thus are cost efficient and more profitable. Therefore, the adoption of net stable funding ratio by Islamic banks can significantly improve their financial performance. The results of this study did not find support of the risk-return hypothesis since the excessive maturity transformation function by Islamic banks does not contribute to overall increase in their profitability. Besides, we find that Islamic banks, which operate on a more conservative approach, are more profitable. These findings suggest that practitioners should appropriately adjust their liquidity creation function. Moreover, the positive capital – profitability relationship supports the implementation of improved regulatory capital requirements in Islamic banks. Our results reveal that sound capital position of Islamic banks provide the banks with ease of access to market funding at lower cost, which in turn increases their profitability. This provides some important implications, especially to the practitioners, to monitor the level of regulatory capital to avoid being under-capitalized, since bank capital is a significant factor in explaining the increased performance of Islamic banks in our results. Furthermore, this study also suggests that policymakers of Islamic banks should focus to increase management efficiency, introduce improved collection mechanisms, and further strengthen customer relationships, since the CIR and LLRTL empirically reduce the profitability of Islamic banks. In addition, the positive concentration – profitability

relationship warrants for an increased protection of Islamic banking industry by regulators and policymakers, to achieve their better efficiency and enhanced financial performance.

Appendix A

A.1 Fisher-Type Unit root Test

Table A.1 presents the augmented dickey-fuller unit root tests of variables included in our three regression models.

Table A. 1 Augmented Dickey-Fuller Unit root test for Panel Stationarity

Variable	Acronym	Inv. χ^2	p -value	Mod. χ^2	p -value
Profitability	ROAA	583.7121	0.0000	31.9377	0.0000
	ROAE	421.4763	0.0000	20.9997	0.0000
Maturity Transformation Risk	NSFR	447.2656	0.0000	22.7384	0.0000
Bank Size	In_TA	227.5155	0.0000	7.9229	0.0000
Bank Capitalization	CAP	286.7022	0.0000	11.9133	0.0000
Income Diversification	NONII_TA	570.6904	0.0000	31.0597	0.0000
Operating Efficiency	EFF	435.2583	0.0000	21.9289	0.0000
Credit Risk	LLRTL	332.2949	0.0000	14.9871	0.0000
Bank Concentration	3_Conc	257.8267	0.0000	9.9665	0.0000
Economic Growth	GDPG	245.7437	0.0000	9.5976	0.0000
Inflation	CPI	561.1361	0.0000	31.2589	0.0000

Source: Author's calculation using Stata (v14.0)

A.2 Maturity Transformation Risk and Banks' Profitability Model

Table B.2.2 Pearson Pairwise Correlation among the variables used in Maturity Transformation Risk and Profitability Model

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) ROAA	1.00										
(2) ROAE	0.72	1.00									
(3) NSFR	0.02	0.03	1.00								
(4) ln_TA	0.23	0.20	-0.29	1.00							
(5) CAP	0.09	-0.03	0.04	-0.31	1.00						
(6) NONII_TA	0.39	0.17	0.15	-0.05	0.14	1.00					
(7) EFF	-0.58	-0.64	0.03	-0.42	0.20	-0.01	1.00				
(8) LLRTL	-0.21	-0.50	0.20	0.04	-0.13	0.13	0.31	1.00			
(9) 3_Conc	0.09	-0.02	-0.19	0.22	0.06	-0.15	-0.11	0.07	1.00		
(10) GDPG	0.28	0.13	0.09	-0.07	0.18	0.03	-0.15	-0.12	-0.02	1.00	
(11) CPI	-0.11	-0.10	0.23	-0.38	-0.11	0.13	0.28	0.17	-0.28	0.04	1.00

Source: Authors' calculations using Stata (v 14.0) software.

All variables are defined in Table 3.3. Bold values are at 1% significance level.

References

- Abduh, M., & Idrees, Y. (2013). Determinants of Islamic Banking Profitability in Malaysia. *Australian Journal of Basic and Applied Sciences*, 7(2), 204-210.
- Abreu, M., & Mendes, V. (2001). Commercial bank interest margins and profitability: evidence for some EU countries Symposium conducted at the meeting of the Pan-European Conference Jointly Organised by the IEFS-UK & University of Macedonia Economic & Social Sciences,, Thessaloniki, Greece.
- Akhtar, M. F., Ali, K., & Sadaqat, S. (2011). Factors influencing the profitability of Islamic banks of Pakistan. *International Research Journal of Finance and Economics*, 66, 125-132.
- Alexiou, C., & Sofoklis, V. (2009). Determinants of bank profitability: Evidence from the Greek banking sector. *Economic annals*, 182, 93-118. doi:10.2298/EKA0982093A
- Alharbi, A. T. (2017). Determinants of Islamic banks' profitability: international evidence. *International Journal of Islamic and Middle Eastern Finance and Management*, 10(3), 331-350.
- Almazari, A. A. (2014). Impact of internal factors on bank profitability: Comparative study between Saudi Arabia and Jordan. *Journal of Applied finance and banking*, 4(1), 125.
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of econometrics*, 68(1), 29-51. doi:https://doi.org/10.1016/0304-4076(94)01642-D
- Ariffin, N. M. (2012). Liquidity risk management and financial performance in Malaysia: empirical evidence from Islamic banks. *Aceh International Journal of Social Science*, 1(2).
- Asutay, M., & Izhar, H. (2007). Estimating the profitability of Islamic banking: evidence from Bank Muamalat Indonesia. *Review of Islamic economics.*, 11(2), 17-29.

- Athanasoglou, P., Brissimis, S., & Delis, M. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of international financial Markets, Institutions and Money*, 18(2), 121-136.
- Bashir, A.-H. M. (2003). Determinants of profitability in Islamic banks: Some evidence from the Middle East. *Islamic economic studies*, 11(1), 31-57.
- Beck, T., Demirgüç-Kunt, A., & Merrouche, O. (2013). Islamic vs. conventional banking: Business model, efficiency and stability. *Journal of Banking & Finance*, 37(2), 433-447. doi:<https://doi.org/10.1016/j.jbankfin.2012.09.016>
- Ben Khediri, K., & Ben-Khedhiri, H. (2009). Determinants of Islamic bank profitability in the MENA region. *International Journal of Monetary Economics and Finance*, 2(3-4), 409-426.
- Berger, A. N., Bonime, S. D., Covitz, D. M., & Hancock, D. (2000). Why are bank profits so persistent? The roles of product market competition, informational opacity, and regional/macroeconomic shocks. *Journal of Banking & Finance*, 24(7), 1203-1235.
- Berger, A. N., & Bouwman, C. H. (2009). Bank liquidity creation. *Review of Financial Studies*, 22(9), 3779-3837. doi:<https://doi.org/10.1093/rfs/hhn104>
- Berger, A. N., Hanweck, G. A., & Humphrey, D. B. (1987). Competitive viability in banking: Scale, scope, and product mix economies. *Journal of monetary economics*, 20(3), 501-520.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, 87(1), 115-143. doi:[https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8)
- Bolt, W., De Haan, L., Hoerberichts, M., Van Oordt, M. R., & Swank, J. (2012). Bank profitability during recessions. *Journal of Banking & Finance*, 36(9), 2552-2564.
- Bordeleau, É., & Graham, C. (2010). *The impact of liquidity on bank profitability*: Bank of Canada working paper.
- Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking & Finance*, 13(1), 65-79. doi:[https://doi.org/10.1016/0378-4266\(89\)90020-4](https://doi.org/10.1016/0378-4266(89)90020-4)
- Chen, Y.-K., Shen, C.-H., Kao, L., & Yeh, C.-Y. (2018). Bank Liquidity Risk and Performance. *Review of Pacific Basin Financial Markets and Policies*, 21(01), 1850007.
- Chiaromonte, L. (2015). Net Stable Funding Ratio and Bank Profitability: What Relations? *Bancaria Journal of Italian Banking Association*, 10.
- Chowdhury, M. A. F., & Rasid, M. E. S. M. (2015). The determinants of the profitability of Islamic banks: a cross-sectional study from Asia and Africa. *International Journal of Business and Globalisation*, 15(3), 375-388.
- Cooper, M. J., Jackson, W. E., & Patterson, G. A. (2003). Evidence of predictability in the cross-section of bank stock returns. *Journal of Banking & Finance*, 27(5), 817-850.
- Curak, M., Poposki, K., & Pepur, S. (2012). Profitability determinants of the Macedonian banking sector in changing environment. *Procedia-Social and Behavioral Sciences*, 44, 406-416. doi:<https://doi.org/10.1016/j.sbspro.2012.05.045>
- Demirgüç-Kunt, A., & Huizinga, H. (1999). Determinants of commercial bank interest margins and profitability: some international evidence. *The World Bank Economic Review*, 13(2), 379-408.
- Deng, S., Elyasiani, E., & Mao, C. X. (2007). Diversification and the cost of debt of bank holding companies. *Journal of Banking & Finance*, 31(8), 2453-2473. doi:<https://doi.org/10.1016/j.jbankfin.2006.10.024>
- Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money*, 21(3), 307-327.
- Dietrich, A., & Wanzenried, G. (2014). The determinants of commercial banking profitability in low-, middle-, and high-income countries. *The Quarterly Review of Economics and Finance*, 54(3), 337-354.

- Djalilov, K., & Piesse, J. (2016). Determinants of bank profitability in transition countries: What matters most? *Research in International Business and Finance*, 38, 69-82.
doi:<https://doi.org/10.1016/j.ribaf.2016.03.015>
- Eichengreen, B., & Gibson, H. D. (2001). *Greek banking at the dawn of the new millennium*. Paper presented at the meeting of the Centre for Economic Policy Research, London.
- Flamini, V., Schumacher, M. L., & McDonald, M. C. A. (2009). *The determinants of commercial bank profitability in Sub-Saharan Africa*: International Monetary Fund.
- Giordana, G. A., & Schumacher, I. (2017). An Empirical Study on the Impact of Basel III Standards on Banks' Default Risk: The Case of Luxembourg. *Journal of Risk and Financial Management*, 10(2), 8.
- Goddard, J., Liu, H., Molyneux, P., & Wilson, J. O. (2011). The persistence of bank profit. *Journal of Banking & Finance*, 35(11), 2881-2890.
- Golin, J., & Delhaise, P. (2013). *The bank credit analysis handbook: a guide for analysts, bankers and investors*: John Wiley & Sons.
- Gujarati, D. N. (2009). *Basic econometrics*: Tata McGraw-Hill Education.
- Haron, S. (1996). Competition and other external determinants of the profitability of Islamic banks. *Islamic Economic Studies*, 4(1), 49-64.
- Haron, S. (2004). Determinants of Islamic bank profitability. *Global Journal of Finance and Economics*, 1(1), 11-33.
- Hasan, M., & Dridi, J. (2011). The effects of the global crisis on Islamic and conventional banks: A comparative study. *Journal of International Commerce, Economics and Policy*, 2(02), 163-200.
- Hassan, K., & Lewis, M. (2009). *Handbook of Islamic banking*: Edward Elgar Publishing.
- Hassan, M. K., & Bashir, A.-H. M. (2003). Determinants of Islamic banking profitability Symposium conducted at the meeting of the 10th ERF annual conference, Morocco
- ICD, & REUTERS. (2015). *Islamic Finance Development Report 2015: Global Transformation*.
- Idris, A. R., Asari, F. F. H. A., Taufik, N. A. A., Salim, N. J., Mustaffa, R., & Jusoff, K. (2011). Determinant of Islamic banking institutions' profitability in Malaysia. *World Appl. Sci. J*, 12, 01-07.
- IFSB. (2017). *Islamic Financial Services Industry Stability Report*. Malaysia: Islamic Financial Services Board.
- Iqbal, Z., & Mirakhor, A. (2011). *An introduction to Islamic finance: Theory and practice* (Vol. 687): John Wiley & Sons.
- Karim, B. K., Sami, B. A. M., & Hichem, B.-K. (2010). Bank-specific, industry-specific and macroeconomic determinants of African Islamic banks' profitability. *International Journal of Business and Management Science*, 3(1), 39.
- Khrawish, H. A. (2011). Determinants of commercial banks performance: evidence from Jordan. *International Research Journal of Finance and Economics*, 81, 148-159.
- King, M. R. (2013). The Basel III net stable funding ratio and bank net interest margins. *Journal of Banking & Finance*, 37(11), 4144-4156. doi:<https://doi.org/10.1016/j.jbankfin.2013.07.017>
- Köhler, M. (2013). Does non-interest income make banks more risky? Retail-versus investment-oriented banks.
- Kosmidou, K. (2008). The determinants of banks' profits in Greece during the period of EU financial integration. *Managerial Finance*, 34(3), 146-159.
doi:<https://doi.org/10.1108/03074350810848036>
- Kosmidou, K., Tanna, S., & Pasiouras, F. (2005). *Determinants of profitability of domestic UK commercial banks: panel evidence from the period 1995-2002*. Paper presented at the meeting of the Money Macro and Finance (MMF) Research Group Conference,
- Lee, C.-C., & Hsieh, M.-F. (2013). The impact of bank capital on profitability and risk in Asian banking. *Journal of international money and finance*, 32, 251-281.

- Li, Y. (2007). *Determinants of banks' profitability and its implication on risk management practices: Panel evidence from the UK in the period 1999-2006* (Dissertation). The University of Nottingham.
- Mahmood, H., Gan, C., & Nguyen, C. (2018). Maturity transformation risk factors in Islamic banking: Implication of Basel III liquidity regulations. *Managerial Finance*.
- Mirzaei, A. (2011). The effect of market power on stability and performance of Islamic and conventional banks. *Islamic Economic Studies*, 18, 45-84.
- Mirzaei, A., Moore, T., & Liu, G. (2013). Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies. *Journal of Banking & Finance*, 37(8), 2920-2937.
- Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of banking & Finance*, 16(6), 1173-1178. doi:[https://doi.org/10.1016/0378-4266\(92\)90065-8](https://doi.org/10.1016/0378-4266(92)90065-8)
- Molyneux, P., & Yip, J. (2013). Income diversification and performance of Islamic banks. *Journal of Financial Management, Markets and Institutions*, 1(1), 47-66.
- Muda, M., Shahrudin, A., & Embaya, A. (2013). Comparative analysis of profitability determinants of domestic and foreign Islamic banks in Malaysia. *International Journal of Economics and Financial Issues*, 3(3), 559.
- Naceur, S. B. (2003). The determinants of the Tunisian banking industry profitability: panel evidence.
- Naceur, S. B., & Kandil, M. (2009). The impact of capital requirements on banks' cost of intermediation and performance: The case of Egypt. *Journal of Economics and Business*, 61(1), 70-89.
- Olagunju, A., David, A., & Samuel, O. (2012). Liquidity Management and Commercial Banks' Profitability in Nigeria. *Research Journal of Finance and Accounting*, 2(7-8), 24-38.
- Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance*, 21(2), 222-237. doi:<https://doi.org/10.1016/j.ribaf.2006.03.007>
- Perry, P. (1992). Do banks gain or lose from inflation? *Journal of Retail Banking*, 14(2), 25-31.
- Rachdi, H., & Mokni, R. B. S. (2014). Assessing the bank profitability in the MENA region: A comparative analysis between conventional and Islamic bank. *International Journal of Islamic and Middle Eastern Finance and Management*, 7(3), 305-332.
- Saad, W., & El-Moussawi, C. (2012). The Determinants of Net Interest Margins of Commercial Banks in Lebanon. *Journal of Money, Investment and Banking*, 23, 118-132.
- Smaoui, H., & Salah, I. B. (2012). Profitability of Islamic banks in the GCC region. *Global Economy and Finance Journal*, 5(1), 85-102.
- Srairi, S. A. (2009). Factors Influencing the Profitability of Conventional and Islamic Commercial Banks in GCC Countries. *Review of Islamic Economics*, 13(1), 5-30.
- Staikouras, C. K., & Wood, G. E. (2011). The determinants of European bank profitability. *International Business & Economics Research Journal (IBER)*, 3(6).
- Sufian, F. (2011). Profitability of the Korean banking sector: Panel evidence on bank-specific and macroeconomic determinants. *Journal of Economics and Management*, 7(1), 43-72.
- Sufian, F., & Habibullah, M. S. (2009). Bank specific and macroeconomic determinants of bank profitability: Empirical evidence from the China banking sector. *Frontiers of Economics in China*, 4(2), 274-291. doi: 10.1007/s11459-009-0016-1
- Trad, N., Trabelsi, M. A., & Goux, J. F. (2017). Risk and profitability of Islamic banks: A religious deception or an alternative solution? *European Research on Management and Business Economics*, 23(1), 40-45. doi:<https://doi.org/10.1016/j.iedeen.2016.09.001>
- Wasiuzzaman, S., & Tarmizi, H. (2010). Profitability of Islamic banks in Malaysia: an empirical analysis. *Journal of Islamic Economics, Banking and Finance*, 6(4), 53-68.
- Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of econometrics*, 126(1), 25-51. doi:<https://doi.org/10.1016/j.jeconom.2004.02.005>

Zarrouk, H., Jedidia, K. B., & Moualhi, M. (2016). Is Islamic bank profitability driven by same forces as conventional banks? *International Journal of Islamic and Middle Eastern Finance and Management*, 9(1), 46-66.