

Resiliency between Islamic and conventional banks in Bangladesh

Dynamic GMM and quantile regression approaches

Ajim Uddin, Mohammad Ashraful Ferdous Chowdhury and

Md. Nazrul Islam

*Department of Business Administration,
School of Management and Business Administration,
Shahjalal University of Science and Technology, Sylhet, Bangladesh*

Abstract

Purpose – The purpose of this paper is to examine the resiliency between conventional banks (CBs) and Islamic banks (IBs) in Bangladesh at the financial crisis, pre-crisis and post-crisis period.

Design/methodology/approach – Data from 25 banks, 18 CBs and 7 IBs, operating in Bangladesh during the period 2005-2014 have been collected and divided into three stages: the pre-crisis period (2005-2006), the crisis period (2007-2008) and the post-crisis period (2009-2014). Dynamic generalized method of moments and quantile regression analysis have been used for this study.

Findings – This paper uses *Z*-score as an indicator of bank stability and found a significant difference in stability between IBs and CBs during the financial crisis. In addition, this paper also tries to identify the type of banks that performed better during pre-crisis, crisis and post-crisis periods but found no significant differences between IBs and CBs in this regards. For robustness, quantile regression found that the statistical significance level of credit risk, capital adequacy ratio and efficiency ratio of CBs and IBs differ at different percentile.

Originality/value – Most of the previous studies were conceptual or narrative and conducted on a global basis, not country-specific. To filling the country-level research gap, this study provides a meaningful insight about how these two types of banks performed in different periods.

Keywords Islamic banks, Quantile regression, Conventional banks, Financial crisis, Resiliency, Dynamic GMM

Paper type Research paper

1. Introduction

The devastating impact of the 2007-2008 global financial crisis (GFC) on the world economy has led economists to reconsider the role of financial institutions. The crisis has generally been recognized as the worst since the Great Depression of the 1930s. By starting as a credit shock, the crisis resulted in a sharp decline in stock values and a series of failures on many conventional banks (CBs). Stout (2011) identified this crisis as a result of excessive risk-taking by US banks using credit derivatives. The banking industry fails drastically to anticipate housing market prospects and borrower's creditworthiness. The focus of banks on credit quantity instead of credit quality leads them to end up with a high volume of low-quality credit and, ultimately, credit crunch.

The interconnection of the banking system and their funding structure allowed the liquidity crises to hastily spread from one bank to another. The impact of this crisis was



severe on banks that have been relying mostly on wholesale funding. As [OECD \(2010\)](#) identified, unlike banks that use other banks' and money market funds, banks that use depository funding have been less affected and have been able to maintain solvency during the financial crisis. Owing to global financial convergence, the systemic risk of one country's banking industry rapidly transmitted to the global financial system. Derivatives and excessive leveraging of US banks led some established financial institutions, both domestic and international, into bankruptcy and brought others to the brink of collapse.

Islamic banks (IBs), known as deposit-taking banking institutions, are different from CBs on the ground of their risk-sharing principles. As it is based on *Shariah*, Islamic banking does not permit participants to accept interest (*riba* or usury) ([Siddiqi, 2006](#), [Basov and Bhatti, 2016](#)). Instead of being involved in debt financing, it encourages people to make the real economic transaction by getting involved in risk and profit-loss sharing ([Beck et al., 2013](#)). After their inception, Islamic financial institutions have grown consistently. The ability to endure the severe consequences of the financial crisis and its emergence as a more equitable and efficient system have made Islamic finance more acceptable even to the non-Muslim community.

Islamic banking as a mode of alternative financing was highlighted during the 2007-2008 GFC. The role of variable interest rates on triggering this crisis provides sufficient ground for Islamic economists to promote Islamic finance as a means to avoid such turbulence. Many academicians suggest that IBs are less risky and performed better than their conventional counterpart during the 2007-2008 financial crisis. Some even go further and immunize IBs against the negative effects of this crisis. International Monetary Fund (IMF) ([2010](#)) in their report showed that comparing to CBs, IBs were more resilient during the initial stage of the crisis but face greater losses once the crisis hit the real economy. [Hasan and Dridi \(2010\)](#) found that during the crisis, IBs played a major role to ensure financial and economic stability. Using various techniques and variables, a number of other studies have been conducted to analyze the impact of the financial crisis on IBs and CBs but most of them are conceptual or narrative and conducted on a global basis. The lack of country-specific research and empirical studies for determining the impact of the 2007-2008 financial crisis on IBs compared to CBs was an intriguing factor for conducting this study.

The banking industry in Bangladesh consists of state-owned commercial banks (SCBs), state-owned development finance institutions, private commercial banks (PCBs) and foreign commercial banks (FCBs). Among these types of banks, foreign banks only control 5.5 per cent of total assets ([Bangladesh Bank, 2014](#)). Comparing total assets, this small percentage of foreign-owned banks might indicate that the banking industry will remain unaffected by the global factors. However, the asset structure of the banking industry of Bangladesh and the remittance dependency of the country's economy make all the banks operating in the country vulnerable to the global crisis. In 2014, foreign remittance accounts for 8.70 per cent of total GDP of the country ([World Bank, 2017](#)).

Apart from this, the GFC also affected the level of international trade and foreign direct investment (FDI) of the country. According to the Asian Development Bank (ADB) ([2009](#)), the main export sector of Bangladesh, RMG has experienced a decline in its export growth rate from 15.9 per cent in 2007-2008 to 10.3 per cent in 2008-2009. The inflow of FDI also received a major shock during the crisis. FDI declined from US\$793m in 2007-2008 to US\$650m in 2008-2009, but also bounced back to US\$913m in 2010 ([BDnews, 2011](#)). As a result, the GDP growth rate of the country dropped from 6.2 per cent in 2007-2008 to 5.9 per cent in 2008-2009 ([ADB, 2009](#)). Therefore, the result of all these factors is expected to have an adverse effect on the banking industry of Bangladesh during the GFC.

This paper attempts to provide an empirical analysis of the effect of the crisis and complement previous descriptive studies on the financial soundness of IBs and CBs. The purpose of this study is to examine the performance of IBs and CBs in Bangladesh during the global financial crises. For this purpose, data from 25 banks, 18 CBs and 7 IBs, operating in Bangladesh during the period 2005-2014 are collected and distinguished as per period into three separate stages; the pre-crisis period (2005-2006), the crisis period (2007-2008) and the post-crisis period (2009-2014). Using non-parametric and regression analysis, this study tries to assess the impact of the crisis on different types of banks' stability, measured by the Z-score.

The emergence of Islamic financing as an alternative to CBs and its ability to work against the negative consequences of the GFC mainly motivated the researchers to conduct this study. In addition to that, the splitting of the study period will complement [Kolsi and Zehri's \(2014\)](#) study and will provide a better understanding of how these banks performed in different stages and their efficiency to recover from the crisis. Finally, the study will fill the research gap that exists between global and country-specific studies by having the first ever such type of empirical study on the banking industry of Bangladesh.

The rest of the paper is organized as follows: first, a review of the literature is provided in Section 2. Section 3 discusses the indicators of banks: soundness and resiliency. In Section 4, the sample, data collection and the research design are discussed. Then, the results are discussed in Section 5. Finally, the conclusions of the paper along with some insights for future research are provided in Section 6.

2. Literature review

The effects of the financial crisis on bank soundness and profitability have generated renewed interest since the global crisis. Researchers devote sufficient attention to finding the causes, implications and strategies to overcome such a crisis. [Kayed and Hassan \(2011\)](#) identified the absence of proper regulatory control and greed and appetite for higher returns as the sources of the 2007-2008 financial crisis. To maximize their return, banks engage in risky lending in an excessive amount and ultimately end up with violating the interest of both the banks and their depositors. To explain such excessive and imprudent lending by banks, [Chapra \(2011\)](#) identified three factors:

- (1) inadequate discipline in the system because of the absence of profit-and-loss sharing (PLS) between lenders and borrowers;
- (2) increased use of derivatives, especially credit default swaps (CDSs); and
- (3) the "too big to fail" attitude of big banks.

The responses of regulatory agencies to banks' irresponsible practices also reinforce their false beliefs that the central bank will bail them out during crises to prevent their collapse ([Chapra, 2011](#)).

Researchers from all over the world tried to identify prudent strategies to deal with and overcome the harsh impact of the GFC. In search of an alternative mode of financing, many researchers ([Mirakhor and Krichene, 2009](#); [Beck et al., 2013](#); [Hasan and Dridi, 2010](#)) mention Islamic finance and its ability to deter shock in times of financial crisis. The rapid expansion of Islamic finance has been an interesting phenomenon to finance scholars, but it becomes concrete after the GFC. Previous comparative studies between Islamic and conventional banking were primarily conducted to identify and explain the efficiency and performance of these banks ([Metwally, 1997](#); [Iqbal, 2001](#); [Beck et al., 2013](#)). Though after the GFC, the focus

has shifted toward their resiliency during the financial crisis, but still the amount of literature is limited and differs largely on the conclusions.

Choudhury and Bhatti (2016a, 2016b), in their book *Heterodox Islamic Economics: The Emergence of an Ethico-Economic Theory*, first developed a philosophical–scientific foundation of heterodox Islamic economics. They identified that human nature and their morality and ethics does affect the empirical financial analysis. Their approach on monotheistic methodology defines a new era of study of Islamic economics and its literature.

According to some researchers, the principle of Islamic finance, i.e. risk sharing, real asset transaction and ethical consideration, provides IBs with the shield to avoid the impact of the crisis (Siddiqi, 2006, Sufian and Noor, 2009, Hasan and Dridi, 2010, Basov and Bhatti, 2016, Chowdhury *et al.*, 2016). The Governor of the Central Bank Malaysia Zeti Akhtar (2009) addressed that the viability and resilience of IBs mainly come from the inherent strengths of Islamic finance, its governance and risk management system and primary emphasis on the financial transactions and productive flows. By agreeing with this view, the Governor of the Central Bank of Turkey Durmuş Yılmaz (2009) also added that the significant resilience of IBs is the result of not having excessive leverage and disruptive financial innovation. In a study, Sufian and Noor (2009) found that IBs of the Middle East and North Africa region performed better and were more efficient during the GFC than Asian IBs. In a cross-country analysis, Hasan and Dridi (2010) found that during the GFC, IBs performed better than CBs. They have better credit and asset growth and better stability compared to their conventional counterparts. Beck *et al.* (2013) analyzed data from 141 countries over the period 1995-2007 and found that during the GFC, IBs had higher asset quality and were better capitalized. They even found that the stock prices of IBs also performed relatively better in this period. Cihák and Hesse (2010) analyzed IBs from 18 countries and concluded that, as size increases, IBs lose their comparative advantage in maintaining financial stability. They found that IBs are financially stronger when they are small, but because of the challenges of credit risk management, large IBs lose this advantage.

However, another school of researchers were reluctant to agree that IBs are performing up to their potential to avoid the financial crisis and maintaining economic stability (Charap and Cevik, 2011; El-Hawary *et al.*, 2007; Greuning and Iqbal, 2008; Zainol and Kassim, 2010). They argued that the performance of IBs was lower than their potential because of their weakness in risk management. The apparent better performance was the result of their better diversification, economies of scale and the continuation of their good performance before the GFC. Chapra (2011, 2009) and Saddy (2009) argued that, Islamic Banks today do not follow Islamic principles properly, and as a result, they are no longer safe from the devastating impact of financial crisis. Like commercial banks, some IBs also relied on leverage and therefore have undertaken significant risks. Deviating from their core principles, IBs are funding corporations with high risk and low credit ratings. Indeed, IBs are mimicking CBs' strategy in profit distribution by paying the dividend out of equity even though they accrue a loss. As a result of the divergence of IBs from their theoretical business model, IBs cannot make themselves resilient during the crisis by covering their losses on the asset side from their liabilities (Bourkhis and Nabi, 2013).

Another group of scholars believed that though IBs avoided the subprime exposure, they are still vulnerable to the second-round effect of the global crisis. The Economist (2009) and El Said and Ziemba (2009) argued that though IBs are not affected initially because of their financial and productive flows, the prolonged duration of the crisis should eventually affect these banks for their asset-based transactions. The value of the real asset will decline with

the prolonged economic downturn and this is expected to impact the IBs and their asset structure.

The impact of the global crisis on the economy of Bangladesh is also well-researched. [Rahman et al. \(2009\)](#) discussed in their paper on the Centre for Policy Dialogue (CPD) that, the GFC poses a negative impact on the export growth rate, remittance earnings and GDP of Bangladesh. They also assumed that the downturn in the labor market will eventually impact the financial market of the country. In a study on low-income Asian countries, [Ree \(2011\)](#) found that the banking sector of Bangladesh is relatively less affected by the GFC, which is largely because of the relatively small international exposure of this industry. He also added that the non-performing loans of Bangladesh's banks increased after the crisis. Bangladesh was also among the 16 sample countries used by Bourkhis and Nabi for their empirical study in 2013. Using both parametric and non-parametric approaches, they found that the impact of the financial crisis on the financial soundness between IBs and CBs does not vary significantly. However, limited country-level empirical studies exist that can explain how the financial crisis impacts the IBs and CBs of Bangladesh.

The banking industry of Bangladesh consists of six SCBs, two specialized development banks, 39 domestic PCBs, nine FCBs and four non-scheduled banks ([Bangladesh Bank, 2014](#)). In addition to the presence of several intriguing features of the post-crisis phenomenon, the presence of a robust Islamic banking sector also played a crucial role in selecting Bangladesh for this study. In Southeast Asia, Islamic banking was first introduced by Bangladesh in 1983 ([Kabir et al., 2012](#)). Now there are 56 banks in Bangladesh, and out of this, eight PCBs are operated as full-fledged IBs and 16 other as CBs using an Islamic banking branch to avail Islamic banking services to their customers ([Bangladesh Bank, 2014](#)).

This study is a humble attempt to add to the literature on the performance and resiliency of IBs and CBs during the financial crisis. Though there are several cross-country studies that have been conducted to identify the effect of the GFC in IBs, this study is the first attempt in Bangladesh. In addition to filling the country-level research gap, this study also provides a meaningful insight about how these two types of banks performed in different periods. Dividing the study period into three distinct segments (pre-crisis, crisis and post-crises) will enable to test whether lagged performance impacted the performance of these banks in the time of crisis. It will also help test [El Said and Ziemba's \(2009\)](#) proposition that IBs are prone to be affected by post-crisis shock.

3. Indicators of resiliency of the banks

The resiliency of a bank is defined as the ability of the bank to withstand adverse events such as bank run, policy changes and natural disaster ([Lindgren et al., 1996](#)). Therefore, it is the ability of the bank to remain solvent in difficult economic circumstances. IMF's financial soundness indicators (FSIs) measure bank resiliency as the means of bank's capitalization, asset quality and profitability. To determine the resiliency of the banks against financial crisis, this study considered Z-score in addition to the five bank-specific accounting ratios which are also included in IMF's FSIs.

3.1 The Z-score

The Z-score ratio is a popular and widely used measure of bank soundness, as it is inversely related to the probability of bank's insolvency ([Bourkhis and Nabi, 2013](#)). The Z-score is denoted as:

$$Z = \frac{\mu + K}{\sigma}$$

where μ denotes the bank's average return on assets (ROA), K is the equity capital in the percentage of total assets and σ is the standard deviation of the ROA which is used as a proxy measure for risk. According to De Nicolo (2000), an increase of the Z -score is equivalent to a decrease in the insolvency risk. Therefore, the greater the Z -score, the more stable the bank is. Under the assumption of bank's return normality, the Z -score can be interpreted as the number of standard deviations below the mean by which profits would have to fall to deplete equity.

3.2 Accounting indicators of resiliency

To determine the resiliency and soundness of the banks, the accounting ratios used in this study are ROA, cost to income ratio (CIR), loan loss provision by gross loan (LLPGL), equity by total asset (EQASS) and logarithm of total asset (LTA). A brief description of these ratios is also presented in Table I.

4. Methodology of the study

4.1 Data and their collection

The underdeveloped Islamic banking sector and unavailability of data greatly limit the analysis. The analysis proceeds bearing several issues in mind. First, the country Bangladesh is selected for its well-developed conventional and Islamic banking industry. Second, for the robustness of the results, 7 IBs and 18 CBs are taken which have been in operation for more than 10 years and are listed on the Dhaka Stock Exchange (DSE) (Appendix). Finally, a short period of 10 years, i.e. 2005-2014, has been selected. The financial statements of the sample banks have been collected from the annual reports of the banks and Bankscope database of Bureau Van Dijk Company. For macroeconomic indicators, inflation and GDP growth rate, data have been collected from the database of the World Bank.

Variable	Definition	Descriptions
Z	Soundness of banks	Z-score, $Z = (\mu + K)/\sigma$ Here, μ denotes the bank's average ROA, K is the equity capital in percentage of total assets and σ is the standard deviation of the ROA
ROA	Profitability of banks	ROA = Net profit/Total asset
CIR	Cost to income ratio	It refers to the operational efficiency of a bank
LTA	Bank size	Natural log of total asset
LLPGL	Credit risk	Loan loss provision/Total loan for each year averaged
EQASS	Capital adequacy	Equity/Total assets
GDP	Annual GDP growth rate	Taken from the World Bank database
INFL	Inflation rate	Represented by annual Consumer Price Inflation Rate. Taken from the World Bank database
Dummy		Islamic = 1, Conventional = 0 Islamic banks in crisis period = 1, conventional banks in crisis period = 0

Table I.
Details of the
variables selected

4.2 Variables and their explanations

The variables of the model and the rationale to be included in this study are described in this section. The definition and brief descriptions of the variables are presented in [Table I](#).

4.3 Data analysis and models

This research is conducted to econometrically analyze the resiliency of IBs and CBs during the 2007-2008 financial crisis. The methodologies applied in this study are both static and dynamic. The static model is widely renowned and has been used in numerous studies. The dynamic model used in this study is based on [Berger et al. \(2000\)](#) and, more recently, [Goddard et al. \(2004a, 2004b\)](#) and [Athanasoglou et al. \(2008\)](#). As [Mamatzakis and Remoundos \(2003\)](#) argue, the dynamic model uses more information and, consequently, the determinant factors will be estimated more efficiently. To depict clearly the true scenario of the banking industry in the time of the crisis and afterward, in this study, two separate models were developed. First, when the Z-score is the dependent variable. As [De Nicolo \(2000\)](#) and [Bourkhis and Nabi \(2013\)](#) argued, the Z-score can be a good indicator of the soundness of a bank. In the second model, the study used ROA as a proxy measure of profitability as the dependent variable. This will enable the researcher to clearly identify how the actual profitability of the banks is affected by the GFC and how efficient the banks were in overcoming the impact of the crisis.

4.3.1 Static models (fixed and random effects). The panel data are used in analyzing the bank's resiliency and profitability. In the panel data, the used model consists n cross-sectional units, denoted $n = 1, \dots, N$, observed at each of T time periods, $t = 1, \dots, T$. In the data set, the total observation is $n \times T$.

The basic framework of the first model (where Z-score is the dependent variable) for the panel data is defined as per the following regression model:

$$Z_{nt} = \alpha + \beta X_{nt} + \varepsilon_{nt}$$

Or,

$$Z_{it} = \delta + \alpha'_{jt} X_{it} + \alpha'_{it} X_{eit} + a_{Di} + \varepsilon_{jt}$$

The functional form of the above model is as follows:

$$Z\text{-Score} = f(\text{bank-specific variables, macroeconomic variables})$$

Econometric specifications:

$$Z = \alpha + \beta_1 ROA + \beta_2 CIR + \beta_3 LLPGL + \beta_4 EQASS + \beta_5 LTA + \beta_6 INFL + \beta_7 GDP + \text{DUMMY bank} + \varepsilon \tag{1}$$

Here, Z represents the dependent variable Z-score.

The basic framework of the second model (where ROA is the dependent variable) for the panel data is defined as per the following regression model:

$$P = \alpha + \beta_1 Z + \beta_2 CIR + \beta_3 LLPGL + \beta_4 EQASS + \beta_5 LTA + \beta_6 INFL + \beta_7 GDP + \text{DUMMY bank} + \varepsilon \tag{2}$$

Here, P represents the dependent variable ROA.

The above models denote the stability and the profitability equations of the static model. The first equation defines the relationship between the stability of both IBs and CBs and the bank-specific (size, operating efficiency, capital adequacy and credit risk) and macroeconomic (GDP growth rate and inflation) factors. The second equation defines the relationship of profitability with regards to bank-specific (size, operating efficiency, capital adequacy and credit risk) and macroeconomic (GDP and inflation rate) variables. Where j refers to an individual bank, t refers to year, y_{jt} refers to the ROA and the observations of bank j in a particular year t , X_i represents the internal determinants of a bank, X_e represents the external determinants of a bank and ε_{jt} is a normally distributed random variable disturbance term. The coefficient of variables is denoted by β , and it represents the amount change in the dependent variable for every change in independent variables. To find the comparative performance between IBs and CBs, this study uses the dummy variable. The least squares method of fixed-effects model (FEM) is applied to control for bank-specific effects, while standard errors are calculated by using White's (1980) transformation to control for cross-section heteroscedasticity.

4.3.2 Dynamic generalized method of moments model. For the analysis of banking sector panel data, fixed- and random-effects models are generally used. However, there is probability that the impact of one-year performance can influence the performance of subsequent year (Athanasoglou *et al.*, 2008). This impact of lagged dependent variable also resulted in a difficulty in the models especially when the period is shorter than the number of observations (Nickell, 1981). To address this issue, the difference generalized method of moments (GMM) model was developed by Arellano and Bond (1991) by differencing all regressors and using GMM.

Arellano and Bover (1995) argued that the difference GMM includes lagged levels as well as lagged differences. The basic assumption of the GMM – the first differences of instrumental variables are uncorrelated with the fixed effects – allows the model to introduce more instruments and improve its efficiency. Roodman (2006) argues that both difference and system GMM estimators are suitable for studies that involve “small T, large N” panels; where independent variables are not strictly exogenous; and heteroscedasticity and autocorrelation exist among the individual sample, in this study, banks. However, the problem of serious finite sample biases might arise with difference GMM if the instruments used have near unit root properties. That's why Bond (2002) suggested for system GMM, as it has notably smaller finite sample bias and much greater precision when estimating autoregressive parameters using persistent series. In addition, the GMM system controls for unobserved heterogeneity and for the persistence of the dependent variable. The following formula for GMM proposed by Athanasoglou *et al.* (2008) is used to conduct the empirical analysis:

$$II_t = C + \delta II_{i,t-1} + \sum_{j=1}^j \beta_j X_{it}^j + \sum_{m=1}^m \beta_j X_{it}^m + \varepsilon_{it} \quad (3)$$

where, II_t is the profitability/stability of bank i at time t where $i = 1 \dots N$, $t = 1$, C is the constant term, $II_{i,t-1}$ is the lag value of the dependent variable, X_{it} are the explanatory variables and ε_{it} the disturbance term, with v_{it} the unobserved bank-specific effect and u_{it} the idiosyncratic error. This is a one-way component regression model, where $v_{et} \sim \text{IIN}(0, \sigma_v^2)$ and independent of $u_{it} \sim (0, \sigma_u^2)$. The X_{it} are grouped into bank-specific X_{it}^j and macroeconomic variables X_{it}^m .

4.3.3 *Quantile regression model.* This study uses a quantile regression (QR) model in which the parameter of explanatory variables can be expressed as a monotonic function of a single, scalar random variable. The model captures systematic influences of conditioning variables on location, scale and shape of the conditional distribution of the response. The model is thus significantly extended with a constant coefficient in which the effects of conditioning are confined to a location shift. Furthermore, this study reveals that traditional optimization techniques, including ordinary least square (OLS) and least absolute deviations (LAD) disregard different behaviors in the tail regions of bank profitability distributions and the risk – return relationships in banks change in the tail regions. Following this line of thought, a QR technique developed by [Koenker and Bassett \(1978\)](#) is used in this study to examine the dynamic relationship between the risk and bank profitability performance.

Assuming that, the θ th quantile of the conditional distribution of the explained variable is linear in x where $\text{Quant}_\theta X_i$, the conditional QR model can be expressed as Θ follows:

$$\begin{aligned} Y_i &= x_i' \cdot \beta_\Theta + u_{\Theta i} \\ \text{Quant}_\theta(y_i|x_i) &= \inf\{y : F_i(y|x)\Theta\} = x_i' \cdot \beta_\Theta \\ \text{Quant}_\theta(u_{\Theta i}|x_i) &= 0 \end{aligned} \tag{4}$$

where $\text{Quant}_\theta(y_i|x_i)$ represents the Θ the conditional quantile of y_i on the regressor vector x_i ; β_Θ is the unknown vector of parameters to be estimated for different values of Θ in $(0,1)$; $u_{\Theta i}$ is the error term assumed to be continuously differentiable c.d.f. (cumulative density function) of $F_i(y|x)\Theta$ and a density function $F_i(y|x)\Theta$. The value $F_i(y|x)\Theta$ denotes the conditional distribution of y conditional on x . Varying the value of u from 0 to 1 reveals the entire distribution of y conditional on x . The estimator is obtained from:

$$\begin{aligned} \min \sum_{i:u_{\Theta}>=0}^n \Theta \times |u_{\Theta i}| + \sum_{i:u_{\Theta}>=0}^n 1 - \Theta \times |u_{\Theta i}| &= \sum_{i:y_i-x_i' \cdot \beta_{\Theta}>=0}^n \Theta \times |y_i - x_i' \cdot \beta_{\Theta}| \\ + \sum_{i:y_i-x_i' \cdot \beta_{\Theta}<=0}^n (1 - \Theta) \times |y_i - x_i' \cdot \beta_{\Theta}| & \end{aligned} \tag{5}$$

5. Result and discussion

5.1 Descriptive study

To better understand the situation of the banks (both IBs and CBs), before, during and after the crisis, the study grouped the data in three distinguished periods. [Table II](#) provides the descriptive statistics of the data and the performance of each type of bank in that period. The study found that the mean profitability of the IBs was better before and after the crisis, but it was similar during the crisis. The mean asset quality of IBs was lower during the crisis, but it improves significantly after the crisis.

In accordance with the findings of [Cihák and Hesse \(2010\)](#), during all of the periods, IBs show significant advantage in terms of efficiency compared to their conventional counterparts, which signifies that IBs are better able to use their assets to generate revenue. However, this result does not confirm studies by [Parashar and Venkatesh \(2010\)](#) and [Abdulle and Kassim \(2012\)](#). In comparing the capital adequacy of both sets of banks during the crisis, this study corroborates [Parashar and Venkatesh's \(2010\)](#) study that CBs outperform IBs in maintaining capital during the crisis.

Variables	Pre-crisis period (2005-2006)			Crisis period (2007-2008)			Post crisis period (2009-2014)			
	Mean	SD	Maximum	Mean	SD	Maximum	Mean	SD	Maximum	
<i>Profitability (ROA)</i>										
Islamic banks	1.52	1.06	3.49	1.39	0.70	0.47	1.42	0.70	0.38	3.54
Conventional banks	1.33	0.536	2.40	1.39	0.71	0.02	1.40	0.67	0.18	3.52
<i>Capital adequacy (EQAASS)</i>										
Islamic banks	8.95	2.11	12.17	9.78	2.05	4.21	9.61	2.83	4.14	14.9
Conventional banks	8.93	4.13	18.76	10.66	3.06	4.73	9.69	2.36	5.28	15.8
<i>Total asset(LTA)</i>										
Islamic banks	4.56	0.399	5.27	4.69	0.37	4.39	5.15	0.33	4.60	5.88
Conventional banks	4.52	0.187	4.88	4.71	0.16	4.34	5.09	0.19	4.60	5.43
<i>Asset quality (LLFGL)</i>										
Islamic banks	1.21	1.01	3.12	1.06	0.92	0.0	2.47	1.16	0.28	5.0
Conventional banks	1.22	0.875	4.15	2.43	4.95	0.13	2.09	0.19	4.60	5.43
<i>Efficiency (CIR)</i>										
Islamic banks	60.88	17.74	80.00	57.32	20.50	19.2	48.04	16.1	24.8	76.0
Conventional banks	45.11	16.45	85.59	40.06	10.52	23.2	43.13	10.2	20.4	65.9
<i>Z-Score</i>										
Islamic banks	22.03	12.82	40.97	24.20	11.89	12.5	24.34	14.5	11.7	59.7
Conventional banks	20.60	10.88	47.76	23.72	9.81	9.59	21.73	7.69	7.06	46.9

Table II.
Descriptive statistics

Finally, the *Z*-score, the primary measure of resiliency, was similar in both types of banks (22.03 and 20.60) before the crisis. But during and after the crisis, IBs show a great improvement in their resiliency parameter, signifying that they were more stable during the crisis and were more efficient to overcome the aftershock of the crisis.

5.2 Model estimation

The analysis of the variables provides some evidence that IBs were on average more resilient during and after the crisis (Table III). Using both *Z*-score and ROA as the dependent variables in static and dynamic GMM method, the study found some intriguing results that also confirm the results of some previous studies. As the Hausman test has proven that in our case, random effect is more suitable than fixed effect[2], this paper only includes the random effect from the static model.

For reliability of the dynamic model, Table III reports that the null hypothesis of no first-order autocorrelation is rejected. The rejection of the null hypothesis of no first-order autocorrelation does not result in an inconsistent system GMM estimator. This is only the case when the second-order correlation is present, but the *p*-value of the Arrelano and Bond test of second-order correlation does not reject the null hypothesis, indicating that there is no second-order correlation. These results confirm the usage of a dynamic panel data model in

Variables	Result when <i>Z</i> -score is the dependent variable		Result when ROA is the dependent variable	
	Static model (Random)	System GMM	Static model (Random)	System GMM
Intercept	2.579	-0.1322***	5.72***	-0.2749***
Lag of dep. variable		0.3360***		0.2558
LLPGL	-0.0193	0.0010	-0.0285*	-0.0054
CIR	0.0170*	0.0636***	-0.0138***	-0.0159
EQASS	2.0037***	2.028***	0.0551***	-0.0362
LTA	-0.0351	0.2055	-0.5103***	-0.7358***
GDP	-0.1433	0.3386	-0.3846***	-0.3637***
INFL	0.0496	0.0861	0.1037***	0.0946**
<i>Z</i> -Score			-0.0043	0.0089
ROA	-0.1699	-0.1075		
Islamic bank dummy	2.434	9.1489***	0.1886	-0.2403
Crisis dummy	0.0826*	0.2957**	0.1922	0.2749
<i>R</i> -squared	0.2754		0.3229	
Sargan test		97.05		95.05
		Prob > $\chi^2 = 0.27$		Prob > $\chi^2 = 0.32$
<i>F</i> -stat/Wald- χ^2	2056***		113.47***	136.92***
AR(1) test		<i>Z</i> = -1.69		<i>Z</i> = -2.8475
		<i>p</i> = 0.0909		<i>p</i> = 0.0044
AR(2) test		<i>Z</i> = 1.1563		<i>Z</i> = 0.97282
		<i>p</i> = 0.2475		<i>p</i> = 0.3306
No of obs.	245	224	245	222

Notes: The dependent variable ROA is calculated as net profit divided by total assets and *Z*-score is calculated ROA plus ratio of equity capital to total assets divided by standard deviation of total assets; CIR – the cost to income ratio is used as a proxy for operating efficiency; LLPGL is a measure of credit risk calculated as the ratio of total loan loss provisions by total assets; EQASS is a measure of capital adequacy calculated as equity divided by total assets; LTA is a proxy measure of size, calculated as a natural logarithm of total bank assets; GDP indicates GDP growth rate; INFL indicates inflation rate; values in parentheses are *t* statistics; (***), (**) and (*) indicate significance at 1, 5 and 10% level, respectively

Table III.
Summary of the result

which several variables are instrumented; using lags of these variables removes autocorrelation in the second order. Furthermore, over-identification is tested using Sargan's test (Roodman, 2006). Both Arrelano and Bond's test of first- and second-order autocorrelation in the residuals and Sargan's test of over-identification have been performed in this study.

Using Z-score as the dependent variable, the static model of the study found that equity to total asset, the proxy of capital adequacy, has a significant positive impact (2.0037***) on bank resiliency, whereas the dynamic model found that both cost to income ratio and capital adequacy ratio have a positive impact on Z-score, 0.0636*** and 2.028***, respectively. As the study used Islamic and crisis dummies to separate those from CBs and non-crisis period, the dynamic GMM model also signifies that IBs are performing 9.1489 points better than their conventional counterpart. Holding other variables constant, IBs were 29 per cent more stable than CBs during the crisis period.

To analyze how performance of both sets of banks was affected by the crisis, as a dependent variable, ROA was also used in this study. The analysis provides some important insights about how IBs' and CBs' performance was affected by the GFC. In the static model, the study found that most of the bank-specific variables have statistically significant contribution on ROA during and after the crisis. In accordance with Miller and Noulas' (1997) findings, the study also found that LLPGL has a significant negative impact on bank's profitability. Consistent with Pasiouras and Kosmidou's (2007) findings, this study also found that cost to income ratio has a significant negative impact on ROA. In conformance to Goddard *et al.*'s (2004a, 2004b) findings, the result shows that capital adequacy and inflation have a positive impact but total assets and GDP growth rate have a negative impact on bank's performance. A possible explanation might be owing to the diseconomies of scale of the large banks of this country.

The two focal points of this study, how IBs performed compared to their conventional counterpart and how bank's performance is affected by the GFC, also get meaningful insights through this analysis. This study found that IBs were more resilient during the crisis, but it did not find any evidence to conclude which type of bank was performing better during or after the crisis. This finding is consistent with the results of Abdulle and Kassim (2012) and Alqahtani, Mayes and Brown (2016), who conclude that both types of banks were indifferent in terms of performance during and after the crisis, whereas it is opposed to the findings of Parashar and Venkatesh (2010), as they suggested that IBs enjoyed relatively superior performance during the crisis.

5.3 Robustness checking – quantile regression

For robustness of the studies, this study also uses the QR model. Table IV lists the estimation results of the QR model for the impact of the bank-specific and macroeconomic variables on the ROA. For comparison, the OLS estimates are also presented. Here, both OLS and the QR at four different quantiles have been studied for IBs and CBs.

For CBs in Table III, the result of OLS remains same at different percentiles in almost all variables except LLRGL. The result of OLS indicates a negative but insignificant relationship to the credit risk and return. However, the QR result indicates that the risk and return relationship is not consistent at different quantiles. OLS estimator, by focusing only on the central tendency of the distributions, does not allow the impact of the LLRGL on bank profitability to differ for more/less profitable banks. By contrast, the quantile-varying estimates of the LLRGL variable were derived by the QR model.

According to OLS, bank size (LTA) has a negative but significant impact on the performance of the bank at 10 per cent level of significance but the result changes at the 60th percentile. At 60th percentile, it has been found that the bank size has a comparatively

Variables	OLS_res	Q20_res	Q40_res	Q60_res	Q80_res
LTA	-0.3286*	-0.2359	-0.3730*	-0.3933**	-0.4268*
LLPGL	-0.0126	-0.0553**	-0.0242	-0.0118	0.0003
EQASS	0.3922*	0.0278	0.0281	0.0431**	0.0372*
CIR	-0.0216***	-0.0175***	-0.0154***	-0.0217***	-0.0196***
GDP	-0.3914***	-0.2713**	-0.2973**	-0.4344***	-0.5537***
INFL	0.0793**	0.0399	0.0751*	0.0923**	0.1393***
Cons	5.4523***	4.1151***	4.7856***	5.9635***	6.6729***

Notes: The dependent variable ROA is calculated as net profit divided by total assets; CIR – the cost to income ratio is used as a proxy for operating efficiency; LLPGL is a measure of credit risk calculated as the ratio of total loan loss provisions by total assets; EQASS is a measure of capital adequacy calculated as equity divided by total assets; LTA is a proxy measure of size, calculated as a natural logarithm of total bank assets; GDP indicates GDP growth rate; INFL indicates inflation rate; values in parentheses are *t* statistics; (***), (**) and (*) indicate significance at 1, 5 and 10% level, respectively

Table IV.
QR conventional
banks

higher negative impact on profitability owing to diseconomies of scale. From the capital adequacy perspective, the result does not differ with OLS and QR. On the other hand, almost all the macroeconomic variables have been found to have an insignificant relationship with the ROA of commercial banks in Bangladesh.

Table V shows the QR result of IBs. Interestingly, the OLS result is not inconsistent with the QR result at different percentiles. It has been found that LLPGL, EQASS, CIR and GDP are important variables at any percentile. Subsequently, Figure 1 depicts the QR estimates and the OLS estimates. Apparently, moving up the bank profitability quantile levels, the QR estimates vary widely. Moreover, a comparison of the QR estimates with the traditional OLS estimates indicates that the OLS estimates underestimate the positive risk– return relationship at the higher quantile levels and obtain the wrong conclusion at the lower quantiles.

In Figure 1, it can be seen that most of the variables for CBs lie in between the upper and the lower bound, except LLPGL, EQASS and LTA. All of these variables cross the significance level (upper bound) after a certain level of percentile. On the other hand, for the counterpart, the quantile graph in Figure 2 shows consistent result with previous findings.

Variables	OLS_res	Q20_res	Q40_res	Q60_res	Q80_res
LTA	0.3639	0.5733	0.3018	-0.0278	-0.1926
LLPGL	-0.3932***	0.2004	-0.4041***	-0.3104***	-0.2448
EQASS	0.1312***	0.1064**	0.1451***	0.1587***	0.1181
CIR	-0.0146**	-0.0167**	-0.0192**	-0.0177***	-0.0146
GDP	-0.3914***	-0.2713**	-0.2973**	-0.4344***	-0.5537***
INFL	0.0288	0.0496	-0.0051	-0.00285	0.0262
Cons	-0.422	-2.1242	0.1599	1.5158	2.559

Notes: The dependent variable ROA is calculated as net profit divided by total assets; CIR – the cost to income ratio is used as a proxy for operating efficiency; LLPGL is a measure of credit risk calculated as the ratio of total loan loss provisions by total assets; EQASS is a measure of capital adequacy calculated as equity divided by total assets; LTA is a proxy measure of size, calculated as a natural logarithm of total bank assets; GDP indicates GDP growth rate; INFL indicates inflation rate; values in parentheses are *t* statistics; (***), (**) and (*) indicate significance at 1, 5 and 10% level, respectively

Table V.
QR Islamic banks

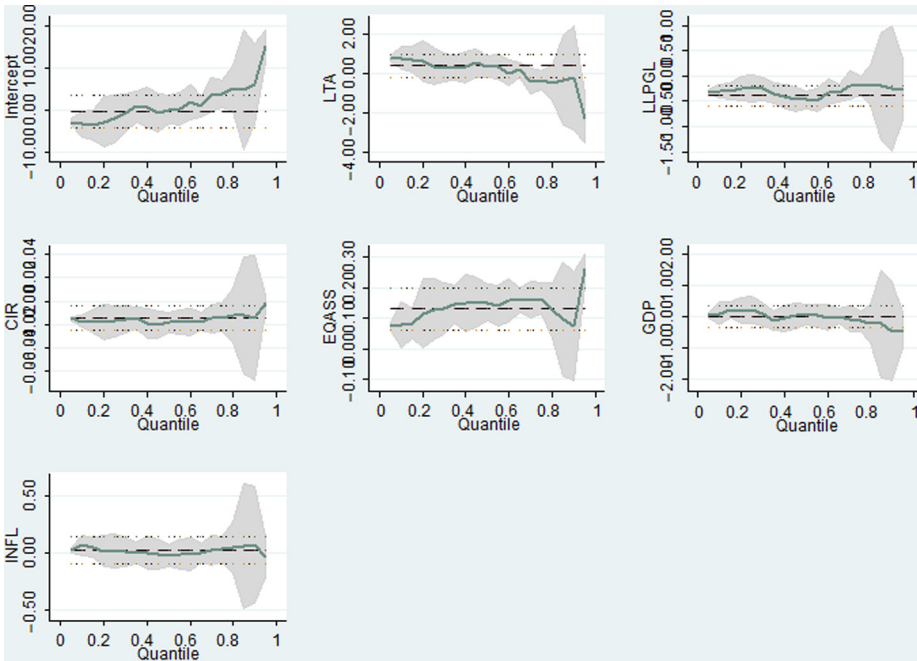


Figure 1.
Regression lines: QR
vs OLS for different
variables for
conventional banks

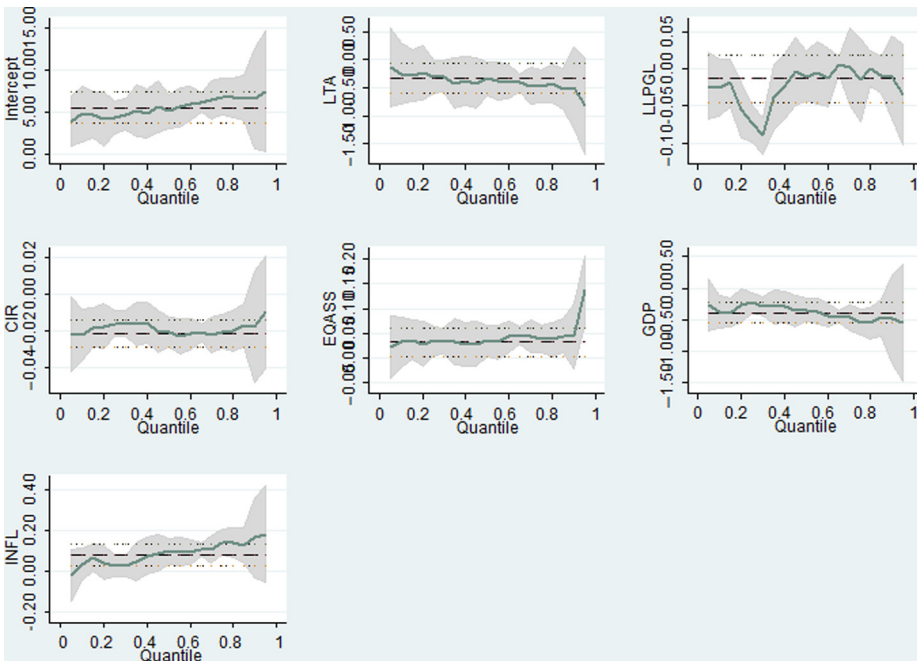


Figure 2.
Regression lines: QR
vs OLS for different
variables for Islamic
banks

Here all the variables remain in the upper and the lower bound of the significance level at different percentiles, except bank size (Figure 2).

6. Conclusion and future implications

The repetitive financial crises have brought conventional financial market into a big inquiry. While some have looked at ways and means to fix the instability inherent in the conventional interest-based system, others have searched for alternative financial systems. The recent financial crisis has led many CBs to insolvency and many others to the brink of it. The devastating impact of the crisis on CBs and financial institutions pursued scholars to search for an alternative medium which is resilient and can detour the impact of the crisis. In this respect, the Islamic financial system seems to offer a promising avenue for future financial resiliency and stability. Venardos (2009) asserted that the Islamic financial system is not immune to risks and can be susceptible to financial crisis because of its close linkages to the real sector. He also argued that the risk in the real sector is lesser than the risk of the conventional financial sector. Kayed and Hassan (2011) addressed that the recent GFC is largely seen as a real test of the resilience of the Islamic financial services industry and its ability to present itself as a more reliable alternative to the conventional financial system. This paper is a humble attempt to identify the extent of the impact of the 2007-2008 financial crisis on the banking industry of Bangladesh. This study showed that the GFC has had an impact on the banking industry of Bangladesh. Using data of 25 banks over the period of 2005-2014, this study found that the stability and profitability of both IBs and CBs were severely affected during the 2007-2008 financial crisis. While conforming to most of the previous research on bank soundness indicator, this study also found that IBs in Bangladesh were more resilient during the crisis period. They were more efficient and stable during the crisis and post-crisis periods. The empirical analysis of the GFC produced new insights to shed some light on whether the alternative financial institution, namely, IBs, are better positioned to deter the devastating impact of the financial crisis compared to their conventional counterpart. This is the first paper, to our knowledge, that comprehensively assesses the resiliency of the banking industry of Bangladesh using robust empirical techniques.

Finally, this paper suggests that to avoid the impact of the crisis, Islamic banking can be a viable option. However, the researchers strongly believe that these are preliminary results that require additional data for variables and more sample countries, and more extensive study is needed to draw concrete conclusions of the findings.

Note

1. To find which model is superior, this study tested the Hausman test. As the probability of chi-square value (8.77) with p -value is 0.412, we can say that the random-effects model is comparatively more suitable than the fixed-effects model, meaning that we will accept the result of the random-effects model.

References

- Abdulle, M. and Kassim, S. (2012), "Impact of global financial crisis on the performance of Islamic and conventional banks: empirical evidence from Malaysia", *Journal of Islamic Economics Banking and Finance*, Vol. 8 No. 4, pp. 9-20.
- ADB (2009), *Bangladesh: Quarterly Economic Update: June 2009*, Asian Development Bank, Bangladesh Resident Mission, Dhaka.

- Alqahtani, F., Mayes, D. and Brown, K. (2016), "Economic turmoil and Islamic banking: evidence from the Gulf cooperation council", *Pacific-Basin Finance Journal*, Vol. 39, pp. 44-56.
- 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 components models", *Journal of Econometrics*, Vol. 68 No. 1, pp. 29-51.
- Athanasoglou, P., Brissimis, S. and Delis, M. (2008), "Bank-specific, industry-specific and macroeconomic determinants of bank profitability", *Journal of International Financial Markets, Institutions and Money*, Vol. 18 No. 2, pp. 121-136.
- Bangladesh Bank. (2014), *Bangladesh Bank Annual Report*, Bangladesh Bank, Dhaka.
- Basov, S. and Bhatti, M.I. (2016), *Islamic Finance in the Light of Modern Economic Theory*, 1st ed., Palgrave Macmillan, Basingstoke.
- BDnews (2011), *Much of FDI Goes to Acquisition: BOL*, 26 July, available at: <http://dhaka.bdnews24.com/details.php?id=201875> (accessed 27 January 2017).
- 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.
- Berger, A., Bonime, S., Covitz, D. and 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*, Vol. 24 No. 7, pp. 1203-1235.
- Bourkhis, K. and Nabi, M. (2013), "Islamic and conventional banks' soundness during the 2007-2008 financial crisis", *Review of Financial Economics*, Vol. 22 No. 2, pp. 68-77.
- Cihák, M. and Hesse, H. (2010), "Islamic banks and financial stability: an empirical analysis", *Journal of Financial Services Research*, Vol. 38 No. 2/3, pp. 95-113.
- Chapra, M. (2009), "Global Islamic financial crisis, can Islamic finance help?", *NewHorizon*, No. 170.
- Chapra, M. (2011), "The global financial crisis: some suggestions for reform of the global financial architecture in the light of Islamic finance", *Thunderbird International Business Review*, Vol. 53 No. 5, pp. 565-579.
- Charap, J. and Cevik, S. (2011), "The behavior of conventional and Islamic bank deposit returns in Malaysia and Turkey", *IMF Working Papers*, Vol. 11 No. 156, pp. 1.
- Choudhury, M.A. and Bhatti, M. (2016a), *Heterodox Islamic Economics: The Emergence of an Ethico-Economic Theory*, 1st ed., Routledge, London & New York, NY.
- Choudhury, M. and Bhatti, M. (2016b), "Quantitative modeling of mathematical relationships in money, spending and the real economy", *Kybernetes*, Vol. 45 No. 2, pp. 323-336, available at: <http://dx.doi.org/10.1108/k-03-2015-0068>
- Chowdhury, M.A.F., Shoyeb, M., Akbar, C. and Islam, M.N. (2016), "Risk sharing paradigm of Islamic banks: case of Bangladesh", *Advances in Islamic Finance, Marketing, and Management: An Asian Perspective*, Emerald Group Publishing Limited, pp. 103-130.
- De Nicolo, G. (2000), "Size, charter value and risk in banking: an international perspective" *International Finance Discussion Papers. (689)*, Board of Governors of the Federal Reserve System (US).
- El Said, A. and Ziemba, R. (2009), *Stress-Testing Islamic Finance*, Roubini Global Economics, available at: www.economonitor.com/analysts/2009/05/10/stress-testing-islamic-finance/ (accessed 17 February 2016).
- El-Hawary, D., Grais, W. and Iqbal, Z. (2007), "Diversity in the regulation of Islamic financial institutions", *The Quarterly Review of Economics and Finance*, Vol. 46 No. 5, pp. 778-800.
- Goddard, J., Molyneux, P. and Wilson, J. (2004a), "The profitability of European banks: a cross-sectional and dynamic panel analysis", *Manchester School*, Vol. 72 No. 3, pp. 363-381.

- Goddard, J., Molyneux, P. and Wilson, J. (2004b), "Dynamics of growth and profitability in banking", *Journal of Money, Credit, and Banking*, Vol. 36 No. 6, pp. 1069-1090.
- Greuning, H. and Iqbal, Z. (2008), *Risk Analysis for Islamic Banks*, 1st ed., World Bank, Washington, DC.
- Hasan, M. and Dridi, J. (2010), "The effects of the global crisis on Islamic and conventional banks: a comparative study", *IMF Working Papers*, Vol. 10 No. 201, p. 1.
- IMF (2010), "Islamic banks: more resilient to crisis?", *IMF Survey Magazine*, available at: www.imf.org/external/pubs/ft/survey/so/2010/res100410a.htm (accessed 7 October 2015).
- Iqbal, M. (2001), "Islamic and conventional banking in the nineties: a comparative study", *Islamic Economic Studies*, Vol. 8 No. 2, pp. 1-27.
- Kabir, M.R., Ullah, M.H. and Khan, M.M. (2012), "Comparative analysis of profit rate on investment (ROI) and fixed rate of interest on loan of conventional banks in Bangladesh", *World Journal of Social Science*, Vol. 2 No. 6, pp. 39-48.
- Kayed, R. and Hassan, M. (2011), "The global financial crisis and Islamic finance", *Thunderbird International Business Review*, Vol. 53 No. 5, pp. 551-564.
- Koenker, R. and Bassett, G. (1978), "Regression quantiles", *Econometrica*, Vol. 46 No. 1, pp. 33-50.
- Kolsi, M. and Zehri, F. (2014), "Islamic banks and conventional banks within the recent global financial crisis: empirical evidence from the GCC region", *International Journal of Financial Services Management*, Vol. 7 No. 3/4, p. 196.
- Lindgren, C.J., Garcia, G. and Saal, M.I. (1996), *Bank Soundness and Macroeconomic Policy*, International Monetary Fund.
- Mamatzakis, E. and Remoundos, P. (2003), "Determinants of Greek commercial banks profitability, 1989-2000", *SPOUDAI*, Vol. 53 No. 1, pp. 94-94.
- Metwally, M. (1997), "Differences between the financial characteristics of interest free banks and conventional banks", *European Business Review*, Vol. 97 No. 2, pp. 92-98.
- Miller, S. and Noulas, A. (1997), "Portfolio mix and large-bank profitability in the USA", *Applied Economics*, Vol. 29 No. 4, pp. 505-512.
- Mirakhor, A. and Krichene, A. (2009), "Recent crisis: lessons for Islamic finance", *Journal of Islamic Economics, Banking and Finance*, Vol. 5 No. 1, pp. 9-58.
- OECD (2010), "Competition, concentration and stability in the banking sector", DAF/COMP(2010)9, available at: www.oecd.org/daf/competition/regulated-sectors-competition-roundtables.htm (accessed 20 February 2016).
- Parashar, S. and Venkatesh, J. (2010), "How did Islamic banks do during global financial crisis?", *Banks and Bank Systems*, Vol. 5 No. 4, pp. 54-62.
- Pasiouras, F. and Kosmidou, K. (2007), "Factors influencing the profitability of domestic and foreign commercial banks in the European Union", *Research in International Business and Finance*, Vol. 21 No. 2, pp. 222-237.
- Rahman, M., Moazzem, K. and Hossain, S. (2009), "Impact of the global economic crisis on the employment and labour market of Bangladesh a preliminary assessment", Paper-80, Centre for Policy Dialogue (CPD), Dhaka.
- Ree, J.K. (2011), "Impact of the global crisis on banking sector soundness in Asian low-income countries", *IMF Working Papers*, Vol. 11 No. 115, p. 1.
- Roodman, O. (2006), "How to do xtabond2: an introduction to difference and system GMM in Stata", Center for Global Development Working Paper, p. 103.
- Siddiqi, M. (2006), *Banking without Interest*, 1st ed., The Islamic Foundation, Lahore.
- Saddy, F. (2009), "Risky business", *Islamic Banking & Finance*, Vol. 7 No. 3, p. 23.
- Stout, L. (2011), "Derivatives and the legal origin of the 2008 credit crisis", *Harvard Business Law Review*, Vol. 1, pp. 1-38.

-
- Sufian, F. and Noor, M. (2009), "The determinants of Islamic banks' efficiency changes", *International Journal of Islamic and Middle Eastern Finance and Management*, Vol. 2 No. 2, pp. 120-138.
- The Economist (2009), *Middle East Finance: Shine Comes off Islamic Banks*, Alacra Store, New York, NY, available at: http://news.alacrastore.com/eiu-news/Middle-East-finance-Shine-comes-off-Islamic-banksVW_VW_MAIN_20090924T164500_0008 (accessed 10 February 2017).
- Venardos, A.M. (2009), *Current Issues in Islamic Banking and Finance: Resilience and Stability in the Present System*, World Scientific Publishing, Singapore.
- World Bank (2017), *Remittance Inflows to GDP for Bangladesh [DDOI11BDA156NWDB]*, Federal Reserve Bank, St. Louis, available at: <https://fred.stlouisfed.org/series/DDOI11BDA156NWDB> (accessed 28 January 2017).
- Yilmaz, D. (2009), "Islamic finance – during and after the global financial crisis", *IMF-World Bank Annual Meeting*, Istanbul, available at: www.bis.org/list/cbspeeches/from_01102009/page_6.htm (accessed 25 January 2016).
- Zainol, Z. and Kassim, S. (2010), "An analysis of Islamic banks' exposure to rate of return risk", *Journal of Economic Cooperation and Development*, Vol. 31 No. 1, pp. 59-83.

Further reading

- Aziz, Z. (2017), *Fifty Years of Central Banking – Stability and Sustainability, Presentation*, Kuala Lumpur, 8 February, available at: www.bis.org/list/cbspeeches/from_01012009/page_4.htm (accessed 12 February 2016).
- Berger, A. (1995), "The relationship between capital and earnings in banking", *Journal of Money, Credit and Banking*, Vol. 27 No. 2, pp. 432-456.
- Iqbal, Z. and Mirakhor, A. (2011), *An Introduction to Islamic Finance*, John Wiley & Sons, Singapore.

418

No.	Name of bank	Type
1	AB Bank Limited	Conventional
2	Al-Arafah Islami Bank	Islamic
3	Bank Asia Limited	Conventional
4	BRAC Bank Limited	Conventional
5	City Bank Limited	Conventional
6	Dhaka Bank Limited	Conventional
7	Dutch-Bangla Bank Limited	Conventional
8	Eastern Bank Limited	Conventional
9	Export Import (EXIM) Bank of Bangladesh	Islamic
10	First Security Islami Bank Limited	Islamic
11	ICB Islamic Bank Limited	Islamic
12	IFIC Bank Limited	Conventional
13	Islami Bank Limited	Islamic
14	Jamuna Bank Limited	Conventional
15	Mercantile Bank Limited	Conventional
16	Mutual Trust Bank Limited	Conventional
17	National Bank Limited	Conventional
18	The Premier Bank Limited	Conventional
19	Prime Bank Limited	Conventional
20	Pubali Bank Limited	Conventional
21	Rupali bank Limited	Conventional
22	Shahjalal Islami Bank Limited	Islamic
23	Social Islami Bank Limited	Islamic
24	Southeast Bank Limited	Conventional
25	Uttara Bank Limited	Conventional

Table A1.
List of banks used in
this study

Corresponding author

Mohammad Ashraful Ferdous Chowdhury can be contacted at: ashraf-ban@sust.edu

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgroupublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.