Impact of banking regulation on risk and efficiency in Islamic banking

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Abstract
Purpose – This paper aims to examine whether bank regulation, supervision and monitoring enhance or impede technical efficiency and risk-taking behaviour of Islamic banks across the globe.

Design/methodology/approach – Technical efficiency scores are calculated using the data envelopment analysis (DEA) model while simultaneity between banks' supervision and regulation on risk and efficiency estimates are calculated using the seemingly unrelated regression (SUR) approach.

Findings – The author’s results suggest that regulations and strict monitoring of banking operation, and higher supervisory power of the authorities, increase the technical efficiency for Islamic banks. The opposite effect is observed in the case of risk-taking behaviour of Islamic banks, with higher restrictions resulting in a reduction in risk taking of Islamic banks.

Research limitations/implications – The Basel II & Basel III guidelines suggested that stricter regulations and supervision could hamper banking efficiency. The existence of a powerful supervisory body could also lead to the inefficiency of banks. The DEA scores from this paper suggest that this may not necessarily be the case, especially as Islamic banks appear to be technically efficient in stricter regulatory conditions.

Originality/value – A message that emerges from this analysis is that there is a strong link between Islamic bank technical efficiency and risk-taking behaviour with the Central Bank regulatory and supervisory policies. It is also conclusive that the Islamic banking system works well within a stricter regulatory environment.

Keywords Islamic banking, Banking regulation, Bank performance, Bank risk, Islam, Banks, Banking

Paper type Research paper

1. Introduction
In recent years, the banking system around the globe has been the subject of intense criticism and scrutiny. In part, many believe that the lack of regulations and supervisory structures have brought the world to the brink of financial collapse, while on the opposite side of that coin many believe that the years of prosperity the world experienced just prior to the collapse were largely due, in part, to the deregulation or lack of regulation, hence, a near free market with regard to the financial sector (Reinhart and Rogoff, 2008; Brunnermeier and Pedersen, 2009). Could there possibly be better efficiency and profitability where a properly implemented regulatory and supervisory framework is in place? Would evidence suggest so? This paper will try to resolve some of the myths by providing empirical support.

Banking regulations can generally be defined as the frameworks controlling the creation, operation and liquidation of banks in an economy. These regulations are put in place by Central Banks and finance ministries and the control is usually exerted

JEL classification – G15, G21, G28, C14
through monitoring carried out by specialized banking supervisory authorities. Spong (2000), from the Federal Reserve Bank of Kansas City, highlights a few important reasons for introducing bank regulations. The most basic reason for introducing regulations is to protect depositors from undue risks to their deposits. Businesses and individuals alike hold significant portions of their funds in banks and there are valid concerns from them in respect of the protection of their funds. As a result, authorities respond to such concerns with regulations attempting to protect the bank depositors. However, like every system that is theologically based, it is often open for interpretation, and, often, this is done nationally or regionally. Furthermore, the Islamic Finance industry has been affected by many issues, and while many relate to the lack of proper supervision others are simply due to the lack of compliance and regulatory measures. When reading such a paper it is easy to dismiss the importance of Islamic Banking whether it be because of our own ignorance, lack of understanding of the system, prejudices or to a certain extent familiarity with conventional banking. However, the Islamic financial markets are among the fastest growing financial products in the world. This will see further growth in years to come as more and more countries are embarking on Islamic banking and discovering the benefits of using Islamic Finance over conventional financing schemes. As highlighted by Rehman and Perry (2011), “while many of the conventional banks suffered major loses in the aftermath of the sub-prime mortgage crisis, most banks following the Islamic system were largely profitable”. However, some dark clouds exist over the horizon for it to be universally accepted as a mainstream bank as it is mostly considered to be an alternative.

Bank regulation and supervision can take the form of detailed and precise prescriptive rules under which all banks operate in the given territory. For example, activity restriction rules may specify which banking activities banks can undertake to reduce their riskiness and prevent them from going bankrupt. If such rules do not truly reflect the risks involved, they could unintentionally induce banks to be involved in unprofitable and risky ventures. Therefore, it is imperative to observe how banks’ operate in the given regulatory and supervisory structure and what is the resultant impact on the technical efficiency and risk taking behaviour of banks.

The term technical efficiency refers to the maximizing of outputs in such a way that the input resources are less utilized. Banks’ technical efficiency is defined as the difference between observed quantity of input and output variables with respect to optimal quantity of input and output variables. An efficient bank can achieve a maximum value of one in comparison to an inefficient bank, which can reduce to the level of zero.

Loan loss reserves, as a fraction to total assets, are used as a measure of banking risk, which is primarily used as a measure of Tier 2 capital. The treatment of loan loss reserves as capital has received considerable attention in the wake of the financial crisis (Ng and Roychowdhury, 2011). Higher levels of reserves are suggestive of greater banking risk accounting for any future bad times.

It has been observed from Islamic banking literature that, to date, none of the studies focussed on Islamic banks’ technical efficiency and risk taking under the presence of regulatory and supervisory guidelines of Central Banks. Most of the studies were purely based on evaluating the efficiency of Islamic banks (Yudistira, 2004; Mokhtar et al., 2006; Kamaruddin et al., 2008; Sufian et al., 2008; Hassan et al., 2009). Thus, one of the major contributions of this paper is to investigate how the technical efficiency and risk taking behaviour of Islamic banks changes under different regulatory and
supervision guidelines. To the best of the knowledge of the author, this will be the first quantitative study to highlight the role of bank regulation and supervision on Islamic banks technical efficiency and risk taking behaviour in major Islamic banking countries across the globe.

The new regulation underlining Basel III aspires to make the global banking system safer by redressing many of the flaws that became visible in the recent financial crisis. Improving the quality and depth of capital and renewing the focus on liquidity management is intended to spur banks to improve their underlying risk-management capabilities. This will raise the biggest challenge for banks, without compromising the returns they need to incorporate a higher level of risk management tools.

The existing literature on regulation and supervision linkage with the risk and efficiency of banks is limited and purely focuses on individual countries, a single banking system or simple accounting ratios (Barth et al., 2003a, b, 2004; Demirguc-Kunt et al., 2004; Beck et al., 2006; Berger et al., 2008). This paper will contribute twofold to the existing literature by first investigating the impact of the bank regulatory and supervisory structure on Islamic banks’ efficiency and risk taking behaviour. Second, this paper will also assess the readiness of the Islamic banking system towards the implementation of Basel III. The chosen period of analysis is 2006-2010 for 11 major contributors of the Islamic banking industry (Egypt, Bahrain, Bangladesh, Indonesia, Kuwait, Malaysia, Pakistan, Qatar, Saudi Arabia, Turkey, and UAE). We are not using Iran in our sample since all the banks in Iran are government controlled and/or follow different Islamic banking rules compared to the rest of the world.

Our results suggest that regulations and strict monitoring of the banking operation, and higher supervisory power of the authorities, increase the technical efficiency for Islamic banks.

The rest of this paper is organized as follows: Section 2 includes a literature review while Section 3 presents the methodology, variables and data. The empirical results are explained in Section 4 and Section 5 concludes the paper.

2. Literature review

Among the biggest critics and voices in respect of the issue of bank regulations are Barth, Caprio and Levine. Barth et al. (2008) noted that most countries with a functioning financial system made significant changes to their bank regulatory framework after the East Asian Financial Crisis of the late 1990s, especially many developing and Asian countries. They do not appear to submit that it might be for the better since mostly it has been about following the Basel guidelines, strengthening capital requirements and the empowerment of supervisory bodies. The criticism by these authors is that there is little evidence to suggest that the implementation of these measures led to a major improvement of the banking system in regard to their efficiency, stability and corruption. Another aspect criticized was the implementation of private monitoring; albeit consistent with the third pillar of Basel II, it does not appear that this has had as much effect as hoped for by policy makers. It was further argued that where banks were forced to curtail their non-lending activities this brought forth further issues in respect of their profitability, and, to an extent, their efficacy.

On the subject of bank regulations, there is also evidence concerning the microeconomics aspect. According to Barth et al. (2007a, b), data shows little evidence that a strengthened ability of the supervisory framework in respect of monitoring and...
the discipline of banks has an impact on improving bank efficiency or even banking and the commercial sector relationships. However, there is a positive effect with regard to increased supervision and corruption in the banking sector. Again, there was a call that the private monitoring of banks had a better effect in respect of their efficiency. Where corruption is a major issue in the banking industry, academicians were of the opinion that proper disclosure could bring forth better banking efficiency on condition that the legal system was fully developed and strong.

2.1 Banking regulation, supervision and efficiency

Barth et al. (2004), in their study, using data from 107 countries in respect of their supervisory and regulatory scope, examined the relationship between banking regulation and supervision on banks' efficiency. It thoroughly examines issues in respect of restrictions on banking activities, barriers to entry, especially in regard to foreign banks, capital requirements, deposit insurance, powers of the supervisory body together with its resources and independence, stringency of loan classification including guidelines to this regard, disclosures, and, finally, to the extent that government ownership influences the banking sector.

On a similar note Demirguc-Kunt et al. (2004) examined the impact of bank regulations, market structure and national institutions on the profitability of banks and found that stricter barriers to entry and bank activities may increase the cost of financial intermediation. The authors also presented evidence consistent with the literature that regulations or stricter regulatory requirements did not bring about much benefit in regard to bank stability, it also impeded firms' ability to access financing from external sources and played a negative role in regard to the valuation of a bank. It also meant that overall development in the financial services industry would suffer a setback.

Often, bank regulations are steeped in bureaucracy in respect of market entry. While it is often true that not everyone should be given a bank operating licence just because they ask for one, it is generally accepted that in many countries where there are easier regulations to market entry, the dynamism of the financial sector improves rapidly. According to Casu and Girardone (2006), a level playing field was the main objective for deregulation in the banking sector. Although the easing of entry made it somewhat easier for entry into the single market, the main effect was a series of major consolidations. Their findings further submitted that where the regulations attempted to make it easier for market entry it also brought about concentration, and, in all the European countries studied, this was fairly consistent, as deregulation led to waves of consolidation and mergers between financial institutions.

It appears that more than one team of academicians are agreeable with regards to the private monitoring of banks, hence it does not appear to be a largely American school of thought or one that is primarily propagated by American based institutions, even in Britain and Continental Europe there appears to be broad support for this issue. According to Delis et al. (2009), there is an indication that regulations and incentives that promote private monitoring have a positive impact on productivity even when they utilized a different data and regression analysis from the others.

Similarly, while measuring the efficiency of the banking system, Pasiouras et al. (2009) focussed on the role of the regulatory and supervisory framework and their impact on banking efficiency utilizing a stochastic frontier analysis. Again, it used a fairly large dataset with studies in 74 countries. Their main area of research was the
effect of the regulations called upon by the three pillars of Basel II. Their findings indicate that cost efficient banks are not necessarily efficient in generating profits. Cost and profit efficiencies were significantly affected in a positive manner where there were requirements for disclosure of information, however, the reverse was true where there were highly powerful supervisory frameworks in place, and, hence, the two are not mutually exclusive. Their submission in regard to regulating banks is that in order for it to be done effectively account needs to be taken of competition, efficiency and financial stability. This is especially so because of the effects that an improper and dysfunctional banking system could have on the economy of a nation, as evidenced by its role in the numerous financial crises in the twentieth-century, which, albeit infrequent, the damage they did often eclipsed that of many natural disasters.

2.2 Banking regulation, supervision and risk
 Regulatory restrictions and banking supervision have a different effect on bank risk-taking, depending on bank activities (Barth et al., 2004). It was noted that greater banking freedom should enable banks to be more high risk-taking. Banks would take advantage of greater freedom to increase bank asset portfolio risk.

Laeven and Levine (2007) noted that regulations that promote diversification, either by requiring banks to diversify their loan portfolios or by allowing banks to engage in an assortment of lending and non-lending activities, reduce bank risk. While a desire to reduce bank risk has motivated regulatory restrictions on bank activities (e.g. the US Glass-Steagall Act), the authors also found that bank supervisory activities and regulatory restrictions increase bank risk. Their finding is consistent with the view that diversifying income flows lowers bank risk and lends additional support to the work questioning the value of restricting bank activities (White, 1986; Kroszner and Rajan, 1994; Gande et al., 1997).

In an interesting take on regulation and bank soundness, Demirguc-Kunt et al. (2008) documented that countries that require banks to regularly and accurately report their financial data to regulators and market participants have sounder banks (measured by Moody’s financial strength ratings). They also noted that these findings highlight the importance of transparency in making supervisory processes effective and strengthening market discipline. The authors concluded that countries should consider giving priority to information provision over other elements of the Basel Core Principles. Tadesse (2006), using a range of survey-based metrics, found that banking crises are less likely in countries with greater regulated and strong supervisory activities.

2.3 Banking regulation, supervision in Islamic banking
 As the Islamic financial services industry is developing at a considerable pace, the need for a legal framework that effectively monitors and supervises its operations is greater than ever. The industry has been steadily growing at average rates of nearly 15 per cent over the past decade. For instance, the Islamic banking industry was regarded to be worth US$300BN in 2003 (Bank of Sudan, 2004) while, at the end of 2010, the industry was worth more than US$895BN (The Banker, 2010). Very soon, it is expected to break the $1 trillion threshold. Therefore, the Islamic finance industry can no longer be regarded as a small and niche market segment, but must be accepted as a substantial and integral part of the global financial system.

However, although market participants and players have both recognized the need for a legal framework governing the Islamic financial services industry, as yet, there is
no uniform set of regulations and framework to govern the growing Islamic finance industry, which stems across 75 countries (Mutalip, 2008). Most of the existing banking regulations in Islamic countries are based on conventional Western banking practices. In addition, the Islamic financial institutions operating in non-Islamic countries often face hurdles since there is an absence of regulatory bodies that operate in accordance with the principles of Shariah (Islamic Laws). Based on these issues, this section discusses what types of regulation are currently in place in different markets to account for Islamic financing.

One attempt to standardize regulations for Islamic financial services industry players has been initiated by the Islamic Financial Services Board (IFSB), which is headquartered in Kuala Lumpur, Malaysia. The IFSB considers itself as an international standard-setting organization promoting soundness and stability of the Islamic financial services industry by issuing global prudential standards and guiding principles for the industry. In that endeavour, the IFSB has proposed standards for all sorts of instruments in the Islamic finance industry, such as banking capital adequacy standards; Sukuk (Islamic bonds), securities and real estate investments capital adequacy standards; guidelines on Takaful (Islamic insurance) governance; guidelines on corporate governance; guidelines on supervisory review process; guidelines on principles of risk management; and guidelines on disclosures to promote transparency and market discipline. These guidelines have been proposed by taking various stakeholders on board as members of the IFSB, which includes Central Bank Governors from most Muslim countries as well as other prominent organizations related to the industry. It also claims to comply with existing international standards, for example for the banking capital adequacy requirements, the IFSB claims its proposals are based on the Basel Committee documents complying with the likes of Basel II along with the necessary modifications to cater for the characteristics of the Shariah complaint products and services. However, whether or not the IFSB’s guidelines are accepted as the international standard for Islamic financing activities is yet to be seen.

As Thani and Othman in IFSB (2008) noted, most countries have attempted to create their own sets of legal frameworks to account for Islamic financing activities within their jurisdictions. Although it is clear that the laws concerning bonds and interest rates are not applicable for Islamic banks, the authors noted that there are at least three common hurdles to establishing an effective legal and regulatory framework for the Islamic finance industry:

1. Lack of harmonized interface between the Shariah principles that form the backbone of the Islamic finance industry and the existing legal framework.
2. To implement taxation systems that do not penalize Islamic finance consumers unfairly since transactions in Islamic finance relate to profit and loss activities whereas many transactions in conventional finance would be tax-free as they may be identified as lending and borrowing.
3. Civil courts applying Western-inspired laws instead of Shariah may lead to anomalies or even contravention of Shariah principles.

Despite the emergence of Islamic finance onto the global stage, the Basel II Capital Accord and its successor, Basel III, make no distinction between conventional banks and Islamic financial institutions. This, perhaps, is unsurprising given that, historically,
the Basel Committee members largely comprise central bank governors and prudential supervisors from non-Muslim countries.

Despite the shortcomings of the Basel standards when applied to Islamic banks, the IFSB has worked hard to develop standards or guidelines that address risk issues specific to Islamic financing, as well as adapting elements from the Basel standards to make them more relevant to Islamic banks. In December 2010 the IFSB published a risk management and capital adequacy guidance note for commodity Murabaha transactions. This guidance complements the previous work by the IFSB in these areas.

Therefore, there is a need for a standardized Islamic finance legal framework that accounts for the hurdles listed above as well as all the other legal obstacles that may arise. However, as noted earlier, currently there is fragmentation in the industry as far as governing regulations are concerned with different countries having their own legal systems.

Overall, the literature review suggests that most academicians submit that bank regulations and supervision do have an impact on bank efficiency and risk taking. Much of the literature has also called on policy makers to maintain deregulation and allow banks to self-regulate themselves. It is a difficult to evaluate whether most of the academicians submit this due to conviction of the free market system or is it genuinely the case. Often, these academics come from countries in which there are legal systems that could be considered to be among the most advanced in the world, and, generally, have high standards of rule of law. However, the literature submitted that even where it is done comparatively in most cases extra regulations will have an impact on the efficiency of a bank. One aspect of regulations and supervision is where they come with restrictions. While evidence tends to point towards efficiency having a negative effect where a bank diversifies its financial type activities, it is often the case that, instead, a restrictive banking system will, in turn, prevent the proper development of the financial services industry. This might be where a number of developing countries face hurdles; this research will try to empirically support this notion.

Thus, it can be seen from the above discussion that there seems to be no study that focussed on regulation and the supervisory impact on bank efficiency and risk taking in the Islamic banking system and that only a handful of studies focussed on the impact of regulation on bank risk and return.

The next section outlines the details of the methodology and data used.

3. Methodology

3.1 Technical efficiency estimation

The methodology employed by this paper is that of a frontier data envelopment analysis (DEA) model. The DEA model of data analysis with regard to bank efficiency has generally been favoured by most academics (Berger et al., 1993; Berger and Humphrey, 1997; Casu and Molyneux, 2003). Despite criticism from some academics (Simar and Wilson, 2007; Ramalho et al., 2010), it is generally accepted by most academics that the DEA model is a sound technique for efficiency estimation. McDonald (2009) examined the second stage DEA efficiency analyses and found that there are good arguments for treating DEA efficiency scores as descriptive measures in a second stage analyses. He summed up that the DEA method was simply the better one as it was relatively simple to use and a broad range of people could understand its usage and the idea behind it.
In the generic situation of \( n \) banks, with each of them consuming \( m \) different inputs to produce \( s \) different outputs and constant returns to scale, this translates into the following linear programming problem being solved \( n \) times; each time for a different bank in the sample:

\[
\text{Min}_{\theta, \lambda} \theta, \quad \text{st} \quad \theta x_i - X \lambda \geq 0, \quad -y_i + Y \lambda \geq 0, \quad \lambda \geq 0, \quad (1)
\]

where \( \theta \) is a scalar, \( \lambda \) is a vector of ones, and, finally, \( X \) and \( Y \) are the \( m \times n \) input and \( s \times n \) output matrices, respectively. In this context, \( \theta \) is the efficiency score for each bank and is measured relative to an estimate of the true production frontier, which is known as the best practice frontier. When the value of \( \theta \) is unity the bank operates on the efficient frontier, and, therefore, is deemed efficient.

Data are pooled across 11 countries, which are selected on the basis that they are OIC member states and have a well-established Islamic banking system. An “intermediation” approach is utilized, as there is an assumption that all banks will have a certain amount of regulated framework and all will have to utilize capital, assets and some form of liability to function. According to Berger and Humphrey (1997), this is the normal practice in the vast majority of financial services industries. Accordingly, we consider personnel expenses, fixed assets and deposits plus short-term funding as inputs and total amount in loan disbursement and total earning assets as outputs.

The estimated technical inefficiency scores are then regressed against a set of regulatory, bank-specific and macro variables, as explained in Section 3.2.

### 3.2 Regulation and bank performance

The modelling framework adopted to estimate the relationship between regulation, efficiency, and risk is built on from the approaches suggested by Pasiouras (2008), Kwan and Eisenbeis (1997), and Altunbas et al. (2007). We specify a system of equations and estimate these using Zellner’s (1962) seemingly unrelated regression (SUR) approach. SUR will allow for simultaneity between banks’ risk and efficiency with regulatory and supervisory structure while also controlling for other important environmental factors. It is believed that SUR can overcome contemporaneous cross-equation error correlation. There are two main motivations for use of SUR. The first one is to gain efficiency in estimation by combining information on different equations. The second motivation is to impose and test restrictions that involve parameters in different equations. The system of equations estimated is as follows:

\[
\text{INEFF}_{ij} = \alpha + \beta \text{SPOWER}_j + \gamma \text{CAPRQ}_j + \delta \text{PRMONIT}_j + \epsilon \text{ACTRS}_j + \phi \text{NLTA}_{ij} \\
+ g \text{TA}_{ij} + h \text{LAD}_i + i \text{LATAC}_j + j \text{OETAC}_j + k \text{LLPTAC}_j + l \Delta \text{GDP}_j \\
+ m \text{LLR}_{ij} + \text{Year}_j \quad (2)
\]

\[
\text{LLR}_{ij} = a + b \text{SPOWER}_j + c \text{CAPRQ}_j + d \text{PRMONIT}_j + e \text{ACTRS}_j + f \text{NLTA}_{ij} \\
+ g \text{TA}_{ij} + h \text{LAD}_i + i \text{LATAC}_j + j \text{OETAC}_j + k \text{LLPTAC}_j + l \Delta \text{GDP}_j \\
+ m \text{INEFF}_{ij} + \text{Year}_j \quad (3)
\]

Definitions for all variables are provided in Appendix.

Equations (2) and (3) examine the impact of regulatory and supervisory structure on bank efficiency and risk taking behaviour. Individual bank technical inefficiency
(INEFF) is obtained as the distance of a bank’s observed technical efficiency from the estimated efficient frontier, as explained in Section 3.1. A number of bank-specific and country specific variables are also included that are believed to also explain the variation in bank risk and inefficiency across the Islamic banking system. Loan loss reserves, as a fraction to total assets (LLR), are used as a measure of banking risk, which is primarily used as a measure of Tier 2 capital. The treatment of loan loss reserves as capital has received considerable attention in the wake of the financial crisis (Ng and Roychowdhury, 2011). Higher levels of reserves are suggestive of greater banking risk accounting for any future bad times. Of course, this estimation as a measure of riskiness can be questionable and backward looking but accounting ratio like this has been widely used across the literature to assess bank appetite for risk.

To account for Basels II and III’s pillars on bank regulation and supervision we use the data from Barth et al. (2001b, 2006, 2007a, b) World Bank database.

SPOWER is a measure of the power of the supervisory agencies. It is calculated on the basis of the answers to 14 questions indicating the extent to which supervisors can change the internal organizational structure of the bank and/or take specific disciplinary action against bank management and directors, shareholders, and bank auditors. Higher values of this variable indicate greater power of the supervisory authorities to get involved in banking decisions. Strong official supervision may signal efficient banking institutions, preventing managers from engaging in excessive risk-taking behaviours.

CAPRQ is an index of capital requirements, accounting for both initial and overall capital stringency. The former indicates whether the sources of funds counted as regulatory capital can include assets other than cash or government securities and borrowed funds, as well as whether the regulatory or supervisory authorities verify these sources. The latter indicates whether risk elements and value losses are considered while calculating the regulatory capital. CAPRQ can take values between 0 and 8 with higher values indicating more stringent capital requirements.

PRMONIT is an indicator of private monitoring that takes values between 0 and 8 with higher values indicating higher disclosure requirements and more incentives to increase private monitoring. Barth et al. (2006, 2004) provide evidence that regulations that enhance and facilitate private monitoring can significantly boost bank efficiency. More recently, Pasiouras (2008) showed that encouraging and facilitating private monitoring of banks can boost efficiency.

ACTRS indicates the level of restrictions on banks’ activities. It can take values between 0 and 4 with higher values indicating higher restrictions. It is determined by considering whether securities, insurance, real estate activities, and ownership of non-financial firms is unrestricted (= 1), permitted (= 2), restricted (= 3) or prohibited (= 4). We construct an overall index by calculating the average value over all four activities. According to Barth et al. (2001a, b, 2003a, b), activity restrictions may have an important impact on bank efficiency by reducing competition and limiting economies of scope, which results in lower efficiency levels.

For the explanatory variables, we used a broad range of variables that are believed to be important in explaining the performance and risk taking propensity of banks. The bank-specific variables include net loans to total assets (NLTA) as rapid loan growth may increase risk and impact adversely on bank efficiency in the long run. Banks that are more liquid may be more efficient in the sense that all other things being equal, an efficient bank can produce more output, part of which includes liquid and other assets,
therefore, we account for this by using liquid assets to deposits ratio (LAD). Bank size, through economies of scale, may influence the relationship between risk and efficiency so we control for the size of assets of banks (TA). Big banks are typically more diversified and gain from other size advantages (Hughes et al., 2001) so it is important to control for this factor. Generally, the effect of a growing size on efficiency has, to a certain extent, been proved to be positive (Athanasoglou et al., 2008; Fiordelisi and Molyneux, 2010).

Finally, a range of country-specific banking variables are included to take account of broad banking system differences across the nations. These include indicators of country banking system liquidity measured by banking system liquid assets to total assets in country (LATAC), efficiency measured by banking system operating expenses to total assets in country (OEPAC) and risk is measured by banking system loan-loss provisions to total loans in country (LLPTAC). While these variables are similar to the bank-specific indicators, they provide another aspect to the analysis in that they control for country differences in efficiency and risk. In other words, they help to show if country-specific financial differences impact on bank-specific risk and efficiency. The average annual growth rate of per capita (ΔGDP) is an environmental variable used to control for local economic conditions. A high level of per capita GDP captures the cyclical conditions of the macroeconomic environment. It is also expected to capture the implications for bank efficiency stemming from operating in different economic environments, as demand for financial products depends on the level of economic activity. Empirical studies tend to find that countries with relatively high GDP growth are characterised by more efficient banking institutions (Demirguc-Kunt and Maksimovic, 1998; Schure et al., 2004; Yildirim and Philippatos, 2007). Yearly dummy variables are included to control for time effects.

3.3 Data
The dataset used in this study is composed of 70 Islamic banks from 11 countries (Egypt, Bahrain, Bangladesh, Indonesia, Kuwait, Malaysia, Pakistan, Qatar, Saudi Arabia, Turkey, and UAE). They are sourced either from data collected by BankScope database or done by manually referring to the annual reports of these banks for year 2006-2010. The reasoning for a five-year data test is because it would yield a better dataset due to accuracy, and, also, where the Islamic banking system was newly established it would have had sufficient time to mature. The other reasoning is that it would also be able to monitor the overall performance during the recent financial crisis (Table I).

4. Empirical results
The banks’ efficiency scores for Islamic banking are estimated relative to a common best practice frontier by pooling the data across countries. This approach allows for estimating efficiency differentials not only between banks within a country but across countries as well using the same benchmark technology.

Figure 1 shows the average DEA efficiency scores by country. Saudi Arabia achieved the highest level of efficiency followed closely by Kuwait, whereas the performance of Bahrain was the worst. One plausible explanation of this result is that those countries (KSA and Kuwait) that have high Islamic banking assets, as of total banking assets, and fewer Islamic banks, are able to operate at better efficiency levels. This indicates that less competition from a similar type of bank yields a higher efficiency level.
Figure 2 shows the banking regulation and supervisory scores on a country basis. Most countries score very high on supervisory index indicating the great extent of official supervisory powers reserved by authorities. In respect of the capital requirement index, Kuwait and Pakistan score the highest on this index with a maximum of 8 points each suggesting strict capital regulations in their countries. In respect of private monitoring, most countries score very high on this index indicating considerable private monitoring of the Islamic banks in those countries. In terms of activity restrictions of Islamic banks, Indonesia is the only country to score a maximum score of 4, while Qatar scores the least. The regulation and supervisory scores for each country highlight significant differences among the nations practising Islamic finance.
The next section of analysis deals with the impact of regulatory and supervisory structures on the efficiency and risk taking behaviour of banks. First, we regress the DEA inefficiency scores against bank regulatory and supervisory practices in the presence of bank specific variables, and then, the next regression will use loan loss reserve (LLR) as the dependent variable with regulatory and supervisory practices as independent variables in the presence of bank specific variables.

The results of regression are reported in Tables II and III.

4.1 Impact of banking regulation and supervision on efficiency

Estimates from the inefficiency equation (equation (2)) derived from the simultaneous estimation are reported in Table II. The inefficiency equation uses inefficiency estimates (INEFFij) obtained from the DEA used in equation (1) as the dependent variable.

It can be observed from Table II that SPOWER has a statistically significant and negative impact on Islamic banks. In other words, higher supervisory power increases

<table>
<thead>
<tr>
<th>Variables</th>
<th>Islamic banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOWER</td>
<td>$-0.071^{**}$</td>
</tr>
<tr>
<td>CAPRQ</td>
<td>$-0.027^*$</td>
</tr>
<tr>
<td>PRMONIT</td>
<td>$-0.108^*$</td>
</tr>
<tr>
<td>ACTRS</td>
<td>$0.028^{**}$</td>
</tr>
<tr>
<td>LLR$_{ij}$</td>
<td>$-0.010^{**}$</td>
</tr>
<tr>
<td>NLTA$_{ij}$</td>
<td>$-0.052^*$</td>
</tr>
<tr>
<td>TA$_{ij}$</td>
<td>$0.779^{**}$</td>
</tr>
<tr>
<td>LAD$_{ij}$</td>
<td>$-0.047^{**}$</td>
</tr>
<tr>
<td>LATAC$_j$</td>
<td>$0.214^{**}$</td>
</tr>
<tr>
<td>LLPTAC$_j$</td>
<td>$-0.662^*$</td>
</tr>
<tr>
<td>OETAC$_j$</td>
<td>$0.018^{**}$</td>
</tr>
<tr>
<td>ΔGDP</td>
<td>$0.292^*$</td>
</tr>
<tr>
<td>Observations</td>
<td>320</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.381</td>
</tr>
</tbody>
</table>

Note: Significant at: $^*5$ and $^{**}1$ per cent levels, respectively
the technical efficiency of Islamic banks. This might be due to the fact that Islamic banks, in addition to national banking laws, are also governed by Shariah laws, which keep in check some undesired activities of Islamic banks, thus increasing their given efficiency level. Our result for Islamic banks is consistent with the findings of Pasiouras (2008) for technical efficiency. Thus, we find evidence to support the argument of the official supervision approach that powerful official supervision can improve the corporate governance of banks (Stigler, 1971). This efficiency increases further if we have some inbuilt supervisory mechanism, as embedded in the Islamic banking system. CAPITRQ has a negative and statistically significant impact on inefficiency on Islamic. Therefore, higher capital requirements increase the technical efficiency of banks. This could be explained by a number of reasons. For instance, VanHoose (2007) mentioned that high capital requirements may result in lower levels of bad loans, thus reducing the probability of financial distress, which also increases the importance of substitutes for other potentially higher earning activities, such as investment activities.

If we focus on the PRMONIT variable, we find a negative impact on Islamic bank inefficiency. In other words, the higher the level of scrutiny by the regulatory body, the more Islamic banks were able to operate at a high efficiency level. This might be due to the fact that Islamic banks incorporate a high corporate governance level as well as Shariah governance level, which help them to reduce corruption and ambiguity in bank lending, and improve the functioning of Islamic banks as true financial intermediaries. As Fernandez and Gonzalez (2005) mentioned, under this combined approach of higher SPOWER and PRMONIT, the greater quality of information provided by the system, which enhances private monitoring through accounting and auditing requirements, might boost the ability of supervisors to intervene in managerial decisions in the right way and at the right time.

Turning to our last regulatory variable, the positive and statistically significant impact of ACTRS on technical inefficiency indicates that lower restrictions result in higher operational efficiency. This is consistent with the view that less regulatory control allows banks to engage in various activities and operate under economies of scale. In other words, our results imply that when banks are restricted in offering

<table>
<thead>
<tr>
<th>Variables</th>
<th>Islamic banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOWER</td>
<td>-0.054</td>
</tr>
<tr>
<td>CAPRQ</td>
<td>-0.071 *</td>
</tr>
<tr>
<td>PRMONIT</td>
<td>-0.011 *</td>
</tr>
<tr>
<td>ACTRS</td>
<td>-0.087 **</td>
</tr>
<tr>
<td>INEFFij</td>
<td>-0.016 **</td>
</tr>
<tr>
<td>NLTAij</td>
<td>-0.027 **</td>
</tr>
<tr>
<td>TAij</td>
<td>-0.023 **</td>
</tr>
<tr>
<td>LADij</td>
<td>-0.071 **</td>
</tr>
<tr>
<td>LATAj</td>
<td>0.071 **</td>
</tr>
<tr>
<td>LLPTAEj</td>
<td>0.748 **</td>
</tr>
<tr>
<td>OETAEj</td>
<td>0.015 **</td>
</tr>
<tr>
<td>ΔGDP</td>
<td>0.163 *</td>
</tr>
<tr>
<td>Observations</td>
<td>320</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.394</td>
</tr>
</tbody>
</table>

**Note:** Significant at: *5 and **1 per cent levels, respectively
a limited number of services, they can potentially acquire expertise and specialization in specific market segments and be more profit efficient.

If we consider other bank specific variables, we find that there appears to be an inverse relationship between loss reserve and efficiency for Islamic banks, which signifies that an inefficient Islamic bank takes on less risk. This can be a useful result to prove that Islamic banks suffered less damage and experienced no banking failures during the recent credit crunch of 2007-2008. Further, we can observe that technical inefficiency is positively related to asset size whereas bank lending appears to be inversely related to inefficiency, thereby suggesting that efficient banks are more successful in expanding their loan business. Inefficient Islamic banks maintain a higher liquidity level. Viewing the country-specific indicators, overall, it seems that banking system liquidity and banking system operating cost are positively linked to inefficiency while loan loss provision is negatively related to inefficiency. In addition, \( \Delta GDP \) has a positive and statistically significant effect on the technical efficiency for Islamic banks.

### 4.2 Impact of banking regulation and supervision on risk taking

Estimates from the risk equation (equation (3)) derived from the simultaneous estimation are reported in Table III. The risk equation uses loan-loss reserves as a fraction of total assets (LLR\(_{ij}\)) as the dependent bank-risk variable.

It can be observed from Table III that SPOWER has a negative impact on Islamic banks but the relationship is not significant, which is in line with Barth et al. (2004).

With respect to CAPRQ and PRMONIT we can establish a statistically significant and negative relationship for Islamic banks. This can be interpreted in the sense that the higher the capital requirement and the better the monitoring and scrutiny of the banking sector the lower will be the risk taking behaviour of Islamic banks. This might be due to the fact that higher capital requirements may represent entry barriers for newcomers, which would restrict competition and allow existing banks to accumulate power, resulting in more prudent and less-risky behaviour.

In the case of ACTRS, we find that Islamic banks show a negative relationship with ACTRS, which signifies that Islamic banks take on less risk, even when their activities are restricted in the financial market. This can be explained in the sense that Islamic banks with inherent Shariah regulation and restrictions are able to avoid many risky ventures.

If we focus on bank specific variables, we observe that there is a negative relationship between inefficiency and bank risks. Banks with higher loan loss reserves tend to be inefficient. The negative relationship for Islamic banks can result from the cost constraints impediment, which restricts the ability of inefficient Islamic banks to take on more risks. Possibly, Islamic banks are more reserve constrained, which might be the reason behind this result. The table also shows that net lending (NLTA\(_{ij}\)) is negatively related to risk, suggesting that loan growth is inseparably linked to loan loss reserve levels. Islamic banks also seem to have a lower loan loss reserve level, which is obvious since most of the Islamic loans are backed by real assets. It can also be interpreted that there are potential diversification benefits associated with size, as noted by Altunbas et al. (2007).

There also appears to be a relationship between liquidity and risk as Islamic banks have lower reserves associated with higher liquidity. This suggests that banks with higher liquidity levels take on more risks, which conforms to the Basel guidelines inasmuch as banks are encouraged to be more liquid to cover the risks being taken. Finally, the country specific banking sector variables also suggest that the level of
liquidity (LATAc) and loan loss provision (LLPTAC) in the respective country’s financial system are positively related to overall banking sector risks. In other words banking systems will take on more risks if they are more liquid and banks are provisioning for loan loss at a higher level.

Nevertheless, the main findings from Tables II and III prove that regulation and supervision are negatively related to Islamic bank technical inefficiency. In respect of the impact of regulatory and supervisory practices on bank risk taking we find that stricter capital requirement and private monitoring reduces the risk taking behaviour of Islamic banks.

5. Conclusions
This paper extends the literature on bank efficiency and risk taking by providing for the first time empirical evidence concerning the association between risk and efficiency with regulation and supervisory approaches in the Islamic banking system. Our sample consisted of a panel dataset of 320 observations covering the period 2006-2010, from 70 Islamic banks operating in 11 countries that have the distinction of comprising the largest contributor towards the growth of Islamic finance. Our results indicate that Islamic banks efficiency was positively influenced by regulations related to the second and third Pillars of Basel II, namely, higher supervisory power, and disclosures. Stricter regulations, related to the first Pillar (i.e. capital requirements) had a positive impact on technical efficiency for Islamic banks. Higher capital requirements also induce a lower level of risk behaviour for Islamic banks. Moreover, our findings for pillar 3 of Basel II, market discipline, indicate that excessive private monitoring and regulatory restrictions on bank activities can affect the efficient operation of banks. The message that emerges from this analysis is that there is a strong link between bank efficiency and bank regulatory and supervisory policies, which obstructs the private sector monitoring bank activities. It is also conclusive that the Islamic banking system works well within a stricter regulatory environment.

Basel II suggested that stricter regulations could hamper banking efficiency. The existence of a powerful supervisory body could also lead to inefficiency. The DEA scores from this paper suggest that this may not necessarily be the case, especially where a country is a developing one and does not have a proper framework to control corruption. Islamic banks appear to be efficient in difficult conditions where it does not have the traditional safeguards, such as a fully functioning and trustworthy legal system.

Furthermore, our evidence shows the potential perils in terms of bank efficiency from excessive requirements for market monitoring in the attempt to strengthen market discipline. However, undoubtedly the recent global economic and financial crisis puts this discussion on a new basis rendering the conflicting approaches that either view regulation as a solution or demonize it as too general and simplistic to be useful. The emerging challenge is to consider which specific aspects of regulatory and supervisory policies affect bank performance and how their implementation and effectiveness is related to the broader institutional framework.

Further areas of study should seek to investigate the consistency of our findings by applying to a more representative and contemporary sample of both conventional and Islamic banks. The approach could also be expanded to examine the consistency of findings by using alternative accounting and market-based indicators of banking risk, Basel capital strength factors and alternative banking efficiency measures.
References


Further reading


About the author
Dr Nafis Alam is an Assistant Professor of Finance at the Nottingham University Business School (NUBS) in the University of Nottingham – Malaysia Campus (UNMC). He has published quite extensively in the area of Islamic finance & corporate finance and his scholarly research has featured in leading journals like Review of Islamic Economics, Qualitative Research in Financial Markets, Journal of Banking Regulation, Journal of Financial Services Marketing and Journal of Internet Banking and Commerce among others. He also co-authored three books on Islamic finance, among them Encyclopaedia of Islamic Finance which is the first of its kind and has sold over 1,000 copies worldwide. He has presented his research in scholarly conferences worldwide; notable among them are Harvard Islamic Finance Forum, International Conference on Islamic Economics and Finance, and Gulf Research Meeting. Currently he is also a member of the editorial advisory board of finance journals and book reviewer for Palgrave. Nafis Alam can be contacted at: nafis.alam@nottingham.edu.my

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### Variable Category Description Source/database

#### Regulatory variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Description</th>
<th>Source/database</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPOWER</td>
<td>Supervisory Power</td>
<td>This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each one of the following 14 questions: (1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors required by law to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Are off-balance sheet items disclosed to supervisors? (6) Can the supervisory agency order the bank’s directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend the decision of the directors to distribute dividends? (8) Can the supervisory agency suspend the decision of the directors to distribute bonuses? (9) Can the supervisory agency suspend the decision of the directors to distribute management fees? (10) Can the supervisory agency supersede bank shareholder rights and declare a bank insolvent? (11) Does banking law allow the supervisory agency or any other government agency (other than court) to suspend some or all ownership rights of a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than court) supersede shareholder rights? (13) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than court) remove and replace management? (14) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than court) remove and replace directors? WB (Barth et al., 2001a, b, 2004, 2006)</td>
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</tbody>
</table>

| CAPRQ    | Capital requirements | This variable is determined by adding 1 if the answer is yes to questions 1-6 and 0 otherwise, while the opposite occurs in the case of questions 7 and 8 (i.e. yes – 0, no – 1). (1) Is the minimum required capital asset ratio risk-weighted in line with Basel guidelines? (2) Does the ratio vary with market risk? (3-5) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital: a) market value of loan losses not realized in accounting books? (b) unrealized losses in securities portfolios? (c) unrealized foreign exchange losses? (6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (7) Can the initial or subsequent injections of capital be done with assets other than cash or government securities? (8) Can initial disbursement of capital be done with borrowed funds? WB (Barth et al., 2001a, b, 2004, 2006) |

(continued)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Description</th>
<th>Source/database</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRMONIT</td>
<td>Private monitoring</td>
<td>This variable is determined by adding 1 if the answer is yes to questions 1-6 and 0 otherwise, while the opposite occurs in the case of questions 7 and 8 (i.e. yes = 0, no = 1). (1) Is subordinated debt allowable (or required) as part of capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries? (3) Are off-balance sheet items disclosed to public? (4) Must banks disclose their risk management procedures to public? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? (7) Does accrued, though unpaid interest/principal enter the income statement while loan is non-performing? (8) Is there an explicit deposit insurance protection system?</td>
<td>WB (Barth et al., 2001a, b, 2004, 2006)</td>
</tr>
<tr>
<td>ACTRS</td>
<td>Restrictions on banks activities</td>
<td>The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities; (2) insurance activities; (3) real estate activities; (4) bank ownership of non-financial firms. These activities can be unrestricted, permitted, restricted or prohibited, which are assigned the values of 1, 2, 3 or 4, respectively. We use an overall index by calculating the average value over the four categories</td>
<td>WB (Barth et al., 2001a, b, 2004, 2006)</td>
</tr>
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**Bank specific variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source/database</th>
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<tbody>
<tr>
<td>LLRij</td>
<td>Loan-loss reserves for bank i in country j</td>
<td>Bankscope and author calculation</td>
</tr>
<tr>
<td>NLTAlj</td>
<td>Net loans to total assets for bank i in country j</td>
<td>Bankscope and author calculation</td>
</tr>
<tr>
<td>TAij</td>
<td>Total assets for bank i in country j</td>
<td>Bankscope and author calculation</td>
</tr>
<tr>
<td>LADijd</td>
<td>Liquid assets to short term deposit for bank i in country j</td>
<td>Bankscope and author calculation</td>
</tr>
<tr>
<td>Yearj</td>
<td>Yearly dummy variables for 2006-2010</td>
<td>Author</td>
</tr>
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</table>

**Country specific variables**

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<thead>
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<th>Description</th>
<th>Source/database</th>
</tr>
</thead>
<tbody>
<tr>
<td>LATACj</td>
<td>Banking system liquid assets to total assets in country j</td>
<td>Bankscope and author calculation</td>
</tr>
<tr>
<td>OETACj</td>
<td>Banking system operating expenses to total assets in country j</td>
<td>Bankscope and author calculation</td>
</tr>
<tr>
<td>LLPTACj</td>
<td>Banking system loan-loss provisions to total loans in country j</td>
<td>Bankscope and author calculation</td>
</tr>
<tr>
<td>ΔGDP</td>
<td>Real GDP growth</td>
<td>IMF</td>
</tr>
</tbody>
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