Performance of islamic banks across the world: an empirical analysis over the period 2001-2008

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Abstract

Our study aims at analyzing Islamic bank efficiency over the period 2001-2008. We found that they were efficient at 92%. The level of efficiency could however vary according to the region where they operate. Asia displays the highest score with 96%. Indeed, country like Malaysia made reforms in order to allow these banks to better cope with the existing financial system, display the highest scores. On the contrary countries with Islamic banking system do not necessarily display efficiency scores superior to the average. The subprime crisis seems to have impacted those banks indirectly. And market power and profitability have a positive impact on Islamic banks efficiency, while it is the contrary for their size. The latter implies that they do not benefit from scale economy, may be because of the specificity of Islamic financial products.

Keywords: Islamic Finance, Islamic Banks, performance, efficiency, stochastic frontier analysis.

JEL classification: G21, G24, G15.

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Introduction

Islamic banking is booming in Muslim and non-Muslim countries, since it is shariah compliant and is intended to Muslim clients in those countries. Although most of the Islamic banks are within Middle Eastern and Emerging countries, some universal banks based in developed countries have started to satisfy a large demand of Islamic financial products. It is the case in the United Kingdom and the United States.

It is hard to pinpoint the start of Islamic banking. Islamic financial transactions have existed until the 14th century, however no institutions exclusively devoted to banking. Among the reasons that could explain the late development of Islamic banks is the powerful rule of the conventional banks and some other historical and political reasons (break of the Islamic world and the colonization).

Islamic finance was introduced by Ahmed Al Najjar[3] on experimental basis in a small town of Egypt in 1963. Since then, many Islamic Banks have been established in Middle East and Asia. Growth of Islamic banking has been increasing ever since, not only in terms of number of countries it is operating in, but also in terms of areas of finance it has ventured in.

The Egyptian experience was based on the mudaraba[4] principle and lasted until 1967. The aim was to win the confidence of farmers and workers who were more religious and traditionally minded. However, those first Islamic banks were less successful than the conventional ones, and were closed for political reasons.

In the past couple of decades, many developments in the Islamic world took place and favor the development and revival of Islamic finance. The recent unprecedented boost in the oil-related income of many Muslim Arab nations induces in those countries inflows of petrodollars. Then attacks of 11th September 2001 and more recently the subprime crisis encouraged capital flight of Muslims (repatriation) and non-Muslims investors and financiers. The Golf region now captures a large concentration of liquidities. Lastly, in order to attract these liquidities to their financial markets, many occidental countries such as the UK, the USA and recently France encourage their banks offering Islamic banking services (see appendix 1 for more details).

[3] He started this experience in Egypt based on the German saving bank model because he had become familiar with during his studies in Germany and the Germans supported him. Despite the religious position in Egypt at that time, he used family contacts to get the official approval from the government. However, he never made any reference to Islam.

[4] It is a partnership where one or more parties contribute capital while the remaining parties bring their efforts/know-how to the business venture. The former agents have no control over the project and no right to participate in the managerial decisions.

Several studies examined the development of this particular area of finance. In particular, some studies examined the risk that can pose Islamic finance to the international financial system, given the amount of petrodollars that they collect and the context of globalization. Sudararajan and Errico, 2002 discussed how to take into account the specificity of those institutions and their products in the management of financial risks; the same for Čihák and Hesse, 2008. They studied the possible channels through which Islamic finance could impact global financial stability. Lastly, Jobst, 2007 examined legal and economic implications of shariah compliance on the configuration of Islamic securitization transactions.

Other studies assessed Islamic bank efficiency based on financial and management ratio or using parametric or non parametric methods, as done for conventional banks. For the first group of studies, one can cite Abdus-Samad, 1999; Bashir, 1999 and Hassan and Bashir, 2003. Those papers focus most of the time on few banks in a country or a very limited number of countries. The second group of papers were written by Yudistira, 2003; Al-jarrah and Moulyneux, 2003, Hussein, 2004; Hassan, 2005. They studied a limited number of Islamic banks settled in one or several countries. Indeed, data on Islamic banks are scarce limiting such studies as well as comparative studies across countries.

Our study aims at examining and evaluating the performance of Islamic banks operating in 17 countries in Middle East, Asia and Africa, but also in United Kingdom. This scope of analysis will allow us to compare Islamic bank efficiency through the differences characterizing those countries. We used a stochastic Frontier Approach (SFA) over the period 2001-2008 to estimate a cost-efficiency frontier and derived scores of cost efficiency, while taking into account explanatory variables. The current paper is structured in the following way: Section (1) analyzes the results of previous studies about the performance and the profitability of these banks in Muslim and non-Muslim countries. Section (2) presents the model and the sample. The results are discussed in Section (3). We conclude in Section (4).

1. An overview of the financial literature

The market share of Islamic banks increases by 15% per annum (Moody's, 2008), this last decade. The emergence and boom of Islamic finance, lead several economist to write on this topic. Many studies discussed in depth about the rationale behind the prohibition of interest (Chapra, 2000), but also the policy implications of eliminating the interest payments (see among others Khan, 1986, Khan and Mirakhor, 1987 and Dar 2003). However, most of the existing literature on Islamic banking unleashes various studies made on the measurement of performance in Islamic banks: they examine the relationship between profitability and banking characteristics.

A first group of studies are interested in the performance of Islamic banks in a specific country, through financial ratios. Those ratios capture (a) profitability, (b) liquidity, (c) risk and solvency and (d) efficiency. For instance, Saleh and Rami (2006) focus on the performance of the first and the second Islamic banks in Jordan: Jordan Islamic Bank for Finance and Investment (JIBFI) and Islamic International Arab Bank (IIAB). They notice that they play a major role in financing ventures in Jordan, particularly short-term investment, and

both banks have increased their activities and expanded their investment but, the JIBFI still has higher profitability. They conclude that Islamic banks have high growth in the credit facilities and in profitability. Samad (2004) focused on the post Gulf War period of 1990-2001 in Bahrain, and examined the performance of the interest-free Islamic banks and the interest-based conventional commercial banks. His study shows that there is no major difference between the two sets of banks in terms of profitability and liquidity performances but there is a significant difference in credit performance. Kader and Asarpota (2007) evaluate the performance of the UAE Islamic banks by comparing the Islamic and conventional banks. They examine the balance sheets and income statements of 3 Islamic banks and 5 conventional banks between 2000 and 2004. Their results show that Islamic banks are more profitable, less liquid, less risky and more efficient than conventional ones. They conclude that the SPL principle (see annex) is the main reason for the rapid growth of Islamic banks and suggest that they should be regulated and controlled in a different way as the two kinds of banks have different characteristics in practice.

Again, Samad and Hassan (2000) performed an intertemporal study in which they compared the performance of the Bank Islamic Malaysia Berhad (BIMB) between two periods of time 1984-1989 and 1990-1997. Then they evaluate the interbank performance by comparing the BIMB's performance with 2 conventional banks (one smaller and another larger than the BIMB) as well as 8 conventional banks. The results show that there is a significant improvement of the BIMB performance between 1984 and 1997 but this improvement is less important than in the conventional banks. Moreover, Islamic banks are less profitable and less risky but more liquid than conventional banks. Moin (2008) compared the performance of Islamic banks relatively to conventional banks in Pakistan. The study makes comparison of Meezan Bank Limited (MBL) which is the oldest Islamic bank in Pakistan and a group of 5 conventional banks for the period of 2003-2007. He adopted an inter-bank analysis of the income statements and the balance sheets of the two groups. The study found that there is no difference in terms of liquidity between the two sets of banks. Besides, the MBL is less profitable, more solvent (less risky), and also less efficient comparing to the average of the conventional banks but it is improving considerably between 2003 and 2007. This is explained by the fact that the latter banks have a dominating position in the financial market with a longer history and experience than the Islamic banks in Pakistan which have started their business few years back. Sarkar (1999) studies the case of Islamic banks in Bangladesh. He finds that Islamic products have different risk characteristics and concludes that prudential regulation should be modified.

Those studies related each to one country and using financial ratios tend to converge towards one conclusion. Islamic banks may be as efficient as conventional ones; however there is a necessity of reforms, regulation and control for each banking system where they operate.

A second group of studies are interested in Islamic banks across several countries. Bashir (1999) and Bashir (2001) examined the balance sheets and the income statements of a sample

of 14 Islamic banks in 8 Middle Eastern countries between 1993 and 1998. He analyzed the determinants of Islamic Banks' performance, specifically the relationship between the profitability and the banks' characteristics. He found that the measure of profitability is an increasing function of the capital and loan ratios. Besides, the study highlights the empirical role that adequate capital ratios and loan portfolios play in explaining the performance of Islamic banks. Factors such as non-interest earning assets and customer and short-term financing, etc contribute to the increase of the Islamic banks' profit. Hassan and Bashir (2003)[5], confirm the results of Bashir (2001) in the sense that the performance of Islamic banks is affected not only by the bank's characteristics but also by the financial environment. Their results indicate that controlling for macroeconomic environment[6], financial market structure, and taxation; the high capital and loan-to-asset ratios improve the banks' performance. The study also provides an interesting but surprising results such as the positive correlation between profitability and overhead; and the negative impact of the size of the banking system on the profitability except net on interest margin.

Lastly, the third group of studies is interested in using efficiency frontier methods. Yudistira (2003) analyzed the impact of financial crises on the efficiency of 18 Islamic banks over 1997-2000. This study is based on a non-parametric approach Data Envelopment Analysis (DEA). It assesses a technical frontier of efficiency composed of best practice banks. The efficiency score provided indicates how well a bank transform its inputs in an optimal set of outputs. He highlighted the small inefficiency scores of 18 Islamic banks as compared to conventional banks. Sufian (2007) adopted the same approach as Yudistira (2003) to examine the efficiency in domestic and foreign Islamic banks in Malaysia between 2001 and 2004. He provided evidence that these banks improve their efficiency slightly in 2003 and 2004. However, domestic Islamic banks are found marginally more efficient than foreign Islamic banks. Besides Islamic banks profitability is significantly and positively correlated to three different types of efficiency: technical, pure technical and scale efficiencies.

Lastly, Mokhtar, Abdullah and Al-Habsh (2006) used the Stochastic Frontier Approach (SFA) to measure and analyze technical and cost efficiency of Islamic Malaysian banks. Their findings show that, on average, the efficiency of the overall Islamic banking industry (full-fledged Islamic banks and Islamic windows) has increased during the period of study while that of conventional banks remained stable over time. However, the efficiency level of Islamic banks is still lower than that of conventional banks. The study also reveals that full-fledged Islamic banks are more efficient than Islamic windows[7] for local banks, while Islamic window of foreign banks tend to be more efficient than those of domestic banks.

Those studies focus on one or a few countries. Our study will cover a large range of countries in middle East, Asia, Africa and United Kingdom. Using the SFA we will compare the

[5] They consider a larger sample in 21 countries between 1994 and 2001 and use cross-country bank level data.

[6] The Islamic banks seem to have higher profit margins in favorable macroeconomic environment.

[7] It refers to conventional banks that offer Islamic financial services, as part of their activity.

efficiency of Islamic banks relatively to their geographic situation. Also we will analyze the determinants of their efficiency basing our reflection on the sensitive variables cited in the literature of Islamic banks efficiency.

2. Model specification and Data

2.1 Methods of efficiency measurement

Efficiency is a concept that is close to the economic logic insofar as it involves the optimization of behaviour. It's Farell (1957) who first defines technical efficiency measurement as the deviation from an ideal isoquant. We then have two perspectives. On the one hand, the maximization of outputs produced from a combination of available inputs (output-oriented measure). And on the other hand, the use of minimum quantities of inputs to produce a given quantity of output (input-oriented measure). In both cases the idea of optimization comes from the desire to avoid waste and to be as efficient as possible in achieving the objectives. Measuring the efficiency of banks leads to determine their level of performance in terms of distribution of financial services, based on inputs they use. Methods for efficiency measurement used in the literature, indicate this ability of banks, since they allow calculation of composite indices to take into account this capacity. Islamic banks are different from conventional banks, in that they reject any financial activity involving the interest perception or financial transactions related to unethical activities (weapons, tobacco, alcohol ...). Because the scope of their intermediation activity is redefined and limited, we are led to raise the issue of their efficiency in the distribution of such financial services.

There are two main methods in the literature for efficiency measurement: (1) the non-parametric approach which comes in two ways: Data Envelopment Analysis (DEA) and Free Disposal Hull (DFH) analysis and (2) the parametric approach which has three variants: the Stochastic Frontier Analysis (SFA), the Thick Frontier Approach (TFA) and the Distribution Free Approach (DFA). The first method is a mathematical linear programming, which determines an envelopment surface composed of banks of best practices. The efficiency index is derived by reference to any deviation from the ideal surface. The second method is more accurate than the first one, because it is possible to estimate econometrically the frontier and separate the error term from the inefficiency term. However, it imposes a functional form to the efficiency frontier. This frontier function may be a Cobb-Douglas, a Constant-Elasticity-Substitution or a Translog, depending on the technological form of the firm's production. The inefficiency term derived from the estimate is subsequently used to calculate the efficiency's score.

2.2 Implementing the stochastic frontier analysis

In the current study, we retain the parametric approach and use more specifically a stochastic frontier analysis (SFA). It has the advantage of being more accurate than the nonparametric

approach like DEA. As we explained it before, it allows separating the error term of the inefficiency term. It is therefore less sensitive to measurement errors and outliers[8].

As objective function, we choose a cost function. It allows taking into account the constraints of banks as financial companies, seeking to optimize their financial performance. Thereby minimizing the costs induced by the efficiency frontier, we will take into account this constraint. As functional form, we choose the Translog, as it best suits the multi-products characteristic of banking technology, involving multiple inputs and outputs, cf. Mester (1997), Bauer et al. (1998), Roger (1998) and Isik and Hasan (2002). Regarding the distribution of error and inefficiency term, studies have been made with different assumptions. Meusen and van den Broeck (1977) assume an exponential distribution for the inefficiency term, while Stevenson (1980) and Greene (1990) proposed a gamma distribution. Finally, Cebenoyan, Coopermann, Register and Hudginns (1993) prefer the semi-normal truncated distribution. However, Berger, Hunter and Timme (1993) and Bauer et al. (1998) showed by a detailed literature review that the semi-normal distribution has become the standard assumption. Moreover comparative studies showed that the different assumptions about the distribution of the error term have no impact on the final results. Therefore, we will assume a semi-normal truncated distribution, while the random error follows a normal distribution. We use the maximum likelihood method for the estimate. Panel data allow us to gain in estimation accuracy by increasing the number of data. However, our data are unbalanced as some banks are not observed at certain points in time.

a) Choice of inputs and outputs related to Islamic banks

Estimating efficiency frontier requires the choice of inputs and outputs used and produced by Islamic banks. The literature on banking activities, propose two competing approaches: the production approach and the intermediation approach. In the first one, bank is expected to produce transaction services and information. Products consist of bank accounts opened by the bank to manage loans and deposits. Thus bank output is measured in number of accounts or transactions. In the intermediation approach, banks are supposed to simultaneously offer safe and liquid deposits on the one hand and on the other hand, loans that are riskier and less liquid assets. Under this approach, bank products are expressed in monetary amounts of deposits, loans and other financial assets. Then banking costs relate to operating costs and financial costs. We will use the intermediation approach as it is widely used in the literature. It also assesses bank efficiency as a whole. Besides, the principle of Islamic banking is participation in the company that is using the funds on the basis of PLS principle. Therefore, the intermediation approach emphasizes intermediation function carried out by Islamic banks.

[8] We use SFA instead of TFA or DFA, because the first one although easy to implement, leads to poor information. DFA requires the assumption that cost efficiency is time invariant. Besides, when the time period of the panel is short, the random noise terms may not average 0, and substantial amounts of random noise will appear in the cost inefficiency error component.

This led us to determine as inputs labour, physical capital and deposits. The prices of those inputs are measured respectively by personnel expenses/total assets (PERSONEXP), other expenses/ total assets (OTHEREXP) and income for deposits/total deposits (INTERESTEXP). For outputs, we have net loans (LOANS), net liquid assets (LA) and total earning assets (SECURITIES). This classification is justified by the fact that Islamic banks engage in other types of profitable activities, since they do not charge interest on loans and deposits (see table 3).

In studies of efficiency measurement for production units, economists usually allow for a second step. It's set up to explain the determinants of efficiency. Battese and Coelli (1996) showed that the two-step estimate biases the efficiency scores. Indeed, the elements used in the second stage to explain efficiency influence its determination in the first step. Thus, by excluding them from the expression of the efficiency frontier function, the result is a measurement bias. Battese and Coelli advised therefore to introduce in the frontier function a vector of explanatory variables. Thus, the computed model will be as equation 1 that follows:

$$\ln CT_{ijt} = \alpha_0 + \sum_{m}^{n} \alpha_m \ln p_{m,ijt} + \sum_{s}^{t} \beta_s \ln y_{s,ijt} + 1/2 \sum_{m}^{n} \sum_{n}^{m} \alpha_{m,n} \ln p_{m,ijt} \ln p_{n,ijt} + 1/2 \sum_{s}^{t} \sum_{t}^{s} \ln y_{s,ijt} \ln y_{t,ijt} + \sum_{m}^{n} \sum_{s}^{t} \delta_{m,z} \ln p_m \ln y_{s,ijt} + z_{ijt} + v_{ijt} - u_{ijt} \quad (1)$$

where p_m and p_n are input prices and y_s and y_t are outputs quantities. Because of the specific form of the cost frontier function, we impose constraints on symmetry, $\alpha_{m,n} = \alpha_{n,m}$ and $\beta_{s,t} = \beta_{t,s}$ homogeneity in prices $\Sigma_m \alpha_m = 1$ and adding-up $\Sigma_m \alpha_{m,n} = \Sigma_n \alpha_{n,m} = \Sigma_m \delta_{m,s} = 0$[9]. We also consider homogeneity constraints by normalizing total cost, the labor price and physical capital price by financial capital price.

The composite error term also takes a specific functional form. The random components, v_{ijt} are independently and identically distributed according to standard normal distribution, $N(0;\sigma_v^2)$ while the bank inefficiency components, $u_{ijt} > 0$ are independently but not identically distributed according to a truncated-normal distribution. The Stochastic Frontier Analysis assumes that the inefficiency component of the error term is positive; that is, higher bank inefficiency is associated with higher cost.

The inefficiency of bank i in country j at time t is defined as exp ($\hat{u}_{ijt}$) where $\hat{u}_{ijt}$ is the estimated value of u_{ijt}. However, only the composite error term $\varepsilon_{ijt} = v_{ijt} - u_{ijt}$ can be observed from estimation of the cost function. The best predictor of u_{ijt} is therefore the conditional

[9] Homogeneity constraints are imposed by normalizing total costs and costs of two of the three outputs by the price of the third one.

expectation of u_{ijt} given $\varepsilon_{ijt} = v_{ijt} - u_{ijt}$. To retrieve the inefficiency component from the composite error for each bank from the cost function estimation, we use the method of Jondrow et al. (1982) to calculate the conditional expectation. To investigate factors that are correlated with bank inefficiencies, we use the so called conditional mean model of Battese and Coelli (1993, 1995), which permits in a single-step estimation of the cost function and identification of the correlates of bank inefficiencies. In particular, the estimation procedure allows for bank inefficiencies to have a truncated-normal distribution that is independently but not identically distributed over different banks. The mean of the inefficiency term is modelled as a linear function of a set of bank-level variables. Specifically, the inefficiency terms, u_{ijt} are assumed to be a function of a set of explanatory bank-specific variables, z_{ijt} and a vector of coefficients to be estimated, θ. In other words, $u_{ijt} = z_{ijt}\,\theta + w_{ijt}$ (2)

where the random variable, w_{ijt} has a truncated-normal distribution with zero mean and variance, σ_u^2 . The point of truncation is $-z_{ijt}\,\theta$ so that $w_{ijt} > -z_{ijt}$ and $u_{ijt} > 0$. The inefficiency component of the composite error term therefore has a truncated normal distribution, whose point of truncation depends on the bank-specific characteristics so that the inefficiency terms are non-negative.

To estimate the stochastic efficiency frontier, measures of bank inefficiency and correlates of bank inefficiencies given by Equations (1) and (2), we use the Frontier econometric program developed by Coelli (1996).

b) Choice of variables that explain cost-efficiency:

The variables influencing efficiency and therefore enabling to explain it, are related to characteristics of the banking firm and its production process, as well as the environment in which banks operate. The size of the bank has often been used in the literature as determinants of efficiency. Allen and Rai (1996) showed that large banks can take advantage on economies of scale by sharing costs in the production process. It is measured by the logarithm of total assets. The same authors and more specifically, authors that have worked on Islamic banks such as Yudistira (2003) take into account regulatory and competitive conditions under which banks operate. Thus a variable used to catch profitability of banks is measured by net income/total assets (ROA) (or net income/equity (ROE)); and for Risk Taking Propensity we used the ratio equity/total assets. Indeed, Islamic banks refrain from charging interests on loans and deposits to devote themselves to the principle of PLS. This redefinition of the banking practices lead to new risks that conventional banks do not incur. Hence, there is a double interest here in our study to assess the impact of their risk taking propensity on efficiency (see table 3).

Another variable that could have an impact on efficiency is the market share. It is measured by the ratio of total deposits of the bank/total deposits in the whole banking system. It can increase costs for the banking system in general because it results in slacks and therefore inefficiency that can not be solved. However, it can have a positive impact on efficiency, if it is the result of consolidation and market selection of the largest and most efficient banks. It

appears therefore through lower costs, providing the market is contestable. The GDP per capita is a proxy of the level of development. It influences many factors related to demand and supply of banking services, mainly deposits and loans. Therefore, countries with a higher level of development are supposed to have more developed banking system, with more competitive interest rates and profit margins. Demand density for banking products (measured by deposits per square kilometre), has a negative impact on costs. In countries with high demand density, banks support lower costs in the distribution of banking products. Again, the provision of banking services may be affected by population density. In countries where this variable is low, banking costs are higher and banks are not encouraged to increase their efficiency. We will test wether those variables are significant or not, according to their relative correlation.

c) Data sources:

We used data from balance sheets and income statements in their standard universal version of Database Bankscope. The values of the variables are expressed in current dollars and have been deflated by the consumer price index of the current year in order to reflect macroeconomic differences among countries. The macroeconomic variables come from International Financial Statistics, from the IMF, available through DataStream. Total deposits in each country for the calculation of market power were converted into dollars using market exchange rate end of period.

3. Empirical Results

Our regression is based on unbalanced panel data of 17 countries from the Middle East (Iran, Jordan, Kuwait, United Arab Emirates, Qatar, Bahrain, Lebanon, Saudi Arabia, Yemen), from Asia (Pakistan, Malaysia, Brunei), from Africa (Sudan, Egypt, Tunisia), but also from United Kingdom. This later country has a few Islamic banks where Muslims immigrants can have financial services. Including this banks in our sample allow us to see how well they perform relatively to their counterparts in country where Muslims are not the minority. The covered period is 2001-2008, which allows us to analyze the impact of subprime crisis on Islamic banks efficiency; and the total number of observations is 340. Even if the temporal dimension of our panel is short and barely captures temporal effects, we enjoy other benefits of panel regression, ie flexibility in modeling differences between banks. Precisely to reflect the heterogeneity of data, we first led Haussmann test to determine the specification of the panel model (Tables 1 and 2). The probability of the test being greater than 10% threshold, it does not allow us to discriminate which of the fixed effects model and random effects model is best suited to the data. However, statistical observations allow us to choose the most appropriate model. For all variables in the model, the Within-variance is inferior to the Between-variance (see Table 3). Similarly, the short period of analysis leads us to prefer the random effects model. Our choice is reinforced by the idea that the random effects model allows us to take into account the one sided error term of the inefficiency for each Islamic bank. By this way, we will be able to capture the individual characteristics that are not captured by explanatory variables meant to explain efficiency.

We first estimate an efficiency frontier with the 3 inputs formerly presented in Section 2. However, the cost of deposits which is the income paid to depositors for Islamic banks, is not indicated in the financial statements provided by Bankscope for all banks in the sample. Therefore, estimate of the frontier, taking into account these three inputs reduces the number of available data for estimating and the γ coefficient is not significant. This reflects the non-existence of the efficiency frontier. This leads us to estimate the efficiency frontier by considering as inputs "Personal Expenses" and "Other Expenses", the latter used to normalize "Total costs" and "Personnel Expenses". At this level our estimation method is to incorporate in the estimation of the frontier, explanatory variables for efficiency, one by one taking into account their possible correlation (Table 4).

The results are presented in Table 1. We choose as a basis the model with three explanatory variables: size (logarithm of Total Assets) Return On Assets (Net Income / Total Assets) and Market Power (Bank Deposits/Total Deposits of the whole banking system). The size of the bank has a positive sign and therefore a positive impact on total costs. This implies that Islamic banks do not know how to benefit from economies of scale. This point could be explained by the peculiarity of Islamic financing that meets ethical standards according to the Shariah law. Thus, the inability to engage in certain conventional banking practices may limit the benefits of scale economies. ROA is a measure of banks profitability impact on efficiency. On a theoretical point of view the most profitable banks are the most efficient ones. The coefficient of this variable is negative, indicating a negative impact of profitability on total costs and therefore a positive one on efficiency. Therefore, it is consistent with theory. Lastly, "market power" is not significant.

Table 1 hereafter

We thereafter conducted robustness tests. Since 4 banks in our sample are located in United Kingdom, we proceeded to estimate the efficiency frontier without them. This regression is displayed in table 5 (*regression i*). Although the explanatory variables of efficiency are not significant, the signs of the coefficients are the same.

A second robustness test consisted in including in the regression explanatory variables related to the macroeconomic environment (following Hassan and Bashir, 2003) in order to control this aspect on the efficiency measurement. Despite, the strong correlation among the explanatory variables as shown by table 4, we estimated the frontier including per capita GDP (GDPc), demand density (Dmde) or population density (DPOP) and the propensity to take risk (Risktaking). Results are shown in table 5 (*regression ii*). Results are qualitatively the same than the regression (2) in table 1. In addition, "market power" becomes significant with a negative coefficient. So when we take into account in the regression the macroeconomic environment, Islamic banks with important market power are more efficient in the distribution of Islamic financial services. GDP per capita is not significant, as well as the demand density (and alternatively the density of the population). On the contrary, the variable "RISKTAKING" depicts a small but significant negative coefficient. These qualitative results are the same when we remove from the sample, banks operating in Great Britain, table 5 (*regression iii*).

Based on those robustness checks, we then choose regression 2 in table 1 as our basis model, for the estimate of efficiency scores. Our results are as follow. Islamic banks are efficient at 92,72% on average over the period 2001-2008. This efficiency differs depending on the region with maximum efficiency displayed by Islamic banks operating in Asia (96,21%). This level reflects the strong performance of Malaysian and Pakistani banks that constitute most of our Asian sample. Malaysia in particular is emerging as one of the most developed centers in Islamic finance, after Iran and Saudi Arabia. Since 1975 the government has reformed the financial system, so that it promotes the development of Islamic banking alongside conventional finance. This was especially possible through the Malaysian Islamic Banking Act of 1983. For the Pakistani case, since 1978, the government has fostered the transformation of the banking system through the constitution of Commission for Transformation of Financial System (CTFS), and the establishments of Islamic Banking Department by the State Bank of Pakistan. Thus the government accompanied and framed this transformation through an appropriate regulatory system.

Besides, Islamic banks operating in Africa displayed an average efficiency score of 93,34%, with 92,75% for Sudan whose banking system is essentially Islamic (government legislation). On the other hand, Islamic banks operating in United Kingdom have an efficiency of 93,25%. This country has made efforts to include in its banking regulation, specific rules for Islamic banks to better exercise in the British environment. Therefore, those banks attract capital from Muslim immigrants and also petrodollars from the Middle East seeking investment opportunities. Finally, the Middle East region has an efficiency score of about 92,49%. Especially, Iran which banking system is essentially Islamic (government legislation) displays an average efficiency of 94,38%. Because of this differences in scores efficiency across regions, we integrate in the regression dummies variable, (*table 5, regression iv*). The dummy variable related to the Middle East region (*D_middle_East*) and to the Islamic banking system as government legislation (*D_islamicbkgsystem*) have very weak negative coefficient but significant. These results mean that operating in those countries for Islamic banks is less costly. Conversely, the dummy related to the United Kingdom (*D_UK*) has a positive and significant impact on the cost frontier, meaning that operating in United Kingdom is more costly.

As a whole, Islamic banks efficiency has a decreasing trend over the period of analysis with a peak in 2005. It may be associated with the war in Iraq that began in 2004, which gave rise to an oil shock. Petrodollars' inflows into Islamic banks could explain this peak. Besides, the lowest levels of efficiency appear in 2007 and 2008. This period corresponds to the subprime crisis. Therefore we wanted to check its impact by using a dummy variable (*D_subprime*). However, it was not significant (*table 5, regression iv*). Despite the decrease of Islamic banks efficiency during this period, we cannot assert that this is due to the crisis.

Figure 1 hereafter.

4. Concluding Remarks

Islamic banks have expanded significantly in recent years because of increasing petrodollars inflows, following the oil shocks. These banks are growing at a rate of 15% per year since the early 2000s. And wherever they settle, the authorities try to implement adequate regulation in order to enable them to integrate the banking system of these countries. It is within this context that our study is inserted to measure and understand what explains the efficiency of these banks.

At this purpose, we use the method of stochastic frontier in one step (Battese and Coelli, 1996). This allows us to integrate in the cost frontier explanatory variables of efficiency. Thus, this study shows that size has a negative impact on efficiency indicating that because they distribute Islamic financial services, they may not benefit from economies of scale. Profitability has a positive impact on efficiency, which is consistent with the literature. Finally, market power has a positive impact on efficiency, the more clients Islamic banks have, the more efficient they are.

Furthermore, our study shows that in general Islamic banks are efficient with an average of 92,72%. However there are differences across regions. Banks operating in countries with an Islamic banking system are not necessarily the most efficient. The most efficient region is Asia (96%), with Pakistani and Malaysian banks. However operating in a country where Islamic banking is government legislation or in Middle East is less costly for Islamic banks. Another result observed is the decrease in efficiency at end of period (2007-2008). Although this period corresponds to the subprime crisis we found no evidence that this decrease was due the crisis. A deepening of this study is to measure the efficiency of Islamic banks in relation to conventional banks.

Appendix 1/ An overview on Islamic Banking

A. Islamic Banking system

A.1 The banking principles in Islamic Finance

Islamic banking has been defined as banking in consonance with the ethos and value system of Islam and governed by the principles laid down by Islamic law called the Shari'ah. The Shari'ah is "Way to the water". The "way" of Islam in accord with:

The Qur'an and the Sunna[10] and the Hadith[11] (which are the source of Islamic laws), and Ijma'[12], Qiyas[13] and Ijtihad[14] (which are used to provide interpretation), facilitate future development and implementation of the Islamic judicial system (Pervez, 1990).

Islamic banking is expected not only to avoid interest-based transactions, prohibited in the Islamic Shari'ah, but also to avoid unethical practices and participates actively in achieving the goals and objectives of an Islamic economy. Business and investments made must be conducted in a responsible and committed way.

There are four basic principles in the Islamic banking:

1. The sharing of profit and loss (hereafter SPL) principle. When meeting between a capital provider and an entrepreneur, the principle of participation condemns compensation in the form of interest on capital contribution (riba). Indeed, Islamic morality regards as unfair that the provider of capital does not enjoy large profits that could be achieved if the contractor receives a fixed fee. And conversely, that the lender can require full remuneration even if the project has led to losses. The sharing of profits and losses binds the provider of capital and the entrepreneur, while providing insurance for the entrepreneur from the pooling of risks that this entails. This also has the advantage in terms of resource allocation and efficiency: the fund provider has interest to know the borrower and interest in this project.

[10] It is the second source of Islam faith, refers to the Prophet's acts and words which are related to his practice of faith. It explains and transmits the Qur'an.

[11] They refer to tradition or stories of the Prophet. In contrast with the Sunna which was practiced, the Hadith are records of what was practiced. They have become a controversy between Islamic groups since there are many interpretations of them.

[12] It is the consensus of the Islamic community, umma. It is through his principle that democracy makes its impact on the conduct of Islamic polity.

[13] It is a deductive analogy by which a jurist applies to a new case a ruling made previously in similar cases.

[14] It is independent judgment provided by scholars of Islamic laws for which clear principles and procedures are stipulated in the Qu'ran and Sunna.

Similarly, the fact that the financier will be interested in the result pushes to oversee the work of the contractor and ensures that it has no illegal activity.

2. There are "some" risks (proportional to the efforts) shared by all the partners, whether funds are used in commercial or productive ventures. According to the Islam vision, the risk is necessary to justify a fee but it is prohibited if it is not controllable. The purpose of the contract must exist, be known and assessed at the conclusion of the agreement to protect against the imbalance of the transaction (gharar).

3. All funds should preferably finance socially productive activity. The bank can therefore under no circumstances engage in alcoholic beverage trade or in the pork meat trade or any other activities explicitly prohibited by the Islamic law.

4. The prohibition of Usury (the collection and payments of interest, also commonly called the Riba). Islamic finance deals only with certain aspects of conventional finance. Indeed according to the Shari'ah, the cardinal sin of economic activity is the riba. It is the undue increase of wealth. The collection of remuneration without effort or risk is prohibited. Therefore, no contract between economic agents must disclose directly or indirectly paid or received interest by any of the contractors. A compensation is fair only if it is the counterpart of a real job. Instead, it is possible to calculate the profit of an economic agent on the basis of the rates on the conventional market. Similarly, contracts to receive a variable remuneration or the occurrence of an event are likely to generate a rating imbalance of the transaction, (gharar).

These principles are accompanied by strong constraints that must be taken into account in the commercial and financial arrangements. According to cases, conventional finance will provide tools to meet them. Often, there will be established a specialized engineering to combine several techniques to achieve the goal under the constraints imposed.

Those financial products are designed in order to eliminate in economic transactions Riba as well as many others such as Gharar (risk or uncertainty) and Qimar (speculation). (has been rewritten for a better transition)

A depositor in an Islamic bank can therefore make earnings on his or her deposit in several ways:

- Through return on his capital if it is employed to finance an investment.
- Through profit's sharing if his capital or a share of his capital is employed in a partnership.
- Through rental earnings on an asset that has been partially financed by his capital.

It is clear from the foregoing that there are five basic Islamic financing contracts that are permissible by the Islamic Shari'ah: cost plus (Murabaha)[15], leasing and lease purchase (Ijara and Ijara wa-Iqtina)[16], leasing structured mode (Istinsa)[17], profit sharing (Mudaraba) and equity participation (Musharaka)[18].

A.2 Categories of Islamic banks

There are five categories of operating Islamic banks (Al-Omar et all., 1996):

- The Islamic Development Bank (IDB) which has a main office in Saudi Arabia and three regional offices.[19]
- The banks which operate in countries where the whole banking system is overseen in some way by religious bodies/institutions (like in Pakistan).
- The banks which operate in Muslim countries and which co-exist with interest-based banks (for example in Jordan, Egypt, Malysia).
- The Islamic banks in non-Muslim countries whose monetary authorities do not recognize their Islamic character (like the Al-Baraka International Bank in London and the Islamic Bank in Durban, South Africa).
- The Islamic banks which exist in non-Muslim countries whose monetary authorities do recognize their Islamic character (for instance the Faisal International Bank, FIB based on Copenhagen, Denmark registered under the Danish Banking Supervisory Board).

The Table (1) presents a glance on the presence of Islamic banking in Muslim and non-Muslim countries:

[15] The Islamic Bank acquires a tangible asset at the request of its customer. Then, the bank sells the asset to its customer on a deferred sales basis with a markup which corresponds to the profit of the bank.

[16] The Ijara transaction is similar to the conventional leasing transaction. However, in Ijara wa-iqtina the customer (the lesee) has the option of owing the asset at the end of the contract.

[17] It is a leasing mode which is used to finance long term or large scale facilities involving like construction of manufacturer. Bank can either own the manufacturer and charge the customer a fee based on profits or sell it to the customer on a differed basis similarly like in the Murabaha transaction.

[18] The Islamic bank and the customer invest jointly money into the venture. They agree on the sharing of profits and losses.

[19] Currently, the IDB has 55 member countries. All member countries must be also a member of the Organization of the Islamic Conference and must pay their contribution to the capital of the bank and accept terms and conditions decided upon by the IDB Board of Governors. Its purpose is to support the economic development and social progress of member countries and Muslim communities. The IDB participates in equity capital and grants loans for productive projects and enterprises.

	Islamic Banks (market share, MS)				
No Islamic Banks	Marginal presence	Small MS	Medium MS	High MS	Government legislation
Iraq	Algeria	Malaysia	Bahrain	Kuwait	Iran
Libya	Lebanon	Turkey	Egypt	Qatar	Pakistan
Morocco	Tunisia	Yemen	Jordan		Sudan
Oman			Saudi		
Syria			UAE		

A.3 Aims of the Islamic banking

The first Islamic banks were created to fill a gap in social and economic life of poor population. Their first aim is to support individuals by mobilizing their resources and increasing their awareness of savings. However, the current Islamic banks seem to support the idea that all the other banks (conventional banks) are illicit and have to be replaced by Islamic ones (Henry et all. 2004).

Islamic banks choose the projects which have the highest rate of profit and are the safest and the most socially beneficial. This is why we distinguish two sets of aims in the Islamic banking which are closely related: economic and social aims.

1. Economic aims

- To satisfy the demand and the financial operations of Muslims today in the framework of the principles and percepts of the shari'ah.
- To invest the capital of Muslims into projects which are permissible by the Islamic law to generate licit profits.
- To establish subsidiaries of the Islamic banks in Muslim and non-Muslim countries through the implementation of innovative and various activities.
- To capture the savings of hundreds of millions of Muslims who have never deposit their money in banks such as farmers and artisans.

2. Social aims

- To promote and consolidate co operations among Muslims.

- In addition to the economic promoting of Muslim countries, the Islamic Banking promotes also social development through the almsgiving (zakat)[20] and the creation of funds employed in charitable works.

B. Conventional versus Islamic Banks

There are some major differences between the conventional and the Islamic banking. As explained before, in contrast with conventional banks which have no business limitations, Islamic banks can finance only business not against the teachings of Islam.

Finances are given to the customer by a contract of loan (where the bank is the creditor and the customer is the debtor) in conventional banks and by a contract of a deferred sale contract in Islamic banks: first, the bank buys the goods that the customer requires or appoints him or her to do it on its behalf. Later, the bank sells them to the customer. The loan transaction in conventional banks is substituted for a buying and a selling transaction in the Islamic banks. The selling price is equal to the acquisition's cost plus an agreed profit margin. This price is the contracted amount that the customer must repay.

If the conventional banks earn their profit by financing the customers at a fixed interest rate, the return of the Islamic banks is given by the profits of their trading and investment activities: If they face some risks, these risks must be proportional to their efforts when they are studying the costumers' business and buying and selling the commodities required by their clients.

Given finances to the customer through a buying and selling transaction leads Islamic banks to face more risk than the conventional banks. In both, they have to take into account some risks as credit risks and currency fluctuation and liquidity risks, but only Islamic banks share loss as well as profit and they cannot compensate it with any additional charge: if the customer is unable to pay, the Islamic bank can neither ask for higher selling price because of the delayed settlement dues nor charge additional money such as penalities and compounded interest (Al-Omer and Abdul-Haq 1996).

Consequently, they have to examine and to understand the customers' investments very well. From the point of view of depositors, Islamic banks are less risky than the conventional ones (see among others Aggrawal and Yousaf 2000, Hassan and Bashir 2003, Yudistira 2003, Sufian 2007, Moin 2008).

Some non-Islamic banks in Egypt open "Islamic" branches. Ray (1995) reveals that eleven conventional banks are involved in Islamic banking business for different reasons such as competing with the Islamic ones but also to attempt to weaken the strongest ones. This is an

[20] Zakat institutionalizes the systematic giving of certain percentage (≃2.5%) of one's wealth each year to benefit the poor. It does not include charitable gifts given out of individual generosity and is not a replacement for taxes, but is seen as a form of compulsory worship, purification and redistribution. As it necessitates a regular reassessment of net wealth, Zakat is thought to help concentrate the mind in encouraging compliance with Shari'ah in all financial dealings (Alam, 2004).

interesting phenomenon because even these non-Islamic banks contribute therefore to the "Islamization" of the whole banking system in Egypt.

Another interesting feature is that people involved in the Islamic banking business are usually apolitical and some of them deal with both Islamic and conventional banks. In contrast with expectations, the Islamic banking is neither the monopoly of the Islamic movement nor of its founders (Ray, 1995 and Henry et all., 2004).

Appendix 2 / Tables and figures

Table1: estimate for the cost-efficiency frontier

	(1)	*(2)*
constant 1	-0,0228	-0,0166
	(0,0030)***	(0,0039)***
lnLOANS	-0,1644	1,2770
	(0,0562)***	(0,1239)***
lnSECURITIES	1,3954	-0,0050
	(0,0402)***	(0,1160)
lnLA	-0,1055	0,4272
	(0,0781)	(0,0856)***
ln PERSONEXP	0,2545	-0,3154
	(0,0430)***	(0,0816)***
lnLOANS-lnLOANS	0,0531	0,1358
	(0,0105)***	(0,0190)***
lnLOANS-lnSECURITIES	-0,0120	-0,4229
	(-0,017)	(0,0275)***
lnLOANS-LA	-0,0174	0,0579
	(0,0107)	(0,0235)**
lnSECURITIES-lnSECURITIES	-0,0670	0,2525
	(0,0080)***	(0,0244)***
lnSECURITIES-lnLA	0,0551	-0,1058
	(0,0202)***	(0,0241)***
lnLA-lnLA	-0,0166	-0,0045
	(0,0039)***	(0,0078)
lnPERSONEXP-lnPERSONEXP	0,1519	0,1453
	(0,0150)***	(0,0329)***
ln PERSONEXP-lnLOANS	0,0042	-0,2991
	(0,0138)	(0,0297)***
lnPERSONEXP-lnSECURITIES	0,0624	0,4120
	(0,0149)***	(0,0278)***
lnPERSONEXP-lnLA	-0,0459	-0,0988
	(0,0084)***	(0,0233)***
constant 2	-8,1070	-2,7578
	(0,4285)***	(0,2162)***
SIZE	0,2886	0,4988
	(0,0177)***	(0,0343)***
ROA	-5,6951	-16,3537
	(0,3092)***	(2,1147)***
MARKET POWER		0,1526
		(0,2653)
Gamma	0,9999	0,9992
	(0,0000)***	(0,0002)***

Log-likelihood ratio	1045,789	1032,3
number of observation	334	277

*, ** and *** significant at levels 10%, 5% and 1% respectively.

Table 2: Haussmann test

	coefficients			
	fixed effects	**random effects**	**difference**	**standard error**
lnLOANS	0,3957	0,3995	-0,0038	0,0170
lnSECURITIES	0,1285	0,1290	-0,0005	0,0222
lnLA	0,4033	0,4004	0,0029	0,0139
lnPERSONEXP	0,4172	0,3464	0,0708	0,0386
lnLOANS-lnLOANS	0,0769	0,0774	-0,0006	0,0023
lnLOANS-lnSECURITIES	-0,1145	-0,1167	0,0022	0,0051
lnLOANS-lnLA	-0,0212	-0,0205	-0,0007	0,0014
lnSECURITIES-lnSECURITIES	0,1011	0,1021	-0,0010	0,0036
lnSECURITIES-lnLA	-0,0684	-0,0689	0,0005	0,0029
lnLA-lnLA	0,0329	0,0330	-0,0002	0,0007
lnPERSONEXPlnPERSONEXP	-0,0003	-0,0059	0,0056	0,0032
lnPERSONEXP-lnLOANS	0,0430	0,0339	0,0091	0,0046
lnPERSONEXP-lnSECURITIES	-0,0564	-0,0397	-0,0167	0,0086
lnPERSONEXP-lnLA	0,0300	0,0284	0,0015	0,0019
Probability > chi2				0,9664

Table 3: statistics for the arguments of the cost-frontier function

Variable		Mean	Standard Deviation	Minimum	Maximum
lnTOTALCOST	overall	6,8564	2,1455	-0,4141	14,5537
	between		2,1481	2,1309	14,5537
	within		0,8524	2,9451	9,1508
lnLOANS	overall	5,1795	2,5465	-2,7988	10,4183
	between		2,4195	-2,1652	9,7068
	within		0,9667	-2,3657	7,7873
lnSECURITIES	overall	6,1571	2,1968	-2,5344	10,7905
	between		2,0720	0,7703	9,9131
	within		0,8574	0,5797	8,6233

lnLA	overall	4,5557	2,3734	-3,3302	9,3142
	between		2,1677	-1,5618	8,1801
	within		1,0172	-0,1042	7,8581
lnPERSONEXP	overall	0,0197	1,7043	-4,2028	17,8739
	between		2,2166	-3,5738	16,7185
	within		0,3832	-1,6673	2,4077
SIZE	overall	43,1454	333,6532	-1,6094	4986,9930
	between		253,9436	2,1570	2067,1260
	within		207,4721	-1538,0430	2963,0120
ROA	overall	0,0191	0,0733	-0,8000	0,5399
	between		0,0618	-0,2167	0,3326
	within		0,0531	-0,5642	0,3660
ROE	overall	0,1174	0,2909	-1,1514	4,6680
	between		0,2191	-1,1514	0,9374
	within		0,2411	-1,1628	4,2003
RISKTAKING	overall	0,2372	0,2318	-0,2000	1,0000
	between		0,2090	0,0393	0,9461
	within		0,1184	-0,3217	0,8567
MARKETPOWER	overall	0,1324	0,2006	0,0000	0,9758
	between		0,1825	0,0000	0,7408
	within		0,0655	-0,1526	0,4372

Table 4: Correlation between determinants of cost-efficiency

	SIZE	ROA	ROE	RISKTAKING	MARKETPOWER	GDPCP	GDPCT	DPOP	DMDE
SIZE	1								
ROA	0,0798	1							
ROE	0,0366	0,4540*	1						
RISKTAKING	0,0308	0,2054*	-0,0943*	1					
MARKETPOWER	0,009	0,094	0,034	-0,0959	1				
GDPCP	0,0962*	0,1830*	0,0865*	0,2144*	0,0677	1			
GDPCT	0,0793*	0,1578*	0,0503	0,2446*	0,025	0,9210*	1		
DPOP	-0,0209	0,1256*	-0,0065	0,3399*	0,1947*	0,2053*	0,1724*	1	
DMDE	-0,0278	0,1815*	0,0559	0,2725*	-0,0503	0,2665*	0,3769*	0,3892*	1

*, ** and *** significant at levels 10%, 5% and 1% respectively.

Table 5: robustness checks for the cost-frontier function

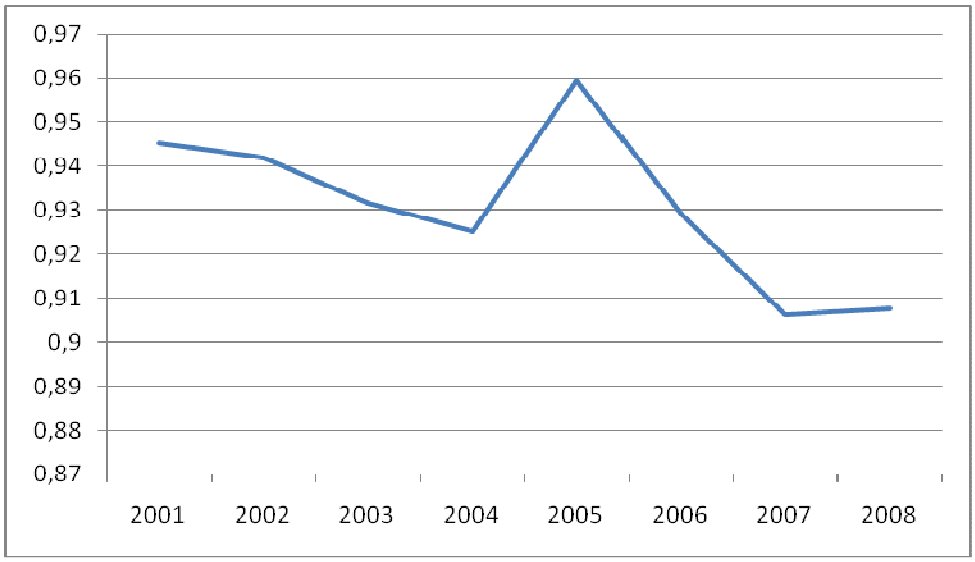
	i	*ii*	*iii*	*iv*
Constant 1	-0,0625	-0,0056	-0,0096	-0,0124
	(0,0499)	(0,0023)**	(0,0061)	(0,0083)
lnLOANS	2,5293	1,4493	0,3089	0,9609
	(0,7839)***	(0,1727)***	(0,1422)**	(0,2095)***
lnSECURITIES	-1,1307	-0,5267	0,5638	-0,0881
	(0,7233)	(0,1192)***	(0,1499)***	(0,0652)
lnLA	0,4528	0,6301	0,5785	0,7706
	(0,7496)	(0,1078)***	(0,1095)***	(0,0619)***
ln PERSONEXP	-0,4330	-0,4583	-0,0228	-0,3127
	(0,8101)	(0,1016)***	(0,0403)	(0,1412)**
lnLOANS-lnLOANS	0,3433	0,0817	0,0655	0,0221
	(0,2934)	(0,0247)***	(0,0310)**	(0,0470)
lnLOANS-lnSECURITIES	-0,9799	-0,4241	-0,1322	-0,2602
	(0,4328)**	(0,0643)***	(0,0641)**	(0,0826)***
lnLOANS-LA	0,1653	0,1711	0,0276	0,1461
	(0,2779)	(0,0090)***	(0,0134)**	(0,0210)***
lnSECURITIES-lnSECURITIES	0,5365	0,3555	0,1047	0,2555
	(0,2121)**	(0,0311)***	(0,0414)***	(0,0289)***
lnSECURITIES-lnLA	-0,1186	-0,2438	-0,1356	-0,2449
	(0,2991)	(0,0233)***	(0,0336)***	(0,0288)***
lnLA-lnLA	-0,0321	0,0014	0,0232	0,0056
	(0,0788)	(0,0078)	(0,0066)***	(0,0132)
lnPERSONEXP-lnPERSONEXP	0,6393	0,3515	0,2885	0,2127
	(0,4496)	(0,0385)***	(0,0465)***	(0,0625)***
ln PERSONEXP-lnLOANS	-0,7617	-0,4907	-0,1574	-0,3221
	(0,7276)	(0,0225)***	(0,0701)**	(0,0545)***
lnPERSONEXP-lnSECURITIES	0,9515	0,5808	0,2290	0,4405
	(0,5218)*	(0,0260)***	(0,0433)***	(0,0786)***
lnPERSONEXP-lnLA	-0,2476	-0,0195	-0,0125	-0,0477
	(0,2927)	(0,0148)	(0,0248)	(0,0237)**
Constant 2	-0,0963	-4,0654	-3,8440	-1,6478
	(0,1345)	(0,3480)***	(0,4988)***	(0,0500)***
SIZE	0,0783	0,7460	0,7678	0,4692
	(0,0960)	(0,0495)***	(0,0378)***	(0,1121)***
ROA	-0,0771	-27,3961	-19,7588	-6,4732
	(0,7692)	(3,7700)***	(3,5437)***	(0,9813)***
MARKET POWER	-0,0728	-1,1569	-2,0684	-3,4723
	(0,7532)	(0,5545)**	(0,6920)***	(0,6496)**
DPOP		0,0000	0,0000	
		(0,0000)	(0,0000)***	
GDPC		0,0008	-0,0030	
		(0,0016)	(0,0016)*	

RISKTAKING		-0,0001	-0,0001	
		(0,0000)***	(0,0000)***	
D_Middle_East				-2,4686E-06
				(0,0000)**
D_UK				0,0042
				(0,0020)**
D_islamicbkgsystem				-3,0057E-08
				(0,0000)***
D_subprime				0,0439
				(0,5053)
Gamma	0,9969	0,9999	0,9999	0,9996
	(0,0063)***	(0,0000)***	(0,0002)***	(0,0007)***
Log-likelihood Ratio	235,23	1270,12	1186,42	855,8
Number of observations	261	277	270	267

*, ** and *** significant at levels 10%, 5% and 1% respectively.

(i) Cost-efficiency frontier without Islamic banks in Great Britain
(ii) Cost-efficiency frontier with the initial sample and macroeconomics variables
(iii) Cost-efficiency frontier with macroeconomics variables without Islamic banks in United Kingdom
(iv) Cost-efficiency frontier with the initial sample and dummies variables.

Figure 1: Evolution of Islamic banks efficiency from 2001-2008.



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