

## The Determinants Efficiency and Profitability of World Islamic Banks

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**Abstract**—The paper investigates the efficiency of the 78 Islamic banks in 25 countries for the period of 1992-2009. Islamic banks products are compliance with the Islamic laws (*syaria*) that forbids the giving or receiving of *riba*<sup>1</sup>. The efficiency estimates of individual banks are evaluated using the non-parametric Data Envelopment Analysis (DEA) method. The empirical findings seem to suggest that the World Islamic banks have exhibited high pure technical efficiency. A multivariate analysis based on the Tobit model reinforces these findings and significantly associated with operating expenses against asset, size, equity, NPL, Asia Financial Crisis and national income level (GDP). We also find positive correlation between bank profitability and technical efficiency levels, indicating that the more efficient banks tend to be more profitable with strong result at Asian Islamic banks. The Fixed Effect Model (FEM) that been used to analyze profitability proposed that profit efficiency is positive and statistically significant with operating expenses against asset, equity, high income countries and non performing loans against total loans. Interestingly, the empirical results show that more profitable banks are those that have higher operating expenses against asset, more equity against asset and concentrated at high income countries demonstrating close relationship between monetary factors in determining Islamic banks profitability.

**Keywords**—*Islamic Banks, Data Envelopment Analysis (DEA), Multivariate Analysis, Profitability, Panel Regression Analysis.*

*JEL Classification:* G21; G28

### I. INTRODUCTION

Islamic banks today exist in all parts of the world, and are looked upon as a viable alternative system which has many things to offer. While it was initially developed to fulfill the needs of Muslims, Islamic banking has now gained universal acceptance. Islamic banking is recognized as one of the fastest growing areas in banking and finance. Since the opening of the first Islamic bank in Egypt in 1963, Mit

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The number of Islamic financial institutions worldwide has risen. The Islamic banking total assets worldwide are estimated to have exceed \$250 billion and are growing at an estimated pace of 15 percent a year. Saleh and Zeitun (2007) found that interesting development of Islamic banking globally. Islamic financial products are aimed at investors who want to comply with the Islamic laws (*syaria*) that govern a Muslim's daily life. *Syaria*' law forbids the giving or receiving of *riba* (because earning profit from an exchange of money for money is considered immoral); mandate that all financial transactions be based on real economic activity; and prohibit investment in sectors such as tobacco, alcohol, gambling, and armaments.

The aim of this paper is to fill a demanding gap in the literature by providing the empirical evidence on the performance of Islamic banks in the world during the period of 1992 to 2009. The efficiency estimate of each Islamic bank is computed by using the non-parametric Data Envelopment Analysis (DEA) method. The method allows us to distinguish between three different types of efficiency measures, namely technical, pure technical, and scale. We have constructed and analyzed the results derived from dynamic panels, which is critical in a dynamic business environment as a bank may be the most efficient in one year but may not be in the following year (s). A dynamic panel analysis will also highlight any significant changes taking place in the Islamic banking sector during the period of study. The paper also explores the proximate sources of (in) efficiency under the multivariate framework and relates the

<sup>1</sup> *Riba*' the English translation of which is *usury* is prohibited in Islam and is acknowledged by all Muslims. The prohibition of *riba*' is clearly mentioned in the Quran, the Islam's holy book and the traditions of Prophet Muhammad (*sunnah*). The Quran states: "Believers! Do not consume *riba*", doubling and redoubling..." (3:130); "God has made buying and selling lawful and *riba*' unlawful..." (2:274).

findings to bank specific characteristics. Then we test the relationship between bank profitability and the bank characteristic and economic condition determinants via Fixed Effect Model (FEM) analysis.

Since the countries of coverage are span across 25 countries, we also study the efficiency result base on the Islamic bank country of origin. The countries are diversified in term of the economy activity; we divided the classification by using 2003 Gross National Income (GNI) published by World Bank. According to 2003 GNI per capita, calculated using the *World Bank Atlas method*<sup>2</sup>. The income groups are: low income, \$765 or less; middle income, \$766 - \$9,385 and high income, \$9,386 or more.

This paper unfolds as follows. Section 2 provides an overview of the related studies in the literature, followed by a section that outlines the method used and choice of explanatory variables for the DEA, Tobit and FEM model. Section 4 reports the empirical findings. Section 5 concludes and offers avenues for future research.

## II. REVIEW OF THE LITERATURE

While there have been extensive literatures examining the efficiency features of the contemporary banking sector, particularly the U.S. and European banking markets, the work on Islamic banking is still in its infancy. Typically, studies on Islamic bank efficiency have focused on theoretical issues and the empirical work has relied mainly on the analysis of descriptive statistics rather than rigorous statistical estimation (El-Gamal and Inanoglu, 2004). However, this is gradually changing as a number of recent studies have sought to apply various frontier techniques to estimate the efficiency of Islamic banks.

Viverita et al. (2007) in their study of Islamic bank in Asia, Africa and Middle East found the average Middle East bank size was some US \$2 billion with Asia Islamic banks averaging US \$900 million and African banks just US \$151 million. The other finding is the age of each bank was correlated against the various efficiency results. It could be expected that newer banks may have had a chance to implement newer technologies. In this case, technical efficiency results were not correlated with the bank's age. More recently, (Sufian et al. 2008) examined the efficiency of the Malaysian Islamic banking sector during the period 2001-2006 by using the non-parametric Data Envelopment Analysis (DEA) method. The empirical findings suggest that during the period of study, pure technical inefficiency outweighs scale inefficiency in the Islamic banking sector implying that the Islamic banks have been managerially inefficient in exploiting their resources to the fullest extent. The empirical findings seem to suggest that the MENA Islamic banks have exhibited higher technical efficiency compared to their Asian Islamic banks counterparts. During the period of study he fined that pure technical inefficiency has greater influence in determining the total technical

inefficiency of the MENA and the Asian Islamic banking sectors.

Ben Naceur and Omran (2008) examine the influence of bank regulations, concentration, financial and institutional development on Middle East and North Africa (MENA) countries commercial banks' margin and profitability during the period 1989–2005. They find that bank-specific characteristics, in particular bank capitalization and credit risk, have positive and significant impact on banks' net interest margin, cost efficiency and profitability. On the other hand, macroeconomic and financial development indicators have no significant impact on bank performance. More recently, Sufian and Habibullah (2009) examine the determinants of the profitability of the Chinese banking sector during the post-reform period of 2000–2005. The empirical findings suggest that all the determinant variables have statistically significant impact on China banks profitability.

## III. METHODOLOGY

A non-parametric Data Envelopment Analysis (DEA) is employed with variable return to scale assumption to measure input-oriented technical efficiency of World Islamic banking sectors. DEA involves constructing a non-parametric production frontier based on the actual input-output observations in the sample relative to which efficiency of each firm in the sample is measured (Coelli, 1996). Let us give a short description of the Data Envelopment Analysis<sup>3</sup>. Assume that there is data on  $K$  inputs and  $M$  outputs for each  $N$  bank. For  $i$ th bank these are represented by the vectors  $x_i$  and  $y_i$  respectively. The convexity constraint determines how closely the production frontier envelops the observed input-output combinations and is not imposed in the constant returns to scale case. The variable returns to scale technique therefore forms a convex hull which envelops the data more tightly than the constant returns to scale, and thus provides efficiency scores that are greater than or equal to those obtained from the constant returns to scale model.

### A. Data Sample, Inputs-Outputs Definition, and the Choice of Variables

It is commonly acknowledged that the choice of variables in efficiency studies significantly affects the results. The problem is compounded by the fact that variable selection is often constrained by the paucity of data on relevant variables. The cost and output measurements in banking are especially difficult because many of the financial services are jointly produced and prices are typically assigned to a bundle of financial services. Two approaches dominate the banking theory literature: the production and intermediation approaches (Sealey and Lindley, 1977). Following among others, Hassan (2005), and Sufian (2006), a variation of the intermediation approach or asset approach originally developed by Sealey and Lindley (1977) will be adopted in the definition of inputs and outputs used in this study. Furthermore, as at most times bank branches are engaged in

<sup>2</sup> Atlas conversion factor, Calculating gross national income (GNI—formerly referred to as GNP) and GNI per capita in U.S. dollars for certain operational purposes, the World Bank uses the Atlas conversion factor. The purpose of the Atlas conversion factor is to reduce the impact of exchange rate fluctuations in the cross-country comparison of national incomes.

<sup>3</sup> Good reference books on efficiency measures are Thanassoulis (2001), Cooper et al. (2000), and Avkiran (2002).

the processing of customer documents and bank funding, the production approach might be more suitable for branch efficiency studies (Berger and Humphrey, 1997).

It is also of considerable interest to explain the determinants of the technical efficiency scores derived from the DEA model. As defined in equations 1 to 3, the DEA score falls between the interval 0 and 1 ( $0 < h^* \leq 1$ ) making the dependent variable a limited dependent variable. A commonly held view in previous studies is that the use of the Tobit model can handle the characteristics of the distribution of (in) efficiency measures and thus provide results that can provide important policy guidelines to improve performance. Accordingly, DEA efficiency scores obtained in the first stage is used as a dependent variable in the second stage one side censored Tobit model in order to allow for the restricted [0, 1] range of efficiency values.

To test the relationship between bank profitability and the bank-specific and macroeconomic determinants described earlier, we estimate a linear regression model and apply the Ordinary Least Square (OLS) method, while the standard errors are calculated by using White's (1980) transformation to control for cross-section heteroskedasticity. As a robustness checks, the empirical setting is also performed by using the least square method of Fixed Effects Model (FEM) to control for bank-specific effects.

Due to entry and exit factor, the efficiency frontier is constructed by using an unbalanced sample of 78 Islamic banks operating in the World during the period 1992-2009 yielding 464 bank year observations. Data for the empirical analysis is sourced from individual bank's annual balance sheet and income statements and BankScope database by IBCA as per June 2010. The BankScope database converts the data to common international standards to facilitate comparisons and all financial information is reported both in local currency and in US dollar. We use US dollar data which makes the comparison across country consistent. For DEA we as multi-product firms producing three outputs namely, *Total Loans* ( $y_1$ ), *Income* ( $y_2$ ), *Other Earning Asset* ( $y_3$ ), and engaging three inputs namely, *Total Deposits* ( $x_1$ ), *Labor cost* ( $x_2$ ) and *Total Assets* ( $x_3$ ). All variables are measured in millions of US Dollars (US\$) and are deflated against the respective countries inflation rates. For Tobit Multivariate Analysis and Fixed Effect Model, there is numbers of explanatory variables that segregate into two categories. The first is Bank characteristics namely OE/TA, EQUITY/TA, LN TA, LOANS/TA, LNDEPO and NPL/TL. While the LNGDP, INFLATION, MARKET and 7 dummy to test various event (AFC, GFC, MENA, ASIA, LOW, MEDIUM & HIGH) fall under economic condition.

#### IV. RESULTS

In this section, we will discuss the technical efficiency change (TE) of the World Islamic banking sectors, measured by the DEA method and its decomposition into pure technical efficiency (PTE) and scale efficiency (SE) components. In the event of the existence of scale inefficiency, we will attempt to provide evidence on the nature of the returns to scale of each Islamic bank. The

Islamic banks' efficiency is examined for each year under investigation.

As suggested by Bauer et al. (1998), DeYoung and Hasan (1998), and Isik and Hassan (2002), constructing an annual frontier specific to each year is more flexible and thus more appropriate than estimating a single multiyear frontier for the banks in the sample. Following the earlier studies, for the purpose of the study, we prefer to estimate separate annual efficiency frontier for each year. In other words, there were six separate frontiers constructed for the study. Isik and Hassan (2002) contended that the principal advantage of having panel data is the ability to observe each bank more than once over a period of time. The issue is also critical in a continuously changing business environment because the technology of a bank that is most efficient in one period may not be the most efficient in another. Furthermore, by doing so, we alleviate, at least to an extent, the problems related to the lack of random error in DEA by allowing an efficient bank in one period to be inefficient in another, assuming that the errors owing to luck or data problems are not consistent over time (Isik and Hassan, 2002).

##### A. *Efficiency of the World Islamic Banking Sectors*

It is clear that the World Islamic banks' efficiency was on increasing on 2003 and 2004 before decline for 3 years in 2005 to 2007 before increase in two last year in sample period on 2008 and 2009. The results seem to suggest that the World Islamic banks have exhibited mean technical efficiency of 66.0%, suggesting mean input waste of 34.0%. This implies that the World Islamic banks could have produced the same amount of outputs by only using 66.0% of the amount of inputs it employed. It is also clear that country income status whether the Islamic Bank operated affected the efficiency level does not specifically at high income country only. We take 2 specific sample of year 2008 and 2003. Year 2008 with 3 bank share the score of the highest efficiency score is Faisal Islamic Bank of Egypt that fall under middle income country, Asia Islamic Bank of Singapore that been categorize high income country and Tadhamon International Islamic Bank of Yemen from Low income country. It shows that the most efficient bank from the sample study is not specifically to certain income country group only but shared among three classification groups. It applies also to the lowest efficient bank for this two year, started at 2008 with Bank Islam Brunei Darussalam from high income country followed by Faisal Islamic Bank of Egypt on 2003 from middle income country. From 1992 to 2009 all the highest efficient score is 100%. While the lowest is varies from the region of 5% to 7%.

During Global Financial Crisis (GFC) on 2008, the result indicated that, the trend is increasing from 50% in 2007 to 65% in 2008 and continuously increases to 95% in 2009. The result clearly stated that World Islamic Bank efficiency level is increasing during GFC period. There is possibility Islamic Bank has better prepared for it and also possibility on migration of consumer confidence from conventional banking system to Islamic banking model during GFC that cause the result that favor Islamic bank.

### B. Composition of the Efficiency Frontier

While the results above highlight the sources of technical inefficiency of the Islamic banks, we next turn to discuss the sources of the scale inefficiency of the Islamic banks. As have been mentioned earlier, a bank can operate at CRS or VRS where CRS signifies that an increase in inputs results in a proportionate increase in outputs and VRS means a rise in inputs results in a disproportionate rise in outputs. Further, a bank operating at VRS can be at increasing returns to scale (IRS) or decreasing returns to scale (DRS). Hence, IRS means that an increase in inputs results in a higher increase in outputs, while DRS indicate that an increase in inputs results in lesser output increases<sup>4</sup>.

During the period of study, high income country Islamic banks seem to have dominated the highest three efficiency frontier, leading by Bahrain, followed by UAE and number three by Qatar. There is eight Islamic banks have failed to appear at least once on the frontier. All of the eight Islamic banks were fall under low and middle income country. In general, the table indicates that while the small banks tend to operate at CRS or IRS, the large banks tend to operate at CRS or DRS, the findings which are similar to the earlier studies by among others McAllister and McManus (1993) and Noulas et al. (1990). To recap, McAllister and McManus (1993) have suggested that while the small banks have generally exhibited IRS, the large banks on the other hand tend to exhibit DRS and at best CRS. As it appears, the low and middle income country where the Islamic banks operated, experienced increasing returns to scale (IRS) in their operations during the period of the study. One implication is that for the low and middle income country Islamic banks, a proportionate increase in inputs would result in more than a proportional increase in outputs. Hence, the Islamic banks at low and middle income country which have been operating at IRS could achieve significant cost savings and efficiency gains by increasing its scale of operations. Thus, the banks that experience IRS should either eliminate their scale inefficiency or be ready to become a prime target for acquiring banks, which can create value from underperforming banks by streamlining their operations and eliminating their redundancies and inefficiencies (Evanoff and Israelvich, 1991). On the other hand, the results seem to suggest that the Islamic bank operated at high income country incline to be more efficient compare to Islamic bank operated at low and middle income country.

### C. The Determinants of the Islamic Banks' Efficiency

Regression results focusing on the relationship between bank efficiency and the explanatory variables will be

<sup>4</sup> To identify the nature of returns to scale, first the CRS scores (obtained with the CCR model) is compared with VRS (using BCC model) scores. For a given bank, if the VRS score equals to its CRS score, the bank is said to be operating at constant returns to scale (CRS). On the other hand, if the scores are not equal, a further step is needed to establish whether the bank is operating at IRS or DRS. To do this, the DEA model is used under the non-increasing returns to scale assumptions (NIRS). If the score under VRS equals the NIRS score, then the bank is said to be operating at DRS. Alternatively, if the score under VRS is different from the NIRS score, than the bank is said to be operating at IRS (Coelli et al., 1998).

discussed in details. The equations are based on 464 bank year observations during the 1992-2009 periods. As pointed by Saxonhouse (1976), heteroscedasticity can emerge when estimated parameters are used as dependent variables in the second stage analysis. Thus, following Pasiouras (2007), QML (Huber/White) standard errors and covariates are calculated. Several general comments regarding the test results are warranted. The model performs reasonably well in at least two respects. For one, results for most variables remain stable across the various regressions tested. Secondly, the findings suggest that all explanatory variables have the expected signs and in most cases are statistically different from zero.

For operating expense to total assets (OE/TA) the result exhibit positive relationship at 0.0001 nearly to negative with bank efficiency levels and is statistically significant at the 1% level. In line with the findings of Akhigbe and McNulty (2005), EQUITY/TA seem to exhibit positive relationship with bank efficiency levels and is statistically significant at the 1% level. The findings seem to suggest that the more efficient banks, *ceteris paribus*<sup>5</sup>, uses less leverage (more equity) compared to their peers. The findings indicate that LNTA, as a proxy of bank's size, shows positive and significant coefficients at 5% & 10% level, suggesting that the larger the bank, the more efficient the bank will be, purely because of the economies of scale arguments. The proxy of loans intensity, LOANS/TA, reveals negative relationship (statistically significant at the 1% level) with bank efficiency levels. The findings seem to suggest that banks with higher loans-to-asset ratio tend to exhibit lower efficiency levels. The finding is contradict with earlier findings by Sufian and Noor (2009). As expected, NPL/TL exhibits positive relationship in all years with bank efficiency and statistical significance at 1% for model 1, 2, 3 and 9 indicating increase in efficiency. The finding is contradicted with earlier findings by Kwan and Eisenbeis (1995) who found negative relationship between problem loans and bank efficiency. We measured the national income growth by using Gross Domestic Product (GDP) which been log and code as LNGDP. The result shown positive relationship between bank efficiency and GDP and all the efficiency measure were statistically significant at the 1% level. The result explains that demand for financial services tends to grow as economies expand and societies become wealthier. Bank businesses will growth with every GDP percentage growth since both variables positively correlated and closely dependent in every economics where Islamic banks operated. Base on observation, during good economy cycle, all finance infrastructures like stock market; demand for financial product by businesses like financing, deposit etc will increase. This directly will increase the Islamic banks efficiency.

The results above seem to suggest that most of the bank trait variables continued to remain robust in the directions and significance level. Favourable economic conditions and continuous growing interest may have fuelled higher demand for Islamic banking products and services, reduces default

<sup>5</sup> is a Latin phrase, literally translated as "with other things the same," or "all other things being equal or held constant."

loan probabilities, and thus resulting in a greater output. As a final check, dummy variables for several events to represent changes over time and environmental changes i.e. AFC, GFC, MENA, ASIA, GNI LOW, GNI MEDIUM and GNI HIGH are used to take into account for changes in the Islamic banking sector environments during the period<sup>6</sup>.

#### D. *The Islamic Banks' Profitability Performance*

We will select ROE as dependent variable base on several reasons. Of all the fundamental ratios that measure profitability, one of the most important is return on equity. It's a basic test of how effectively a company's management uses investors' money. By measuring how much earnings a company can generate from assets, ROE offers a gauge of profit-generating efficiency. Firms that do a good job of milking profit from their operations typically have a competitive advantage, a feature that normally translates into superior returns for investors. Internal determinants or bank characteristic are factors that are mainly influenced by a bank's management decisions and policy objectives. Such profitability determinants are the level of liquidity, provisioning policy, capital adequacy, expenses management, and bank size. On the other hand, the external determinants or economic condition, both industry and macroeconomic related, are variables that reflect the economic and legal environments where the financial institution operates. (Sufian and Habibullah 2009).

The ratio of Operating Expenses to Total Assets (OE/TA) is used to provide information on the bank operating costs against asset have. The result exhibit positive relationship with bank profitability at all 10 models with 5 models is statistically significant at the 1% level. The result justification that talent is attracted to benefit and financial returns offered by organization in working environment is also applicable in Islamic bankings on justifying strong positive relationship between bank profitability with OE/TA ratio. Referring to the impact of capitalization, it is observed from Table 6 that EQUITY/TA exhibits positive relationship with profitability and is statistically significant at 1% level. But when we control for GNI country income, the result is still positive but not significant. These consistent with previous studies by Sufian and Habibullah 2009 providing support to the argument that well capitalized banks face lower costs of going bankrupt, thus lowers their funding cost, or that they have lower needs for external funding resulting in higher profitability. Nevertheless, strong capital structure is essential for banks in emerging economies since it provides additional strength to withstand financial crises and increased safety for depositors during unstable macroeconomic conditions. Then we test the bank originated from Asian, value of 1 for banks from the Asian (ASIA) region and 0 otherwise is included in model 6 & 7 of the regression. The result exhibits negative relationship with profitability and is statistically significant at 10% level. The result is interesting since Asian Islamic banks is less profitable compare than MENA Islamic banks and consistent

with our earlier result for bank efficiency, ASIA is less efficient compare to MENA. These seem to suggest that bank efficiency and profitability have positive correlation. For GNI country classification income, the result implies that Islamic banks originated from MEDIUM income countries have negative relationship with profitability. This contradicts with basic understanding that when people have money, banking sector will benefit from it via higher deposits, more subscribers in financial product etc. It may results of middle income countries consumer does not engage with banking product and facility that contribute to these negative relationships with bank profitability. The result for HIGH income countries found positive relationship and statistical significant at 10% level. This is interesting since MEDIUM & HIGH income countries have different result finding between one and another. The result support Pareto rules of 80/20 where 20% population will contribute 80% of profitability, most of HIGH income countries<sup>7</sup> in the study are relatively smaller in population. This indicate that although earlier result in bank efficiency relationship stated negative, it seem that the negative relationship on bank efficiency have vice versa relationship for profitability. We may stated that profitability of HIGH income countries is correlated with understanding that people or organization will engage more with banking product that can lead towards profitability of the Islamic banks.

## V. CONCLUSION

The empirical findings seem to suggest that the World Islamic banks have exhibited high pure technical efficiency. A multivariate analysis based on the Tobit model reinforces these findings and significantly associated with operating expenses against asset, size, equity, NPL, Asia Financial Crisis and national income level (GDP). We also find positive correlation between bank profitability and technical efficiency levels, indicating that the more efficient banks tend to be more profitable with strong result at Asian Islamic banks. The Fixed Effect Model (FEM) that been used to analyze profitability proposed that profit efficiency is positive and statistically significant with operating expenses against asset, equity, high income countries and non performing loans against total loans.

Due to its limitations, the paper could be extended in a variety of ways. Firstly, the scope of this study could be further extended to investigate changes in cost, allocative, and technical efficiencies over time. Secondly, it is suggested that further analysis into the investigation of the Islamic banking sector efficiency to consider risk exposure factors. Finally, investigation of changes in productivity over time as a result of technical change or technological progress or regress by employing the Malmquist Total Factor Productivity Index could yet be another extension to the paper. Despite these limitations, the findings of this study are expected to contribute significantly to the existing knowledge on the operating performance of the World Islamic banking industry. Nevertheless, the study have also

<sup>6</sup> AFC and GFC is dummy for specific event for the financial crisis while GNI LOW, MEDIUM AND HIGH were use as indicator variables for country income levels where the Islamic Banks originated. All of this was included in the regression equation base on different regression model.

<sup>7</sup> High Income Countries in the study is Bahrain, Brunei, Kuwait, Singapore, UAE, Qatar & UK, all relatively small in population except for UK.

provide further insight to bank specific management as well as the policymakers with regard to attaining optimal utilization of capacities, improvement in managerial expertise, efficient allocation of scarce resources and most productive scale of operation of the banks in the industry. This may also facilitate directions for sustainable competitiveness of World Islamic banking operations in the future.

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