DETERMINANTS OF COST EFFICIENCY OF ISLAMIC BANKS OF PAKISTAN

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ABSTRACT

Efficient utilization of the resources as trust of the depositors is the first and foremost responsibility of the Islamic bank, as directed in Al-Quran (17:29). Efficiency in managing the cost of the bank is only aspect that bank can control which can lead to increase in income of bank and depositors. There is a vast literature on theoretical models of business cost minimization but in reality the situation is not promising. This paper aims to measure and compare the real cost efficiency of full-fledged Islamic banks operating in Pakistan between the years of 2003 to 2015, using the Panel Stochastic Frontier Approach (SFA). The results revealed that surprisingly the Islamic banks in Pakistan are only 36 percent cost efficient, which can be contributed to the challenges faced because of parallel Islamic & conventional banking system and the nature of support from the regulatory and economic system. While determining the factors for efficiency for banking, fixed effect estimates revealed that operating efficiency, asset utilization has a positive effect while profit margin has a negative effect on cost efficiency. This study concludes that Islamic banks are facing issues of excess liquidity, inadequate support from regulatory authorities and competition from the conventional banking system which are causing inefficiency in cost management.

Keywords: Stochastic frontier approach, Islamic banks, cost efficiency

INTRODUCTION

Islamic banks today exist in all parts of the world and are looked upon as a viable framework which has numerous things to offer. While it was at first created to satisfy the needs of Muslims, Islamic banking has increased all inclusive acknowledgement in a brief amount of time. In Pakistan, the evolutionary technique for Islamic banking was embraced, to establish Islamic banks parallel to the current conventional banks. This incorporates three principal methods for the advancement of this sector: 1. Full-fledged Islamic banks are urged to be set up; 2. Islamic banks are allowed to establish subsidiaries; 3. Conventional banks are allowed to set up stand-alone Islamic banking branches. The parallel existence of conventional and Islamic banking has a fundamental flaw- the conversion of

conventional banks to Islamic banks is slow and as long as a supply/market for conventional banking is maintained, customers will continue their patronage with conventional banks.

The beginning rationale of the parallel framework permitted an advantageous way of presenting the Islamic banking framework in a short period of time and at a lower expense. Rationally, this would drive the general industry to be more competitive, prompting improved performance and improved efficiency of Islamic banking (Alias et al., 1994; Kaleem, 2000). On the other hand, with facilities and incentives provided by the central bank to both conventional and Islamic banks, determining whether this efficiency has been accomplished should be analyzed.

The epistemological approach, as indicated in Berger et al. (1993) signifies that if banks are efficient, then we might expect improved profitability, greater amounts of funds intermediated, better prices and service quality for consumers, and greater safety and soundness if some of the efficiency savings are applied towards improving capital buffers that absorb risk. Consequently, the efficiency of banks improves the overall economy which affects the welfare of the society as a whole.

The majority of the recent empirical research on banking efficiency is based on the intermediation approach. The intermediation approach was suggested by Sealey & Lindley (1977). It views bank as an intermediation of financial services and assumes that banks collect funds (deposits and purchased funds with the assistance of labor and capital) and transform these into loans and other assets. The deposits are treated as inputs along with capital and labor and the volumes of earning assets are defined as measures of output. The intermediation approach is considered to be more appropriate for evaluating the entire financial institutions because this approach is inclusive of interest and/or funding expenses, which often accounted for between one-half and two-thirds of total costs. Moreover, the intermediation approach is also considered to be superior for evaluating the importance of frontier efficiency for the profitability of financial institutions, since the minimization of total costs, and not just production costs, is needed to maximize profits (Iqbal & Molyneux, 2005).

This study examines the efficiency of Islamic banking industry in Pakistan from 2003 to 2015, by using the Panel Stochastic Frontier Approach (SFA) technique. This study only focused on full-fledged Islamic banks because efficient spending is a cornerstone of Islamic law (Al-Quran 17:29), but if these banks are not 100% in their cost management, then what are the reasons behind it.

Since the majority of the conventional banks have Islamic windows, which make it difficult to compare cost efficiency between Islamic and conventional banks. To the researcher's best knowledge, SFA is rarely used to analyze technical cost efficiencies especially for banks in Pakistan, the advantage it has over other models make it desirable. This approach can determine the value of inefficiency

for each bank and year, which later can be explored. The data is extracted from the annual reports of Islamic banks. This study will help us to exactly figure out whether the parallel implementation of Islamic banking is in line with the definitive goal of creating a favorable environment for them to compete in an effective way with their conventional counterparts. Secondly, this study will determine the factors which influence the cost efficiency of Islamic banks of Pakistan.

This paper is divided into six parts; following this introduction, section two reviews briefly the previous studies on bank frontier efficiency. Section three provides the theoretical foundation of the study, section four proceeds with the methodology and data used to carry out the efficiency analysis and determinants of efficiency. Section five examines the empirical findings and section six concludes the paper.

LITERATURE REVIEW

The idea of production efficiency started from Cobb & Douglas (1928). The study commenced on the structural connection between inputs and outputs in economic production. Berger & Humphrey (1997) expanded the Cobb-Douglas model in the banking sector by concentrating chiefly on financial sector efficiency. Financial sector efficiency underlines that for cultivating profitability there must be proficient allocations of financial assets. This implies that the economy has the opportunity to move what it saves from the assets for more gainful ventures. The economy might likewise use them in future allocations.

There are two efficiency ideas utilized as a part of banking performance: production efficiency (Farrell, 1957) and X-efficiency (Leibenstein, 1966). Farrell (1957) focuses on the estimation of production efficiency, while Leibenstein (1966) focuses on explaining why firms may not be accomplishing maximum efficiency in their profitable choices and conduct. Production efficiency has two segments, allocative efficiency and technical efficiency. These are viewed as the segments of economic efficiency. Efficiency is likewise perceived in Islam, which is why it should be talked about to determine efficiency idea from the Islamic perspective. Each Muslim entrepreneur ought to have a powerful urge to build efficiency (diminish expenses) to benefit customers (Yusoff, 2002) by understanding the Maqasid Shariah (the objective of Islam law). Fused in Maqasid is everything that is viewed as important to safeguard and improve faith, life, intellect, posterity, and wealth.

An increasing number of studies focus on the significance of organizations for the productive operations of the financial framework. Specifically, it gives the idea that the economic, legal and social situations in which financial foundations and markets function depend on economic development (La Porta et al., 1998, 2000). Better foundations can improve competition all through the economy and

absolutely influence bank cost efficiency. Be that as it may, the effect of these better establishments on bank efficiency is not unambiguous. For example, a political economy perspective of financial improvement contends that feeble establishments can expand the cost efficiency of banks through regulatory capture, such that financial foundations utilize their energy to reshape the regulatory motivation, and regulatory organizations thusly give advantages. For example, government subsidies provided to certain financial organizations. These clashes highlight the requirement for studies that clear up the impact of establishments on bank efficiency (Lensink & Meesters, 2012).

Cost and benefit efficiency is identified with the treatment of deposit by a bank. Heffernan (2005) shows that deposits may be dealt with either as inputs or outputs. In any case, the utilization of deposits has been utilized more as input in most bank efficiency researches that apply DEA technique, e.g., Brown & Skully (2004). Favero & Papi (1995) found that their outcomes were not delicate to renaming deposits as an output instead of right now. Another study investigated the impact of the decision on the treatment of deposits on efficiency results (Wheelock & Wilson, 1995; Berger et al., 1993b) and inferred that the picked methodology has an effect on the levels of efficiency scores, however, does not infer solid adjustments in their rankings.

A study performed by Sathye (2001) uncovers that there is no relative advantage gathering to foreign banks. In any case, later studies in light of X-efficiency have found that foreign-owned banks in the United States (US) were essentially less proficient than US-owned banks (DeYoung & Nolle, 1996; Mahajan et al., 1996; Chang et. al., 1998). Foreign-owned banks, for the most part, needed to trade efficiency (both benefit and expense) for fast expansion of market share. Then again, the non-US studies found that foreign banks are more effective than domestic banks; for Hungarian banks (Hasan & Marton, 2001); and Turkish banks (Zaim, 1995; Isik & Hassan, 2002).

The investigations of efficiency utilizing frontier methodologies did not begin until Sherman & Gold (1985) started their own. They applied the frontier methodology to deal with the banking industry by concentrating on the operational efficiency of the branches of a reserve funds bank. From that point forward, various studies have been led utilizing frontier methodology to deal with the measurement of banking efficiency. There have been extensive studies on bank efficiency done in the US and European nations and the greater part of them concentrated on ordinary banking (Berger & Humphrey, 1997; Kraft & Tirtiroglu, 1998; Goddard et al., 2001). Just few efficiency studies on Islamic banking can be discovered (Elzahi Saaid, 2002; Hussein, 2003; Hussein, 2004).

Some intriguing results were found in the investigation of Islamic banks in Pakistan, Iran and Sudan amid the time of 1994-2001, acknowledged by Hassan (2003; 2006). By utilizing both parametric and non-parametric techniques, he

found that the significant studies of technical efficiency of Islamic banks are scale efficiency, not technical efficiency, which is unique in relation to what Fukuyama (1996) found in the study on Japanese credit associations. He likewise found that Islamic banks are generally more productive in containing costs yet moderately wasteful in creating benefit. The outcomes by Hassan (2003) demonstrated that a bigger bank size and more prominent benefit infer higher efficiency, which is steadily in line with the discoveries of Brown & Skully (2003). In another cross-country research on 35 Islamic banks, Brown & Skully (2003) has presumed that Iranian banks were discovered to be the biggest and the most cost-effective, whilst the Sudanese, which offers agribusiness funds, the slightest expense proficient. Utilizing the non-parametric technique (DEA), they additionally found that the most cost-proficient banks were from the Middle East.

While there is a vast number of writings analyzing banking efficiency (Weill, 2004; Delis & Papanikolaou, 2009), just a handful of studies has utilized two or more frontier methodologies for the estimation of bank efficiency on the same information set-particularly in connection to emerging economies and developing countries. In the 1990's defenders of methodological cross-checking began to discuss the relative benefits of the parametric and non-parametric methodologies for measuring bank efficiency. Such studies applied both direct programming and econometric routines to normal information sets and led explicit examinations of the outcomes acquired from the two systems for measuring efficiency. The findings of research conducted in European and other countries suggest that while DEA and SFA techniques lead to similar conclusions, there were variations in results of technical inefficiency and allocative inefficiency (Ferrier & Lovell, 1990; Resti, 1997; Drake & Weyman-Jones, 1996; Tabak et al., 2014).

Another string of existing writing analyzes the use of numerous strategies for the US and Asian information. US studies concentrate on deciding the consistency of the consequences of frontier methodologies, which filled a past gap (Bauer, et al., 1998). Studying the efficiency to Taiwanese banks from 1982 until 1997, Huang & Wang (2002) inferred that the specific frontier technique used to quantify efficiency can bring about significantly diverse conclusions over a few unique measurements of the efficiency range (e.g., relative estimation of the efficiency score, the connection between efficiency scores after some time, the existence of scale efficiency).

Researchers have dedicated their consideration regarding contrasting the parametric and non-parametric frontier methodologies utilizing information from non-financial firms. Pereira de Souza et al. (2010) assess the efficiency of 60 Brazilian power and appropriation utilities by utilizing both DEA and Bayesian SFA models. They demonstrated that efficiency scores obtained from the SFA model are higher than the DEA; however, the (Pearson & Spearman) relationships between the DEA and SFA models are moderately high. Odeck & Brathen (2012) utilized a meta-examination to explain the varieties in mean technical efficiency

over 40 past seaport studies. They found that the varieties are for the most part because of the system, information sort and the quantity of variables utilized. Specifically, the studies that utilized DEA models, cross-sectional information and a more prominent number of variables yield higher mean technical efficiency scores than those that utilized SFA models, panel data and less independent variables.

In a rundown, the majority of production efficiency investigations of banks have been focusing on the traditional side; because Islam likewise has high consideration for efficiency; studies to evaluate production efficiency of Islamic banks should likewise be done. As customary strategies for examination will be carried out, identifying issues with input and output variables must be accommodated, especially treatment of deposits to manage the operations of Islamic banks. Another perspective which must be incorporated into the investigation is the performance correlation among domestic and foreign banks. At exactly that point would there be an adequate extension and on level ground to think about the discoveries of customary and Islamic banks as far as production efficiency is concerned. These viewpoints are planned for future research here.

In addition, the empirical evidence from the limited literature in the area generates mixed results when comparing the different frontier efficiency techniques although there are some areas of consensuses. The literature demonstrates that neither the nonparametric nor parametric approaches have an absolute advantage over the other and suggests that it is advisable to use the parallel application of competing methods to cross check the efficiency results. Additionally, a few studies have investigated the efficiency of Chinese banks using either a non-parametric or a parametric frontier approach (Ariff & Can, 2008; Chen et al. 2005), using DEA (Berger et al., 2009; Fu & Heffernan, 2007; Kumbhakar & Wang, 2007), and using SFA (Dong et. al, 2014; Zhang et. al, 2015; Chiou & Porter, 2015; Kumar & Gulati, 2014).

In the determination of banking efficiency using SFA approach, the inputs used in this study are the total labor employed, total capital and total funds as proposed by (Isik & Hassan, 2002a, 2002b; Hassan 2005; Mohammad et al., 2008). The quantity of labor is actually the total staff, the capital is comprised of operating fixed asset of the banks and the total funds are total deposits with the bank. The total banking cost included the returns on deposits and other dues like interest expense, and operating costs.

Girardone et al. (2004) used the logit regression approach to determine the factors which influence cost efficiency of Italian banks. Sufian & Noor (2009) proposed that ROA as an indicator for cost efficiency for Islamic banks based on DEA approach. Srairi (2010) compared 71 commercial banks of GCC region using SFA approach and concluded that conventional banks are more efficient as compared to Islamic banks, other than this empirical studies, there is no study which focused purely on Islamic banks of Pakistan. The proposed indicators for cost efficiency are

ROA (as proposed by Sufian & Noor, 2009), Operating efficiency ratio where it is expected that efforts to achieve efficiency of operation could lead to efficiency of cost, ROD which directly counters the cost of deposits, Asset utilization where higher utilization helps in recovering the cost of the capital & liquid assets and profit margin where higher profit indicates low competition which can cause inefficiency.

Theoretical Framework

The following **Figure 1** illustrates the theoretical framework of the study. In the first section the cost efficiency of Islamic bank is determined using production function approach in Stochastic Frontier Analysis. The inputs used are Labor, Capital and Deposits. And in the second section, the determinants of cost efficiency are estimated using fixed effect model. The proposed determinants are returns on asset, profit margin, asset utilization and operating efficiency of the bank.

Figure 1:

Theoretical framework
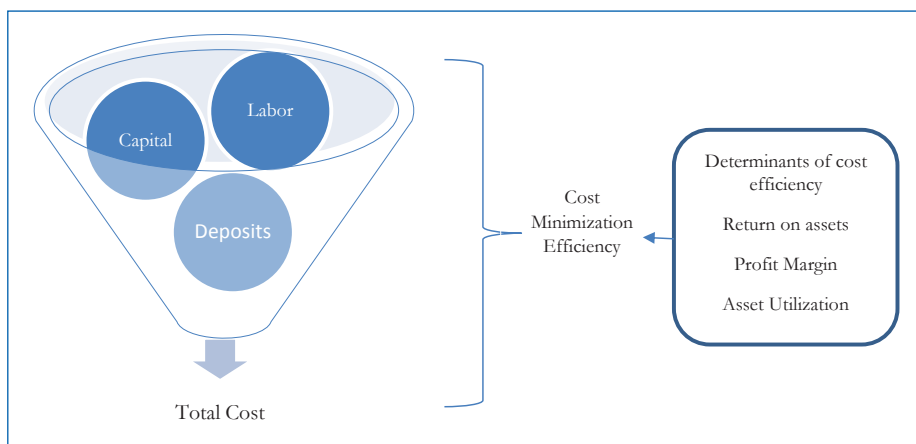
METHODOLOGY

There are several econometric and linear programming techniques used to measure efficiency, as discussed earlier, most popular is the DEA approach which only works on small sample and cannot calculate time evolution of the inefficiency. The non-parametric approach is simple and easy to calculate since it does not require the specification of the functional form (Coelli, 2004). However, it suffers from the drawback that all deviations from best-practice frontier are

attributed to inefficiency since it does not allow for noise to be taken into account. The parametric approach has the advantage of allowing noise in the measurement of inefficiency. However, the approach needs to specify the functional form of either cost or profit model. Commonly used parametric methods are the stochastic frontier approach, the thick frontier approach and the distribution-free approach, while two common non-parametric techniques are the free disposal hull analysis and data envelopment analysis. Cullinane et al. (2006) compared the efficiency estimates of DEA and SFA and concluded that estimates are correlated to each other but SFA is superior as it can work on different distributions. Mokhtar et al. (2006) explained the advantages of SFA approach, in which this approach first constructs the grand frontier benchmark using the pooled data. Second by comparing to the benchmark, it provides the relative efficiency for each Islamic bank for each time period. This construction of grand frontier is adopted from Bhattacharyya et al. (1997) which makes it robust for unbalanced panel data.

In order to fully capture the production possibilities frontier, translog function is used. This incorporates the complimentary effect of every input on all other inputs also effect of technology and its complementary effect (Kim, 1992), but this specification requires large sample. This study usede the natural log function instead of translog function as natural log form is the linearized form of the translog function in the SFA. Since the time component in time varying decay model is insignificant hence there is no need of using trend (to incorporate technology) in the translog function (Press, 2011).

Model Specification:
Sample
In order to estimate the cost efficiency of the Islamic banks, 5 full-fledged Islamic banks constructing unbalanced panel for years 2003-2015 were chosen. The banks included in this study were Meezan Bank, Al Baraka Bank, Burj Bank, Dubai Islamic Bank, and Bank Islami, these banks constitute the complete market of full-fledged Islamic banks.

Variables
The data included in this study are as follows, they are based on studies like Isik & Hassan (2002a, 2002b), Hassan (2005) and Mohammad et al. (2008):

L = Total staff (as total labor)

D = Total deposits

K = Physical capital

C = Return to deposits and other dues expensed deflated to CPI (as total real cost)

ROD = Return on deposits (net profit/total deposits)

ROA = Return on assets (net profit/total assets)

PM = Profit margin (profit after tax/return earned on financing)

AU = Asset utilization (total operating income/total assets)

OE = Operating efficiency (operating expenses/operating income)

The following is the sketch of the model. We know that the expected cost function of Islamic banks is:

$$E(C_{it}) = f(L_{it}, K_{it}, D_{it})$$

In order to solve uncertainty, the following is used:

$$C_{it} = f(L_{it}, K_{it}, D_{it}) + \varepsilon_{it}$$

Using cost frontier approach, the scalar term k is added. Here k can be any value between 0 and 1. K = 1 then will indicate that the independent variables are 100% efficient in cost minimization and any deviation from this value will indicate the presence of inefficiency in cost minimization.

$$C_{it} = f(Lit, K_{it}, D_{it})*k + \varepsilon_{it}$$

Taking natural logarithm

$$\ln(C_{it}) = f(\ln L_{it}, \ln K_{it}, \ln D_{it}) + \ln(k) + \varepsilon_{it}$$

Since this approach measures technical efficiency so ln(k) becomes a technical error (μ) and the random error (ε). Its value lies between -∞ to 0.

$$\ln(C_{it}) = f(\ln L_{it}, \ln K_{it}, \ln D_{it}) + \mu_{it} + \varepsilon_{it}$$

Now statistical models add another scalar Z which is +1 if it is a cost minimization estimation and -1 if it is a revenue maximization estimation.

$$\ln(C_{it}) = f(\ln L_{it}, \ln K_{it}, \ln D_{it}) + Z\mu_{it} + \varepsilon_{it}$$

Technically, it means that this model splits the error term in such a way that there are two components of error term, one is random error which is normally distributed and with zero arithmetic mean and second is half normal (normal distribution with positive values only) for the cost model with a particular arithmetic mean (zero or non-zero).

Aigner et al. (1977) and Greene (2005a, 2005b) provides the description of stochastic cost frontier model for panel data. While Weill (2004) and Delis & Papanikolaou (2009) illustrated specifically for banking sector. The true fixed effect and true random effect models which provide the time-varying firm cost inefficiency. Hausman (1978) proposes the approach to choosing the appropriate model amongst fixed effect and random effect models.

$$\ln C_{it} = \alpha_i + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \beta_3 \ln D_{it} + Z\mu_{it} + \varepsilon_{it}$$

Here δ_u and δ_v will be reported with the estimation, δ_u shows the standard deviation of technical variation in the cost whose average value may or may not be zero. Whereas δ_v is the standard deviation of random noise variation in the cost which whose average is zero by construction.

Hence the ratio of technical variation (δ_u) to the total variation ($\delta_u + \delta_v$) is positive (i.e. non-zero) then it will show the percent of the variation of cost of Islamic banks, which is because of technical/systematic reasons.

The term 'technical' is used in cost minimization when we are trying to make a model out of cost function and checking production possibilities frontier approach; the extreme points on PPF are efficient and if the somehow output is less than the extreme point then there is some inefficiency (technical error).

Further, the efficiency of Islamic banks is generated using $E(\exp(-\mu)|\varepsilon)$ and the following model is constructed.

$$\text{Efficiency}_{it} = E(\exp(-\mu)|\varepsilon) = \alpha_i + \beta_1\, ROA_{it} + \beta_2\, OE_{it} + \beta_3\, ROD_{it} + \beta_4\, AU_{it} + \beta_5\, PM_{it} + \varepsilon_{it}$$

RESULTS

The following are the estimation results of stochastic frontier model with the specification of cost inefficiency calculation. Refer **Table 1**.

Table 1:

Stochastic Frontier Model

Panel Stochastic Frontier Model: Dependent variable LnC$_{it}$		
Independent Variable	**Fixed Effect** Coefficient [t-value]	**Random Effect** Coefficient [t-value]
LnL$_{it}$	-0.002 [-3.37]	-0.002 [-3.34]
LnK$_{it}$	-0.017 [-3.20]	-0.017 [-3.25]
LnD$_{it}$	0.023 [4.56]	0.025 [4.69]
Intercept		-0.088 [-1.72]
Sigma-u	0.022 [4.06]	0.022 [4.13]
Sigma-v	0.011 [2.89]	0.012 [3.50]
Sample	51	51
Wald	48.73 (0.00)	52.75 (0.00)
Hausman	0.00 (1.00)	
P values in parenthesis		

Here in **Table 1**, we can see that for all the Islamic Banks in Pakistan the model of explaining the total cost of the bank through three inputs named as total labor, total capital and total deposits. Hausman test showed no statistical evidence regarding the difference in estimates of fixed effect and random effect model. Hence Hausman test hints that random effect model is appropriate because of having both consistency and efficiency property. Based on the Wald test indicates that the proposed inputs are significantly explaining the cost of the Islamic banks.

In this model, we can see that for the case of Islamic banks of Pakistan, increase in the labor employed and the capital utilized lead to decrease in cost of the banks by 0.002% and 0.017% respectively on average. While the increase in the deposits lead to increase in the cost of the banks by 0.025% on average keeping other factors constant.

The negative effect of the labor and capital suggests that Islamic banks are experiencing economies of scale in terms of overall banking service provision, but the lack of profitable financing options and promotion of high-cost deposits due to competition with the conventional banks lead to having a positive effect on deposits with the total costs of Islamic banks.

The advantage of this stochastic frontier model is that it does bifurcation of the variance in residuals into two parts, one which is because of random factors and one which is because of systematic factors. The term systematic factors suggest that this variance is because of some explainable hindrances hence called the inefficiency in the product maximization or cost minimization. Here the variance due to the random component is 0.38 and variance due to technical reasons is 0.011. So we can calculate how much percent the technical variation is as compared to the total variation, it is 0.022/(0.022 + 0.012) which turn out to be 0.64, hence here the inefficiency in the cost minimization function of Islamic banks of Pakistan is 64%. Hence Islamic banks are only 36% cost efficient, these estimates correspond to work done on 43 Islamic banks of the world and 10 Islamic banks of Asia by (Mohamad et al., 2008).

The term $E(\exp(-\mu)|\varepsilon)$ is extracted from the model representing the degree of efficiency for each bank, which is estimated against possible determinants of efficiency such as ROA, operating efficiency, ROD, asset utilization, and profit margin.

The significant value of Hausman test provided in **Table 2** below indicates that fixed effect model is appropriate for estimating determinants of efficiency. The significant F test of fixed effect model suggests that all proposed independent variables are jointly explaining the efficiency of Islamic banks.

The results of the fixed effect regression analysis show that only ROA and ROD are insignificant in explaining the efficiency of Islamic banks. Here, increase in operating efficiency of Islamic banks by 1% will lead to increase in efficiency by

0.001% on average. While 1% increase in the asset utilization will lead to increase in the efficiency of the banks by 0.18% on average. Also, 1% increase in the profit margin of the Islamic banks will decrease the efficiency of the banks by 0.001% on average keeping others constant.

Table 2:

Determinants of efficiency

Determinants of Efficiency of Islamic Banks		
	Fixed Effect	**Random Effect**
Variables	Coeff. [t-value]	Coeff. [t-value]
ROA_{it}	-0.005 [-0.79]	0.007 [1.45]
OE_{it}	0.001 [3.54]	0.0004 [2.73]
RODit	-0.020 [-0.56]	-0.060 [-1.87]
AU_{it}	0.182 [4.96]	0.140 [6.50]
PM_{it}	-0.001 [-2.43]	-0.001 [-1.94]
Intercept	0.969 [238]	0.974 [339]
Sample	51	51
F test	5.58 (0.00)	63.86 (0.00)
R squared	0.54	0.59
Redundant effects	3.00 (0.02)	
Hausman	13.55 (0.03)	

CONCLUSION

Studies on Islamic banking efficiency using the frontier method are still lacking, although several studies have been conducted regarding conventional banking and few have done using DEA approach. This study fills the gap of frontier efficiency analysis of Islamic banks in Pakistan. It applies the Panel Stochastic Frontier Approach (SFA) in evaluating the efficiency of Islamic banks. The advantage of this SFA approach is that it allows for noise and time variant efficiency. SFA model used total cost as objective and total labor employed, total capital and total deposits available as inputs of the bank as proposed by Isik & Hassan (2002a, 2002b), Hassan (2005) and Mohammad et al. (2008).

This study has been set to provide empirical evidence of 5 full-fledged Islamic banks in Pakistan from 2005-2015. The imbalanced panel data is used based on the availability and age of the Islamic banks. This time period encompasses early growth and liberalization for the banking sector and also the current phase of banking sector competition and regulatory challenges.

Based on the estimates of (Greene, 2005b) SFA true random effect model with cost minimization specification, all the Islamic banks are 64% inefficient in their cost minimization process. This level of inefficiency is approximately matched to (Mohamad et al., 2008) for the case of Islamic banks of Asia, while they are less efficient as compared to Malaysian Islamic banks based on estimates of Mokhtar et al. (2006). This high level of inefficiency in cost minimization represents the challenge that Islamic banks face in Pakistan in coping with the changes in institutional and regulatory requirements.

The results from the panel random effect stochastic frontier cost model indicated that in terms of labor and capital, Islamic banks are enjoying economies of scale, where expanding the business is matched with higher demand causing the cost to fall. While Islamic banks are experiencing excess liquidity and facing pressure to proceed the returns for the increasing deposits.

The estimates indicated that currently, Islamic banks are experiencing economies of scale, such that an increase in labor and capital utilization leads to decrease in the cost of the banks. This indicates two prospects on the asset side, first is that banking network has not reached the full potential optimal size based on supply, and the second is that at this stage the demand of Islamic banking supersedes the supply. Here the results show the positive effect of deposits on cost. These results have implications from the liability side of the bank. Islamic banks in Pakistan are currently experiencing situation of excess liquidity because of lack of profitable investment ventures, hence increase in deposits are effecting cost of the bank.

This study then generated the quantitative series for the efficiency of Islamic banks. The factors which influence cost efficiency of Islamic banks proposed by this study are operating efficiency, asset utilization and profit margin. The results from the random effect model, suggest that the Islamic banks have to endure the higher operating expense and become less operating-efficient in order to increase the cost efficiency. This is probably because the lack of support by the central bank, regulatory authority and government in managing its higher risks as compared to conventional counterparts. While the more assets are utilized, the more Islamic banks will become cost efficient which depicts the easing of the pressure of increasing of deposits. This pressure was indicated in the SFA estimates in terms of the positive effect of deposits of cost. Lastly, increase in the profit caused inefficiency, suggests deviation of the banking business from the perfect competition leading to inefficient production and delivery of services.

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