Examining Efficiency of Islamic and Conventional Banks in Pakistan: Using Data Envelopment Analysis

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Keywords : conventional banks, islamic banks, efficiency, ratio analysis, data envelopment analysis.

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Strictly as per the compliance and regulations of:

Examining Efficiency of Islamic and Conventional Banks in Pakistan: Using Data Envelopment Analysis

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I. Introduction

Financial sector which include stock exchange, banks, financial institutions, credit unions and money lenders etc. make key contribution toward economic growth and social well being. According to a report of (State Bank of Pakistan [SBP], 2010) the assets of Pakistan's financial sector has grown up to 9.2 trillion rupee in 2010 with five year average increase of 13.86% annually, and banking sector was the biggest player whose assets composition in financial sector was 73.2%. Banks as an integral component of financial sector mobilize savings of people and allocate credit among the investors. Efficient performance of banks boost investment, increase output and the financial sector is a base on which real sector is raised. The need of developed banking system is as much important for economy as blood for body. Its importance toward economic and social well being fascinate to study banking efficiency.

There are two banking streams that are currently operating in Pakistan; Conventional and Islamic banks. Conventional banks are operating since the establishment of Pakistan while Islamic banks are recent phenomena and they have started operating since 1980. Islamic banks are also showing high growth rate of 15% per annum. People's interest and growth of Islamic banks led conventional banks to open Islamic windows inside Conventional banks that are operating independently. According to Shariah principles the structure of Islamic financial institutions/Islamic banks is based on four important paradigms.

a) Prohibition of interest.

b) Speculation is strongly restricted.

c) Zakat is compulsory to be deducted from each account.

d) Prohibition in dealing with goods and services that are declared illegal.

Islamic banking industry has wide range of institutions to generate profit from investing, trading and consumer services. Islamic banking is of course risky but its structure is more stable and its payoff from successful practices is also tremendous. There are 05 full-fledged Islamic and 12 conventional banks operating under Islamic windows operation. As a whole all of these have 841 Islamic branches operating in the country. Conventional banks are not subject to the limits prescribed above.

The Induction of Islamic windows among conventional banks have increased competition between Islamic banks and conventional banks. This competition is essentially leading both of these streams toward efficiency. There long term market share and profitability depends on seeking efficiency in respective levels i.e. Technical, Pure and Scale efficiency. It has also been studied that there is a great competition in banking sectors because of innovative techniques and latest technology. The only way to survive and compete in this industry is an optimal and efficient utilization of scarce resources.

Conventional banking industry is highly strong industry; having rich history and expertise, enjoying interest that is main driver of their banking system, having huge amount of capital and choice to enter in Islamic banking industry but Islamic banks are not blessed with all those benefits that are being enjoyed by conventional banks. First, beside all these favorable conditions for conventional banks and restrictions for Islamic banks fascinate to know that still various studies have approved better performance of Islamic banks.

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Second, it is necessary to monitor the performance of financial sector especially banking sector to design a batter strategy to fill up its loophole.

In response toward the importance and significant role of banking sector for economic and social well being, various studies have been conducted in Malaysia and Bahrain for efficiency evaluation but still there is an acute shortage of literature under Pakistani scenario. Similarly there is also need to monitor panel based performance of banking industry for its consistent and smooth operations in Pakistan. As far as the breadth of previous comparative literature is concerned; dataset was limited up to 2008 by considering either ratio analysis or DEA technique. This is a gap that present study seeks to fill by increasing its breadth from 2007-11 with panel based comparative analysis of Islamic and conventional banks in Pakistan. Consequently, understanding banking efficiency is equally important for investors, bank managers, clients, policy makers and all other stakeholders to take an appropriate, performance based decision.

This study is designed to examine efficiency Islamic and conventional banks and to rank them by using ratio analysis and DEA technique. Studies that have been conducted in Pakistani perspective are limited up to 2008 while this study is an extension which takes data for the period of 2007-11 into account. Two techniques ratio analysis and DEA technique are employed by considering Input/output oriented measure under DEA.

II. An Overview of the Literature

The literature on banking efficiency has grown up considerably during the nineties century. The concept of efficiency under DEA technique could be traced back to 1928 when Cobb and Douglas Originated efficiency through structural relationship in input and output of economic production. Due to increasing competition among the banking industry especially after arrival of Islamic banks in the banking industry and its tremendous growth direct the intention of researchers, managers and policy makers to develop criteria to evaluate banking efficiency. Then the scope of Cobb and Doulas work was enhanced by Berger and Humphrey through applying it on banking sector (Kamaruddin, Safa and Mohd, 2008).

Iqbal (2001) conducted a comparative analysis of Islamic and conventional banks by utilizing both trend and ratio analysis. He found that Islamic banks performance was fairly well during 1990-98. Both trend and ratio analysis indicates that Islamic banks are performing better in term of efficiency as compare to conventional banks. The trend analysis of this research study indicate downward trend of Islamic banks. The reason behind downward trend was the involvement of conventional banks and introductory stage of Islamic banks.

Safiullah (2010) perform an analysis of financial performance of Interest based and interest free Islamic banks streams. It has been found that conventional banks are doing better in term of efficiency and liquidity while interest free banks are performing better in term of solvency, liquidity and profitability. Finally it has been concluded through categorized ratio analysis test that Islamic banks are superior to that of conventional banks. It has also been stated that opening of Islamic windows in conventional banks is also an indicator of superiority of Islamic banks while it is also suggested for conventional banks to spread their network to rural areas that may enhance the performance of conventional banks as well.

Hamid and Azmi (2011) investigate the performance of interest free and interest based banking system by using ratio analysis and t-test to check significance. The result reveals that Islamic banks are more liquid and less risky as compared to the interest based banking system. Liquidity, profitability, solvency and community involvement is checked from 2000 to 2009. The empirical analysis of this research study does not indicate any statistical difference in performance and found that the performance of both banking stream is almost same.

Sufian and Noor (2009) compared by considering MENA and Asian Islamic banks to evaluate their technical, pure and scale efficiency. The result reveals that MENA Islamic banks were having higher average technical efficiency as compare to their Asian counterparts. In addition a significant positive relationship of technical efficiency has been found with profitability, size, capitalization and loan intensity and technical inefficiency outweigh scale inefficiency. This research study was also conducted by using Data Envelopment Analysis technique and it is suggested at the end to improve the managerial skills for more efficiency enhancement of Islamic banks.

Usman, Wang, Mahmood and Shahid (2010) stated by applying DEA technique over a panel of conventional banks of Pakistan. It has been found that Foreign owned banks are more efficient in tern of technical efficiency while state owned and domestic private banks are found to be the least efficient banks. Productive efficiency is further divided into Technical and Allocative efficiency. This research study was intended to evaluate the efficiency of Pakistani Conventional banks from 2001-2008. It has been concluded in this study that there is need to do something for the betterment of state owned and domestic private banks to enhance their technical efficiency.

Akhtar (2010) examine the performance of Commercial banks of Pakistan by considering data from 2001-2006 using DEA technique. It has been found that foreign banks are better in term of X-efficiency from domestic public as well as private banks. It has been

found in this research study that foreign owned banks have mastered the Cross borders opportunities and skill. While Pakistani banks are still fail to utilize the domestic benefits and opportunities. That's why Pakistani banks are failed to perform better. It has been suggested in this research to improve the internal performance as well as managerial skills of these commercial banks. Furthermore it has been suggested to use technology, managerial skills and internal resource and opportunities optimally in order to bring efficiency.

Nazir and Alam (2010) evaluate the performance of 28 commercial banks of Pakistan to check the effect of Privatization over operating income. DEA techniques was used to evaluate the performance of these commercial banks from 2003-2007. The result of this research study indicates that privatization cannot help banks in improving their operating income even the result of several previous research shows positive relationship of privatization and profitability of banks. But the results of this research study were contradictory with previous research that added further robustness in findings. Several assumption have been made over this contradictory result First, Law & order situation of Pakistan is instable, Bad-Debts, implications of SBP, and growing commercial banks industry led to decline in efficiency. The results of this research study are favorable for State owned commercial banks.

Another research study investigates the scale efficiency of Islamic banks by using DEA and it has been found that Scale efficiency score was highest in 2007. While the Dawood Islamic bank was found to be the most efficient in term of scale (Bin-Dost, Ahmad, and Warraich, 2011). This research study took data from 2006-09 of five full fledged Islamic banks of Pakistan and it was concluded that performance of Dawood Islamic bank was quite higher than other banks. On average basis 2006 was least scale efficient while the score of scale efficiency was highest in 2007.

Shah, Shah, and Ahmed (2011) compared Islamic banks with Conventional banks and found that Islamic banks are better than conventional banks in term of technical efficiency in loan base approach and scale efficiency is also higher than conventional banks While, Conventional banks are better in term of income base approach. This research study is conducted by estimating efficiency of Islamic banks and convention banks similarly; the efficiency of local and foreign owned banks was also calculated in it. As far as structure is concerned Islamic bank's efficiency is quite lower than foreign owned banks while Islamic banks efficiency is better by comparing it with local owned banks.

The results of previous studies are mix and this study is in line with these different studies and will examine the efficiency of Pakistani banks by considering two approaches: Data Envelopment Analysis approach and Ratio analysis approach for further authentication.

III. Methodology

a) Data and Source

Financial reports including balance sheets and income statements of respective banks are used to conduct this analysis so the data of 19 banks has been taken including 05 full-fledged Islamic and 14 Conventional banks from "*financial statement analysis of financial sector*" over SBP site and these 19 banks are further divided into 04 different panels given below. SBP site and respective banking sites are explored to collect financial and non financial data. All these banks are analyzed using Ratio analysis approach and DEA approach on overall and individual Panel basis.

b) Ratio Analysis

In order to rank the performance of commercial banks, two calculated measures of financial performance have been taken from State Bank of Pakistan site. These Ratios include Efficiency and liquidity ratios that could be seen in Appendix I. Rating points are awarded by taking average value of five years efficiency and liquidity ratio that has been taken from SBP website. These banks are rated by giving 0 to 1 points based on the performance of efficiency and liquidity. A bank that is showing highest performance in ratio is awarded with 1 points and bank showing lowest and weak performance, that ratio is awarded with 01 point respectively. Each ratio and bank is evaluated under same process. Finally the sum of all these points is taken to count their total rating points and rank them. A bank whose total rating points are highest is ranked first, second, third and so on.

- Ratios/ Profitability Ratios
- Liquidity Ratios

c) Data Envelopment Analysis (DEA)

Second, A Non parametric DEA approach is used to evaluate the efficiency of Islamic and conventional banks and this technique will also help to fulfill the limitations of using ratio analysis technique. Now a day DEA technique has earned well reputation and is very popular among researchers.

While analyzing Decision Making Units (DMU's) input oriented measure define that how much input quantity can proportionately be reduced without changing produced level of output quantity. On the other hand one could cross question that by how much output quantity be proportionately enhanced without changing the level of input quantity consumed. Output oriented measure is an opposed measure to input oriented measure.

Constant return to scale (CRS) indicates that a level of proportionate increase in inputs will resultantly bring proportionate increase in output. Where Variable return to scale (VRS) means that it is not compulsory that output increase in same proportionate percentage

with inputs. Furthermore VRS propose two more facets where DMU's are operating either on *Increasing return to scale (IRS)* or *decreasing return to scale (DRS)*. If the proportionate increase in inputs results in higher proportionate increase in outputs then it will be called IRS. On the other hand DRS means proportionate increase in inputs will result in less proportionate increase in outputs.

Modern efficiency measure could be traced back when Parrell (1957) drew upon the work of Debreu (1951) and Koopmans (1951) and define about a measure that was simple to evaluate efficiency of DMUs that was able to consider multiple inputs. He further proposed that efficiency of a firm is based on two basic components.

Technical Efficiency which describe the ability of a company to generate maximum output from a given set of inputs and *Pure Efficiency* depend on managerial decisions which reflect the ability of management to use inputs or outputs in an optimal proportion. Technical efficiency is decomposed into pure technical efficiency and scale efficiency. Efficiency estimation of all these three measures vary from 0 to 1; Where 01 indicates absolute perfection and fully efficient whereas 0 represent absolute inefficiency. The wedge between 01 and the value observed measure technical inefficiency. Let us assume under Technical Efficiency measure that (X1, X2) two input variables that are used to produce single output (y). Under this assumption we could draw SS' unit Isoquant of fully efficient firm available in Figure 1. The inputs of firm are defined by P whereas Q is an efficient point on the frontier. Technical efficiency of a DMU is most commonly measured by the ratio

$$TE_I = 0Q/0P$$

That is equal to one minus QP/0P and it will take value between 0 and 1. Furthermore TE is decomposed into two important components, in order to drive scale and pure technical inefficiency. For that purpose, data is evaluated through CRS and VRS. If there is any difference between CRS and VRS then it represents scale inefficiency. Figure 2 illustrate by considering one input and one output and have drawn 2 frontiers for CRS and VRS. Similarly scale efficiency is measured by ratio

$$TE_{I,CRS} = AP_C/AP$$

Whereas PP_C is Technical inefficiency under CRS

$$TE_{I,VRS} = AP_V/AP$$

PP_V is Technical inefficiency under VRS

$$SE_I = AP_C/AP_V$$

So the difference between above two is P_CP_V is put down to Scale inefficiency
We can also see that

$$TE_{I,CRS} = TE_{I,VRS} \times SE_I$$

Because,

$$AP_C/AP = (AP_V/AP) \times (AP_C/AP_V)$$

Figure 1: Calculation of Technical efficiency in DEA
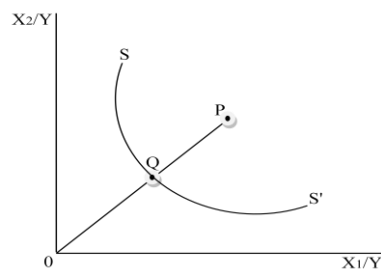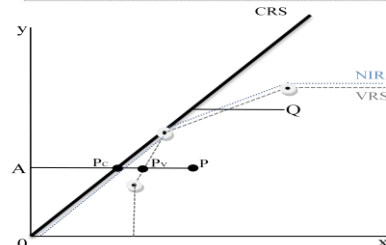

Figure 2: Calculation of Scale efficiency in DEA

The piecewise linear form of the non-parametric frontier in DEA can cause a few difficulties in efficiency measurement. Some author use the term *Input excess* while some author considers only those DMU efficient whose slack value is 0. The problem arises because of the sections of the piece wise linear frontier which run parallel to the axes which do not occur in most parametric functions. Figure 3 illustrate SS' piecewise linear form on non parametric frontier whereas C and D firms are efficient because both lies over frontier. We can see that A and B are inefficient firm so their efficiency could be evaluated by OA'/OA and OB'/OB respectively. We can see that A' lies over the frontier where X_1 input is same for firm C and A' while X_2 input could be reduced because firm C is getting less X_2 input and is considered efficient. It is called input slack that is also possible in output when multiple outputs are used.

Figure 3: Efficiency measurement and input slacks
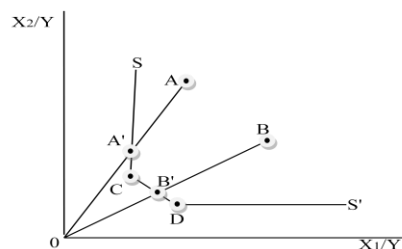
The selection of input and output variable is still disputable while there is no consensus among researchers about selection of these variables. There are two more frequent approaches that are used to analyze efficiency through DEA technique and these approaches are intermediation approach and

production approach. Under intermediation approach banks are considered as a central party that resolve financial problem by transferring surplus to deficit. While in production approach banks are seemed to be as a producer of loan and deposits.

This research study is designed by considering three output and two input variables. Output variables include *lending funds, deposits* and *portfolio investments* while input variables are *borrowed funds* and *capital*. As we know that there is no consensus among researchers about selection of input and output variables while the selection of variables for this research study is based on previous literature and availability of financial data.

IV.   EMPIRICAL FINDINGS

First of all findings are based on the application of ratio analysis technique whereas the focused banks are ranked based on their efficiency and liquidity performance. Secondly technical efficiency (TE), pure efficiency (PE) and scale efficiency (SE) is analyzed by using DEA of Islamic and Conventional banks of Pakistan. Nineteen banks are being studied and

evaluated under this section by using DEA technique using DEAP 2.1 software.

a)   Ratio Analysis Technique

Information stated in Table 1 is presenting Ratios derived through SBP's site for the period of 2007-2011 evaluated on an average basis. Each ratio is evaluated by considering scale formula ranging from 0 to 01. It has been found that Muslim commercial Bank Ltd. (MCB) is leading among Public, Private, Foreign and Islamic banks with highest rating points of 0.7186. Similarly Muslim commercial bank is followed by Deutsche bank AG and National bank of Pakistan with 0.6320 and 0.6139 rating points respectively. On the other hand Albaraka Islamic Bank, The bank of Punjab and Oman international bank SAOG are residing at the bottom with 0.4276, 0.3292 and 0.3136 respective rating points. All of the remaining banks lie in between these banks and the gap among all these banks is showing the comparative inefficiency. If we make bench mark of MCB then we can see that Albaraka Islamic bank, the bank of Punjab and Oman International bank SAOG lies far away behind MCB.

Table1 : Ranking of selected banks in Pakistan by using ratio analysis

All Banks	Rating Points	Ranking
MCB Bank Limited	0.718615462	1
Deutsche Bank AG	0.632022043	2
National Bank of Pakistan	0.613900239	3
United Bank Limited	0.608167709	4
Habib Bank Limited	0.601568927	5
Allied Bank Limited	0.587464196	6
Citi Bank N.A.	0.585478205	7
Bank Al-Habib Limited	0.554410777	8
First Women Bank Limited	0.553222519	9
Meezan Bank Ltd.	0.524414301	10
The bank of Tokyo-Mitsubishi	0.523622077	11
HSBC bank Middle East Ltd	0.513578248	12
Dubai Islami Bank Pakistan Ltd.	0.508482355	13
Burj Bank Limited	0.501151569	14
The Bank of Khyber	0.488104536	15
BankIslami Pakistan Ltd	0.467529093	16
Albaraka Islamic Bank	0.427637894	17
The Bank of Punjab	0.329291006	18
Oman International Bank SAOG	0.313647988	19
Mean all banks	0.529068902	-
Mean Conventional banks	0.544506709	-
Mean Public Sec. banks	0.496129575	-
Mean Private Sec. banks	0.614045414	-
Mean Foreign banks	0.513669712	-
Mean Islamic banks	0.485843042	-

Source : Authors evaluation is based on Financial Ratios derived from SBP's report "Financial Statement analysis of financial sector (2007-2011)" under Pakistani Context.

b) Data Envelopment Analysis Technique

This section represents the performance 19 selected banks on overall bases for the period of 2007-2011. By using three output variables that include *lending funds, deposits* and *portfolio investments* and two input variables such as *borrowed funds* and *capital*, we have derived following technical, pure and scale efficiency scores under input and output oriented measures.

Under input oriented measure Table 2 is showing technical, pure and scale efficiency of all selected banks on average basis for the period of 2007-2011. Input oriented measure shows efficiency/ In-efficiency in term of Inputs that how efficient/inefficient the bank is in minimizing its inputs through given set of outputs. The concept of utility from economics has been added in it under utilization of input and output oriented measures. The concept of economics is utilized in a sense where consumer wants to enhance his utility of outputs through optimal utilization of inputs resources and he aim to get more utility with minimum level on inputs.

The result shows that First women bank limited, National bank of Pakistan, Habibd bank limited are fully efficient in term of technical, pure and scale efficiency basis. It means that these three banks are using input resources optimally. The bank of Khyber from public sector banks scored technical efficiency of 0.2842 that is very low so it means that the level of inefficiency or wastage of input resources is 0.7158 to get a same level of efficient banks, that is comparatively very high. Similarly Oman international bank and the Bank of Tokyo Mitsubishi are the weakest banks in term of technical, pure and scale efficiency. On average basis technical, pure and scale efficiency is derived 0.6400, 0.7613 and 0.7883 respectively under input oriented measure. Under output oriented measure average technical, pure and scale efficiency score could be arranged 0.6505, 0.7631, and 0.8111 respectively.

Table 2 is also showing technical, pure and scale efficiency of Pakistani banks over the period of 2007-2011 under output oriented measure. Output oriented measure shows efficiency/inefficiency in term of output that how efficient/inefficient the bank is in maximizing its output by keeping given set of inputs. By using output oriented measure we can find it out that how efficiently and optimally banks are utilizing their given/available input resources to maximize the level of output. Similarly the efficiency of First women bank limited, National bank of Pakistan and Habib bank limited are more efficiently utilizing their given set of inputs to maximize the level of outputs Similarly, the Bank of Khyber, Oman international bank and the Bank of Tokyo Mitsubishi are inefficient banks but there is a minor difference between the results of input and output oriented measure. Under Output oriented measure

technical, pure and scale efficiency could be arranged 0.6505, 0.7631 and 0.8111 respectively.

In this study it is interesting to note that pure technical inefficiency outweighs scale inefficiency in Pakistan. In essence, the finding of this study suggests that all Pakistani banks including Islamic and conventional banks are managerially inefficient in controlling their operating costs and utilizing their resources to the fullest. Sufian, Noor and Majid (2008) compared MENA and Asian banks by doing a comprehensive study for efficiency evaluation. The result suggests that Asian banks are suffering with pure technical inefficiency. Not only Pakistan but even the whole Asian region is suffering wish pure technical inefficiency where pure technical inefficiency outweighs scale inefficiency.

Furthermore, two major categories of selected conventional and Islamic banks are decomposed into sub-categories such as; public sector banks, private sector banks, foreign banks and Islamic banks. All these decomposed sub-categories excluding Islamic bank reveals pure technical inefficiency that contributes more toward technical inefficiency. Scale efficiency is better than pure technical efficiency in these major and sub-categories. Technical, pure and scale efficiency score of Islamic banks are 0.6139, 0.8055, and 0.7406 under input oriented measure. While under output oriented measure technical, pure and scale efficiency score are 0.6139, 0.8405 and 0.7159 respectively. Pure and scale efficiency score of Islamic bank reveals scale inefficiency outweighs pure inefficiency that means Islamic banks have been operating at a relatively non-optimal scale of operations i.e. either they were too small or too large to be scale efficient. As far as the scope of Islamic banks under Pakistani scenario is concerned it seems that Islamic banks are operating at too small scale. So there is an immense need for conventional banks to strengthen their management by controlling operating cost and utilizing their resources to the fullest while Islamic banks need to operate at optimal scale.

Table 2 : Technical, pure and scale efficiency of banks in Pakistan

All banks	Input Oriented			Output Oriented		
	TE	PE	SE	TE	PE	SE
First Women Bank Limited	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
National Bank of Pakistan	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
The Bank of Khyber	0.2842	0.5644	0.5768	0.2842	0.5812	0.5884
The Bank of Punjab	0.6252	0.7138	0.8794	0.6252	0.6988	0.9008
United Bank Limited	0.7984	0.8444	0.9504	0.7984	0.8968	0.8894
MCB Bank Limited	0.9008	0.9054	0.9938	0.9008	0.903	0.9972
Habib Bank Limited	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Allied Bank Limited	0.8476	0.8658	0.9754	0.8476	0.8556	0.9902
Bank Al-Habib Limited	0.6536	0.7016	0.9344	0.6536	0.6894	0.9560
Citi Bank N.A.	0.5322	0.7144	0.7962	0.5322	0.7188	0.7784
Deutsche Bank AG	0.7448	0.8582	0.8408	0.7448	0.8692	0.8298
HSBC bank Middle East Ltd	0.6118	0.7396	0.833	0.6118	0.7504	0.822
Oman International Bank	0.0138	0.3310	0.0576	0.2138	0.2176	0.3425
The bank of Tokyo-Mitsubishi	0.0784	0.2002	0.4370	0.0784	0.1158	0.738
Albaraka Islamic Bank	0.4512	0.6320	0.6736	0.4512	0.7092	0.6266
BankIslami Pakistan Ltd	0.5842	0.9524	0.6050	0.5842	0.9838	0.5902
Dubai Islami Bank Pakistan	0.6766	0.8036	0.8288	0.6766	0.8128	0.8196
Meezan Bank Ltd.	0.8028	0.9038	0.8964	0.8028	0.9002	0.9016
Burj Bank Limited	0.5550	0.7358	0.6992	0.555	0.7968	0.6418
Mean all banks	0.6400	0.7613	0.7883	0.65055	0.76312	0.8111
Mean Conventional banks	0.6493	0.7456	0.8053	0.66362	0.73547	0.8451
Mean Public Sec. banks	0.7273	0.8195	0.8640	0.72735	0.82000	0.8723
Mean Private Sec. banks	0.8400	0.8634	0.9708	0.84008	0.86896	0.9665
Mean Foreign banks	0.3962	0.5686	0.5929	0.43620	0.53436	0.7021
Mean Islamic banks	0.6139	0.8055	0.7406	0.61396	0.84056	0.7159

Source : Financial Statement Analysis of Financial Sector (2007-2011) report of SBP.

Note : TE=Technical Efficiency; PE=Pure Efficiency; SE=Scale Efficiency. This Comparison is based on Five years average values of Technical, Pure and Scale Efficiency while these values lies in between the range of 0 to 1.

V. Conclusion

The present finding of ratio analysis is based on efficiency and liquidity ratios. Each bank is evaluated and ranked on the basis of their ratio. The result under ratio analysis technique presents that conventional banks are performing well in an overall evaluation of banks. The finding of present study suggests that performance of conventional bank is better than Islamic banks. The results of this study are also consistent with (Rosly & Bakar, 2003; Safiullah, 2010) who found that conventional banks are better in term of efficiency and liquidity ratio.

Under DEA technique TE, PE and SE are calculated over the period of 2007-11 employing both input and output oriented measures. Under input oriented OTE (Overall Technical Efficiency) measure 3 banks First women bank, National bank of Pakistan and Habib bank limited are fully efficient whereas overall mean Technical Efficiency is 0.64 and inefficiency in utilizing input is 0.36. Input oriented measure show the level of input inefficiency that how the banks can reduce their inputs at a given level of output. The Technical inefficiency is due to Pure and Scale inefficiency. The empirical results of Pure and Scale efficiency are 0.7613 and 0.7883 respectively. Whereas managerial inefficiency is 0.2387 and inefficiency due to size is 0.217. Input oriented measure show a significant level of Technical, Pure and Scale inefficiency.

Output oriented measure show the level of output inefficiency that how a banks can increase their outputs at a given level of inputs. The result derived through output oriented measure of overall banks over the period of 2007-11 indicate OTE, OPE and OSE as 0.6505, 0.7631 and 0.8111 respectively. The result suggests Technical, Pure and Scale inefficiency as 0.3495, 0.2369 and 0.1889 respectively which means that there is considerable room to enhance output through given level of inputs.

Mean TE under both Input and output oriented measures of Islamic bank is 0.839 that is better than Public sector banks and foreign banks while lower than Private sector banks. Mean PE under input oriented

measure of Islamic bank is 0.932 that is better than public sector banks but weak than private sector and foreign banks. The result of output oriented measure of Islamic bank is calculated as 0.922 that is again better than public sector and foreign banks but the performance of private sector is much better than Islamic banks. A SE of Islamic bank under both input and output oriented measure is calculated as 0.887 and 0.895 respectively. SE under both input/output oriented measure of Islamic bank is better than public sector and foreign banks but weaker than private sector banks of Pakistan. The results of this study are consistent with (Srairi, 2009; Mokhtar et al., 2008) who found that conventional banks are more efficient than Islamic banks.

VI. Limitation and Suggestions

Like any other study, the present study has also several limitations that justify the need to conduct more research. First, even we know that DEA technique evaluate efficiency by making benchmark from available information but it is not always possible for a bank to become fully efficient over time because, several input and output variables are being used that are difficult to manage. Second, Selected input and output variables might not be exhaustive and the dataset is limited so, future studies could enhance the scope of their study by adding other variables in their research. Third, this study employs ratio analysis and DEA technique to evaluate efficiency in Pakistani context. Future studies may enhance the scope by doing cross country analysis and comparing the efficiency score with other countries. Furthermore future studies of banking industry should compare efficiency score based on parametric approach along with non parametric and ratio analysis approach to check efficiency and consistency between and among them.

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APPENDICES

Appendix I : Efficiency and Liquidity Ratio

Sr. No.	Ratios	Formula
	Profitability/Efficiency Ratio	
1	Spread Ratio	$= \dfrac{\text{Net Markup/Interest Income}}{\text{Markup Interest Earned}} * 100$

Spread ratio is a gap/spread of interest amount collected from lender and interest amount paid to the depositors. Higher the ratio means better the performance of specific bank.		
2	Net markup/Interest margin	$= \dfrac{\text{Interest income} - \text{Interest Expense}}{\text{Total Assets}} * 100$
Interest margin ratio is calculated by dividing net amount of interest income by dividing it with total assets to calculate the Net Interest margin as per Total Assets.		
3	Return on Equity	$= \dfrac{\text{Profit/Loss After Taxation}}{\text{Total Equity}} * 100$
Return on Equity ratio is an indicator to find out the value of profit as per Equity of each shareholder. It is direct measure to calculate shareholders profit by divided Profit after Tax over Total Shareholder's equity.		
4	Return on Assets	$= \dfrac{\text{Profit/Loss After Taxation}}{\text{Total Assets}} * 100$
Return on Asset Ratio is calculated to find out the value of profit after tax as per employed value of Total assets. This is a very important ratio to be calculated.		
5	Non-markup/Interest income to total assets	$= \dfrac{\text{Total Non} - \text{Markup Income}}{\text{Total Assets}} * 100$
Non markup income ratio is derived by extracting the value of non markup income and dividing it over total assets. It represents that how much income gained by excluding the value of markup.		
6	Net markup/interest income (after prov.) to total assets	$= \dfrac{\text{Net Markup/Interest income(After Provision)}}{\text{Total Assets}} * 100$
This ratio is calculated by taking interest earned and subtracting the value of provision. Later on it is divided over Total Assets to calculate the net markup interest value as per the value of total assets.		
7	Markup/interest expense to markup/interest income	$= \dfrac{\text{Markup/Interest Expense}}{\text{Markup/Interest income}} * 100$
A simple ratio that is calculated by dividing interest expense over interest income. It represents the proportionate ratio of income and expense.		
8	Non-markup/interest expense to total income	$= \dfrac{\text{Non Markup/Interest Expense}}{\text{Total Income}} * 100$
A non markup interest expense over total income is calculated by excluding the value of markup interest expense and interest income.		
Liquidity Ratio		
9	Cash & Cash equivalent to Total assets	$= \dfrac{\text{Cash} + \text{Cash Equivalent}}{\text{Total Assets}} * 100$
Cash and cash equivalent are most liquid forms of assets. This ratio presents the amount of most liquid assets as per ratio of total assets.		
10	Investment to Total Assets	$= \dfrac{\text{Investments}}{\text{Total Assets}} * 100$
It represents the amount of Assets that has been distributed in different projects to gain profit. It shows us the proportion of assets use up for investment purposes.		
11	Advances net of Provision to Total assets	$= \dfrac{\text{Advances Net of Provisions}}{\text{Total Assets}} * 100$
Another important ratio for banking sector to calculate the proportion of advances and assets.		
12	Total liability to Total assets	$= \dfrac{\text{Total Liability}}{\text{Total Assets}} * 100$
Total liability to Total assets ratio is an important ratio which show us the proportion of debts that are used to finance business as per ratio of Total Assets.		
13	Gross advances to deposits	$= \dfrac{\text{Gross Advances}}{\text{Deposits}} * 100$
This ratio is showing the percentage of Gross advances and deposits.		
14	Gross advances to borrowing & deposit	$= \dfrac{\text{Gross Advances}}{\text{Borrowing} + \text{Deposits}} * 100$
Another important ratio for banks that is used to calculate the percentage of Gross advances and deposits. To check out whether advances are more than the value of borrowing + Deposits or less than that.		

Source : Financial statement analysis of financial sector (2007-2011), report of SBP