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AN ANALYSIS OF BANKS PERFORMANCE IN PAKISTAN USING TWO-STEP DOUBLE BOOTSTRAP DEA APPROACH

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Abstract. This study analyzes the technical efficiency and sources of technical efficiency of conventional banking sector of Pakistan by applying the DEA double bootstrap technique. In the first stage, we applied the bootstrapped DEA variable returns to scale model for measuring the efficiency scores by utilizing the two inputs and three outputs. In the second stage, we employed the bootstrapped truncated maximum likelihood regression model to determine the sources of technical efficiency. As per our results, size of banks does not matter for technical efficiency of banks as the coefficient was insignificant. The liabilities of banks negatively and significantly affect efficiency of banks. Privately owned banks significantly perform better than public sector banks in terms of efficiency scores. Thus, our results shed support in favour of privatization hypothesis.

Keywords: Technical efficiency, Banks, DEA double bootstrap, Truncated regression, Pakistan

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I. INTRODUCTION

Banks play a significant role in growth and development of any economy where they hold the savings of the public and finance the expansion of

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business, investment and trade. So, it is not possible to work effectively in the fast developing world without a strong banking system. Empirical evidence shows a positive relationship between financial sector growth and economic growth (Zaidi, 2005). Since commercial banks are the leading financial institutions, therefore, developing countries have focused their attention on the performance of banking sector. This is because efficiency of banking sector affects economic growth positively while their inefficiency retards economic growth by creating financial crisis. Evaluation of efficiency is significant for the investors, expected depositors and policy makers as banks play a vital role in the formation and implementation of monetary policy.

It is important for companies, organizations or banks to touch the optimal level in order to compete with their business rivals all over the world. It is a pre-requisite for every country to observe that its institutional performance is adorable with high efficiency and maximum output in order to attain its targets. Fundamentally, performance measurement examines the achievement of different organizations, companies or banks by comparing the facts and figures about what really occurred to what was preliminarily decided or intended (Wholey and Hatry, 1992). Maximization of the output or profit and minimization of the cost are the basic criteria for measuring the efficiency. Under certain conditions, the technical efficiency (TE) is measured as the ability of a bank or unit to produce. An organization or a bank is known as technically efficient if it is producing a certain quantity of output by utilizing the minimum quantity of inputs or producing maximum output from a certain given quantity of inputs. According to Koopmans (1957), “A possible point in the commodity space is called efficient whenever an increase in one of its coordinates (the net output of one good) can be achieved only at the cost of a decrease in some other coordinate (the net output of another good).”

Farrell (1957) was the first to introduce the measuring of the efficiency of producing units. A lot of work has been done on Farrell’s (1957) classic TE. There are two basic techniques for the measurement of efficiency: parametric and non-parametric. Meeusen and Broeck (1977) and Aigner *et al.* (1977) have initiated the parametric technique which is known as stochastic frontier analysis (SFA). Linear programming models of Charnes *et al.* (1978) and Fare *et al.* (1985) provided the basis for the production efficiency analysis. Charnes *et al.* (1978) developed the DEA. Banker *et al.* (1984) further modified it on the basis of frontier efficiency concept first defined by Farrell (1957).

Simar and Wilson (2007) have identified several limitations of the two-stage DEA technique, *i.e.* the data generating process (DGP) is not described in these models and the efficiency scores, which are estimated in DEA, are serially correlated. As such, the general two-stage DEA techniques are statistically invalid due to these limitations. Simar and Wilson (2000) also explain that DEA efficiency scores are exaggerated because of the underestimation of the frontier by this technique. In view of these severe drawbacks of DEA, Simar and Wilson (2007) proposed an alternative estimation and statistical inference procedure based on a double-bootstrap approach. In this study, the DEA double bootstrap is employed for analysis.

The remaining of the study is designed as follows: Section II contains review of related literature in the context of this study. Section III provides methodological framework and describes sources of data. Empirical results of conventional banking sector are discussed in section IV. Section V concludes this study and provides some recommendations.

II. REVIEW OF LITERATURE

Several studies are found in literature on measuring the performance of banking sector. But almost in every study, two approaches (DEA and SFA) are widely used to analyze the efficiency of different sectors including banking sector. But empirical analysis with respect to the appropriate technique is limited in Pakistan. Very rare, if any, study is found in Pakistan which has analyzed the efficiency of banking sector by applying DEA double bootstrap technique.

Percin and Ayan (2006) measured the efficiency of 31 commercial banks of Turkey over the 2003 to 2004 period by applying the DEA and Malmquist Productivity Index (MPI). They used two outputs and four inputs for measuring output oriented efficiency scores. They found that eleven banks were efficient under the assumption of constant returns to scale while sixteen banks remained efficient under the assumption of variable returns to scale in DEA. Meanwhile, they found that there was a significant increase in the efficiency of banking sector for the 2003 to 2004 period as MPI analysis showed.

Akmal and Saleem (2008) measured the efficiency of thirty commercial banks of Pakistan for the 1996 to 2005 period. They applied general two-stage DEA approach to measure the efficiency in the first stage and in the second step they used Tobit regression to find the impact of macroeconomic and internal bank factors on efficiency. They found that efficiency of foreign banks was greater than local national and privatized banks and overall efficiency level of banking sector started to increase after 2000.

Chansarn (2008) applied the DEA to examine the relative efficiency of 13 Thai commercial banks for the 2003 to 2006 period. He used DEA under two different approaches: operational approach where three inputs and two outputs were utilized and intermediation approach where two inputs and two outputs were used to measure the relative efficiency. It was found that efficiency of Thai commercial banks was very high and stable under operational approach and the efficiency was moderately high and little volatile under the intermediation approach.

Nazir and Alam (2010) applied the traditional method and DEA approach to calculate efficiency scores of twenty-eight commercial banks of Pakistan over the 2003 to 2007 period. They also tested whether privatization really improved the efficiency of banks? Their results suggested that privatization could not help banks in improving their operating income. It was also noted that public banks were better able to cover their interest and non-interest expenses from their corresponding revenues.

Akhtar *et al.* (2011) analyzed the determinants of profitability for conventional banks of Pakistan over the 2006 to 2009 period. They employed the OLS method for analyzing the multivariate regression. They formulated two different regression models with different dependent variables (return on equity and return on assets as proxies of profitability) and the same independent variables for both models. Gearing ratio, assets management and non-performing loans showed a significant impact in both models while size of banks was insignificant indicator where return on equity was used as the proxy for profitability.

Assaf *et al.* (2011) measured the efficiency of nine Saudi banks for the 1999 to 2007 period. They applied DEA double bootstrap technique for measuring the TE in the first stage and found out determinants of efficiency by applying the truncated regression in the second stage. They used three inputs and three outputs based on the intermediation approach to evaluate the efficiency scores. They found that Saudi banks were operating in a highly efficient environment.

Haque and Tariq (2012) evaluated the efficiency of banking sector of Pakistan including sixteen conventional and six Islamic banks for the 2006 to 2010 period. They applied non-parametric frontier technique of DEA analysis for measuring efficiency by utilizing three inputs and three outputs based on intermediation approach. They found that efficiency of overall banking sector deteriorated from 1 in 2006 to 0.73 in 2009 while during this period Islamic banks performed significantly better than conventional banks.

Ngo (2012) analyzed the changes in performance of Vietnamese banking sector over the 1990 to 2010 period. He applied the DEA window analysis in the first stage. In the second stage, he used a Tobit model for regression analysis to find out the impact of macroeconomic variables on TE. He found that performance of banks under study decreased with the increase in their size over time. He proposed that tight monetary policy or loose fiscal policy could help improve the efficiency of Vietnamese banking sector because of the great impact of government spending and short-term interest rate on efficiency.

Sangeetha and Mathew (2013) analyzed the efficiency of twenty six public banks of India for the 2009 to 2011 period. They employed input-oriented multi-stage DEA to measure the efficiency by utilizing two inputs and two outputs on the basis of intermediation approach. They found that only three banks (IDBI, Corporation Bank and State Bank of India) were consistently efficient over the entire period. They also found that forty to fifty percent banks were under the average efficiency scores and suggested that these three banks could be taken as reference for other banks to improve their efficiency.

Thilakaweera *et al.* (2014) measured the efficiency of fifteen commercial banks of Sri Lanka in the post conflict period (2009 to 2012) of economic expansion. They applied the bootstrapped DEA simulation approach to measure the bias-corrected efficiency scores. They used both intermediation perspective (with three inputs and one output) and operating perspective (with two inputs and two outputs). They found that national banks were less efficient in the 2009 to 2010 period and their efficiency increased in 2011 and 2012 under the intermediation approach while state-owned banks showed high efficiency under the operating approach for the whole period.

It can be observed from the review of existing literature that there are several studies on measuring efficiency of banking sector with different techniques. In these studies, mostly general DEA approach and Tobit regression analysis have been employed which are not appropriate approaches as severely criticized by Simar and Wilson (2007). In Pakistan, there is much space to work on banking sector using the most appropriate technique. That is why an application of DEA double bootstrap technique will be employed in this study to analyze the technical efficiency.

III. METHODOLOGY

Farrell (1957) was the first who introduced the method of measuring the efficiency of producing units. A lot of work has been done on Farrell's (1957) classic TE. It is obvious that there are two basic techniques for the measurement of efficiency: parametric and non-parametric. Meeusen and Broeck (1977) and Aigner *et al.* (1977) initiated the parametric technique which was known as stochastic frontier analysis (SFA). The SFA technique requires specification of functional form and estimates the cost frontier such as parametric approaches require some assumptions. The main quality of this technique is to incorporate the stochastic error in the specification of the model. However, the main problem associated with this technique is the enforcement of the distributional assumption of the error term. Further, SFA technique is sensitive to functional form of the objective variable. In addition, as said by Mahadevan (2002), "Different specifications of the production function under the parametric approach provide different results and this is a serious methodological problem."

Linear programming models of Charnes *et al.* (1978) and Fare *et al.* (1985) provided the basis for the production efficiency analysis. Where the convexity assumption is adopted in the literature, those techniques are known as data envelopment analysis (DEA). Charnes *et al.* (1978) developed the DEA and Banker *et al.* (1984) further modified it using the frontier efficiency concept first defined by Farrell (1957). It is a non-parametric technique and is widely used for measuring the efficiency of decision making units. It does not require specification of functional form with respect to the inputs and outputs or the setting of weights for various factors. DEA creates an efficient frontier for every observation. The maximum output can be obtained empirically by a given set of inputs. The details of DEA are available in Coelli *et al.* (2005).

Despite these features, DEA has several drawbacks. The error term is not specified in DEA which means that errors are included in the efficiency estimates. There is no explanatory quality in DEA technique to determine the sources of technical efficiency. In addition, it is assumed in DEA that decision making units have full control over the inputs which can be discretionary variables. So, it is a weak assumption because non-discretionary variables (environmental variables) are present in every sector of the economy, which are to be necessarily incorporated in the production function for measuring the accurate efficiency (Ouellette and Vierstraete, 2004). A lot of work has been done on incorporating the environmental variables in DEA technique. Banker and Morey (1986) and Ruggiero (1996) directly incorporate the non-discretionary variables in DEA technique and measure the efficiency in a single stage model while others like Ray (1991), Muñiz (2002) and recently Simar and Wilson (2007) omit the environmental variables from the DEA programme and introduce them in the second stage of the technique.

Simar and Wilson (2007) identified severe limitations of two-stage DEA technique which is frequently applied by the existing studies. They revealed that previous literature involving production process of DEA two-stage models were defective because the data generating process (DGP) was not described in these models. Thus, TE scores estimated by DEA are highly doubtful. They also found that these efficiency scores were serially correlated. Therefore, the general two-stage DEA techniques are statistically invalid. Simar and Wilson (2000) also explain that DEA underestimates the frontier and hence efficiency scores are exaggerated. Keeping in view these severe drawbacks of DEA, Simar and Wilson (2007) proposed an alternative estimation and statistical inference procedure based on a double-bootstrap approach. We have employed this approach in our study.

IV. DATA ENVELOPMENT ANALYSIS AND DOUBLE BOOTSTRAP

We have used the output oriented variable returns to scale (VRS) model for obtaining the efficiency scores because constant returns to scale (CRS) is applicable in the case where banks or branches are operating at their optimal scale. However, due to varying size of banks, imperfect competition and financial constraints banks are not working at their optimal scale. The output-oriented DEA efficiency estimator $\hat{\theta}_{vrsi}$ for any data set (x_i, y_i) for each conventional bank can be attained by solving the following linear programming equation.

$$\hat{\theta}_{vrsi} = \max\left(\begin{array}{l} \theta > 0 \mid \theta_i Y_i \leq \sum_{i=1}^{n} \gamma_i Y_i;\ X_i \geq \sum_{i=1}^{n} \gamma_i X_i; \\ \sum_{i=1}^{n} \gamma_i = 1;\ \gamma_i \geq 0,\ i = 1, \ldots n \end{array}\right) \quad (1)$$

In equation (1), Y and X are observed outputs and inputs and $i = 1, \ldots, n$ is the specific bank. The $\theta_i Y_i$ is the efficient level of outputs, θ is the scalar and γ_i is the non-negative vector of constants defining the optimal weights of inputs to outputs. The obtained value of $\hat{\theta}_{vrsi}$ is the technical efficiency estimate for ith bank. In case of output oriented, outputs should be increased for getting the higher technical efficiency by a given set of inputs where $\hat{\theta}_{vrsi} = 1$ means that the bank is considered fully efficient while $\hat{\theta}_{vrsi} < 1$ means that the bank is not fully efficient and it needs to increase the outputs from the given set of inputs for reducing the inefficiencies.

Two things should be made clear with respect to equation (1). First, the assumption of VRS is applied in this linear programme and second, it is observed by Simar and Wilson (2000) that $\hat{\theta}_{vrsi}$ is upward biased estimator, as banking frontier can be underestimated. Due to limitations of DEA, the smooth bootstrap technique of Simar and Wilson (1998, 2000) is applied in this study for getting the bias-corrected efficiency scores and their confidence intervals accompanied by the DEA with bootstrapping approach.

The bias-corrected efficiency scores which are estimated in the first stage are left truncated by 1. In the second stage, a single truncated regression with bootstrap will be employed for regressing these TE scores of all banks against a set of explanatory factors in the following truncated maximum likelihood regression model.

$$\hat{\theta}_{vrsi} = b + z_i \beta + \varepsilon_i \qquad (2)$$

In equation (2), *b* is the constant term, ε_i is the identically and independently distributed random error term, and z_i is a vector of specific variables (these are known as environmental variables) for bank *i* that is expected to be related to the bank's efficiency score. We applied algorithm 2 of Simar and Wilson (2007) for bootstrap procedure in this study. This algorithm consists of seven steps and provides inference about coefficients. A step by step DEA double bootstrap procedure is described briefly in various studies such as Barros and Assaf (2009) and Assaf *et al.* (2011).

V. SELECTION OF VARIABLES AND SOURCES OF DATA

There are two perspectives for selecting the inputs and outputs for DEA: intermediation perspective and production perspective. According to Berger and Humphery (1997), intermediation perspective considers a bank as a unit that uses labour and capital to transform funds. On the other hand, production perspective considers a bank as a producer of various services for its clients. They also found that production perspective was more appropriate for finding the efficiency of the branches of the bank whereas intermediation perspective was more appropriate for finding efficiency of overall banks. We have employed the intermediation approach for selecting the inputs and outputs for measuring TE.

In this study, two inputs (operating fixed assets and total deposits) and three outputs (net investments, net interest income and total advances) are employed to measure the TE. The entire data is collected in thousands of Pak rupees. The selection of inputs and outputs are supported by various studies, such as Chansarn (2008), Burki and Niazi (2010), Haque and Tariq (2012) and many others.

To find out the sources of TE, the bias-corrected efficiency will be regressed against the environmental variables in truncated regression. For this purpose, following truncated regression model will be employed and description of the variables is given under this model.

$$\hat{\hat{\theta}}_{it} = \beta_0 + \beta_1 A_{it} + \beta_2 L_{it} + \beta_3 O_{it} + \beta_3 E_{it} + \varepsilon_{it} \quad (3)$$

$\hat{\hat{\theta}}_{it}$ is the estimated *TE* scores based on the assumption of VRS. Where *A* represents the log of total assets of i^{th} bank in time period t which is used as a proxy for economies of scale and *L* denotes the log of total liabilities of i^{th} bank in time period *t*. *O* is a dummy variable which is 1 for private banks and 0 for public sector banks which shows the ownership impact while *E* represents the age of the bank which is a proxy for learning by experience.

The data of twenty conventional banks is collected from their Annual financial reports for the 2007 to 2013 period.

VI. EMPIRICAL ANALYSIS

The results of *VRS TE* scores based on 2500 bootstrapped iterations for the 2007 to 2013 period are presented in Appendix A. Banks' names are given in the first column. The original DEA efficiency scores are presented in the second column. Bias-corrected efficiency scores are given in the third column. The lower and upper bounds of confidence interval are presented in the fourth and fifth columns, respectively. The same is shown for the 2007 to 2013 period.

It can be observed that original efficiency scores, which are denoted by DEA, overestimate the results and underestimate the frontier, as described in the limitations of DEA by Simar and Wilson (2000). Bias-corrected efficiencies (which are denoted by BC in the following tables) are estimated after 2500 iterations which are free of exaggeration. The main importance of these estimations is that they also fall within the confidence intervals while DEA scores do not fall within the confidence interval because it under-estimates the frontier and shows the inefficient units as efficient units.

In this study, output oriented DEA Double Bootstrap model is applied, the efficiency score 1 shows the technically fully efficient bank while estimated efficiency score less than 1 shows the inefficient or less efficient bank. In case of output-oriented model, different levels of output are produced by utilizing same set of inputs. So, for minimizing the inefficiencies, maximum level of output should be obtained with the fixed set of inputs.

In the existing results, bias corrected technical efficiency scores vary for every entity in the given time periods. It can be observed from Table 1 that overall bias corrected efficiencies deteriorated during 2008 and 2013. In 2008, the bias-corrected mean efficiency score is at its peak with the score of 0.7620 which shows that almost 24% overall level of output can be increased by utilizing the same set of inputs. In 2013, this score is 0.5603 which shows that after the financial crisis conventional banking sector of Pakistan could not resist against the financial crisis and the efficiency score decreased to this level.

TABLE 1

Mean Efficiencies of Banks

Year	DEA	BC
2007	0.8548	0.7248
2008	0.8812	0.7620
2009	0.866	0.7615
2010	0.8527	0.7125
2011	0.8251	0.6633
2012	0.8143	0.6326
2013	0.7969	0.5603

Source: Authors' own estimates.

Truncated Regression

After measuring the bias-corrected TE of the conventional banking sector for the 2007 to 2013 period, the efficiencies of 20 banks for seven years were pooled in one truncated regression form as showed in equation (3) and maximum likelihood method was applied for truncated regression as discussed in the second step of the Simar and Wilson's (2007) double bootstrap procedure. Results of determinants of VRS TE, standard errors and t-statistic are presented, respectively, in column 2, 3 and 4 of Table 2.

TABLE 2

Determinants of VRS Technical Efficiency Scores
Using a Bootstrapped Truncated Regression

Regressor	B.hat	SE	t-statistic
Constant	2.9776	1.0752	2.7695*
Total assets	2.52734	1.5665	1.6134
Total liabilities	–2.7279	1.4946	–1.8252***
Ownership	0.2597	0.1182	2.1979**
Experience	0.0013	0.0031	0.4217

NOTE: *, ** and *** mean the coefficients are significant at 1, 5 and 10 percent levels, respectively. The number of observations was 140.

In the second stage, coefficients were bootstrapped 2000 times. Log of total assets which is a proxy for the size of banks has a positive but insignificant impact on the efficiency score. It means economies of scale are weakly prevailing in the conventional banking sector. Log of total liabilities has a negative and significant impact on efficiency of banks. The coefficient was statistically significant at 10 percent level of significance. Third variable was the dummy variable which was used to measure the impact of private ownership on TE. The coefficient of private ownership was positive and statistically significant at 5 percent level. It was found that private banks were almost 26 percent more efficient in terms of technical efficiency scores as compared to public sector banks. Thus, this empirical evidence sheds support in favour of privatization hypothesis. The fourth variable was the age of banks which was used as a proxy for learning by experience. Its coefficient was very small and statistically insignificant signifying the fact that new and older banks do not differ in terms of TE score if other things were held constant.

VII. CONCLUSION AND RECOMMENDATIONS

The purpose of this study was to estimate the technical efficiency of conventional banks of Pakistan including 16 private and 4 public sector banks. The core objective of the managers is to analyze the performance of their entity because they desire to know as to how well are their entities working under the given resources. There are many techniques to measure the efficiency but in this study, DEA double bootstrap is applied to measure the technical efficiency because it is an appropriate approach as compared with other existing techniques.

In the first stage, we have estimated the bias-corrected TE scores because DEA measures the biased efficiencies due to its underestimating the frontier. It can be observed from the results of this study that DEA scores do not fall within the confidence interval and these efficiencies are beyond the confidence interval because of the bias while 2500 times bootstrapped TE scores fall within the interval.

It was found in this study that not even a single bank was technically fully efficient in bias-corrected form over the whole period of estimations. It is found that overall efficiency, which was measured in the form of mean efficiency, has decreasing trend over time. The main reason for this fall might be the existence of alternative banking sector in Pakistan which is known as the Islamic banks which were much less affected by financial crisis. It might be the reason of decline in efficiency that people concentrated on Islamic banking after 2008 which may be filtered after a separate study with an appropriate technique. This study is distinct because it provides the evidence of post impact of financial crisis on conventional banking sector of Pakistan.

In the second stage of this approach, the bias-corrected TE scores were specified as the dependent variable with left truncation, and truncated bootstrapped maximum likelihood regression model was applied because the general regression models were not suitable. In this paper, coefficients were bootstrapped with 2000 simulations because the coefficients did not significantly change beyond 2000 iterations. It is found in this study that there is no evidence of economies of scale in the conventional banking sector of Pakistan. Total liabilities had negative and significant impact on the technical efficiencies. Private ownership had positive impact while learning by experience had a very small positive but insignificant impact.

On the basis of results of the present study, it can be suggested that banks should focus on increasing their efficiency scores by eliminating all wastages. Secondly, banks should start their business with high own funds and keep the liabilities at their minimum level because they have a significant negative impact on efficiency scores. Thirdly, privatization should take place as it has a significant positive impact on efficiency scores. Finally, there is a need for banks to learn from their experience as it can improve the efficiency scores.

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APPENDIX A

DEA and Bootstrapped Efficiency Scores
Along with Lower and Upper Bounds

Banks Name	DEA	BC	LB	UB
2007				
ABL	0.9913	0.8868947	0.8134358	0.9845777
Alfalah	1	0.7636393	0.7139825	0.9921935
Askari	1	0.8841982	0.8259743	0.9923271
Bank Alhabib	1	0.8465987	0.7440769	0.9894482
BOP	0.9714	0.8910172	0.8261875	0.9661439
BOK	0.9933	0.8668471	0.7820302	0.9848314
MCB	0.3368	0.3047535	0.2815624	0.3341559
NBP	0.6645	0.6079229	0.5724726	0.6593115
Faysal	1	0.6689269	0.6046142	0.9924602
FWB	0.9161	0.8419926	0.7765655	0.9093601
Habib Metro	1	0.6827768	0.6075341	0.9915928
HBL	0.7263	0.6551918	0.6013273	0.7212279
JS	0.8842	0.778036	0.7071001	0.878126
Kasb	1	0.6607094	0.6060995	0.9920569
NIB	1	0.8865748	0.8126461	0.990695
Samba	0.7541	0.6750395	0.6087037	0.749165
Silk	0.6967	0.645887	0.6004565	0.6924715
Soneri	0.7	0.63454	0.5861315	0.6967062
Summit	1	0.9030429	0.8494038	0.9924217
UBL	0.4609	0.4107977	0.3815581	0.4579071
2008				
ABL	1	0.844497	0.7707727	0.9946969
Alfalah	0.8571	0.7699734	0.6950376	0.8519749
Askari	1	0.8490413	0.7879032	0.9935858
Bank Alhabib	1	0.8833969	0.8258159	0.9938814
BOP	0.4783	0.4420953	0.4155876	0.4757415
BOK	0.9379	0.8619358	0.8088133	0.9318636
MCB	1	0.8716771	0.8095318	0.9938846
NBP	0.7	0.6478036	0.6032173	0.6976257
Faysal	1	0.7668486	0.6642723	0.993174
FWB	0.818	0.7345867	0.6690609	0.8125353
Habib Metro	1	0.7587581	0.6645484	0.9951587
HBL	0.8181	0.7416148	0.6695984	0.812729

Banks Name	DEA	BC	LB	UB
JS	1	0.8178728	0.7521966	0.994497
Kasb	1	0.8442263	0.7873467	0.9935189
NIB	0.9914	0.8899787	0.7822886	0.9862739
Samba	1	0.7681273	0.6663911	0.9942616
Silk	0.55	0.5014646	0.4590651	0.548279
Soneri	0.8	0.7574037	0.7097966	0.7976763
Summit	1	0.8672996	0.8143134	0.9938561
UBL	0.6724	0.6218917	0.5789347	0.6682834
2009				
ABL	1	0.8472387	0.7737356	0.9940105
Alfalah	1	0.8539829	0.7720012	0.9929865
Askari	1	0.855309	0.7877378	0.9935541
Bank Alhabib	1	0.8882674	0.8241423	0.9926429
BOP	0.923	0.8574079	0.7959575	0.9174935
BOK	1	0.7780055	0.6788138	0.9938002
MCB	0.5119	0.4727526	0.4337232	0.5091641
NBP	0.8035	0.7547922	0.7058788	0.799445
Faysal	1	0.858386	0.7714953	0.99362
FWB	0.7768	0.6999878	0.656076	0.771507
Habib metro	0.7911	0.7049297	0.6392111	0.7864577
HBL	0.7678	0.7046762	0.6424688	0.7628706
JS	1	0.8431856	0.7862296	0.9934075
Kasb	0.6139	0.5606915	0.513901	0.6105349
NIB	1	0.8841968	0.8380822	0.9942093
Samba	1	0.7758856	0.6805201	0.9940429
Silk	0.7816	0.7168559	0.6621407	0.7765572
Soneri	0.85	0.7980613	0.7467369	0.8477328
Summit	0.8006	0.7131485	0.6476283	0.7958972
UBL	0.7	0.6619487	0.6204193	0.6975933
2010				
ABL	0.5882	0.518376	0.4621594	0.5835707
Alfalah	0.7209	0.6367084	0.5793534	0.7158912
Askari	0.3623	0.3177091	0.2771995	0.3598776
Bank Alhabib	0.9323	0.7941148	0.7050352	0.9255444
BOP	1	0.8609668	0.7839041	0.9924516
BOK	1	0.7138339	0.6490402	0.9912478
MCB	0.7111	0.6379154	0.592042	0.7054952
NBP	0.9455	0.8653354	0.8096151	0.9383408

Banks Name	DEA	BC	LB	UB
Faysal	1	0.8175399	0.7521035	0.9921877
FWB	1	0.6621999	0.6140489	0.9928669
Habib metro	0.9306	0.8122226	0.699627	0.9236349
HBL	1	0.8234238	0.7502331	0.9922895
JS	0.4053	0.3599202	0.332293	0.4023254
Kasb	0.7343	0.6539697	0.6041795	0.7295029
NIB	1	0.8360287	0.7905343	0.9926834
Samba	1	0.6429223	0.6123589	0.9906812
Silk	1	0.880685	0.7998402	0.9931774
Soneri	0.9611	0.8720247	0.8064794	0.9529883
Summit	1	0.8483201	0.7841422	0.992908
UBL	0.7614	0.6964762	0.6518783	0.7555124
2011				
ABL	0.7126	0.6157394	0.559347	0.7061279
Alfalah	0.6222	0.5339226	0.481668	0.6171273
Askari	0.3	0.2595908	0.2280102	0.2985987
Bank Alhabib	1	0.6171997	0.5913291	0.9908648
BOP	0.95	0.8110092	0.7331692	0.9462146
BOK	1	0.6076795	0.5909971	0.9909721
MCB	0.6728	0.5858506	0.544278	0.6672331
NBP	0.8	0.7129492	0.6507528	0.7967999
Faysal	1	0.6003368	0.591311	0.9897504
FWB	1	0.6181601	0.5906825	0.9919034
Habib metro	0.9152	0.7898975	0.7024209	0.907314
HBL	1	0.8061625	0.7705402	0.9891564
JS	0.4168	0.3646639	0.3400623	0.4123182
Kasb	0.8271	0.7570733	0.6995221	0.8231073
NIB	1	0.8108747	0.7829616	0.9927121
Samba	1	0.8036321	0.7364169	0.9919446
Silk	0.75	0.6954417	0.6462634	0.7468666
Soneri	1	0.9039536	0.8443603	0.9916007
Summit	0.85	0.7705001	0.7010136	0.8467652
UBL	0.6855	0.6022466	0.5559586	0.6803816
2012				
ABL	0.7328	0.6324101	0.5864202	0.7239207
Alfalah	0.5965	0.5065222	0.4717017	0.5902381
Askari	1	0.8658744	0.810584	0.9894933
Bank Alhabib	0.3201	0.263151	0.2373402	0.316819

Banks Name	DEA	BC	LB	UB
BOP	0.377	0.3350098	0.3138279	0.3734963
BOK	1	0.5710303	0.5998128	0.9876488
MCB	0.7665	0.6739135	0.6254075	0.7588208
NBP	1	0.5540983	0.5973985	0.9899665
Faysal	1	0.5678265	0.5982251	0.9911486
FWB	1	0.7409388	0.7208833	0.9875875
Habib metro	1	0.851592	0.775268	0.9887259
HBL	1	0.5803306	0.5973934	0.9906522
JS	0.6626	0.5845115	0.5449614	0.6565334
Kasb	0.6304	0.5482075	0.512148	0.6242656
NIB	1	0.7559521	0.7440604	0.9885901
Samba	0.9278	0.7984742	0.7370789	0.9196298
Silk	0.75	0.6795656	0.6291172	0.7457948
Soneri	1	0.8000938	0.7446296	0.9901158
Summit	0.826	0.7414744	0.6790398	0.8188303
UBL	0.6967	0.6004602	0.5528406	0.6910079
2013				
ABL	0.5733	0.4820355	0.4542599	0.5645008
Alfalah	0.5769	0.4482681	0.421878	0.5678886
Askari	0.9166	0.7885282	0.7188115	0.9029226
Bank Alhabib	0.4597	0.3473763	0.3251018	0.4527521
BOP	0.7046	0.5793806	0.5437199	0.6954437
BOK	1	0.4678412	0.5755642	0.9845926
MCB	0.75	0.6407865	0.5976342	0.7456239
NBP	1	0.4831267	0.5760097	0.9861818
Faysal	1	0.4756806	0.5766608	0.9865488
FWB	1	0.7390269	0.7347122	0.9865017
Habib metro	1	0.7843632	0.7536718	0.9848182
HBL	1	0.4789353	0.5764076	0.9856697
JS	0.6666	0.5841691	0.5437742	0.6566691
Kasb	0.4837	0.3978047	0.3739955	0.4771952
NIB	1	0.4537872	0.5749461	0.9860237
Samba	0.25	0.212566	0.1960353	0.2481619
Silk	0.8	0.6954094	0.6453263	0.7932151
Soneri	1	0.778802	0.7520262	0.9841971
Summit	1	0.7391737	0.726552	0.9864456
UBL	0.7575	0.6285852	0.5898238	0.7463