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Evaluating The Efficiency of Pakistani Microfinance Banks Through Data Envelopment Analysis: A Non-Parametric Approach

Abstract

The aims of this study is to observe the efficiency of prominent microfinance banks working in Pakistan as the microfinance banks not only playing its role in poverty alleviation but also becomes an important stakeholder that becomes a cause of generating income activities in Pakistan through provision of small loans to unbanked people. A non-parametric approach (Data Envelopment Analysis Techniques) applied to observe the efficiency of five DMUs including FINCA Bank Limited, APNA Bank, NRSP, The First Micro Finance Bank, and Khushhali Bank. In this study Deposit (X1), Fixed Assets (X2) and Capital/Owner Equity (X3) were taken as input whereas Investment made by said DMUs (Y1), Advances/Loan sanctioned to customers (Y2) and Total Assets/Total worth (Y3) were taken as output to measure the efficiency score of aforementioned DMUs. For this study 5-year data from 2013 to 2017 regarding inputs and outputs were taken from Market Mix Survey. The results of the study signposted that Khushhali Bank and NRSP Bank dominated on all remaining DMUs on the basis of Technical Efficiency (TE) and Scale Efficiency (SE) whereas with reference to Pure Technical Efficiency (PTE) and overall efficiency score Khushhali Bank dominated on all DMUs.

Key Words: Technical (TE), Pure Technical Efficiency (PTE), Scale Efficiency (SE), Decision Making Unit (DMUs) & Data Envelopment Analysis (DEA).

Introduction

Efficiency scores of microfinance banks has equal importance for all stakeholders including customers, banks employees, banks shareholders, investors and regulator because microfinance banks not only playing its role in poverty alleviation but also become a cause of generating economic activities in Pakistan through the provision of micro credit and others services including insurance, promoting

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savings and operational assistance regarding utilization of loans as well. Besides this efficiency scores comprises various factors of financial performance therefore efficiency score can be used as tools or base for decision making by various stakeholders including customers, depositors, bank employee, creditors, credit rating agencies, regulatory bodies and investors as well. The aims of this effort is to measure the efficiency of prominent microfinance banks working in Pakistan as the microfinance banks not only playing its role in poverty alleviation but also becomes an important stakeholder that becomes a cause of generating income activities in Pakistan through provision of small loans to unbanked people. This study significantly different from previous studies as this study purely conducted on microfinance banks besides these various financial indicators like deposit, fixed assets and capital used as input to enhance the output in form of investment, advances and total assets.

A non-parametric approach (DEA Techniques) applied to observe the efficiency of five Microfinance Banks (DMUs) including FINCA Bank, NRSP Bank, First Microfinance Bank and Khushhali Bank. In this study Deposit of active customers (X1), Fixed Assets/Permanent nature assets (X2) and Capital/Owner Equity (X3) were taken as input whereas Investment made by all Microfinance Banks (DMU) (Y1), Advances/Loan sanctioned to customers (Y2) and Total Assets/Total worth of DMU (Y3) were taken as output to measure the efficiency score of aforementioned DMU. For this study 5-year data from 2013 to 2017 regarding inputs and outputs were taken from Market Mix Survey. Efficiency of microfinance banks with reference to intermediation and operating profit can be measured by using DEA techniques by taking labor, deposit and capital as source of input (Rahim et al, 2013). Efficiency score is an important element that can be used to observe the past, present and future performance of banks as number of elements including deposit, capital, investment, advances, fixed assets and total assets was taken to observe the efficiency scores of banks that comprises on more than one year (Chapra, 2007).

Most of investors all over the world facing problems while taking decision regarding making investment in banking sector as they did not have any idea about the financial performance of concerned banks but on the basis of efficiency score they can take better decision as the efficiency score was calculated on the basis of various financial indicators including deposit, advances, operating profit, net profit, investment, total assets, fixed assets and capital (Arthur, 2009). Size of bank as an important element that cannot be overlooked while measuring the efficiency of banks besides this financial products of microfinance banks are different and unique as compare to conventional/Commercial banks and size of microfinance banks are less as compare to conventional/Commercial banks that becomes a cause of lower efficiency of microfinance banks as compare to conventional/Commercial banks. Therefore, majority of study indicated that efficiency score of large size bank were remained higher as compare to small size bank. (Chapra, 2007). Matthews and Ismail (2006) and Rahim et al. (2013) added

that foreign banks are large in size as compare to local banks, therefore foreign technically more efficient as compare to local banks.

The key objective for conducting this study is to measure and compare the specific factors that become a based to make a contrast of Microfinance banks performance and conventional/Commercial banks performance in Pakistan. Better resources allocation, survival, growth and stability and economic system can be ensured through better financial/Economic performance/Output of banking sector. He also added that better financial performance of banking sector not only uplifting the investment but also increasing the shareholder wealth. Financial performance of an organization linked with multiple factor including operating efficiency, bank size, bank capital position, liquidity and assets management (Srairi, 2010). However, results of various studies indicates that some internal factors also affect the performance of an organization like overheads, liquidity position, risk and solvency ratio, leverage ratio, earnings performance, credit risk, concentration, operating and general expenses, deposit by customer, size of banks and macroeconomic factors such as GDP, inflation rate, interest rate, exchange rate etc. (Abdelader & Saleem, 2013).

Literature Review

Berg et al. (1998) used the concept of TE and Allocative Efficiency (AE) to measure the efficiency scores of different firms. Favero & Papi (1995) mentioned that Charnes, Cooper and Rhodes (CCR) and BCC are the two basic models of Data Envelopment Analysis (DEA) and Data Envelopment Analysis (DEA) techniques can be used to measure the efficiency score of banking sectors and others financial institutions as CCR model of efficiency follow the constant return to scale whereas BCC model follow the variable return to scale. According to Matthews & Ismail (2006) DEA model worked on the basis of "Black Box" assumptions that inputs creates outputs but its production process is implicit and unknown. Bader et al. (2008) stressed that previous studies was conducted on this topic can be divided into two groups. One group measured the efficiency of banking sector through ratio analysis and second group access the performance of banks through DEA with reference to TE, PTE and SE. They further added that frontier method is better as compare to the standard financial ratio analysis techniques because in frontier analysis techniques remove the differences in input and output prices and other exogenous market factors that put impact on standard performance of the firms.

Rozzani and Rahman (2013) conducted a study in GGC countries six banks by collecting data from 2000 to 2004 by using the DEA Techniques. He mentioned that efficiency of banks with reference to constant return to scale was higher as compare to variable return to scale. He further added that efficiency scores of banks depend on size of banks as well. According to his findings the selected banks have the same efficiency from 2000 to 2004. He also added that with reference to TE a significant increase was observed in GCC countries from 2000 to 2004. Saeed et al. (2013) measured the efficiency of banks that are situated at Middle East, North Africa and Asis by using the DEA model with reference to technical efficiency, pure technical efficiency and scale efficiency. Hassan (2006) carried out a research work on Sudanese banking sector by using the data from 1992 to 2000. In this study he applied different parametric and non-parametric

DEA techniques on the panel of seventeen Sudanese banks. According to the findings of the study 37% banks efficient with reference to allocate efficiency and 60% banks considered efficient technically. This study suggested that Sudanese Microfinance banks was mainly inefficient due to managerial rated rather than the AE.

The Siddique & Rahim (2003) conducting a study to calculate the X-efficiency (TE & AE) by using the Stochastic Frontier Approach (SFA) by using the Sudanese. He added that overall inefficiency was resulting more on TIE rather than on allocative inefficiency (AIE). He also mentioned than inefficiency in Sudanese Microfinance banks rises due to wasting more input rather than choosing irrelevant input combination. Drake (2006) steered that largest four banks of United Kingdom have the problems of Decreasing Return to Scale from the period 1984 to 1995. He also observed that banks of USA and UK presenting same result with reference to X-efficiencies. He mentioned that larger banks efficiently and effectively minimize their cost than the small banks. He concluded that larger banks technical efficiency and scale efficiency are higher than the small banks. Johnes et al. (2013) conducted a study by making 55 US commercial banks as sample. He found that 88% efficiency was increasing return to scale. In this study he mentioned that the efficiency of small size banks was higher as compare to large size bank. The efficiency of small scale banks was higher as the small scale banks used latest technology and overcoming the capital cost more efficiently and effectively. He concluded that banks were higher in PTE compared to SE.

Drake and Hall (2006) mentioned that there is a significant relationship was observed between size of banks and pure technical efficiency and scale efficiency. Pasiouras (2008) argue that banks accept deposits and utilize these deposits in advancing loans; thus, banks are recognized as an intermediary between borrower and lenders he further added that banks use deposits, fixed assets and capital as input and produce output in terms of total assets, investment and advances.

Methodology

A non-parametric approach (DEA) Techniques will be applied to observe the efficiency of five prominent Microfinance Banks of Pakistan (DMUs) including FINCA Bank, APNA Bank, NRSP Bank, First Micro Finance Bank, and Khushhali Bank. In this study Deposit deposited by active customers (X1), Fixed/Permanent Assets (X2) and Capital/Owner Equity (X3) were taken as input whereas Investment made by all DMUs if different sector (Y1), Advances/Loan sanctioned to customers (Y2) and Total Assets/Total worth of DMU (Y3) were taken as output to measure the annual efficiency score of aforementioned DMU with reference to TE, PTE and SE. After that all DMUs will be ranked on the basis of average score TE, PTE and SE. At the end overall efficiency score will be calculated and DMU will be ranked on the basis of overall efficiency scores.

Model of Study

Figure1: - The Basic CCR Model

$$(FP_o) \qquad \max_{\boldsymbol{v},\boldsymbol{u}} \ \theta = \frac{u_1 y_{1o} + u_2 y_{2o} + \cdots + u_s y_{so}}{v_1 x_{1o} + v_2 x_{2o} + \cdots + v_m x_{mo}}$$

$$\text{subject to} \quad \frac{u_1 y_{1j} + \cdots + u_s y_{sj}}{v_1 x_{1j} + \cdots + v_m x_{mj}} \leq 1 \quad (j = 1, \ldots, n)$$

$$v_1, v_2, \ldots, v_m \geq 0$$

$$u_1, u_2, \ldots, u_s \geq 0.$$

Sr. #	Sign	Description of Sign
1	θ	Denotes Efficiency
2	u	Denotes Weight assigned to output
3	v	Denotes Weight assigned to input
4	y	Denotes output
5	x	Denotes input
6	j	Denotes for Decision Making Unit (DMU)

Variables of the Study.

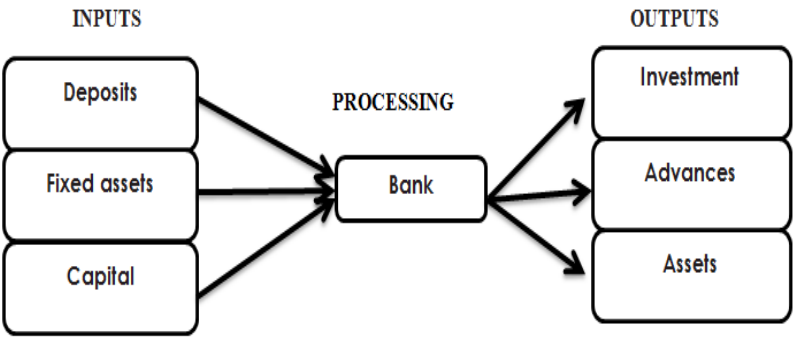
Table 2: - Variables Notation and Description

Variable	Notation	Description
Inputs		
Deposit	X_1	Deposits of customers
Fixed Assets	X_2	Operating fixed assets
Capital	X_3	Share Capital
Outputs		
Investment	Y_1	Investment
Advances	Y_2	Financing and other Related Assets
Assets	Y_3	Total Assets

Source: *A.Zanib & M.T.Majeed (2016)*

Conceptual Framework:

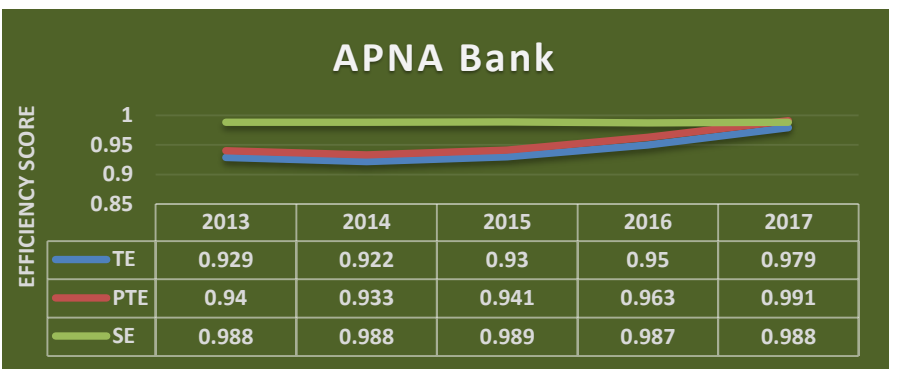
Figure 2:- Conceptual Model



Source*: Fig 2 A.Zanib & M.T.Majeed (2016)*

Results

FIGURE 3: - EFFICIENCY SCORE OF APNA BANK.



	2013	2014	2015	2016	2017
TE	0.929	0.922	0.93	0.95	0.979
PTE	0.94	0.933	0.941	0.963	0.991
SE	0.988	0.988	0.989	0.987	0.988

The above-mentioned Figure-3 cum chart showing the efficiency scores of APNA M Bank. According to the figures, bank is little bit beyond in achieving 100% efficiency. TE as well as PTE lines on the graph showing increasing trend. Additionally, APNA Bank is also not operating according to its size as shown by the SE line.

FIGURE 4: - EFFICIENCY SCORE OF FIRST MICROFINANCE BANK.

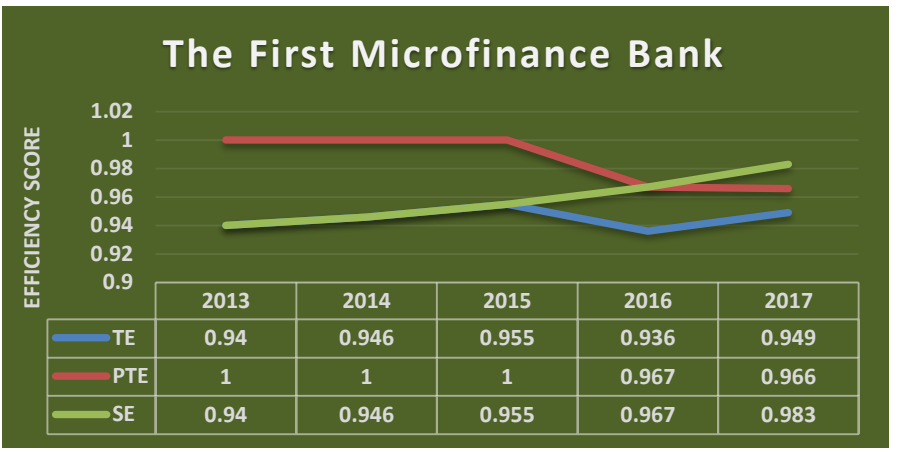


Figure 4: -depicts the efficiency scores of First Micro Finance Bank**.** For the first two years the scores of PTE are 100% means that bank was efficient regarding variable return to scale but not efficient in terms of constant return to scale, SE scores also indicate that bank is not working according to its size.

FIGURE 5: - EFFICIENCY SCORE OF NRSP BANK

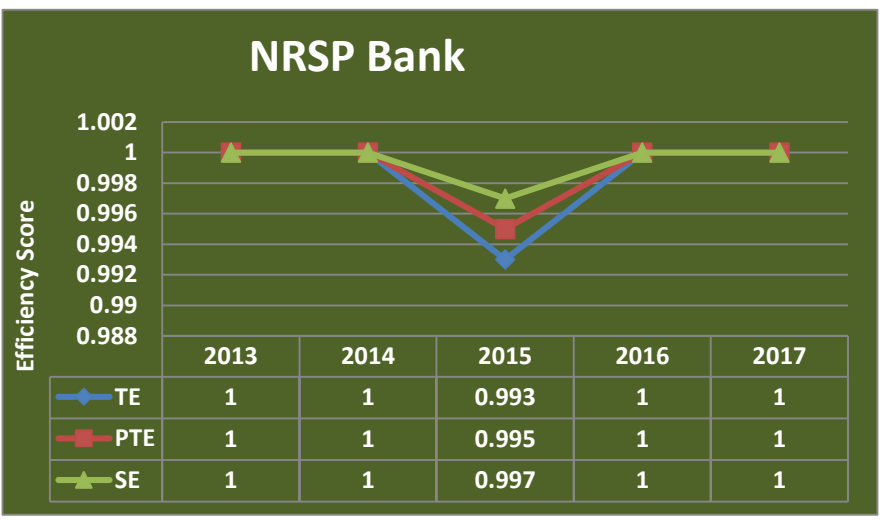


Figure 4:- indicates the performance of NRSP Bank All efficiency scores are 100% in all years except 2015. In 2015 there is a slight slack in the efficiency score. All the performance indicators depict positive performance, like TE, PTE and SE score indicate that bank is efficient in its operations.

FIGURE 6: - EFFICIENCY SCORE OF FINCA BANK.

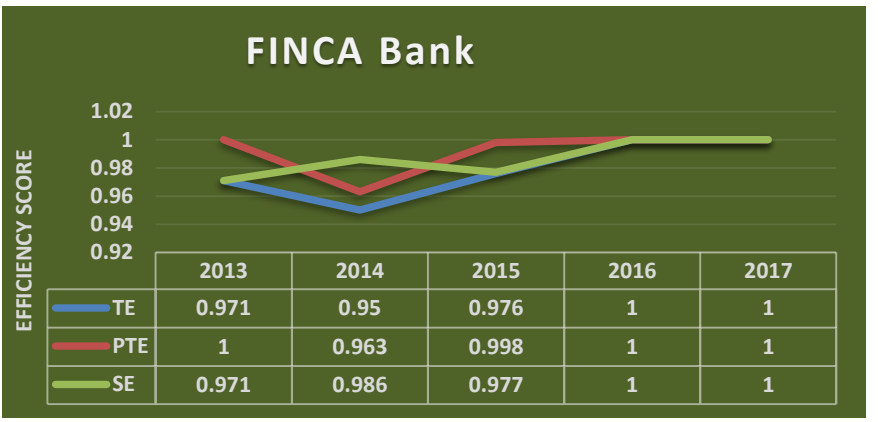


Figure 6:- signifying that FINCA Bank has a gradual increasing trend in the performance scores. In 2014 to 2017 efficiency scores are 100% means bank is efficient and also operating at its best.

FIGURE 7: - EFFICIENCY SCORE OF KHUSHHALI BANK.

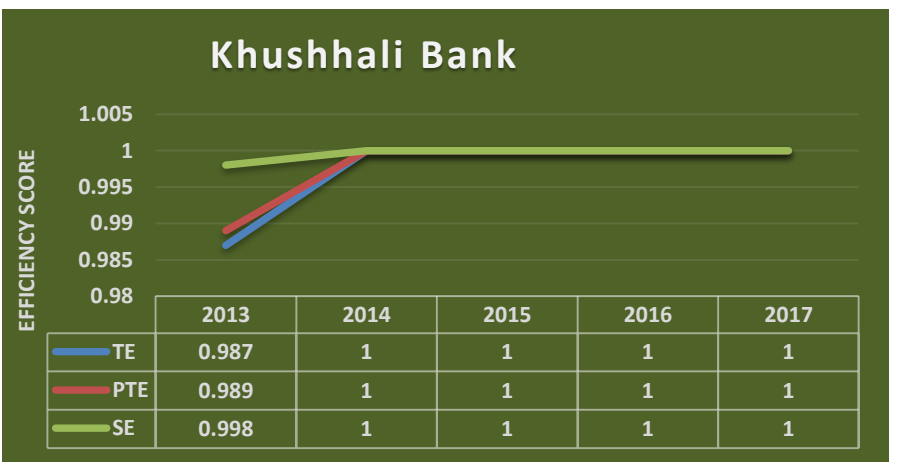


Figure 7:- specified Khushhali Bank the performance according to the above mentioned table and graph only in 2013 the efficiency of bank was below the target line, but in the preceding years bank perform well in constant return to scale, on variable return to scale as well as operating according to its size as indicated by the TE, PTE and efficiency as per SE scores respectively.

TABLE 3: - RANKING OF DMU ON THE BASIS TE:

Sr. #	Name of DMU	Average Score of (TE)	Position
01	APNA Bank	0.94	4th
02	First Microfinance Bank	0.95	3rd
03	NRSP Bank	1.00	1st
04	FINCA Bank	0.98	2nd
05	Khushhali Bank	1.00	1st

FIGURE 8:- RANKING OF DMU ON THE BASIS OF TE:

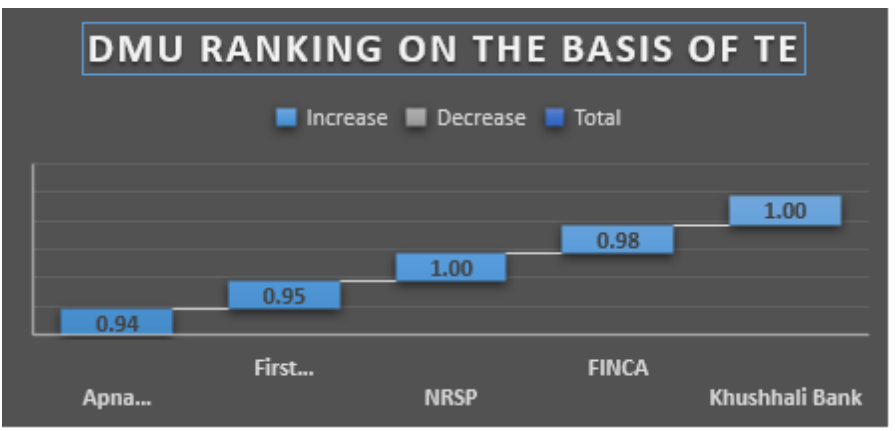
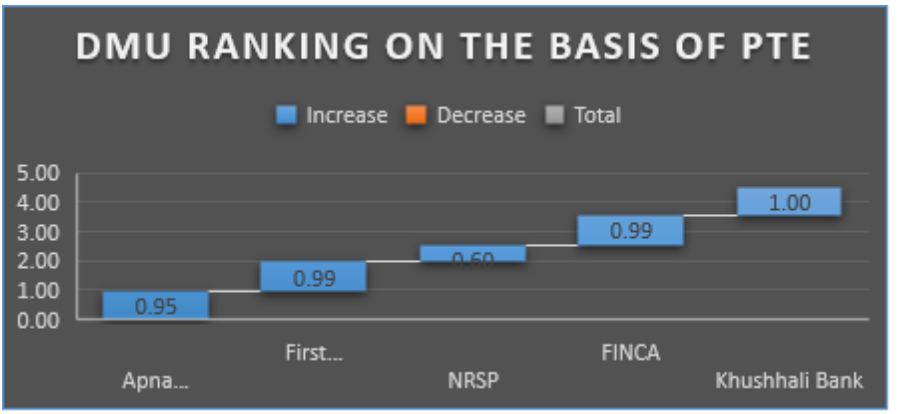


Table-3 and Figure-8 indicated the efficiency score of all DMUs on the basis of TE. According to the means score of efficiency Khushhali Bank and NRSP Bank dominated on all others DMUs whereas remaining DMUs performance also satisfactory on the criteria of TE.

TABLE 4:- RANKING OF DMU ON THE BASIS OF PTE).

Sr. #	Name of DMU	Average Score of (PTE)	Position
01	APNA Bank	0.95	3rd
02	First Microfinance Bank	0.99	2nd
03	NRSP Bank	0.60	4th
04	FINCA Bank	0.99	2nd
05	Khushhali Bank	1.00	1st

FIGURE 9: - RANKING OF DMU ON THE BASIS OF PTE.



As per Table-4 and Figure-9 Khushhali Bank Limited dominating on all other DMUs with reference to PTE, whereas performance of all other DMUs remarkable except the performance of NRSP Bank. Management of NRSP Bank may have revised his policy and efficiency score of PTE may be improved.

TABLE 5:- RANKING OF DECISION MAKING UNIT ON THE BASIS OF SE.

Sr. #	**Name of DMU**	**Average Score of (SE)**	**Position**
01	APNA Bank	0.99	2nd
02	First Microfinance Bank	0.96	3rd
03	NRSP Bank	1.00	1st
04	FINCA Bank	0.99	2nd
05	Khushhali Bank	1.00	1st

FIGURE 10: - RANKING OF DMUs ON THE BASIS SE.

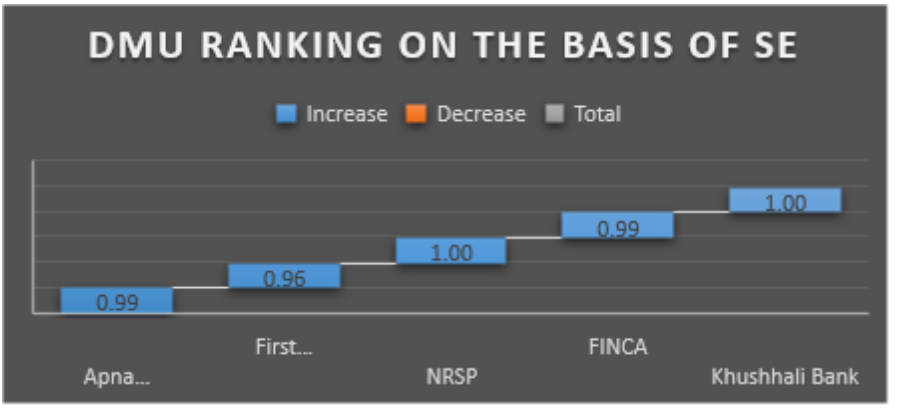


Table-5 and Figure 10 indicating the performance of all DMUs on the basis of SE. As per mean efficiency score of SE onec again Khushhali Bank and NRSP Bank dominating on all others DMUs and performance of remaining DMUs were also satisfactory as the mean value score of all other DMUs greater than 0.9.

TABLE 6:- OVERALL RANKING OF DMUs ON THE BASIS OF TE, PTE & SE.

Sr. #	**Name of DMU**	**TE**	**PTE**	**SE**	**Total Efficiency**	**Overall Ranking**
01	APNA Bank	0.94	0.95	0.99	2.88	4th
02	First Microfinance Bank	0.95	0.99	0.96	2.89	3rd
03	NRSP Bank	1.00	0.60	1.00	2.60	5th
04	FINCA Bank	0.98	0.99	0.99	2.96	2nd
05	Khushhali Bank	1.00	1.00	1.00	3.00	1st

FIGURE 11: - OVERALL RANKING OF DMUS ON THE BASIS OF TE, PTE & SE:

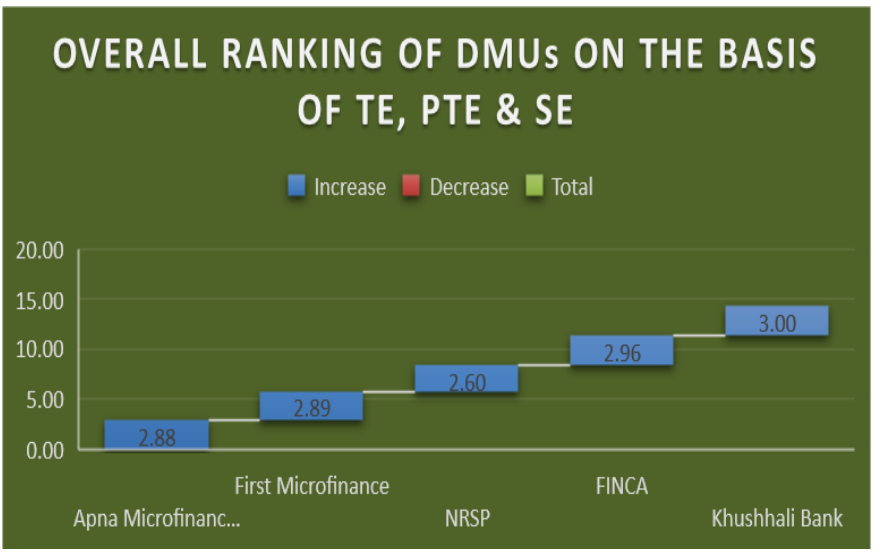


Table-6 and Figure-11 showed the mean value score of all DMUs with reference to TE, PTE & SE. As per overall performance score Khushhali Bank dominating on all others DMUS and getting 1st position on the basis of overall efficiency score. FINCA M Bank secured 2nd position, First Microfinance Bank got 3rd position, APNA Bank Limited secured 4th position and NRSP Bank showing worst performance by getting 5th position on the basis of overall mean efficiency score.

Conclusion

Performance of Khushhali Bank and NRSP Bank with reference to TE mean score and SE mean score are better than all other DMUs, whereas with reference to PTE mean score Khushhali Bank dominating on all others DMUs. Khushhali Bank Limited also leading and dominating on all other DMUs with reference to overall performance (Mean score of TE, PTE & SE) as the mean value score of Khushhali Bank is greater than all other DMUs.

References:

1. Abdelkader, I.B. and Salem, A.B. (2013), "Islamic vs conventional microfinance institutions: performance analysis in MENA countries", *International Journal of Business and Social Research*, Vol. 3 No. 5, pp. 1-15.
2. Bader, M.K., Mohamad, S. and Ariff, M. (2008), "Cost, revenue and profit efficiency of Islamic versus conventional banks: international evidence using data envelopment analysis", *Islamic Economic Studies*, Vol. 15 No. 2, pp. 1-54.
3. Bauer, P., Berger, A., Ferrier, G.D. and Humphrey, D. (1998), "Consistency conditions for regulatory analysis of financial institutions: a comparison of frontier efficiency methods", *Journal of Economics and Business*, Vol. 50 No. 2, pp. 85-114.
4. Chapra, M. (2007), "Challenges facing the Islamic financial industry", *Handbook of Islamic Banking*, Edward Elgar, Cheltenham.
5. Drake, L., Hall, M. and Simper, R. (2006), "The impact of macroeconomic and regulatory factors on bank efficiency: a non-parametric analysis of Hong Kong's banking system", *Journal of Banking and Finance*, Vol. 30 No. 5, pp. 1443-1466.
6. Favero, C. and Papi, L. (1995), "Technical efficiency and scale efficiency in the Italian banking sector: a nonparametric approach", *Applied Economics*, Vol. 27 No. 4, pp. 385-395.
7. Hassan, M.K. (2006), "THE X-efficiency in Islamic banks", *Islamic Economic Studies*, Vol. 13 No. 2, pp. 1-30.
8. Johnes, J., Izzeldin, M. and Pappas, V. (2013), "A comparison of performance of Islamic and conventional banks 2004-2009", *Journal of Economic Behavior & Organization*, Vol. 103, pp. 1-15.
9. Matthews, K. and Ismail, M. (2006), "Efficiency and productivity growth of domestic and foreign commercial banks in Malaysia", Cardiff Economics Working Papers, pp. 1-23.
10. Pasiouras, F. (2008), "Estimating the technical and scale efficiency of Greek commercial banks: the impact of credit risk, off-balance sheet activities, and international operations", *Research in International Business and Finance*, Vol. 22 No. 3, pp. 301-318.
11. Rahim, A., Rahman, A. and Rosman, R. (2013), "Efficiency of Islamic banks: a comparative analysis of MENA and Asian countries", *Journal of Economic Cooperation and Development*, Vol. 34 No. 1, pp. 63-92.
12. Rozzani, N. and Rahman, R.A. (2013), "Determinants of Bank efficiency: conventional versus Islamic", *International Journal of Business and Management*, Vol. 8 No. 14.
13. Saeed, S., Ali, F., Adeeb, B. and Hamid, M. (2013), "Examining efficiency of Islamic and conventional banks in Pakistan: using data envelopment analysis", *Global Journal of Management and Business Research Finance*, Vol. 13 No. 10, pp. 1-11.
14. Siddique, M.A. and Rahim, M. (2013), "Efficiency analysis of full-fledge Islamic Banks and Standalone Islamic branches of conventional banks in Pakistan: a comparative study for the period of 2007-2012", *Journal of Islamic Business and Management*, Vol. 3 No. 2, pp. 1-21.
15. Srairi, S.A. (2010), "Cost and profit efficiency of conventional and Islamic banks in GCC countries", *Journal of Productivity Analysis*, pp. 45-62.