The Nexus of Efficiency and Profitability: A Case Study of Private Commercial Banks of Pakistan

Farhat Ullah Khan
Assistant Professor, Department of Business Administration, Gomal University, Dera Ismail Khan, KP, Pakistan.
Email: farhatullahpk@gmail.com

Aman Ullah Khan
Assistant Professor, Department of Business Administration, Gomal University, Dera Ismail Khan, KP, Pakistan.

Siraj-Ud-Din
Assistant Professor, Department of Management Sciences, Khushal Khan Khattak University, Karak, KP, Pakistan.

Abstract   The study aimed at exploring the relationship between efficiency and profitability of private commercial banks operating in Pakistan. The efficiency represented by technical efficiency has been assessed by non-parametric data envelopment analysis approach while profitability indicated by return on assets has been computed through conventional ratio analysis for period 2009 to 2013. The analysis revealed that technical efficiency declined during the study period and remained at 89%. HMB was identified as the top-performing bank in technical efficiency while MCB remained highly profitable. Banks were then grouped based on TE and ROA. MBL, UBL, DIB, SCB, BAH, HBL and HMB observed as top-performing banks based on TE and ROA. These banks are considered a role model for other inefficient and less profitable banks. Whereas, other banks were grouped as weak, based on below-average ROA and TE scores. These banks can adopt distinct product mix or business strategies to become profitable in future.

Key Words:
Efficiency, Profitability, Commercial Banks, Return on assets, Technical Efficiency, Data Envelopment Analysis.

Introduction

Commercial banks play a dynamic and vibrant role in the economy. It collects the funds from the savers or depositors and allocates them to the highest value use, thereby generating economic activities and limiting the risks in the economy (Akhtar, Ali, & Sadaqat, 2011). It also assists the payment system, mobilizes savings, and allocates the monetary resources for the most productive uses. The economists are of the view that an efficient banking system is a sine qua non for sustainable economic growth and macroeconomic stability of a country. Due to its significant position in the economy, the policymakers always strive to frame such policies that could facilitate banks to operate on sound, efficient and competitive footings (Abbas, Azid, & Besar, 2016). In a dynamic and competitive banking system, only robust banks with a high level of both efficiency and profitability can ensure a fair return to stakeholders and minimize the risks of bankruptcy as they have the potential to withstand any sort of financial crunch. On the contrary, the increasing number of inefficient banks in the financial system of a country could lead to misappropriation of resources, reduced profit on investment or capital, and escalated costs of transactions (Kumar, 2008).

Consequently, this leads to suppress the growth of the overall economy in general and the banking sector particularly. Thus, it becomes mandatory in the above circumstances to identify the sound and distressed banks in the banking system so that an appropriate remedy for distressed banks may be evolved (Gulati, 2011). The turnaround and growth of the banking sector in Pakistan has been remarkable and exceptional in recent years. The banking industry of Pakistan has been classified as the best performing sector in the region due to Its unprecedented profitability, well-contained bank-wide system risks, properly diversifying credit, and low non-performing loans. All these happened because of banking deregulation and liberalization policies introduced after the 1990s. These policies took a strong foothold in Pakistan as the Government decided to denationalized banks, allowed entry of foreign banks, removed the limit on interest rates, abolished concessional lending schemes, etc. The banks under these policies could set their lending rates based on market forces of demand and supply which ultimately leads to creating competition among the market players (Aftab, Ahamad, Ullah, & Sheikh, 2011; Bhatti & Hussain, 2010).In the present era of globalization branded by strong competition, the firms are striving hard to explore novel ways of reducing inefficiencies and increasing profits for maintaining their competitive position.

The management of the companies is in a constant struggle to identify and pinpoint the main sources of inefficiencies by using sophisticated performance evaluation methods. The aim behind this motivation is to open the "black box" of production for spotting areas of weak performance and to identify the strengths of the companies that might be established as a standard for the whole industry. The purpose of this research is to focus on the nexus of efficiency computed via Data Envelopment Analysis (DEA) and the profitability measured by accounting ratio of return on assets (ROA) for commercial banks of Pakistan. Several researchers have studied the performance of commercial banks through either efficiency or profitability parameters in Pakistan. (for example, Afzal et al., 2019; Rehman, 2016; Ahmed and Burki, 2016; Khan and Khattak, 2016; Ahmad & Burki, 2015; Ahmad et al., 2015; Rizvi, 2011; Ahmad, 2011; Abbas, K., 2010; Ahmad et al., 2009; Qayyum & Ahmad, 2007;). However, no attention has been made to assess the nexus of efficiency and profitability by applying the efficiency-profitability pattern or matrix. Thus, the present study intends to examine the relationship pattern of efficiency and profitability of commercial banks of Pakistan.

Objective of Study

The study attempts to explore relationship or nexus between technical efficiency and profitability of commercial banks of Pakistan over the five-year period from 2009 to 2013. The study contributes to the existing literature by applying data envelopment analysis to calculate efficiency along with conventional financial ratios for profitability measurement. This process is performed to examine the link between efficiency and profitability of all commercial banks included in the study sample. This approach is beneficial and helpful for managers and regulators in identifying the robust and weak banks within the banking industry. It can also be helpful to devise strategies for a possible merger of weak banks, or it can pave the way for strategic groups to acquire the underperformed banks in the industry. Moreover, such analysis may prove valuable to detect potential areas for improvement in the banking sector as well.

Literature Review

Evaluating the firm's performance in business research is very important. Preliminary studies have revealed that the competitive advantage of a firm involved in its performance through a change in resources by simply focusing on the purely financial ratio can be overlooked (Eling & Jia, 2019). This aspect of performance is an important component of the firm's performance and can be critically unveiled from a performance boundary point of view. Thus, the question arises as to the extent to which a firm translates performance into profit. In other words, what is the connection between what firms do and what they expect their shareholders to receive in the form of profits? The purpose of this article is to examine whether there is a relationship between a firm's performance and profitability. In other words, as the firm's performance improves, whether that means the firm will be more profitable or not. Find out if increasing a firm's efficiency improves profits. Banks' performance can be measured by accounting measures (financial ratios) or by economic measures (performance frontier approaches). The accounting ratio is mostly used by financial statements to identify the factors contributing to the bank's profits. The most commonly used profitable measures return on assets (ROA) and return on equity (ROE). Numerous researchers have explored the performance of banks in terms of profitability through accounting ratios. For example, Haris, Yao, Tariq, Malik, and Javaid (2019) examined the profits of 26 Pakistani banks. Profits were measured by the four accounting ratios of ROA, ROE, net interest margin, and PM from 2007 to 2016.

Similarly, Yao, Haris, and Tariq (2018) examined the profits of 28 Pakistani banks measured by accounting ratios of ROA, ROE, NIM, and Profit Margin (PM). Ahamed (2017) used the financial or accounting ratio of ROA and ROE as parameters to estimate the profitability of 107 commercial banks in India during the period 1998-2014. Tan (2016) examined the effects of competition and risk on the profits of 41 Chinese commercial banks between 2003 and 2011. Pre-tax ROA, ROE, NIM and four profit factors were used to estimate the profits. Rekik and Kalai (2018) examined the performance and profitability of traditional banks in 14 countries using both accounting ratio and performance boundary methods. In this study, ROA and ROE were used as profit parameters, while the Stochastic Frontier Approach was used to achieve the cost and profit performance of 110 banks in 14 countries. Ahmad and Noor (2011) compared the performance and profitability of Islamic banks in 25 countries. The study applied DEA's Frontier Analysis approach to calculate technical performance while calculating the ratio for profit calculation. To calculate performance, the study used three inputs of total reserves, labor costs, and total assets, while three outputs of total debt, income, and other earned assets were employed based on an intermediate approach. The ROE accounting ratio was used to measure profits. The results show a positive correlation between performance and profitability, reflecting the fact that banks are more profitable to achieve high performance.

Setiawan and Kodratillah (2017) reviewed performance and profitability relationship of Islamic commercial banks in Indonesia from 2012 to 2016. DEA, an economic measure, was applied to evaluate technical performance,

while ROA was traditionally used as a profit measure. Accounting ratio. Kumar (2008) explored the performance and profitability nexus of 27 public sector commercial banks in India in 2005. This study estimated the profit shown in ROA (accounting Ratio) and technical efficiency over DEA (economic measure). Keramidou, Mimis, Fotinopoulou, and Tassis (2013) explored the efficiency and profitability of the Greek meat processing industry between 1994 and 2007. Peng, Jeng, Wang, and Chen (2017) explored the role of bancassurance business in improving the performance and profitability of Taiwanese banks from 2004 to 2012. This performance was measured by the DEA approach. Banks' profits were measured by ROA and ROE. Narwal and Pathneja (2016) examined the effects of corporate governance and bank-specific changes on the productivity and profitability of Indian private and public sector banks from 2004-05 to 2013-14. Accounting Productivity Index Productivity Index was applied while ROA was used to measure profitability. The results indicated that corporate governance has no effect on the profitability and productivity of banks, while almost all variables related to banking reflect the productivity and profitability of public sector banks.

Methodology

The aim of the present study is to find out the relationship between the economic measure of efficiency and accounting measures of profitability for commercial banks of Pakistan. The relationship has been discussed frequently in the economic literature for banking as well as other financial institutions (Stavárek & Polouček, 2004). It is important to mention that efficiency, and profitability is more often used incorrectly and interchangeably. The differences, however, exist between them. First, the profitability appraises the extent to which a business firm produces income or profit from factors of production. It focuses on the revenue-generating capacity of a business by incurring expenses and/or it measures the extent of profits produced by the number of assets invested in the business. The efficiency assesses the extent to which the business uses its various resources or factors of production in an efficacious way. It deals with the relationship between inputs and outputs. Moreover, efficiency and profitability can be measured under different approaches and methodological concepts. Similarly, profitability represents an indicator of firm performance and can be computed without any reference benchmark. On the contrary, a relative reference point or benchmark is required for computing and interpreting the concept of efficiency. Since the methods used for computation of efficiency, and profitability differs, therefore the results obtained under such methods may also contradict each other.

Ratio analysis is one of the widely and frequently adopted approaches to evaluate the bank's performance. It is defined as the ratio of a single input to a single output of a producing firm. This approach cannot fully capture the true concept of a firm's efficiency in case of a firm producing multiple outputs from multiple inputs. When there is difficulty in converting the multiple inputs and outputs into a single ratio, then the process of measurement needs to be done separately. Thus, it could lead to futile results when the ratios are examined in isolation. The futility of results increases as the number of ratios increases in the model to assess the firm's performance. Therefore, it is contended that a relative evaluation of a firm's performance needs to be executed on a more effective and useful basis. Nonetheless, the ratio analysis is still perceived as a better and reasonable method to measure partial facets of the overall performance of a firm like liquidity, profitability, efficiency, productivity, and many others. To eradicate the difficulties or deficiencies in ratio analysis, frontier analysis approaches to measure a firm's performance emerged. They can incorporate multiple inputs and outputs of a firm into a single aggregated ratio and can set benchmark performance against which the relative performance of a firm can be measured or evaluated. It also determines how close or away a firm is from the benchmark called best practice frontier.

The literature provides two such frontier analysis methods, namely parametric and non-parametric methods. However, a consensus on which is preferred method has not been reached yet in the academic literature. The first method was initially proposed by Aigner et al. (1977) and the second developed by Charnes et al., (1978). Each method uses a separate technique to wrap data set under distinct assumptions about the structure of production technology and random noise. Moreover, based on these assumptions, both methods have their own strengths and weaknesses. The parametric approach is stochastic and seeks to separate the effect of inefficiency from the effects of random noise. While the non-parametric is non-stochastic and do not allow random noise instead attributes the error owing to data problems, luck, other measurement error. The efficiency measurement may be tangled by these random deviations from efficiency frontier in the presence of random noise. The parametric approach imposes particular functional form based on behavioral assumptions that presuppose the shape of the frontier. No predefined structure is imposed over the data set in case of non-parametric method. Among the frontier analysis approaches, stochastic frontier approach (SFA), Thick Frontier approach (TFA), and Distribution free approach (DFA) are the popular and preferred methods.

Similarly, data envelopment analysis (DEA), and Free Disposal Hull (FDH) are much-practising methods. The existing literature, however, favours non-parametric approaches for assessment of a bank's efficiency. Among these

approaches, DEA is mostly put into practice. A survey by Sharma, Sharma, and Barua (2013) found that DEA has been mostly used to measure the technical efficiency of banks whereas SFA has been applied to assess either cost efficiency or bank's branch efficiency. Furthermore, the study also found that 75% of the articles reviewed have applied DEA as a method to analyze the efficiency of banks. Similarly, Emrouznejad and Yang (2018) surveyed the DEA literature from 1978 to 2016 and declared the exponential growth in the application of DEA methodology. In the last few years, the study reported on average about 1000 research papers per year published in various reputed journals used DEA. Thus, the present study applies DEA due to its worldwide applications in banking efficiency. Data envelopment analysis measures the efficiency of a productive unit referred to as the decision-making unit (DMU) in the literature. It uses mathematical programming approach to evaluate the performance of a DMU relative to other DMUs in the studied sample set. This method was first devised by Charnes et al., (1978) and thus commonly known as Charnes, Cooper, and Rhodes (CCR) model. It measures the efficiency by the ratio form of the weighted sum of outputs to a weighted sum of inputs.

The ratio is then condensed to the single ratio of virtual input and output and ultimately to summarized relative efficiency score. The DEA requires that input and output weights of DMU are to be assigned based on their relative importance. This is done to compute Pareto-efficiency of every DMU which is attained when any input cannot be reduced further without reducing any other output or when no output can be augmented without augmenting the input. Under DEA setting, a DMU can take either score of one or less than one. The DMU, with a score of one is called efficient, and a score of less than one indicates inefficient DMU. The efficient DMUS thus form the efficiency frontier, which is also known as the best practice frontier or technology. The DMUs that lie below this frontier are termed inefficient. DEA also provides strategies on how to improve the efficiency of these inefficient units relative to efficient units on the frontier. The managers can then assess as to what extent a unit is unproductive with respect to outputs, the level of over or under usage of inputs and how this situation can be improved. The dual linear mathematical program to solve the efficiency of DMU is given below:

$$\text{Min } Z_0 = \theta_0 \qquad\qquad\qquad\qquad\qquad\qquad\qquad (i)$$
Subject to
$$\theta_0 x_{io} - \sum_{j=1}^{n} \lambda j \ x_{ij} \geq 0 \ , i = 1,2,\ldots\ldots\ldots,m; \qquad (ii)$$
$$\sum_{j=1}^{n} \lambda j \ y_{rj} \geq y_{ro} \qquad , \ r = 1,2,\ldots\ldots\ldots,s; \qquad\qquad (iii)$$
$$\lambda j \geq 0 \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (iv)$$

where θ_0 indicates the technical efficiency of DMU_0 to be assessed,
λ_j is an n-dimensional constant to be approximated.
y_{rj} is the amount of rth type of observed output for *j*th DMU.
x_{ij} is the amount of i*th input for jth DMU.*

The equation (i) in the above model illustrates the score of technical efficiency for DMU_0, i.e. unit to be evaluated and is referred to as CCR efficiency. This equation is repeated for all DMUs included in the sample. The score of θ_0 equal to one represents technically efficient DMU, and the score θ_0 less than one reveals a DMU is technically inefficient. The equation (ii), (iii), and (iv) represents the inputs, outputs, and weights constraints to be non-negative.

Selection of Input-output Variables

The application DEA for the computation or measurement of efficiency requires inputs and output variables to be defined properly. The banking literature is still indecisive in the selection of input and output variables. However, two approaches, namely production and intermediation approaches, are frequently applied. The intermediation approach introduced by Sealey and Lindley (1977) states that the bank is an intermediary that channelizes the funds borrowed from depositors to borrowers in the form of advances or loans. On the other hand, the production approach proposed by Benston (1965), considers the bank as a production unit that uses traditional factors of production (land, Labour, and capital) to produce services like the number of transactions performed, loan applications processed, payment instruments made and others, for borrowers and depositors. The present study adopted the intermediation approach due to its wide use in the banking literature for the selection of inputs and outputs. Three inputs of labor, loanable funds, and fixed assets, whereas two outputs of loans and investments have been chosen for measurement of efficiency. While return on assets (ROA) has been used to measure the profitability of commercial banks.

Data and Sample

The data on input-output variables and ROA has been obtained from the financial statements' analysis published by the state bank of Pakistan (www.sbp.org.pk) for the year 2009 to 2013. A sample of thirty (22) private commercial banks were taken.

Results and Discussion

Results of Efficiency Analysis

The empirical results of twenty (22) private commercial banks have been obtained through an input oriented CCR DEA model for the period 2009 to 2013. Under DEA, a score equal to 100% represents that the bank is technically efficient while a score of less than 100% indicates technically inefficient bank. The average technical efficiency (TE) scores declined over the five-year period and remained at the level of 89%. It means that the current level of input consumption could produce 1.12 times (i.e., 1/0.89) more output than currently produced, or the current output could be generated with 11% (i.e., 100% - 89%) less input used (see table 1).

Table 1. Descriptive Statistics on Technical Efficiency: Period (2009-2013)

Year	Average	Std. Dev.	Min.	Max	Efficient	Inefficient	Above Average	Below Average
2009	91%	10%	59%	1	5	17	13	9
2010	90%	7%	75%	1	4	18	10	12
2011	89%	8%	77%	1	6	16	11	11
2012	89%	9%	71%	1	6	16	11	11
2013	85%	12%	55%	1	4	18	14	8
2009-13	89%	8%	77%	1	1	21	10	12

Table 2. Technical Efficiency Scores of 22 Private Commercial Banks: Period (2009-2013)

Bank/Year	Technical Efficiency					
	2009	2010	2011	2012	2013	2009 to 2013
ABL	96%	94%	82%	83%	85%	88%
AKL	80%	84%	81%	86%	82%	83%
ALB	90%	75%	77%	79%	68%	78%
BAF	80%	82%	78%	82%	72%	79%
BAH	95%	100%	100%	100%	100%	99%
BB	100%	94%	93%	100%	100%	97%
BIP	59%	90%	83%	87%	77%	79%
DIB	100%	100%	92%	86%	94%	94%
FYB	100%	85%	87%	96%	74%	89%
HBL	98%	99%	100%	100%	100%	99%
HMB	100%	100%	100%	100%	100%	100%
JS	80%	85%	77%	71%	90%	81%
KASB	90%	78%	80%	82%	55%	77%
MBL	100%	88%	85%	89%	84%	89%
MCB	89%	87%	90%	77%	90%	87%
NIB	93%	93%	100%	93%	87%	93%
SAMBA	94%	99%	100%	100%	93%	97%
SCB	98%	100%	100%	100%	95%	98%
SILK	73%	94%	88%	93%	85%	87%
SONERI	89%	88%	92%	88%	86%	89%
SUMMIT	96%	84%	84%	73%	64%	80%
UBL	96%	89%	91%	94%	88%	92%
Mean	91%	90%	89%	89%	85%	89%

The following sections provide year-wise technical efficiency (TE) scores for twenty-two private banks operating in Pakistan provided in table 2.

Year 2009

The average technical efficiency (TE) in the year 2009 stood at 91%. It shows that the current output could be achieved with 9% (100%-91%) fewer inputs currently employed. There are five (05) banks, namely BB, DIB, FYB, HMB, and MBL, which achieved a score of 100%. These banks are, thus, declared as technically efficient. Apart from these banks, eight (08) banks are above the average score, while nine (09) are below the average. The Bank

Islami Pakistan (BIP) has been observed as highly inefficient with TE score of 59% (see figure 1).
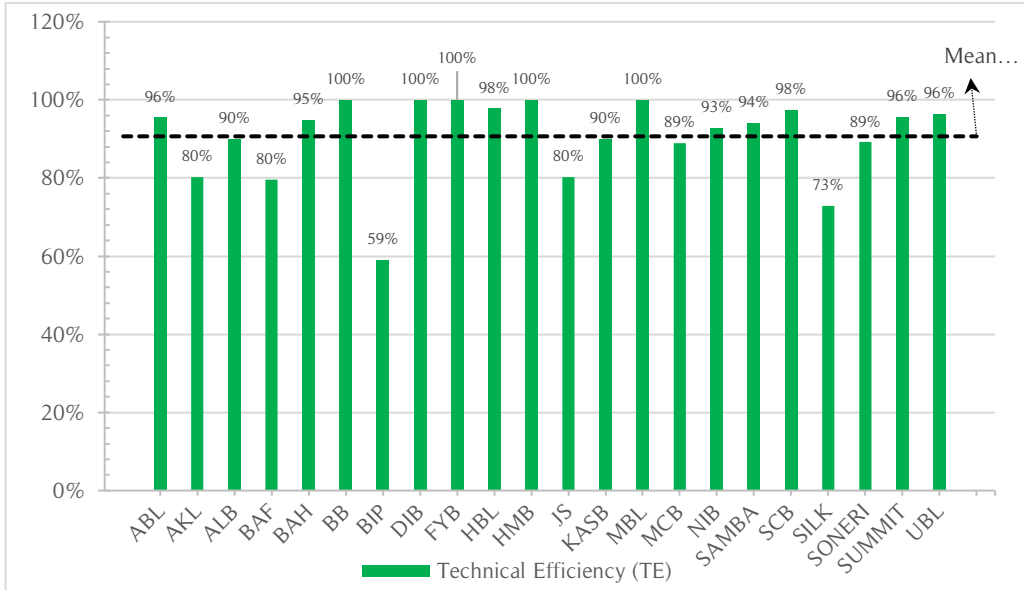

Figure 1. Technical Efficiency of private commercial banks: Year 2009

Year 2010

The efficiency of private banks slightly declined to 90% in the year 2011 as against the previous year. The average inefficiency tuned to the level of 10%, indicating that the current year outcomes could have obtained by using 10% fewer inputs. Only four (04) banks (i.e., BAH, **DIB, HMB**, and **SCB**) have attained a 100% technical efficiency score while the remaining eighteen (18) banks stayed below. The minimum score of 75% was recorded for ALB (Allied Bank). The banks above and below average counts to 10 and 12, respectively. The overall deviations in technical efficiency scores were in the range of only 7%.
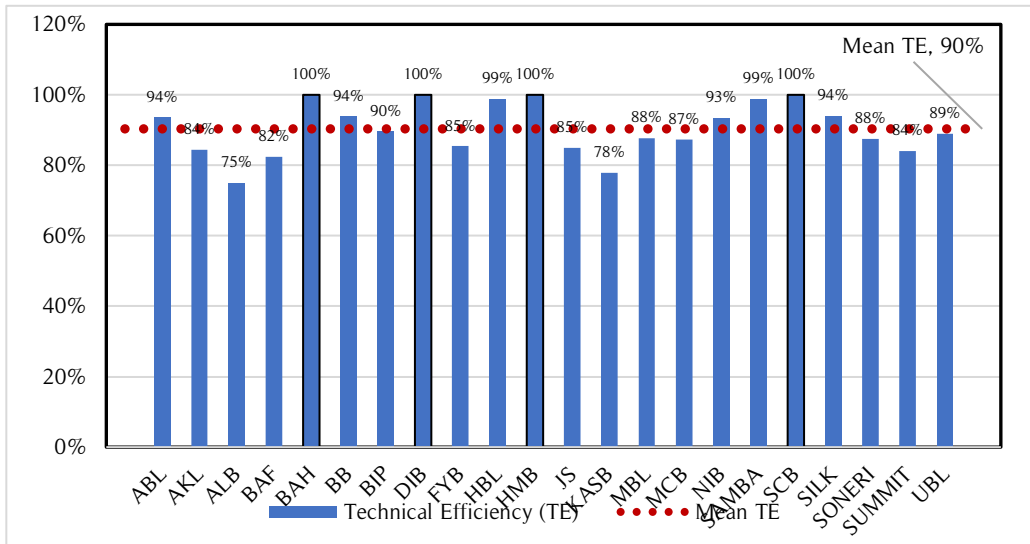
Figure 2. Technical Efficiency of private commercial banks: the year 2010

Year 2011

The average score deteriorated further in the year 2011 and stayed at 89% with inefficiency level of 11% and a standard deviation of 8%. The total number of efficient and inefficient banks were six (06) and sixteen (16), respectively. The banks stood efficient were BAH, HBL, HMB, NIB, SAMBA, and SCB. The minimum score of 77% was observed in the case of ALB and JS banks. Furthermore, fifty percent of banks (11 banks) each remined above and below the average score in this year.
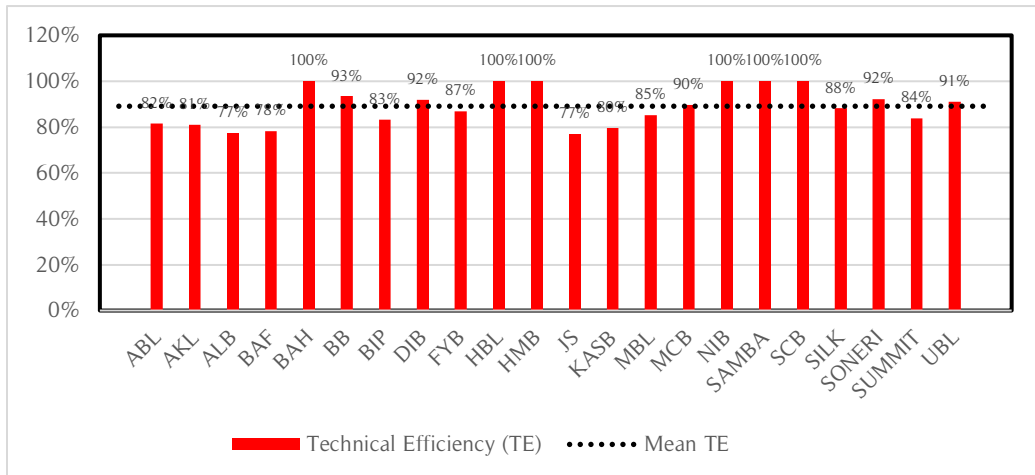

Figure 3. Technical Efficiency of Private Commercial Banks: Year 2011

Year 2012

The mean efficiency score in this year stood at 89% indicating a gap of 11% inefficiency in inputs usage. Only six (06) banks achieved the target efficiency of 100%, and these were BAH, BB, HBL, HMB, SAMBA and SCB whereas the remaining sixteen (16) banks did not reach the target level. The minimum score of 71% was recorded for JS bank in the year. Eleven banks did not cross the average score while the same number of banks scored above average score in the study period.
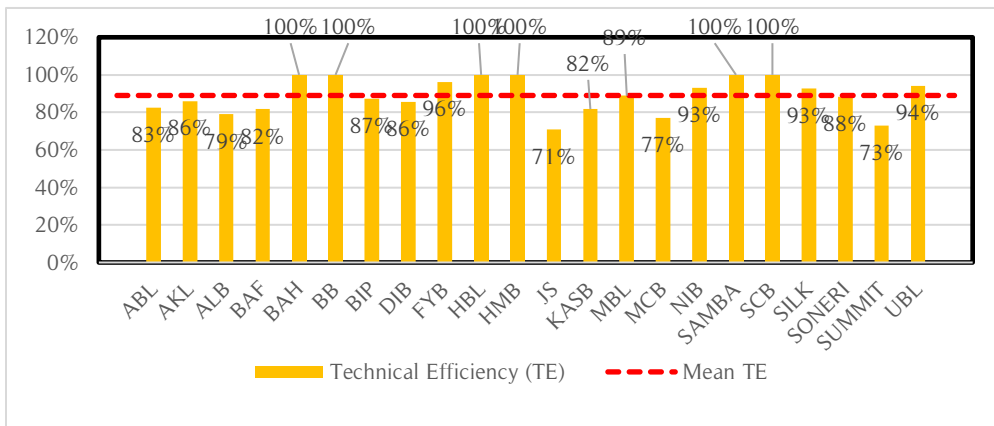
Figure 4. Technical Efficiency of private commercial banks: year 2012

Year 2013

The mean score of efficiency continued to decline the year and reached the level of 85%, leaving the highest inefficiency level of 15% during the five-year period. The four (04) banks, which notched the 100% efficiency level were *BAH*, *BB*, *HBL*, and **HMB.** On the other side, eighteen (18), representing 82% of total banks in the study

stayed below this level. The KASB bank scored a minimum of 55% in the year. The banks that stood above and below the average accounted for 64% (14 out of 22) and 36 % (08) respectively.
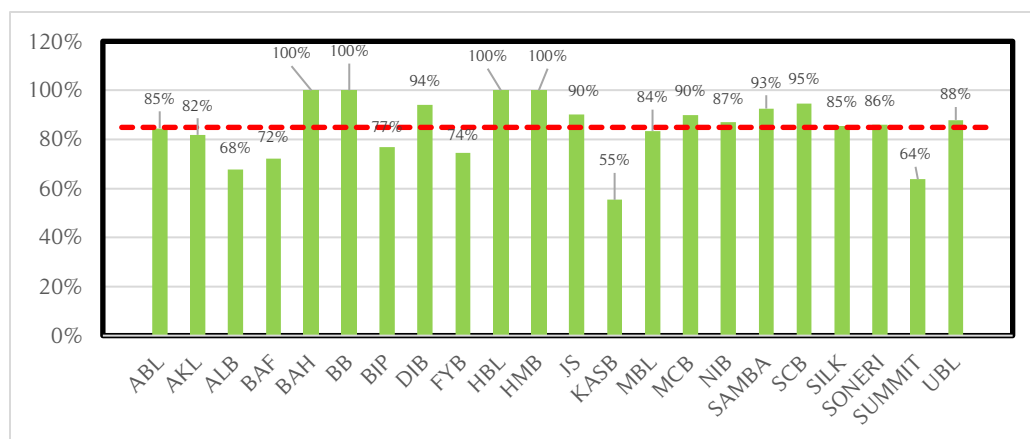

Figure 5. Technical Efficiency of Private Commercial Banks: Year 2013

Overall, the private commercial banks operated at an average TE score of 89% with the declining trend during the five-year study period. Only one bank namely HMB, scored 100% throughout the period and thus can be labelled as the leader of private banks. In the second place, BAH was efficient in all years except 2009. Similarly, BB, SCB and HBL were among those which stood efficient in three out of five years. The DIB, and SAMBA were efficient technically in two years while MBL and NIB remained efficient in only one study period.

Results of Profitability

The profitability of twenty (22) commercial banks has been measured by return on assets (ROA). It is obtained by the ratio of pre-tax profit to total assets for each bank. If the outcome of this ratio is positive, it indicates that the bank has earned profit. But if the ratio turns out to be negative, then it shows that the bank incurs loss on the investment of assets. The descriptive statistics and individual ROA scores have been presented in the table 3 and 4 respectively. the year-wise discussion on ROA for private banks is provided in the following sections.

Table 3. Descriptive Statistics of ROA: Period (2009-2013)

Year	Mean	Std. Dev.	Min.	Max
2009	-0.62%	2.55%	-7.08%	3.06%
2010	-0.38%	2.29%	-5.90%	2.96%
2011	0.64%	1.37%	-3.45%	2.96%
2012	0.66%	1.06%	-2.02%	2.75%
2013	0.43%	1.40%	-2.30%	2.67%
2009-2013	0.15%	1.59%	-3.67%	2.88%

Table 4. Return on Assets of 22 Private Commercial Banks: Period (2009-2013)

Bank	2009	2010	2011	2012	2013	2009-13-Avg
ABL	1.71%	1.84%	1.99%	1.87%	2.01%	1.88%
AKL	0.42%	0.29%	0.50%	0.37%	-1.36%	0.04%
ALB	-2.85%	-1.71%	0.57%	-0.87%	-0.05%	-0.98%
BAF	-0.03%	0.28%	1.27%	0.85%	0.77%	0.63%
BAH	1.14%	1.22%	1.18%	1.22%	1.13%	1.18%
BB	-2.25%	-3.03%	-1.04%	0.18%	-2.12%	-1.65%
BIP	-1.41%	0.09%	0.70%	0.42%	0.22%	0.00%
DIB	0.64%	0.02%	0.40%	0.54%	0.17%	0.35%
FYB	0.67%	0.45%	0.44%	0.45%	0.52%	0.51%
HBL	1.55%	1.84%	1.96%	1.42%	1.34%	1.62%

HMB	1.16%	1.11%	1.13%	1.12%	1.13%	1.13%
JS	-1.81%	-1.03%	0.66%	0.98%	0.73%	-0.09%
KASB	-7.08%	-4.64%	-3.45%	-0.89%	-2.30%	-3.67%
MBL	1.34%	1.23%	1.69%	1.28%	1.20%	1.35%
MCB	3.06%	2.96%	2.96%	2.75%	2.67%	2.88%
NIB	0.33%	-5.90%	-1.34%	0.14%	0.89%	-1.18%
SAMBA	-2.50%	-0.39%	0.75%	0.86%	0.21%	-0.21%
SCB	0.27%	1.14%	1.52%	1.52%	2.61%	1.41%
SILK	-4.23%	-1.56%	0.77%	-0.39%	-1.26%	-1.33%
SONERI	0.15%	0.12%	0.60%	0.70%	0.61%	0.44%
SUMMIT	-5.41%	-4.20%	-1.01%	-2.02%	-1.45%	-2.82%
UBL	1.48%	1.52%	1.84%	2.00%	1.82%	1.73%
Mean	-0.62%	-0.38%	0.64%	0.66%	0.43%	0.15%

Year 2009

The commercial banks posted an average ROA of -0.62% with a standard deviation of 2.55% during the year 2009 (see table 3). The negative sign implies that overall banks incurred a loss of 2.55 rupees by investing 100 rupees in assets. The profitability of individual banks for the year 2009 is also presented in figure 6 to provide a vivid picture. There are nine (09) banks, representing 41% of total banks, which had negative ROA ranging from -0.03% for BAF to -7.08% for KASB. Furthermore, the positive ROA indicates that the bank has earned profit through the investment of assets. There are thirteen (13) or 59% banks which have attained positive ROA, implying profit earned per unit utilization of assets. The highest positive ROA of 3.06% has been noticed for MCB while the lowest of 0.15% for Soneri Bank. On the other hand, KASB and summit banks suffered losses as indicated by their highest negative ROA.
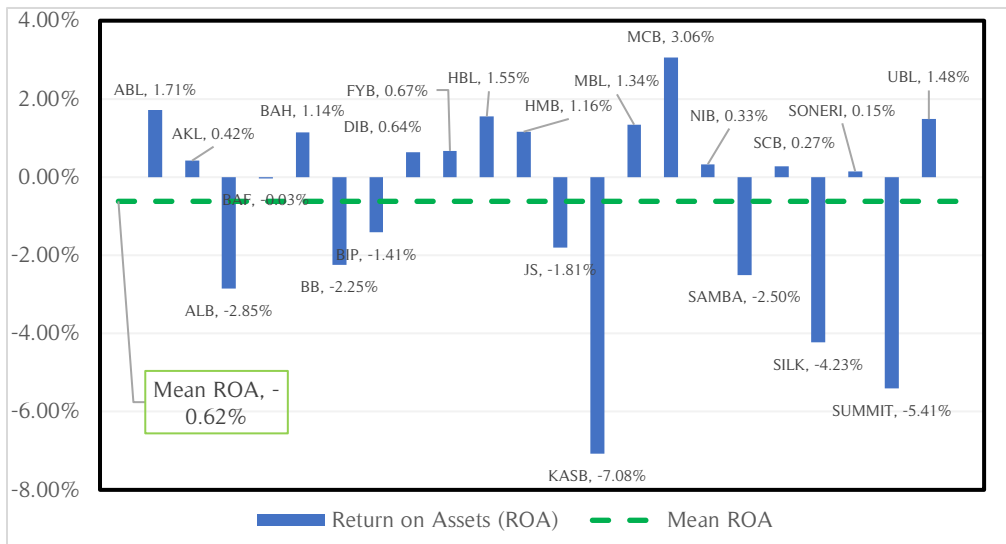

Figure 6. Profitability of Private Banks Based on Return on Assets (ROA) for the Year 2009

Year 2010

The relative position of 22 private banks in terms of profitability measured by ROA is presented graphically in figure 7 for the year 2010. The average ROA of -0.38% was observed, reflecting a loss of 0.38 rupees per unit investment in total assets. Out of 22 banks, 63 percent (14 out of 22) earned profit and 36 percent suffered loss as indicated by positive and negative ROA, respectively. The highest positive value was seen for MCB and the lowest value for DIB. Similarly, the highest and lowest negative values for ROA were observed in case of NIB (-5.90%) and SAMBA (-0.39%), respectively.
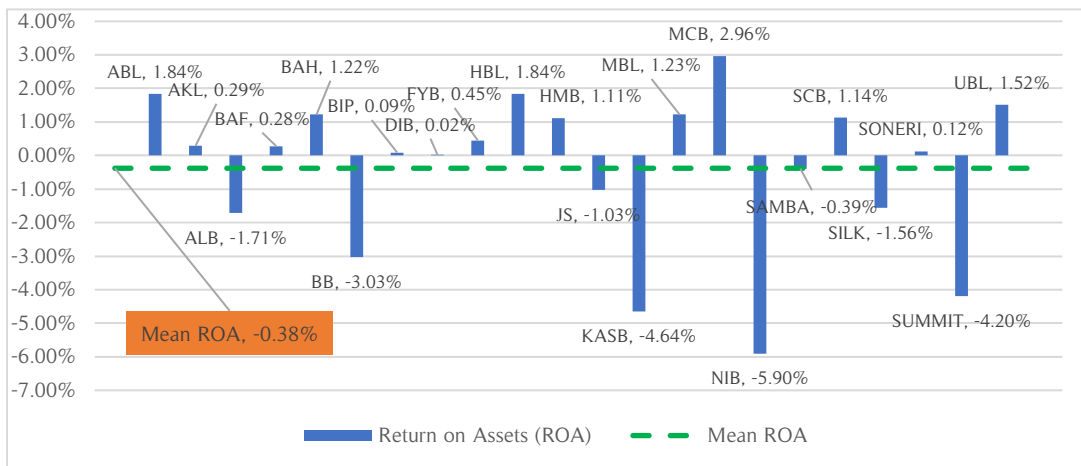
Figure 7. Profitability of private banks based on Return on Assets (ROA) for the Year 2010

Year 2011

The private banks demonstrated progress in terms of ROA in the period 2011. The mean ROA turned positive and stood at 0.64% as against negative ROA of the previous year 2010. It implies that private banks have utilized their assets more efficiently by earning profit during the period. Most banks representing 82% earned profit indicated by positive ROA and can be seen in figure 8. Among these, MCB, once again, earned the maximum profit while DIB earned the lowest (i.e., 0.40%). Similarly, the banks which incurred loss accounted for 18% only. The highest loss was suffered by KASB (i.e., -3.45%) among these banks.
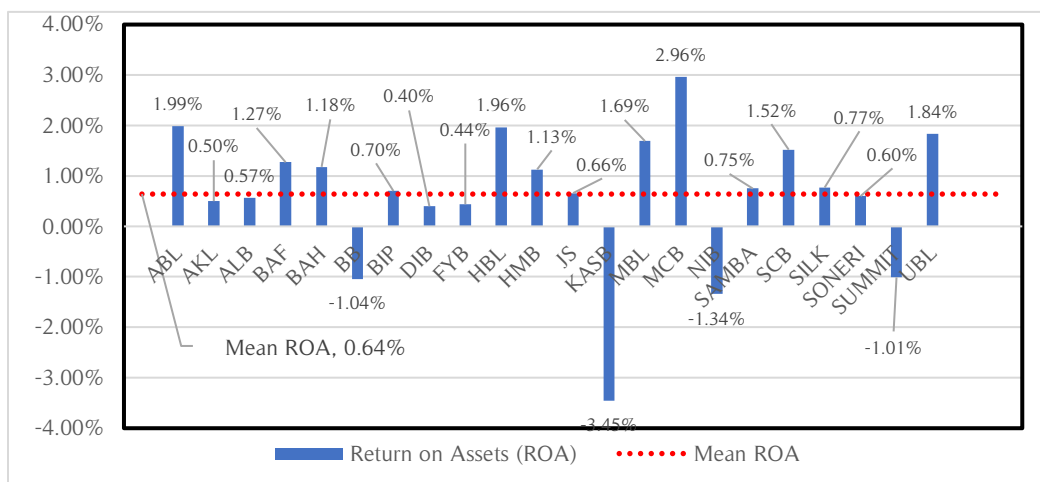
Figure 8. Profitability of private banks based on Return on Assets (ROA) for the Year 2011

Year 2012

The progress in profitability by private banks continued in the year 2012. The mean ROA witnessed at 0.66% showing that the banks on average earned 0.66 rupees per unit investment in total assets. Overall, 18 out of 22 banks exhibited positive ROA (indicating profit earned) while only 04 showed negative ROA (implying loss incurred) during the period. The bank MCB maintained its high profitability ratio again in this year with maximum ROA of 2.75% among private banks. likewise, the SUMMIT bank with ROA of -2.02%) suffered highest loss during the year.
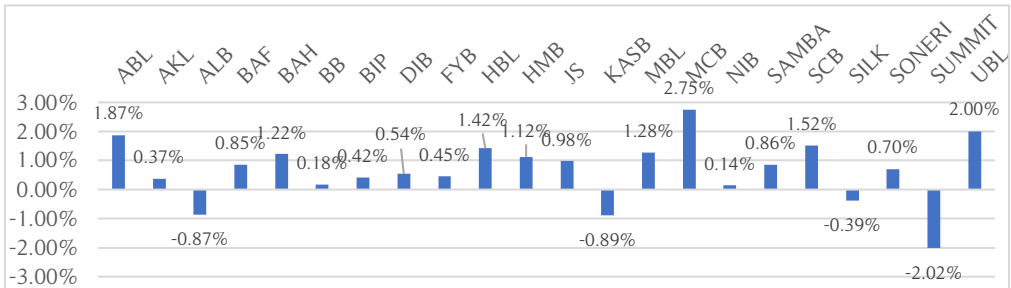
Figure 9. Profitability of Private Banks Based on Return on Assets (ROA) for the Year 2012

Year 2013

The private banks remained profitable in the year, as indicated by positive mean ROA. However, its profitability declined compared to the previous year. The overall analysis reveals that 72% (16) banks earned profit as their ROA was positive. The MCB bank once again continued its top position by registering ROA of 2.67%. On the other hand, 28% of banks had negative ROA in which the KASB bank exhibited the highest negative ROA of -2.30%, implying that it had suffered the highest loss during the period.
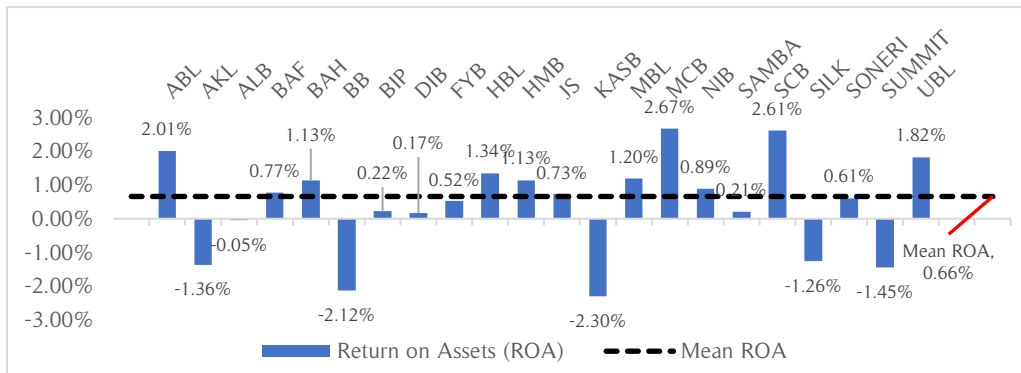
Figure 10. Profitability of private banks based on Return on Assets (ROA) for the Year 2013

Summary of ROA

The overall performance of private commercial banks for the whole period (i.e., 2009-13) has been displayed in figure 11. It can be seen from figure 9 that 14 banks are identified as profitable (Positive ROA) and 08 (36%) banks incurred losses (negative ROA) on average. The most profitable bank throughout the study period is MCB (ROA = 2.88%), while KASB has been identified as a bank that suffered the highest losses (ROA = 3.67%).
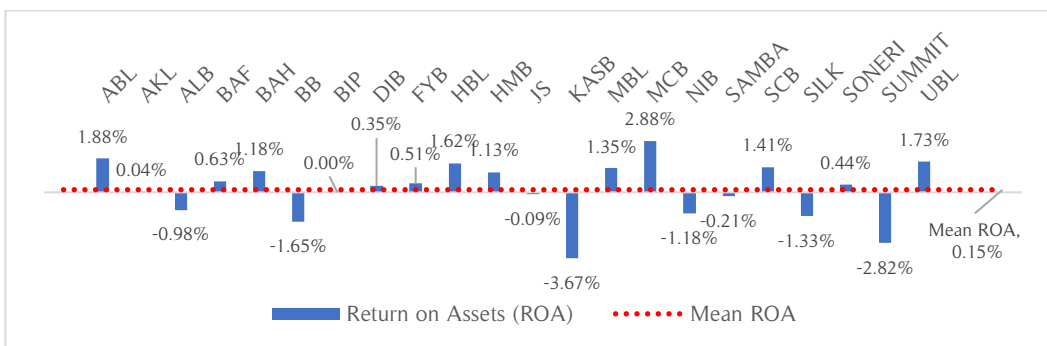

Figure 11. Profitability of private banks based on Return on Assets (ROA) for the period 2009-13

The Nexus of Efficiency and Profitability

This section presents the relationship between efficiency measured through DEA and the profitability measured by the conventional accounting ratio of ROA. The analysis covers the study period from 2009 to 2013. A separate analysis of these two measures has already been provided in the prior sections. Now, the year-wise nexus (or relationship) of these measures is presented in the following sections.

Year 2009

Figure 12 displays the relationship of efficiency and profitability of twenty (22) private commercial banks of Pakistan. The efficiency is denoted by technical efficiency while profitability is shown by Return on Assets (ROA) for the year 2009. The figure has been split into four quadrants. The upper left-hand corner is named as the first quadrant, which contains the banks having high ROA but low TE score. The Lower left-hand corner is designated as the second quadrant that includes those banks which have low ROA and low-efficiency score. The third quadrant (upper right) represents those banks having a high ROA ratio and high-efficiency score. The fourth quadrant (lower right portion) includes banks with low ROA and high-efficiency scores.

The first quadrant includes four banks (MCB, AKL, SONERI, and BAF) which have above-average profit (ROA > mean ROA of -0.62%) and have below-average efficiency (since TE < mean TE of 91%). In the second quadrant, five banks (KASB, ALB, JS, SILK, and BIP) are placed which have both low profitability and efficiency. These are the banks which need to improve both efficiency and profitability to survive in the industry. There are ten (10) banks in the third quadrant representing 45 percent, which has earned above-average profit (as their ROA was higher than the mean ROA of -0.62%) and has maintained high-efficiency level (since TE > Mean TE). These banks are MBL, HMB, DIB, FYB, HBL, SCB, UBL, ABL, BAH, and NIB and are considered as leaders of the private banks during the year 2009.
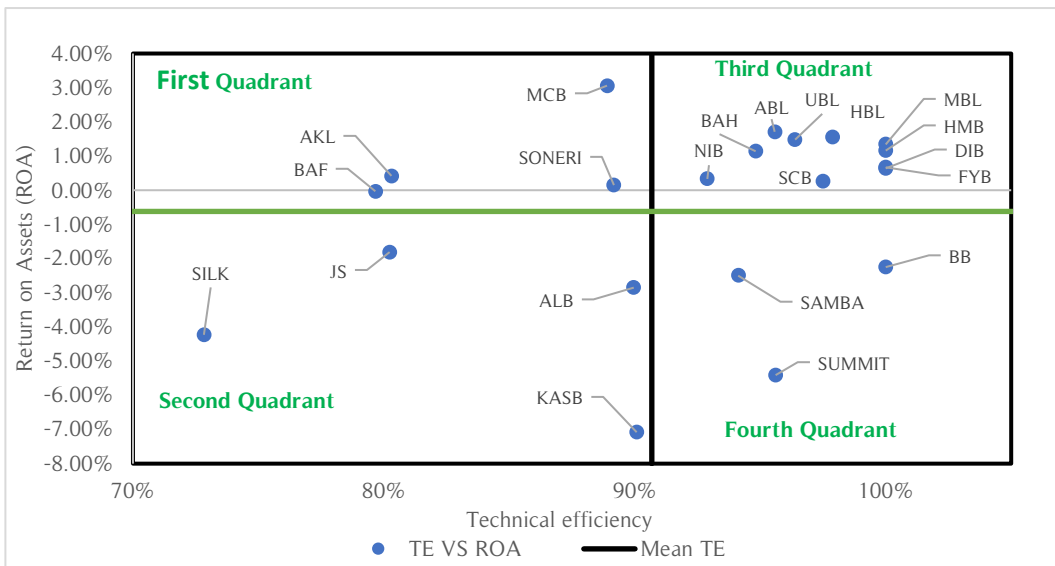

Figure 12. The Nexus of Technical Efficiency and Return on Assets: Year 2009

In the fourth quadrant, four (04) banks, namely BB, SUMMIT, and SAMBA achieved high-efficiency scores, but experienced loss as indicated by their negative ROA.

Year 2010

As depicted in figure 2, the first quadrant includes eight (08) banks (MCB, UBL, MBL, FYB, AKL, BAF, SONERI, and BIP) which scored above average ROA and below-average TE. The second quadrant comprises four (04) banks (JS, ALB, Summit, and KASB) with below-average ROA and TE. The third quadrant contains six (06) banks (ABL, HBL, BAH, SCB, HMB, and DIB) which scored the above average with respect to both ROA and TE measures. The fourth quadrant encompasses three (03) banks (i.e., Silk, BB, and NIB) that achieved below average ROA and TE.
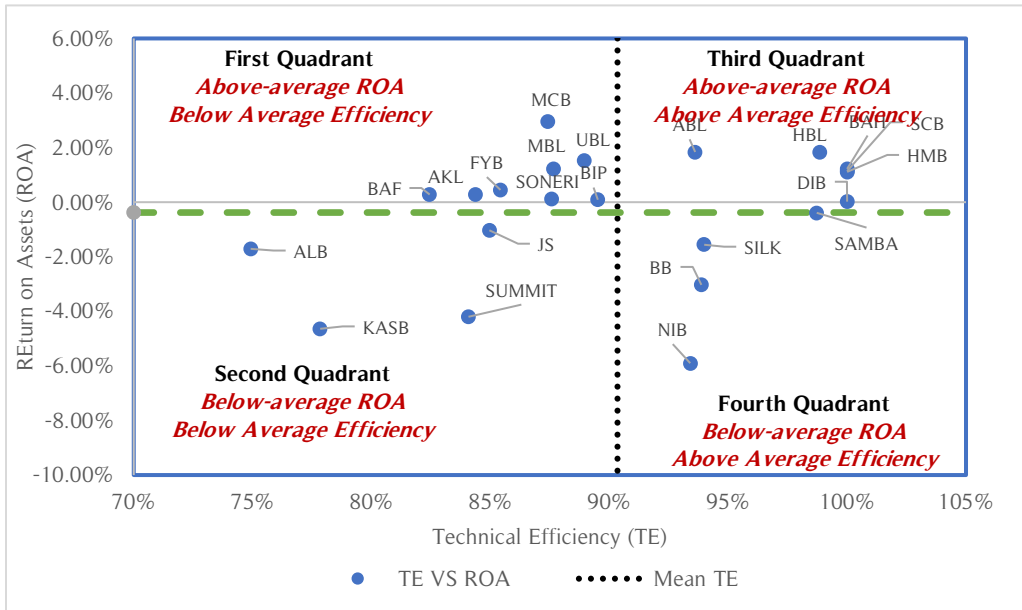
Figure 13. The Nexus of Technical Efficiency and Return on Assets: Year 2010

Year 2011

In the year 2011, six (06) banks (JS, BAF, ABL, BIP, MBL, and Silk) have been placed in the first quadrant as they scored above average ROA (Profitability) and below-average TE score. Similarly, three (03) banks (DIB, BB, and NIB) are positioned in the fourth quadrant due to below-average ROA and TE scores. There are eight (08) banks, namely MCB, UBL, Soneri, Samba, BAH, HBL, SCB, and HMB, which have scored above average ROA and TE. These are the banks which are highly efficient as well as profitable and thus placed in the third quadrant. Likewise, five (05) banks which include ALB, AKL, FYB, SUMMIT, and KASB have placed in the second quadrant due to below-average ROA and TE scores. These are the banks which need to improve earning capabilities as well as to enhance its efficiency of resources utilization.
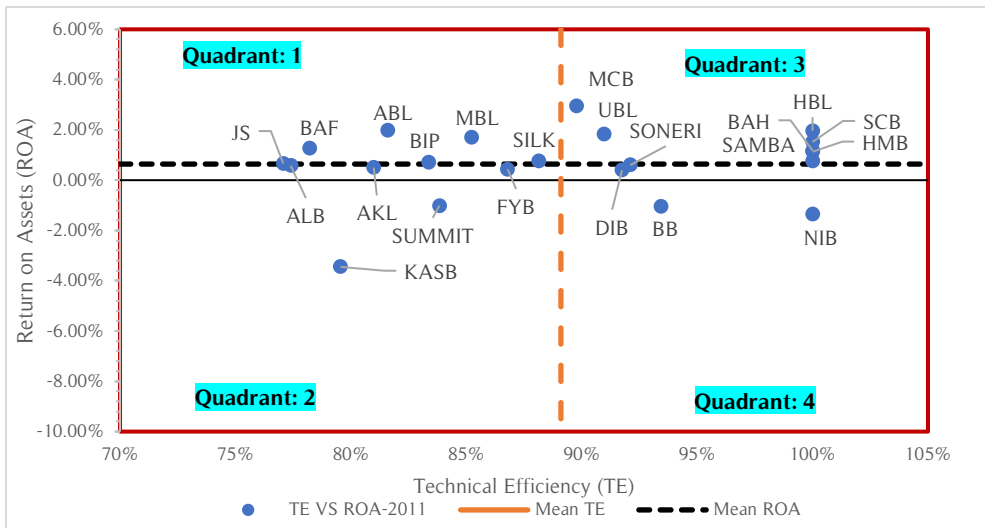

Figure 14. The Nexus of Technical efficiency and Return on Assets: Year 2011

Year 2012

In the year 2012, four banks (JS, MCB, BAF, ABL, Soneri, and MBL) have been placed in the first quadrant based on below-average ROA and TE scores. These banks have earned above-average profit by operating at a below-average technical efficiency level. They can become more profitable if they use their resources more efficiently. On the contrary, there are six banks comprising Summit, ALB, KASB, DIB, AKL, and BIP which remained below-average performer in terms of both ROA and TE. These banks may focus both on improving their earning capabilities and at the same time, need to consume their resources consciously and carefully. Moreover, there are four banks (NIB, SILK, FYB, and BB) which are placed in the fourth quadrant due to their low ROA and High-Efficiency score. These banks need to focus on the increasing income-generating activities to capture the market share. The six (06) banks, namely UBL, BAH, HBL, HMB, SCB, and Samba are declared as leading banks and thus placed in the third quadrant. These banks have shown excellent performance in terms of profitability and efficiency parameters. They have achieved high ROA ratio and high TE score.
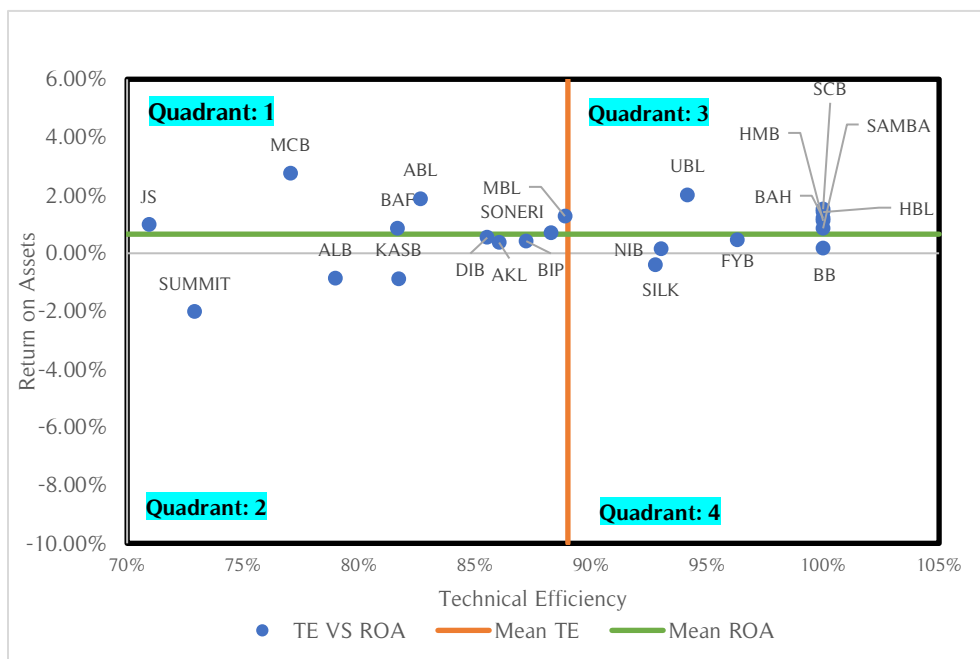

Figure 15. The Nexus of Technical Efficiency and Return on Assets: Year 2012

Year 2013

Figure 16 shows the relative position of individual private commercial banks of Pakistan in terms of technical efficiency (TE) and return on assets (ROA). There are three banks (BAF, ABL, and MBL) which lie in the first quadrant; it reveals that these banks have scored above-average ROA (profitability) and showed below-average performance in terms of technical efficiency. Though these banks were lucky to earn above-average profits, they have made it by wasting more scarce resources as indicated by their below average technical efficiency score. They can earn more if more focus is diverted towards careful use of bank's resources. Apart from this, six banks (Summit, ALB, BIP, KASB, FYB, and AKL) have performed poorly as their ROA and TE scores are below average. These banks are, thus, placed in the second quadrant, and they need to put special attention towards their efficiency and profitability; otherwise, their survival in future could be at stake. The results further reveal that nine banks (UBL, MCB, Soneri, BAH, HBL, NIB, JS, and HMB) are identified as a better performer in terms of both ROA and TE. These banks recorded above-average score in both performance measures and therefore, are categorized under the third quadrant. There are four banks (Samba, DIB, SILK, and BB) which are technically more efficient but remained unlucky to become profitable. These banks showed above-average performance inefficiency while stayed below the average in terms of ROA.
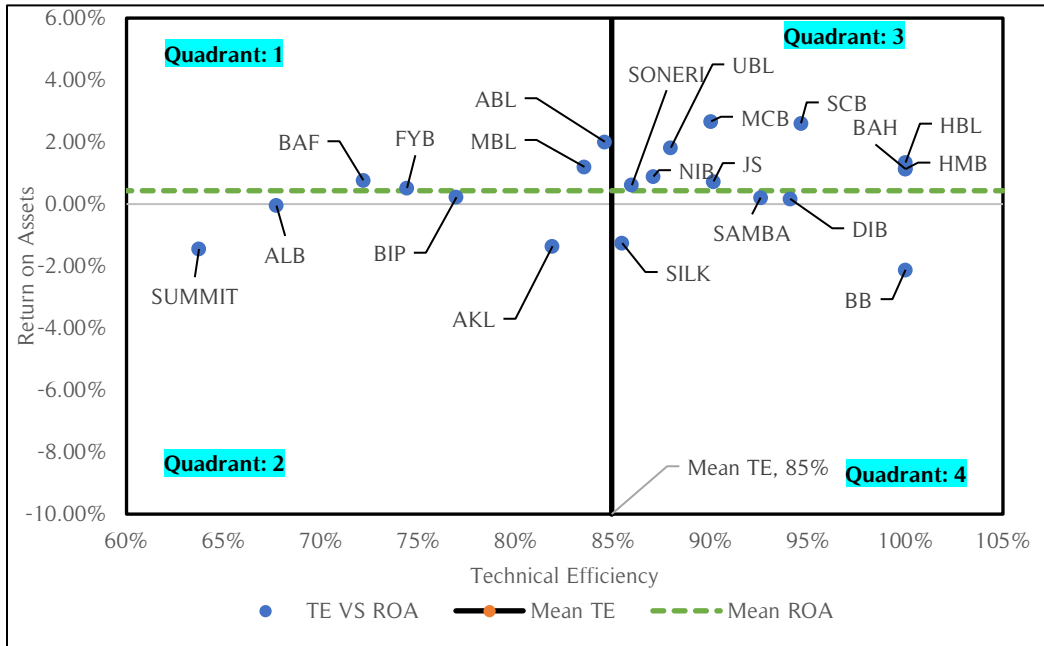
Figure 16. The Nexus of Technical Efficiency and Return of Assets: Year 2013

Summary of nexus between Technical Efficiency and Return on Assets: Period 2009 to 2013.

This section presents the relationship of technical efficiency and Return on assets (ROA) for the whole period from year 2009 to 2013.
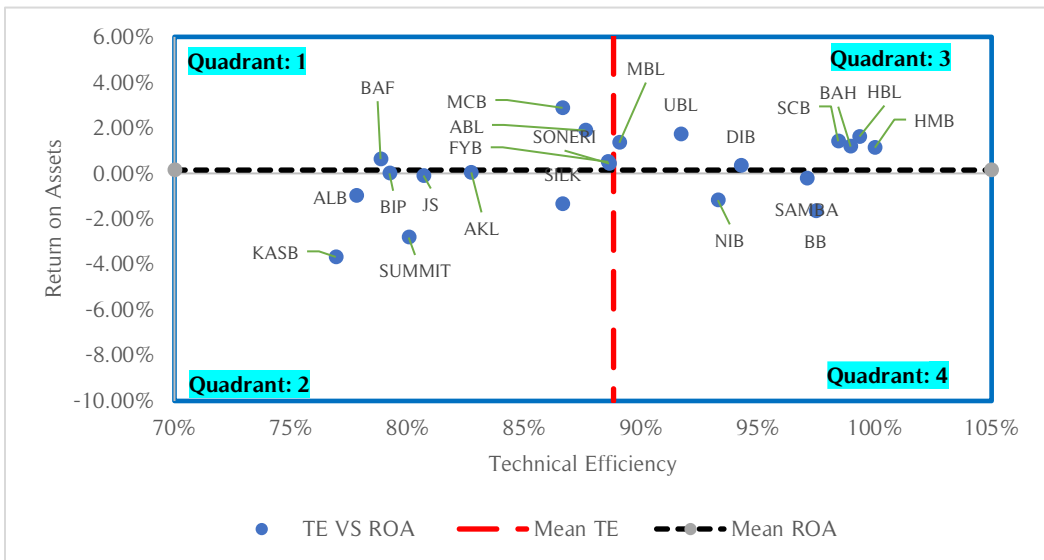

Figure 17. The Nexus of Technical Efficiency and Return on Assets: Period 2009-2013

Figure 17 displays the relative performance of individual banks with respect to technical efficiency and return on assets (profitability) for the period 2009 to 2013. The first quadrant represents those banks which have above-

average ROA but below average TE. These banks are BAF, FYB, ABL, MCB, and Soneri. In the second quadrant, seven (07) banks (KASB, Summit, ALB, BIP, JS, AKL, and Silk) showed below-average performance in terms of ROA and TE. These banks have to struggle hard to improve their efficiency and profitability for their survival. The third quadrant contains MBL, UBL, DIB, SCB, BAH, HBL, and HMB, which performed better in terms of both efficiency and profitability measures. They got above-average profit as well as above-average efficiency. The fourth group includes only three banks (NIB, Samba, and BB) which grabbed above-average efficiency but sustained losses in their bank operations.

Conclusion

The study aimed at exploring the relationship between efficiency and profitability of private commercial banks operating in Pakistan. The efficiency represented by technical efficiency has been assessed by non-parametric data envelopment analysis approach while profitability indicated by return on assets (ROA) has been computed through conventional ratio analysis for the period 2009 to 2013. The analysis revealed that technical efficiency declined during the study period and remained at 89%. The HMB was identified as a top-performing bank in terms of technical efficiency since it achieved 100% efficiency score throughout the period. On the other hand, the MCB was the only bank that remained highly profitable throughout the study period based on a high ROA ratio. In addition, the banks were further split into four groups based on their TE and ROA. The first group (Quadrant) included five banks (i.e., BAF, FYB, ABL, MCB, and Soneri) with above-average ROA and below-average TE score. These banks need to improve their efficiency in resources utilization to grab more profit in the future. The second quadrant included those banks having below-average ROA and TE scores. Among these, 07 banks, namely KASB, Summit, ALB, BIP, JS, AKL, and Silk, fall under this quadrant. These banks can be considered as target banks for merger or acquisition. The banks in the third quadrant having high ROA and TE score can be considered as the leaders of the private banking sector. These banks are MBL, UBL, DIB, SCB, BAH, HBL, and HMB. These banks are considered as a benchmark or role model for other inefficient and less profitable banks. The fourth group includes only three banks (NIB, Samba, and BB) which grabbed above-average efficiency but sustained losses in their bank operations. These banks can adopt distinct product mix or business strategies to become profitable in the future.

References

Abbas, M., Azid, T., & Besar, M. H. A. H. (2016). Efficiency, effectiveness and performance profile of Islamic and conventional banks in Pakistan. *Humanomics.*

Aftab, M., Ahamad, S., Ullah, W., & Sheikh, R. A. (2011). The impact of bank efficiency on share performance: Evidence from Pakistan. *African Journal of Business Management, 5*(10), 3975-3980.

Ahamed, M. M. (2017). Asset quality, non-interest income, and bank profitability: Evidence from Indian banks. *Economic Modelling, 63*, 1-14.

Ahmad, N. H., & Noor, M. (2011). The determinants efficiency and profitability of world Islamic banks. Paper presented at the 2010 International Conference on E-business, Management and Economics.

Akhtar, M. F., Ali, K., & Sadaqat, S. (2011). Factors influencing the profitability of Islamic banks of Pakistan. *International Research Journal of Finance and Economics, 66*(66), 1-8.

Bhatti, G. A., & Hussain, H. (2010). Evidence on structure conduct performance hypothesis in Pakistani commercial banks. *International Journal of Business and Management, 5*(9), 174.

Eling, M., & Jia, R. (2019). Efficiency and profitability in the global insurance industry. *Pacific-Basin Finance Journal, 57*, 101190.

Emrouznejad, A., & Yang, G.-l. (2018). A survey and analysis of the first 40 years of scholarly literature in DEA: 1978–2016. *Socio-Economic Planning Sciences, 61*, 4-8.

Gulati, R. (2011). Evaluation of technical, pure technical and scale efficiencies of Indian banks: An analysis from cross-sectional perspective. *Paper presented at the 13th Annual Conference on Money and Finance in the Indian economy.*

Haris, M., Yao, H., Tariq, G., Malik, A., & Javaid, H. M. (2019). Intellectual capital performance and profitability of banks: Evidence from Pakistan. *Journal of Risk and Financial Management, 12*(2), 56.

Keramidou, I., Mimis, A., Fotinopoulou, A., & Tassis, C. D. (2013). Exploring the relationship between efficiency and profitability. Benchmarking: *An International Journal.*

Kumar, S. (2008). An analysis of efficiency–profitability relationship in Indian public sector banks. *Global Business Review, 9*(1), 115-129.

Narwal, K. P., & Pathneja, S. (2016). Effect of bank-specific and governance-specific variables on the productivity and profitability of banks. *International Journal of Productivity and Performance Management.*

Peng, J.-L., Jeng, V., Wang, J. L., & Chen, Y.-C. (2017). The impact of bancassurance on efficiency and profitability of banks: Evidence from the banking industry in Taiwan. *Journal of Banking & Finance, 80*, 1-13.

Rekik, M., & Kalai, M. (2018). Determinants of banks' profitability and efficiency: Empirical evidence from a sample of Banking Systems. *Journal of Banking and Financial Economics, 1* (9)), 5-23.

Setiawan, C., & Kodratillah, O. I. (2017). Examining Banks Profitability and Banks Efficiency of Islamic Commercial Banks in Indonesia. *Paper presented at the Proceedings of 12th Asia-Pacific Business Research Conference.*

Sharma, D., Sharma, A. K., & Barua, M. K. (2013). Efficiency and productivity of banking sector. *Qualitative Research in Financial Markets.*

Stavárek, D., & Polouček, S. (2004). Efficiency and profitability in the banking sector Reforming the financial sector in central European countries (pp. 74-135): *Springer.*

Tan, Y. (2016). The impacts of risk and competition on bank profitability in China. *Journal of International Financial Markets, Institutions and Money, 40*, 85-110.

Yao, H., Haris, M., & Tariq, G. (2018). Profitability determinants of financial institutions: evidence from banks in Pakistan. *International Journal of Financial Studies, 6*(2), 53.