“Technical efficiency and its determinants: an empirical study on banking sector of Oman”

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Technical efficiency and its determinants: an empirical study on banking sector of Oman

Abstract

The present study aims to investigate the degree of technical, pure technical, and scale efficiencies in commercial banks of Oman by using the data envelopment analysis (DEA) approach. For the period under study, the contribution of scale inefficiency in overall technical inefficiency has been observed to be higher than pure technical inefficiency. The results related to returns-to-scale emphasize that decreasing returns-to-scale is the major form of scale inefficiency. Study shows that Bank Dhofar and Ahli Bank are consistent in their performance as they are the two most efficient banks throughout the period. Bank Muscat, the largest bank of Oman is suffering from decreasing returns-to-scale. The estimated efficiency scores are further regressed (using Tobit model) on a set of explanatory variables, i.e. bank size, profitability, capital adequacy and liquidity. Study reveals that bank size is insignificant; profitability and liquidity are significant positive explanatory variables.

Keywords: data envelopment analysis (DEA), Tobit, technical efficiency, bank.
JEL Classification: G21.

Introduction

Banks play an important role in the growth and stability of an economy. They help in channelizing the household savings to corporate and industries where it is optimally used for the development of the country. Therefore, financial institutions work as an intermediary and if this financial intermediation is efficient it is going to add value to economy as a whole. Thus, the performance of banking system is important and is a point of concern for all the stakeholders. The performance measurement of banks is of prime importance for all the economies whether it is a developed or developing economy. Performance of banks can be measured either by using financial ratios or by measuring its efficiency. Efficiency is defined as ratio of output and input of the firm. Proper and efficient utilization of resources or inputs to get desired quantity and quality of output is always expected by the management of a firm.

As compared to past, today banking industry is facing a tough competition and the probability of bankruptcy is also high as the financial markets across the world are integrated. Because of integration, risk in one part of the world is easily transmitted to rest of the countries. In this uncertain scenario, it is essential to measure the technical efficiency of these banks. Present study analyzes the technical efficiency of Omani banks for the period 2009 to 2013, using data envelopment analysis (DEA) the most commonly used nonparametric technique to evaluate the efficiency of banks. The technique of measuring technical efficiency of decision making units (DMUs) was first proposed by Charnes, Cooper and Rhodes in 1978 and later extended by Banker, Charnes and Cooper in 1984. DEA is very useful if the sample is small as it is less data demanding. Therefore, DEA is a right choice for Omani banking sector as it is small banking sector having only sixteen banks.

Study analyzes the technical efficiency of Omani banks by splitting the overall technical efficiency score into two components pure technical efficiency which measures management performance and scale efficiency which measures suitability of bank size. The present study is an attempt to quantify the degree of overall technical efficiency (OTE), pure technical efficiency (PTE), and scale efficiencies (SE) of banks in Oman using a two-step data envelopment analysis (DEA) methodology. As a first step overall technical, pure technical, and scale efficiency scores for individual banks have been achieved. The splitting of overall technical efficiency into pure technical and scale efficiency helps us in detecting the source of inefficiencies. The PTE is a measure of technical efficiency which represents managerial flaw in handling resources used to run an organization. The measure of scale efficiency provides the ability of the management to choose the optimum size of bank or in other words, to choose the scale of production. In the second-step, the overall technical efficiency (OTE) scores obtained in the first-step are regressed on the bank specific variables which help in determining factors affecting bank efficiency.

1. Literature review

In literature, abundant studies are available on measuring the efficiency of banks and financial institutions. In recent years, the performance measurement concerns for financial institutions have attracted a great deal of attention. Several studies have attempted to analyze efficiency issues by using DEA, a non-parametric technique; some are based on estimating bank efficiency. The application of DEA in measuring bank efficiency can be attributed to the work of Sherman & Gold (1985) where they used DEA to investigate the efficiency in operation of bank branches.

Bhattacharya et al. (1997) studied the efficiency of Indian banks using, DEA technique followed by stochastic frontier approach to explain variation in efficiencies. Authors followed intermediation approach with interest expense and operating expense as two inputs and three outputs as deposits, advances and investments. Similarly we have one more study where intermediation approach was used to select input and output; Mokhtar et al. (2008) adopted DEA technique to measure technical and cost efficiency of Islamic banks in Malaysia for the given period of 1997 to 2003. They used Intermediation approach and concluded that conventional banks are more efficient than Islamic banks. Hassan and Hussein (2003) examined the efficiency of 17 Sudanese banks for the period 1992 to 2000. The study employed a variety of parametric measures to assess cost and profit efficiency, and non-parametric data envelopment analysis (DEA) to measure cost, allocative, technical, pure technical and scale efficiency. The results demonstrated that overall cost inefficiency of the Sudanese Islamic banks was mainly due to technical (managerial underperformance).

Rahim et al. (2013) examined the efficiency of Islamic banks of Middle Eastern and North African (MENA) and Asian countries using DEA based on the intermediation approach. They concluded that the main source of technical inefficiency among the Islamic banks was the scale of operations. Debasish (2006) also attempted to measure the relative performance of Indian banks, using the output-oriented CRR DEA model. The analysis used nine variables and seven output variables in order to examine the relative efficiency of commercial banks over the period 1997-2004. AlKhathlan and Abdul Malik (2008) examined the relative efficiency of Saudi Banks for the period 2003 to 2008. They applied both CRS and VRS models of DEA and concluded that Saudi banks are efficient in managing their resources.

Literature also consists of studies based on two-step analysis, as DEA itself is not sufficient to give any conclusive results. There are numerous studies based on determinants of technical efficiency, where authors have commonly used Tobit regression model to estimate the effect of key bank specific and macroeconomic variables on bank's efficiency. Studies like Jackson and Fethi (2000) investigated the determinants of efficiency of Turkish commercial banking sector, and concluded that bank size and operating profit are significant factors affecting technical efficiency while capital adequacy ratio was having statistically significant adverse impact on the performance of banks. Ben-Khedhiri et al. (2011) examined the effect of financial sector reform on bank performance in selected MENA countries by measuring technical efficiency during the period 1993-2006. They further employed a second stage analysis using Tobit regression to investigate the impact of institutional, financial and bank specific variables on bank efficiency. Sufian (2009) applied DEA techniques to study the efficiency of Malaysian banking sector during Asian crisis of 1997 for the period of 1995-1999. Bank size, ownership and profitability were the positive and significant parameters effecting bank efficiency. Efficiency was negatively related with economic conditions and expense preference behavior. San, O. et al. (2011) in their study measured relative efficiency of domestic and foreign banks in Malaysia. The study was based on 9 domestic and 12 foreign banks over the period of 2002-2009. They used intermediation approach and later on Tobit model to measure the determinants of efficiency. The finding of this study shows that domestic banks have a higher efficiency than foreign banks operating in Malaysia.

In the available literature there are very few studies based on bank efficiency of GCC countries and as per authors information there is not a single study exclusively devoted to bank efficiency of Oman. As we know that DEA is a relative study so we will get different results if the sample is changed, therefore present study which is based on Omani banks, is relevant and will give useful insights for banking sector in Oman. The existing literature on DEA and bank efficiency is not conclusive as far as the selection of input and output variables is considered. There is a divergent opinion for the determinants of bank efficiency, especially for parameters like bank size and capital adequacy we have mixed results. Thus, this study attempts to add some value to the existing literature by providing recent empirical evidence on the technical efficiency and its determinants for commercial banks in Oman.

2. DEA methodology

Data envelopment analysis (DEA) is a non-parametric linear programming technique that develops an efficiency frontier by optimizing the weighted output/input ratio of each provider. It is a comparative approach for identifying performance of a firm or its components by considering multiple inputs and outputs. DEA was proposed by Charnes, Cooper and Rhodes (1978), in their paper they evaluated the efficiency of public sector non-profit organizations using an input orientation and assumption of constant returns to scale (CRS). The assumption of variable returns to scale (VRS) was first introduced by Banker, Charnes and Cooper (1984), where they suggested the use of variable returns to scale (VRS) that decomposes OTE into product of two components, pure technical efficiency (PTE) and scale efficiency (SE).

Technical efficiency can be estimated under two directions; an input-oriented or output oriented approach. Input-oriented aims at reducing the input amounts by as much as possible at a given level of output, and the output-oriented approach maximizes output levels at a given input level. Under CRS assumption the input-oriented and output-oriented measures always provide the same value but they are unequal when VRS is assumed.

DEA assigns different weights to input and output of different firms so that a firm maximizes efficiency relative to other firms. The efficiency scores of all the units lie between zero and one, where the most efficient unit will have a score of one. Since, the efficiency scores are not absolute, but relative, the most efficient firm may be inefficient if the sample is changed. Hence, the larger the sample, the better is the result.

3. Mathematical model of DEA

Assume that there are s DMUs to be evaluated. Each consumes different amounts of inputs and produces j different outputs, i.e. DMUr consumes x_{ir} amounts of input to produce y_{jr} amounts of output. It is assumed that these inputs, x_{ir}, and outputs, y_{jr}, are non-negative, and each DMU has at least one positive input and output value. The CCR model aims to maximize the ratio of weighted outputs for given weighted inputs of the bank under the study. The objective function, defined by a_r, for r^{th} bank, is maximized subject to the constraint that any other bank in the sample cannot exceed unit efficiency by using the same weights.

Hence, the objective function is:

$$Max\ a_r = \frac{\sum_{j=1}^{l} u_j y_{jr}}{\sum_{i=1}^{k} v_i x_{ir}}.$$

Subject to condition:

$$\frac{\sum_{j=1}^{l} u_j y_{jr}}{\sum_{i=1}^{k} v_i x_{ir}} \le 1, \qquad \text{(a)}$$

$$u_j,\ v_i \ge 0, \qquad \text{(b)}$$

where: $i = i^{th}$ input, $i = 1, ..., k$; $j = j^{th}$ output, $j = 1, ..., l$; $r = r^{th}$ bank, $r = 1, ..., s$; a_r = objective measure of efficiency for r^{th} bank; r = a specific bank to be evaluated; y_{jr} = the amount of output j from bank r; x_{ir} = the amount of input i to bank r; u_j = weight chosen for output j; v_i = weight chosen for input i; s = the number of banks; l = the number of outputs; k = the number of inputs.

4. The CRS model in form of restricted linear program

The above problem can be converted into linear program form by restricting the denominator of the objective function to unity, and adding this as a constraint to the problem. Therefore, linear programming form is as follows:

$$Max\ a_r \frac{\sum_{j=1}^{l} u_j y_{jr}}{\sum_{i=1}^{k} v_i x_{ir}}.$$

Subject to:

$$\sum_{i=1}^{k} v_i x_{ir} = 1, \qquad \text{(a)}$$

$$\sum_{j=1}^{l} u_j y_{jr} - \sum_{i=1}^{k} v_i x_{ir} \le 0, \qquad \text{(b)}$$

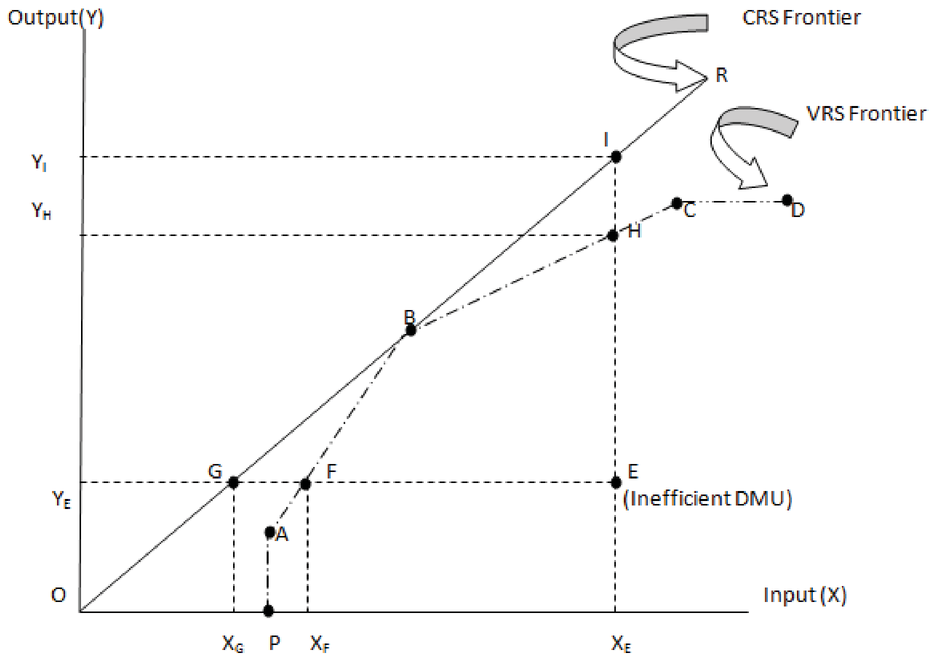
$$u_j,\ v_i \ge 0, \qquad \text{(c)}$$

$j = 1,2,\ldots\ldots l$, $i = 1,2,\ldots.k$ and $r = 1,2,\ldots..s$.

The solution for the above linear programming gives efficiency score (a_r) for bank r, where $0 \le a_r \le 1$.

5. Graphical explanation of technical, pure technical and scale efficiencies

In the above mentioned CRS assumption the technical efficiency measure represents overall technical efficiency (OTE) which measures inefficiencies due to the input/output configuration and as well as the size of operations. But CRS assumption is only appropriate when all DMU's are operating at an optimal scale. However, imperfect competition and other business factors may cause a DMU to operate at non-optimal scale. Many studies have decomposed the OTE scores obtained from CRS DEA into two components, one due to scale inefficiency and one due to pure technical inefficiency. This may be done by conducting both a CRS and a VRS DEA upon the same data. The efficiency measure corresponding to VRS assumption represents pure technical efficiency (PTE) which measures inefficiencies due to only managerial underperformance. The relationship SE = OTE /PTE provides a measure of scale efficiency. For the one-output and one-input case, the derivation of the concepts of technical, pure technical, and scale efficiency under DEA approach is illustrated in Figure 1.



Source: authors' self construction.

Fig. 1. OTE, PTE and SE measures

Figure 1 provides two efficient frontiers: one assumes CRS (shown by line OR) and one assumes VRS (shown by line segment PABCD). Projecting the inefficient DMU E onto VRS efficient frontier (point F) by minimizing input X while holding output Y constant (i.e., input-orientation), PTE for DMU E is defined as X_F/X_E. Similarly, if we change the optimization mode to that of output maximization, PTE for firm E is now defined as Y_E/Y_H. Focusing on the CRS efficient frontier, DMU E is projecting onto point G, where the input-oriented OTE measure is defined by X_G/X_E. Output oriented OTE measure is similarly defined as Y_E/Y_I. However, given that the slope of CRS efficient frontier equals to 1, then $X_G/X_E = Y_E/Y_I$, which means orientation does not change OTE scores. Extending the above illustration to scale efficiency, input- and output-oriented scale efficiency measures are defined as, $X_G/X_F = Y_H/Y_I$, respectively. Increasing returns-to-scale imply that the DMU can gain efficiency by increasing production of Y (which generally occurs when producing on the PAB of VRS efficient frontier), while decreasing returns-to-scale imply that a reduction in scale increases efficiency (which occurs on the portion BCD of VRS efficient frontier). If one is producing optimally, then, there is no efficiency gain by changing the scale of production. This occurs when firm operate at the point B where the two frontiers are tangent i.e., OTE = PTE.

6. Tobit regression model (stage two of DEA analysis)

Tobit regression model is represented by Equation (1), where dependent variable y_i^* represents overall technical efficiency scores obtained from DEA and independent variables x_{2i}, x_{3i}, x_{4i}, and x_{5i} represent bank specific variables considered in this study.

$$y_i^* = \beta_1 + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + u_i, \quad (1)$$

$$y_i = 0 \text{ if } y_i^* \leq 0;\ y_i = y_i^* \text{ if } 0 < y_i^* \leq 1;\ y_i = 1 \text{ if } 1 < y_i^*.$$

As dependent variable y_i^* represents relative efficiency scores which lie between 0 and 1, it has been censored from left as well as from the right. In available literature most of the authors have specified censored regression model (Tobit) for the second stage. The logic for the use of Tobit model is that technical efficiency scores are between 0 and 1 and therefore censored regression should be used. Tobit as a censored regression for second stage of DEA was considered inappropriate by McDonald (2009). This was because technical efficiency (TE) is fraction data and not generated by censoring process. Therefore, he suggested the use of ordinary least square (OLS) as most appropriate. Studies like Chirkos and Sears (1994), Ray (1991) and Stanton (2002) have also used OLS in second stage of DEA.

7. Data and variables

Several alternative DEA models have been employed in banks efficiency literature. In the literature, we come across two commonly used approaches for selecting inputs and outputs: the production approach and the intermediation approach. But literature proves that there is no consensus on what comprise the inputs and outputs of a bank (Sathye, 2003). Under the production approach, banks are considered as producer of deposits, loans and services by using resources and inputs like labor and capital. Production approach is used by Sathye (2001), Neal (2004) and many others. Under intermediation approach, banks are viewed as an intermediary who channelizes the funds from surplus units to deficit units, collecting funds from depositors and converting them to loans. Intermediation approach is used by Mokhtar et al. (2008) and Bhattacharya et al. (1997). Berger and Humphrey (1997) argue that neither of these two approaches is perfect because they cannot fully capture the dual role of financial institutions as providers of transactions processing services and also being financial intermediaries. Current study has selected seven commercial banks from Oman for the 2009 to 2013. Oman banking sector comprises 16 banks out of which 7 are locally incorporated and 9 are the branches of foreign banks. In this study only locally incorporated banks are considered for efficiency measurement. These are Bank Muscat, National Bank of Oman, HSBC Bank Oman, Oman Arab Bank, Bank Dhofar, Bank Sohar and Al Ahli Bank. Foreign banks operating in Oman included Standard Chartered bank, Habib Bank, Bank Melli Iran, Bank Saderat Iran, Bank of Baroda, State Bank of India, National Bank of Abu Dhabi, Bank of Beirut and Qatar National Bank.

As already discussed above that selection of relevant input and output variables for estimating bank efficiency is most challenging task and the intermediation approach as proposed by Sealey and Lindley (1977) is most commonly used by the authors. Therefore, as in majority of the empirical literature, author has adopted the intermediation approach as opposed to the production approach for selecting input and output variables for computing the various efficiency scores for individual banks. Fixed assets and total deposits are selected as input variables while loans & advances and investments as the output variables for first stage of DEA analysis. In Tobit model the overall technical efficiency (OTE) scores achieved from the first step are used as censored dependent variable and four variables: total assets, capital adequacy ratio, loan to deposit ratio and operating profit to total assets are selected as dependent variables. Logarithm of total assets is used as a proxy for bank size, capital adequacy ratio as proxy for capital adequacy, loan to deposit ratio as proxy for liquidity and operating profit to total assets as proxy for profitability. All the input and output variables for DEA and independent variables for Tobit analysis are collected from the annual reports of respective banks for the year 2009-2013.

8. Empirical results

The results of DEA model i.e. overall technical efficiency (OTE), pure technical efficiency (PTE) and scale efficiency (SE) for all the sample banks over the period 2009-2013 are displayed in Table 1. It is observed that out of the seven sample banks considered for this study, only Ahli Bank and Bank Dhofar are technically efficient in all the years. Bank Muscat is the biggest bank of Oman in terms of asset size and number of employees but is not technically efficient. When the overall technical efficiency was divided into two components of pure and scale efficiency, it is discovered that Bank Muscat is inefficient in scale and efficient in pure technical. Means there is no problem with the management of inputs or in other words underperformance of management, the reason of inefficiency for Bank Muscat is inappropriate size of bank resources. Inappropriate size of a bank, either too large or too small may sometimes be a cause of technical inefficiency. Scale inefficiency of Bank Muscat is of decreasing return-to-scale which implies that a bank is too large to take full advantage of scale or in other words it is a case of diseconomies of scale.

Table 1. Estimated results: data envelopment analysis

2009				
Banks (2009)	Technical efficiency	Pure technical efficiency	Scale efficiency	Return to scale
Ahli Bank	1	1	1	Constant
Bank Dhofar	1	1	1	Constant
Bank Muscat	0.806	1	0.806	Decreasing
Bank Sohar	0.899	1	0.899	Decreasing
HSBC Bank	0.761	0.800	0.951	Increasing
National Bank of Oman	0.969	1	0.969	Decreasing
Oman Arab Bank	0.751	0.885	0.849	Decreasing
2010				
Ahli Bank	1	1	1	Constant
Bank Dhofar	1	1	1	Constant
Bank Muscat	0.869	1	0.869	Decreasing
Bank Sohar	1	1	1	Constant
HSBC Bank	0.772	0.775	0.997	Decreasing

Table 1 (cont.). Estimated results: data envelopment analysis

2010				
National Bank of Oman	0.991	1	0.991	Decreasing
Oman Arab Bank	0.826	0.887	0.931	Decreasing
2011				
Ahli Bank	1	1	1	Constant
Bank Dhofar	1	1	1	Constant
Bank Muscat	0.773	1	0.773	Decreasing
Bank Sohar	0.786	0.817	0.963	Decreasing
HSBC Bank	0.599	0.631	0.948	Decreasing
National Bank of Oman	0.935	1	0.935	Decreasing
Oman Arab Bank	0.794	0.948	0.838	Decreasing
2012				
Ahli Bank	1	1	1	Constant
Bank Dhofar	1	1	1	Constant
Bank Muscat	0.813	1	0.813	Decreasing
Bank Sohar	0.843	0.955	0.883	Increasing
HSBC Bank	1	1	1	Constant
National Bank of Oman	0.869	0.963	0.902	Decreasing
Oman Arab Bank	0.722	0.913	0.791	Decreasing
2013				
Ahli Bank	1	1	1	Constant
Bank Dhofar	1	1	1	Constant
Bank Muscat	0.929	1	0.929	Decreasing
Bank Sohar	0.981	1	0.981	Increasing
HSBC Bank	1	1	1	Constant
National Bank of Oman	0.906	0.939	0.965	Decreasing
Oman Arab Bank	0.810	0.933	0.868	Decreasing

Source: authors' self estimation.

National bank of Oman which is the second largest bank in Oman, is also suffering with scale inefficiency (decreasing return-to-scale). HSBC Bank is one of the foreign bank working in Oman has pure technical inefficiency and scale inefficiency from 2009 to 2011 but it becomes technically efficient in 2012 and 2013. The reason for this shift may be the merger of Oman international bank with HSBC Bank in June, 2012. Bank Sohar has given a mixed result like technically efficient in 2010 but in remaining years is inefficient because of scale inefficiency. It is the youngest bank of Oman established in 2007 that is why small in size and showing increasing return-to-scale. Among all the banks considered, Oman Arab Bank is having the lowest average performance followed by HSBC Bank and then Bank Muscat.

9. Determinants of bank efficiency

The major drawback of DEA approach is its failure to draw statistical inference. This drawback is overcome by a two-step procedure, in second step efficiency scores determined using DEA as a first step are regressed on factors affecting bank efficiency. In the past several studies attempt to investigate the factors that influence the efficiency of banks. Some studies examined only bank-specific factors and others examined both bank-specific and environmental factors. Commonly found bank-specific factors are size, profitability, capitalization, loans to assets (Casu and Molyneux, 2003; Casu and Girardone, 2004; Ataullah and Le, 2006; Ariff and Can, 2008). In this study, OTE scores determined in the first DEA step are regressed on four bank specific factors like bank profitability measured by ratio of operating profit to total assets, bank risk measured capital adequacy ratio (CAR), bank size measured by logarithm of total assets of banks and liquidity of banks is measured by loan to deposit ratio which measures risk and total assets which measures bank size. If the banking factor is found to be significant, its sign can indicate the direction of influence on the efficiency score.

Table 2. Estimation results: Tobit model

	Coefficient	Std. error	*p*-value
Constant	0.373332	0.600874	0.5344
Bank size	-0.035074	0.036054	0.3306
Capital adequacy	0.033237	0.016747	0.0472
Liquidity	0.824311	0.213820	0.0001
Profitability	13.37608	6.191225	0.0307

Source: author's self estimation.

Table 2, reports the results for the Tobit regression, where dependent variable is the OTE scores obtained from the first step. A positive and significant coefficient of independent variable means an efficiency increase with the increase in that variable whereas a negative coefficient means an association with an efficiency decline. The results of the regression are significant at 95% level or higher. All the four variables considered under study have different impact on efficiency. Bank size is insignificant and negatively related to the technical efficiency and therefore has no impact on efficiency. Thus, banks do not appear to have benefits of economies of scale. Capital adequacy ratio (CAR) is also marginally significant, which means it has a limited role in bank efficiency. Unlike bank size, CAR is having positive coefficient. The most important parameter for bank efficiency is profitability followed by liquidity of the bank. Bank profitability and bank liquidity have significant positive effects on efficiency, indicating that the larger and more profitable banks have higher technical efficiency.

Conclusion

The objective of this study was to measure technical efficiency of seven commercial banks operating in Oman using two-step procedure. In first step DEA is used to measure technical efficiency scores and in second step censored regression using Tobit model is used to investigate the determinants of technical efficiency. The independent variables used in the regression are log of total assets, capital adequacy ratio (CAR), loan to deposit ratio and operating profit to total assets

Technical efficiency scores of individual banks show, that Ahli Bank and Bank Dhofar have consistently been most efficient while Oman Arab bank has been consistently inefficient bank during the period. It is evident from the results that the technical inefficiency in the Omani banking sector is due to both poor input utilization (i.e., managerial inefficiency) and failure to operate at most productive scale size (i.e., scale inefficiency). The analysis of returns-to-scale, suggests that except Bank Sohar all other banks like Bank Muscat, national Bank of Oman and Oman Arab Bank have consistently shown decreasing returns-to-scale and, thus, need a downsizing in their operations to observe an efficiency gains. Panel data analysis could be the alternate way to execute this DEA. As using panel data we can get much comprehensive picture about the best bank in terms of efficiency over the period of 2009-2013. Therefore, non-usage of panel data can be considered as limitation of this paper.

The results of Tobit regression analysis confirm that the most important parameter for the output efficiency is the Operating Profit per Total Asset (OPTA) followed by the loan to deposit ratio. Other two factors capital adequacy ratio (CAR) and total assets (bank size) do not have any significant impact on the overall technical efficiency of Omani banking industry. Operating profit to total assets has a positive and significant effect on efficiency. Assets size has no significant influence. Thus, the idea that larger banks have higher efficiency does not seem to hold in the Omani banking industry. On the whole, the study suggests that there is adequate opportunity for improvement in the performance of inefficient banks by choosing a correct input-output mix and selecting appropriate scale size. The findings of this study are expected to provide significant insights to policy makers for improving and optimizing usage of valuable resources in various banks. As Oman is relatively unexplored in the world of research, this paper and its findings may also provide directions for future research in this area.

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