Efficiency Dynamics and Financial Reforms: Case Study of Pakistani Banks

Ahmad, Usman; Farooq, Shujaat and Jalil, Hafiz Hanzla
Pakistan Instittute of Development Economics Islamabad Pakistan

2009

International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 25 (2009)

http://www.eurojournals.com/finance.htm

Efficiency Dynamics and Financial Reforms: Case Study of Pakistani Banks

Usman Ahmed[1]
Staff Economist, Pakistan Institute of Development Economics (PIDE)
Islamabad Pakistan
E-mail: rohanahmed2001@yahoo.com
Tel: +92-51-9201240; Fax: +92-51-9110886

Shujaat Farooq
PhD Student, Pakistan Institute of Development Economics (PIDE)
Islamabad Pakistan
E-mail: shjt_farooq@yahoo.com
Tel: +92-332-8306825; Fax: +92-51-9110886

Hafiz Hanzla Jalil
Staff Economist, Pakistan Institute of Development Economics (PIDE)
Islamabad Pakistan
E-mail: hanzla_jalil@hotmail.com
Tel: +92-51-9201240; Fax: +92-51-9110886

Abstract

Banking sector in Pakistan were facing problems of weak health and low profitability due to various factors i.e. low productivity, high intermediation cost (high cost deposits), huge expenditures on establishment, over staffing, large number of loss making branches and mismanagement of funds etc. Owing to this, banking sector in Pakistan was under great deal of pressure to maintain their profitability. To overcome these issues, Pakistan undertook financial sector reforms in early 1990s with financial support of World Bank and Japanese government under the banking sector adjustment loan (BSAL) program. The main goal of these reforms was to improve the Total Factor Productivity (TFP) of financial system through separating ownership, management and strengthening the accountability mechanism.

Using the data sets of 20 domestic commercial banks of Pakistan, this study is intended to measure the banking efficiency through Data Envelopment Analysis (DEA) Malmquist Index of Total Factor Productivity (TFP) from 1990 to 2005 to access the impact of reforms on banking sector. The analysis is useful not only for policy makers but it also assess the impact of reforms on domestic commercial banks of Pakistan

Keywords: Reforms, Banking, TFP analysis,

[1] The authors are special thanks to Professor Dr. Abdul Qayyum Registrar (PIDE) and Dr. Muhmmad Arshad Khan Senior Research Economist (PIDE) Islamabad for their valuable comments on earlier draft of this study.

1. Introduction

Commercial banks have become a field of rising interest of industrial economists who endeavor in an important branch of industrial economics viz., theory of incomplete information and principal-agent framework. Asymmetry of information in the principal agent problem provide reasons for banks to play a special role to minimize the agency costs between borrowers and lenders. Although capital market also establish relationships among borrowers and lenders but commercial banks have comparative advantage due to their superior capability to provide debt with inside information. The banking sector in Pakistan has been dominated by government owned financial institutions, and mainly has accommodated the financial needs of government, public enterprise and private sectors (Khan, 1995; Khan and Khan, 2007), however, Public sector dominancy among others lead to inefficiency in banking sector (Haque, 1997).

It is widely accepted that the Pakistan's banking sector and financial institutions were under a great deal of pressure to maintain their profitability. Banks nuisances related to inadequate productivity, high intermediate cost of funds, huge expenditure on establishment, over staffing, large number of loss making branches and mismanagement of funds (Klien 1992). There were not only slacks in skills and knowledge development but also a mismatch between the skills required by the economy and the skills produced by national educational institutions. Pakistan is away behind to other developing countries in these two aspects. The State Bank of Pakistan (SBP) is subsidizing large private sector firms which were selling low quality products at high prices under a regime of controls.

In order to overcome these issues, the government has initiated financial sector reforms since early 1990s with the objective to create a level-playing field for enhancing competition in financial institutions, strengthening their governance and supervision, adopting a market-based system of monetary, exchange and credit management for better allocation of financial resources. Specific achievements were expected in terms of greater ownership of private sector in financial institutions; increased financial depth, intermediation and efficiency, reduced interest rate spread, better management of domestic debt in terms of cost and sustainability, reduced segmentation in government debt market, reduced distortion in term structure of interest rates, reorientation of monetary policy from direct to indirect control, enhanced efficacy of monetary transmission and increased effectiveness of SBP in supervising banks.

Furthermore, these reforms were expected to improve the efficiency in financial markets through separating ownership and management, and strengthen the accountability mechanism with the idea that a more efficient financial system would lead to mobilize human resource in the banking industry, efficient allocation of domestic capital resources and an improvement in the access of poor people to financial services. As part of these steps, the government not only privatized commercial banks but also allowed private sector to establish financial institutions to increase competition and efficiency in the banking system. All these efforts were conducive to boost economic growth and poverty reduction.

To enhance competition and efficiency, recent policy emphasis is on consolidation of small institutions into bigger units through legal and regulatory framework. Consequently, the new financial system in Pakistan will follow a three-tier structure. The top tier will comprise of strong international banks providing credit and financial services to large-scale industries and other corporate clients, consumer financing. This tier would be mainly owned by private sector and encouraged to reach out to small and medium enterprises. Second tier would consist of specialized and other private sector banks in addition to micro finance institutions in public and private sector. The focus of this tier is to provide credit and financial services to micro, small and medium enterprises, in addition to meeting specialized credit requirements for exports, agriculture and rural sectors. The third tier is conceived to consist of private non-bank financial companies resulting from the consolidation of existing fragmented non bank financial institutions (NBFIs). They will undertake equity underwriting, merger and acquisition, asset management, corporate bond issues, securities trading, leasing, venture capital etc.

The analysis of impact of various banking sector reforms on productivity and efficiency has attracted a lot of attention in the last two decades. Using data set of 341 branches of Agricultural Development Bank of Pakistan [2] (ADBP), Din et al. (1996) has analyzed the scale and scope efficiency of branch level banking operations by estimating multi product translog cost function for the period 1991-1995 and found that banks production technology exhibits both overall and product specific economies of scale. However, this study didn't account for the administrative expenses incurred by the head office and various regional offices of the banks.

Burki and Niazi (2003) investigated the impact of policy reforms on performance of commercial banks over the period 1991–2000 by Data Envelopment Analysis (DEA) method to measure performance by cost efficiency and isolate the contribution to cost efficiency of allocative efficiency, technical efficiency, pure technical efficiency and scale efficiency. Their results show that banking efficiency has varied overtime from highest efficiency in 1991 to lowest efficiency in 1996. Further investigating the source of mean cost inefficiency, they found that allocative inefficiency contributes more than technical inefficiency. The highest levels of efficiency were achieved by foreign banks followed by private banks while state-owned banks achieved least cost efficiency.

Rime and Stiroh (2003) examined the performance of Swiss banks for the period 1996-1999 using Malmquist index of total factor productivity (TFP) and found evidence of economies of scale for small and medium size banks, but little evidence for the large banks. Akhter (2002) estimated the efficiency of 40 commercial banks in Pakistan for the year 1998 through DEA technique and found that overall average efficiency of commercial banks in Pakistan is less than the World Mean Efficiency (Berger and Hamphery, 1997). The estimated technical efficiency was lower than the allocative efficiency. The private banks were found to be more efficient than the public and foreign banks.

Using DEA approach, Rizivi (2001) analyzed the productivity of banking sector in Pakistan for the period 1993-1998 and decomposed the total factor productivity into its constituent components. The author found that productivity growth as well as efficiency improvement has remained stagnant during the period of reforms covered by this study. However, the domestic banks performed slightly better than foreign banks. Rogers and Sinkey (1999) examined common features of US commercial banks for the year 1993 by Malmquist index and found that these banks tended to be large, had smaller net interest margins, had relatively fewer cost deposits, and exhibited less risk. Battacharya et al. (1997) examined productive efficiency of 70 Indian commercial banks during the early stages of the on-going liberalization process. They estimated the technical efficiency scores using DEA and then used stochastic frontier analysis to attribute variation in the calculated efficiency scores to three component sources namely temporal, ownership and random noise components. They found public owned banks to be the most efficient followed by foreign banks and privately owned banks. Qayyum and Ahmed(2006) estimated the technical and pure technical efficiency of 22 commercial banks of Pakistan for the period 1991-2000 and found that the Government of Pakistan is successful in improving the efficiency of the domestic commercial banks in Pakistan through the implementation of financial sector reforms

The literature mainly used two approaches to estimate the productive efficiency of the banking industry. First, parametric approach used by (Berger.et al. 1997, Limi 2002, Din et al.1996 and Hardy and Patti 2003) and second non-parametric DEA approach by (Aly et al. 1990, Favero and Papi 1995, Rizivi 2001, Berger et al. 1997, Burki and Niazi (2003), Qayyum and Ahmed (2006) and Qayyum and Ahmed (2006). However, the studies related to Pakistan are fewer and only confined to analyze few banks or partially covering the period of reforms. The aim of present paper is to estimate the changes in total factor productivity (TFP) of the commercial banks in Pakistan and to decompose productivity changes into technical efficiency and technological changes for the period 1991 to 2005.

The section II provides methodology and data description, section III elaborates the selection of input and output variables. Fourth section provides discussion on the results and the last section concludes the study.

[2] Renamed later as Zarai Tarqiati Bank Limited (ZTBL)

2. Methodology and Data

The Malmquist index measures the total factor productivity (TFP) change, between two data points over time, by calculating the ratio of distances of each data points relative to a common technology. It can be used to decompose the productivity change into Technical Change (TC) and Technical Efficiency Change (TEC). Our study uses the output-oriented model of Data Envelopment Analysis (DEA) Malmquist to put much weight on the expansion of output quantity out of a given amount of inputs. Therefore, TFP index is a ratio of the weighted aggregate outputs to weighted aggregate inputs, using multiple outputs and inputs.

The idea of Malmquist productivity index was initially proposed by Caves, et al. (1982) in the parametric frontier framework. Berg, et al. (1991) extended the idea of the Malmquist index to non-parametric frontier. This approach can be extended by decomposing the Constant Return to Scale (CRS) technical efficiency change into scale efficiency and "pure" Variable Return to Scale (VRS) technical efficiency components on scale efficiencies. (Fare et al, 1994). Data Envelopment Analysis (DEA) is a special mathematical linear programming model to assess the efficiency and productivity of banking sector. This method also allows the use of panel studies to estimate changes in total factor productivity and breaking it down into two components namely, technological change (TC) and technical efficiency change (TEC). TFP growth measures how much productivity grows or declines over time. TFP grow by adopting innovations such as electronics, improved design, or which we call technological change (TE) etc. Fare et al (1994) calculated an output/input-based Malmquist productivity change index using the formula given below.

$$M_0\left(Y_{t+}, X_{t+1}, Y_t, X_t\right) = \left[\frac{D_0^t\left(X_{t+1,}\, Y_{t+1}\right)}{D_0^t\left(X_{t,}\, Y_t\right)} \times \frac{D_0^{t+1}\left(X_{t+1,}\, Y_{t+1}\right)}{D_0^{t+1}\left(X_{t,}\, Y_t\right)}\right]^{1/2}$$

Where

M_0 = Malmquist Index, **X** = Input Matrix, **Y** = Output Matrix,
D_0 = Distance Function, **T** = Time

The above equation represents the productivity of the production point (X_{t+1}, Y_{t+1}) relative to the production point (X_t, Y_t) by using the technology of period t and the period t+1. TFP growth is the geometric mean of two output-based Malmquist TFP indices from period t to period t+1. If M>1 it indicates growth in productivity from period t to t+1, which itself result from either growth in technical efficiency or technological progress or even product of the both. In other words, a value greater than one will indicate positive TFP growth from period t to period t+1 while a value lesser than one will indicate a decrease in TFP growth or performance relative to previous year.

Malmquist TFP index measures the changes in total output relative to changes in inputs. This approach was first suggested by Swedish Statistician Malmquist (1953). The Malmquist index of Total Factor Productivity Change (TFPC) is the product of technical efficiency change (TEC) and technological change (TC); it can be expressed as,

TFPC = TEC × TC

Technical efficiency change (catch-up) measures the change in efficiency between current (t) and next (t+1) periods, while the technological change (innovation) capture the shift in frontier technology.

According to Squires and Reid (2004), technological change (TC) is the development of new products or the development of new technologies that allows methods of production to improve and results in the shifting upwards of the production frontier. More specifically, technological change includes new production process, innovations and the discovery of new products called product innovation. With passage of time, firms figure out more efficient ways of making existing products while allowing output to grow at a faster rate than economic inputs, therefore, the cost of production declines over time with process innovations. It is worth to mention that the VRS/CRS option has no influence on the Malmquist DEA because both are used to calculate the various distances used to construct the Malmquist indices.

3. Selection of Input and Output Variables

Since the definition of inputs and outputs has become controversial in the banking literature therefore, it is important to describe that how variables are defined (Benston et al. 1982). Input and output specification is critical to banking efficiency studies (Berg 1993) and depends on how one defines banking activity. Economists look at bank from five different angles (Favero and Papi (1995)

By using production approach, the banks are producers of deposits and loans by using inputs labor and capital. Within this production approach, on one hand deposits are treated as output (Resti 1994) but on the other hand, the Intermediation Approach (IA) considers financial institutions as primarily intermediaries, channeling funds between borrowers and savers as intermediators of financial resources. Therefore, in the context of intermediation approach, deposits are treated as inputs (Miller and Noulas 1996). In this study, we have used the Malmquist Index for estimation of TFP by incorporating deposits, labor and kapital as inputs and loans & advances and investment as outputs.

Our study is based on the annual data covering the period from1991-2005 for the 20 domestic commercial of Pakistan by dividing the sample period into three sub periods: pre- reform period (1991-1997), First Phase of Reforms (1998-2001) and Second Phase of Reforms (2002-2005). The data is collected from various issues of Banking Statistics of Pakistan published by the State Bank of Pakistan and different annual reports of scheduled banks (various issues).

4. Results

4.1. Banking Industry

Table 1 shows the results of TFP growth and efficiency of banking sector. The results shows that average increase in the technical efficiency scores of in period t+1 is -9.17 percent as compared to-0.064 percent in period t, thus indicate 141.63 percent change in growth.

Table 1: Distances Summary of Firm Means of the Banking Industry of Pakistan (1991-2005)

Years	t	t+1
1991	0.934	1.97
1992	0.888	0.674
1993	0.862	1.292
1994	0.828	1.098
1995	0.832	0.957
1996	0.931	0.69
1997	0.796	1.685
1998	0.811	0.757
1999	0.867	0.928
2000	0.860	1.53
2001	0.840	0.741
2002	0.925	1.188
2003	0.819	0.808
2004	0.813	0.778
2005	0.925	0
Average Growth Rate	**-0.064%**	**-9.16923%**

Moreover in the pre reform period catch-up have a capacity of 3.1 percent. The impact of innovation on banking industry has a capacity of 3.3 percent and 6.3 percent required for TFP growth.

In the first phase of reforms TC has decrease by 14.3 percent followed by TFP 12.2 percent, but TEC has increase at 2.1 percent. It means that there is an increase in TEC as compared to the pre reforms period while both TC and TFP showing decreasing trend.

Table 2: Malmquist Index Summary of Firm Means of the Banking Industry of Pakistan (1991-2005)

Banks	TEC	TC	TFPC
Zarai Taraqiati Bank Limited (ZTBL)	0.963	0.909	0.875
Allied Bank Limited (ABL)	1.013	0.905	0.917
Askari Commercial Bank Limited (ACBL)	0.977	0.910	0.888
Bank Al-Habib Limited	1.010	0.955	0.965
Mybank Limited	1.024	0.960	0.983
First Women Bank Limited (FWBL)	1.027	0.994	1.021
Habib Bank Limited (HBL)	1.006	1.008	1.014
Bank Alfalah Limited	1.003	1.044	1.047
Metropolitan Bank Limited	0.996	1.015	1.010
MCB Bank Limited	1.000	0.993	0.993
National Bank of Pakistan (NBP)	0.996	0.897	0.893
Prime Commercial Bank Limited	0.998	0.873	0.872
Soneri Bank Limited	0.990	0.868	0.859
Union Bank Limited (UBL)	1.000	0.903	0.903
United Bank Limited	1.000	1.006	1.006
Faysal Bank Limited	0.988	1.058	1.045
The Bank Of Punjab	0.999	1.076	1.076
The Bank Of Khyber (BOK)	1.000	1.119	1.119
KASB Bankk Limited	1.000	1.111	1.111
Saudi Pak Commercial Bank Limited	0.998	1.093	1.091
Mean	**0.999**	**0.982**	**0.981**

After initiating the second phase of reforms growth of TFP is 17.4 percent followed by TC with 14.6 percent and TEC with 2.4 percent, respectively. It means that all three indicators of growth TFP, TC and TEC showing increasing trend in the second phase of reforms as compared to the pre reforms and first phase of reforms. The result supports the hypothesis that banking reforms improves the efficiency of banking industry and the banking industry shifts its efficiency from 87.8 percent to 117.4 percent with an increase of 29.6 percent. In overall term, TFP growth has increase due to innovation in the financial sector.

Table 3: Malmquist Index Summary of Annual Means of Banking Industry of Pakistan (1992-205)

Periods	Years	TEC	TC	TFPC
Pre-Reform	1992	0.955	0.470	0.449
	1993	0.963	1.562	1.505
	1994	0.953	0.512	0.488
	1995	0.987	1.069	1.056
	1996	1.158	1.321	1.529
	1997	0.825	1.544	1.275
G.M	**1992-97**	**0.969**	**0.967**	**0.937**
Phase-1	1998	1.044	0.605	0.632
	1999	1.066	1.192	1.271
	2000	0.995	0.968	0.963
	2001	0.982	0.781	0.767
G.M	**1998-01**	**1.021**	**0.859**	**0.878**
Phase-2	2002	1.094	1.376	1.505
	2003	0.883	0.775	0.684
	2004	0.995	1.278	1.271
	2005	1.146	1.267	1.452
G.M	**2002-05**	**1.024**	**1.146**	**1.174**
G.M	**1992-05**	**1.008**	**1.095**	**1.103**

4.2. Public Banks

One of the most gratifying aspects of these reforms in the financial sector has been broadening access to finance the middle and lower income groups during the last five years. Since the State owned banks dominates in overall financial system and accounts more than 90 per cent of financial assets and also catered the needs of the Government for meeting their deficit financing, corporate sector and financed international trade. However, during last five years, central bank has tried to open up the financial sector by promoting and encouraging non-bank financing companies [3] to reach out new type of borrowers and savers.

The State Bank of Pakistan is facilitating the commercial banks for agriculture credit, SME loaning and microfinance. Four years ago, ZTBL was the only major provider of credit to agriculture but now, the commercial banks have overtaken ZTBL as the main sources of agriculture credit. During this period the volume of credit to agriculture particularly small and subsistence farmers has almost tripled. Similarly, from a modest start the outstanding loans for SMEs now account for 26 to 28 percent of all private sector loans. Khushali Bank, Pakistan Poverty Alleviation fund, microfinance institutions and NGOs are now serving about half a million poor mostly the women in rural areas.

The results of TFP growth and efficiency for the public sector banks are reported in table 4. A significant improvement has been seen (-3.007 percent) in period t+1 relative to previous years (–0.264 percent) resulting 10.381 percent growth.

The results of Malmquist Index used to measure TFP growths of banks are presented in table 5. The results show for the period 1991-2005 TFP of public sector banks has grown with variations. Furthermore the results show that only one out of five banks had TFP growth (i.e. equal or above one) in 1991 to 2005.

Table 4: Distances Summary of Firm Means of the Public Banks in Pakistan (1991-2005)

Years	t	t+1
1991	1.000	1.283
1992	0.940	1.075
1993	1.000	1.367
1994	0.993	1.720
1995	0.914	0.675
1996	0.896	2.669
1997	0.991	0.994
1998	0.974	0.895
1999	0.962	1.481
2000	0.927	0.903
2001	0.978	1.094
2002	0.957	7.786
2003	0.998	1.158
2004	0.946	0.892
2005	0.963	0.000
Average Growth Rate	**-0.264%**	**-3.007%**

The main source of TFP growth for the public sector banks has the technical efficiency change (TEC). Only UBL have shown improvement in TC and playing leading role by adopting new technology whereas ZTBL has lowest growth rate in all three TEC, TC and TFC. No bank has shown improvement in TEC. FWBL, NBP and UBL shows improvement while ZTBL remains at lower position. Overall, TFP growth of public sector banks has decreases.

[3] Leasing, malarias, mutual funds etc.

Table 5: Malmquist Index Summary of Firm Means of the Public Banks in Pakistan (1991-2005)

Banks	TEC	TC	TFPC
Zarai Taraqiati Bank Limited (ZTBL)	0.987	0.768	0.758
First Women Bank Limited (FWBL)	1.000	0.871	0.871
Habib Bank Limited (HBL)	0.999	0.963	0.962
National Bank of Pakistan (NBP)	1.000	0.955	0.955
United Bank Limited (UBL)	1.000	1.214	1.214
Mean	**0.997**	**0.943**	**0.941**

The results of table 6 shows that between 1991 and 1992, there is a 6.9 percent decrease in TEC while 0.8 percent increasein TC qand 0.1 percent increase in TFP.

Moreover in pre reform period, the catch-up is 0.02 percent while the impact of innovation on public sector banks is 19.6 percent and 19.5 percent capacity/change in TFP. Therefore, there was need for reforms in the public banks.

In the first phase of reforms, growth in TC is 10.5 percent followed by TFP 10.1 percent and with almost no change in TEC. For the second phase of reforms, overall all three indicators TEC, TC and TFPC decline during Phase-I and Phase-II with TFP growth is 1.9 percent, TC is 2.4 percent but TEC decreased to 0.04 percent. Therefore, banking reforms have shown a decline trend in efficiency and banking industry shifts its efficiency frontier from 110.10 percent to 101.90 percent, with a decrease of 8.2 percent.

Table 6: Malmquist Index Summary of Annual Means of Public Banks in Pakistan (1992-205)

Periods	Years	TEC	TC	TFP
Pre-Reform	1992	0.931	1.085	1.01
	1993	1.074	1.201	1.289
	1994	0.993	0.238	0.237
	1995	0.912	1.135	1.035
	1996	0.969	2.827	2.739
	1997	1.129	0.271	0.306
G.M	**1992-97**	**0.998**	**0.804**	**0.803**
Phase-1	1998	0.982	1.657	1.628
	1999	0.985	1.521	1.499
	2000	0.965	0.397	0.383
	2001	1.057	1.491	1.575
G.M	**1998-01**	**0.997**	**1.105**	**1.101**
Phase-2	2002	0.977	1.338	1.308
	2003	1.046	0.336	0.351
	2004	0.946	1.34	1.268
	2005	1.016	1.825	1.855
G.M	**2002-05**	**0.996**	**1.024**	**1.019**
G.M	**1992-05**	**1.000**	**0.958**	**0.958**

5. Concluding Remarks

Financial sector in Pakistan has gone through a number of changes during last two decades. The liberalization policy of bank opening has resulted with the reemergence of private banking sector in the economy and has strengthen the role of controlling authorities such as the State Bank of Pakistan (SBP) and the Security and Exchange Commission of Pakistan.

This study analyzed the main source of TFP growth for 20 commercial banks in Pakistan under the framework of intermediation approach. The result shows a significant movement towards the frontier or catch-up which showing a deteriorating trend in case of catch-up over time, which implies that banks had abortive to develop and acquire or injected the improvement from the new technology. Banks in our sample are distributed into total sample and public banks. The foremost sources of TFP

growth for the total and public sector banks are catching up. The general conclusion for the TFP growth indicates an increase in the TFP growth for the total sample and for the public banks.

Financial sector reforms tainted the structure of ownership of the banking sector during the two decades. Earlier banking sector dominated by the state owned banks. Now the share of public sector banks has declined and confined to only four purely state owned banks. TFP of four commercial banks ABPL, MCB, UBL and HBL which has been privatized during the reforms process show improvement in TFP growth.

Although, the reforms have created a healthy competitive environment, but on the other hand strengthen the capacity of the regulator to watch over and supervise the banking system in an effective manner. The study indicates that Government of Pakistan is successful in improving the effectiveness and productivity of the domestic commercial banks in Pakistan through the implementation of financial sector reforms. However, it is just a modest beginning of journey towards reaching out to the poor and the middle class. The schedule for future reforms is even more daunting and challenging than whatever modest achievements we have made so far. The journey is long, tortuous and the road ahead is full of stones and boulders. Therefore, all the stakeholders of the financial sector have to work hard to remove these impediments and require continues march towards destination without getting fatigued.

Overall conclusion of the study is that financial sector reforms are successful in improving the efficiency of the domestic commercial banks role as intermediations in Pakistan. However, this study is constructed on only one aspect of commercial bank that is role as intermedians. There are a number of dimensions to be explored which include bank as production unit, economic and allocative.

References

[1] Akhter M Hanif (2002), "X-Efficiency Analysis of Commercial Banks in Pakistan: A Preliminary Investigation". *The Pakistan Development Review, Part II.*

[2] Aly, H.Y., R. Grabowski, C. Pasurka and N. Rangan (1990), "Technical, Scale and Allocative Efficiencies in U.S Banking: An Empirical Investigation". *The Review of Economics and Statistics.*

[3] Banking Statistics of Pakistan (various issues) by State Bank of Pakistan

[4] Banker, R.D., A. Charnes, and W.W. Cooper (1984), "Some Models for Estimating Technical and Scale Efficiencies in DEA Models". *Management Science.*

[5] Berger y Humphery (1997), "Efficiency of Financial Institutions: International Survey and Directions for Future Research". *European Journal of Operations Research (especial issue) vol. 98.*

[6] Berg, S.A. (1993), "Banking Efficiency in the Nordic Countries". *Journal of Banking and Finance.*

[7] Berg, S.A., Forsund, F.R., Jansen, E.S. (1991), "Technical efficiency of Norwegian banks: the non-parametric approach to efficiency measurement", *The Journal of Productivity Analysis*, Vol. 2 No.1, pp.127-42.

[8] Berger, A., Leusner, J., Mingo, J., (1997), "The efficiency of bank branches". *Journal of Monetary Economics*

[9] Berger, A.N., Humphrey, D.B. (1990), "Measurement and efficiency issues in commercial banking", Charleston, SC., paper presented at a NBER Conference on Research on Income and Wealth,

[10] Burki, Abid A. and Niazi, Ghulam Shabbir Khan (2003), "The Effects of Privatization, Competition and Regulation on Banking Efficiency in Pakistan, 1991 – 2000". *Regulatory Impact Assessment: Strengthening Regulation Policy and Practice, Chancellors Conference Centre, University of Manchester, Manchester, UK*

[11] Caves, D.W., Christenson and Diewert, W.E. (1982), "The Economic Theory of Index Numbers and Measurement of Input, Output and Productivity", Econometrica, vol.50,pp. 1393-1414

[12] Charness A., Cooper W. & Rhodes E. (1978): "Measuring the Efficiency of Decision Making Units". *European Journal of Operations Research vol. 26*

[13] Coelli, T. 1996. "A Guide to DEAP Version 2.1 A Data Envelopment Analysis (Computer) Program". *CEPA Working Paper 96/08.*

[14] Din, ud M, Ghani, E and Qureshi, S K. (1996) "Scale and Scope Economies in Banking: A Case Study of the Agriculture Development Bank (ZTBL) of Pakistan". *The Pakistan Development Review. Vol: 35 pp. 203-213*

[15] *Fare, R., Grosskopf,S., Norris,M. and Zhang, Z (1994), " Productivity Growth, Technical Progress and Efficiency Change in Industrialized Countries", American Economic Review, 84, pp.66-83.*

[16] Fare, R S G and Knox L C.A. (1994). *Production Frontiers.* Cambridge: Cambridge University Press.

[17] Favero, C. A. and Papi, L. (1995). "Technical Efficiency and Scale Efficiency in the Italian Banking Sector: A Non-Parametric Approach", *Applied Economics, Vol. 27*

[18] Ferrier, G.D., and Knox Lovell (1990), "Measuring Cost Efficiency in the Banking: Econometric and Linear Programming Evidence". *Journal of Econometrics.*

[19] Government of Pakistan, (2005-2006), "The Economic Survey", *Ministry of Finance, Economic Advisory Wing, Islamabad.*

[20] Haque, Nadeem, 1997, "Financial Market Reform in Pakistan," *The Pakistan Development Review, Part II.*

[21] Hardy, D., Patti, E., (2003), "The Effects of Banking System Reforms in Pakistan" *IMF Working Paper.*

[22] Hardy, Daniel C., and Emilia Bonaccorsi De Patti (2001), "Bank Reforms and Bank Efficiency in Pakistan". *IMF Working Paper WP/01/138).*

[23] John C. Topuz, Ali F. Darrat and Roger M. Shelor (2005), "Technical, Allocative and Scale Efficiencies of REITs: An Empirical Inquiry" *Journal of Business Finance & Accounting.*

[24] Khan, A H. (1995), "Need and Scope for Further Reforms in the Financial Sector in Pakistan". *Journal Bankers Institute of Pakistan.*

[25] Klien, U.M (1992), "Commercial Banking in Pakistan" In Anjum Nasim (ed), Financing Pakistan's Development in the 1990s, *Oxford University Press, Karachi.*

[26] Limi Atsushi (2002), "Efficiency in the Pakistani Banking Industry: Empirical Evidence after the Structural Reforms in the Late 1990s" *Unpublished*

[27] Mlima & Hjalmarsson (2002), "Measurement of Inputs and Outputs in the Banking Industry" *Tanzanet Journal vol. 3(1).*

[28] Pamela E. and Emilyn Cabanda (2005), "An Empirical Analysis of TFP Gains in the Philippine Food Processing Industry: A Multi-criteria Approach" *Journal of Asian Studies on the Pacific Coast.*

[29] Parkan, C. (1987), "Measuring the efficiency of service operations: an application to bank branches", *Engineering Costs and Production Economics*, Vol. 12 No.2, pp.237-42.

[30] Qayyum, A. and Ahmad, M. (2006) Efficiency and Sustainability of Micro Finance Institutions in South Asia, South Asian Network of Economic Research Institutes (SANEI)

[31] Rafi Khan and Safiya Aftab (1994), "Assessing the Impact of Financial Reforms on Pakistan's Economy". *Pakistan Journal of Applied Economics.*

[32] Rangan, N., Pasurka, Hassan, .C., Grabowski, R. (1988), "The technical efficiency of US banks", *Economics Letters*, Vol. 28 No.2, pp.169-75.

[33] Resti, A. (1994), "Bank efficiency and returns to scale: a data envelopment analysis of Italian banks", *Political Economics*, Vol. 10 No.2, pp.269-91.

[34] Rizvi (2001), "Post-liberalisation Efficiency and Productivity of the Banking Sector in Pakistan". *The Pakistan Development Review.*

[35] Sathye M. (2003), "Efficiency of Banks in Developing Economy: The Case of India" *European Journal of Operations Research.*

[36] Seiford, L.M, and R.M. Thrall (1990), "Recent Development in DEA: The Mathematical Programming Approach to Frontier Analysis". *Journal of Econometrics*

[37] Sherman, H.D., Gold, F. (1985), "Bank branch operating efficiency", *Journal of Banking and Finance*, Vol. 9 No.2, pp.297-315.

[38] State Bank of Pakistan (2001). Pakistan Financial Assessment, 1990 – 2000. Karachi: *Research Department, State Bank of Pakistan.*

[39] State Bank of Pakistan (2002). Pakistan Financial Assessment, 2001 – 2002. Karachi: *Research Department, State Bank of Pakistan.*

[40] State Bank of Pakistan (2003). Pakistan Financial Assessment, 2003. Karachi: Research *Department, State Bank of Pakistan.*

[41] State Bank of Pakistan (2004). Pakistan Financial Assessment, 2004. Karachi: *Research Department, State Bank of Pakistan.*

[42] Yue, P. (1992), "Data envelopment analysis and commercial bank performance: a primer with applications to Missouri banks", *Federal Reserve Bank of St Louis*, pp.31-45.