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Abstract

This study aims at investigating empirically the x-efficiency, scale economies, and technological progress of commercial banks operating in Pakistan. As banking sector efficiency is consider as a precondition for macroeconomic stability, monetary policy execution, and economic growth. We also make efficiency comparisons between the domestic and foreign banks and big banks.

Our results indicate that the domestic banks operating in Pakistan are relatively less efficient than their foreign counterparts. The scale economies for small banks, especially foreign banks are higher. Results show also that market share of big five banks are declining over the period but average interest spread shows fluctuations. The main conclusions that can be drawn from these results are that mergers are more likely to take place, especially in small banks. If the mergers do take place between small domestic banks and foreign banks, these will reduce cost due to scale economies as well as x-efficiency (because foreign banks are x-efficient relative to small domestic banks). Even if mergers do take place between small and big banks, cost will reduce with out conferring any monopolistic power to these banks. This will also help in stability of the financial sector, which an important concern of the State Bank of Pakistan (SBP). So the best policy option for SBP is to encourage mergers, while keeping a check on interest spread, so that the benefits from reduction in cost due mergers are passed on to depositors and borrowers.

Introduction

Policy makers, regulators and managers have been concerned with the issue of how efficiently banks transform their various inputs into multiple financial products, because banking sector efficiency is considered a precondition for macroeconomic stability (Ngalande, 2003).It is also important for effective monetary policy execution (Hartman, 2004), furthermore, efficient allocation by banks has positive implications for economic growth (Galbis, 1977).

A positive link between financial intermediation and economic growth is empirically supported, widely accepted and has been increasingly incorporated as determinant in growth

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model over the past several decades (Gurley and Shaw, 1955 and Goldsmith, 1969). The link could be either through factor accumulation or through changes in efficiency channel (Collins, 2002). It is the latter channel which is more important because mere factor accumulation could not stimulate economic growth without efficient financial intermediation mechanism through which allocation take place (Slutz, 2001). besides, high return on investment, through this efficient financial intermediation mechanism, promotes innovations with positive impact on economic growth (Luccheti, 2000).

Economic efficiency can be decomposed into two basic components: technical efficiency and price efficiency (allocative efficiency). A firm is said to be technically more efficient than another firm if it can produce more output using a given amount of inputs as compared to another firm (Yotopulas and Lau 1973). A profit-maximizing firm is regarded as an allocatively efficient firm where profit maximization means that the marginal cost of the firm will be equal to marginal revenue of the firm. If there are differences in the economic efficiency of two firms then it might be either because of technical or price inefficiency.

Efficiency is linked to more controversial issues like competition, economies of scale and regulation. There is a trade off between these concepts. Efficiency and competition are closely linked together. In competitive banking system, banks must operate efficiently. With out such a competition banks might attempt to gain higher prices by restricting output or colluding with one an other. The competition and efficiency depend upon the number of banks operating in the market, freedom of entry and exit, and ability of banks to achieve an appropriate size (economies of scale) for serving their customers. Smaller number of banks in the market could encourage the monopolization and collusion, while bank of suboptimal size might be operating inefficiently. Another trade off is between competition and stability of the banking sector. The studies

focusing on competition in banks show that competition among the banks result into banks failure because of risk taking behavior of banks. Matutes and Vive (2000) argue that banks pose too high deposits rate when social failure cost is high. Cordella and Yeyati (1998) find that competition in deposits rate reduces the banks' incentive to limit risk exposure. Hellman et al.(2000) show that competition increases the potential scope for gambling between banks. It is here that regulation comes in. However, too much regulation either to curb such competition or monopolistic power is dangerous. So that regulation should be such that it keeps balance between these forces in conflicting directions.

Efficiency of banking sector becomes more important in the vent of liberalization and globalization of financial market. The liberalization and globalization of financial market pose new challenges as well as provide opportunities to banking industries in developing countries like Pakistan... Furthermore, the Basel Accord II, which is to be implemented next year, and Pakistanis is one of the signatory of this accord, may lead to merger of the banks.

Therefore is a dire need to probe into these issues which are essential for survival in this globalized and liberalized environment. There are only a few studies (Musleh-Ud Din et al, 1996, Limi, 2003, Akhter, 2002, and Kiani, 2005) that attempted to investigate the relative technical efficiency for the banking sector of Pakistan. But no study investigating scale economies, and technological progress exists. This study is an attempt in this regard. The objective of this study is to measure the cost efficiency, scale economies, and technological progress of Pakistani commercial banks. The study will also investigate the impact of scale economies upon level of competition and efficiency of the banking sector in Pakistan, using Fourier-Flexible cost function. Panel data from 1998 to 2005 are used for analysis.

The organization of the Study is as follows. Section 2 reviews the existing empirical studies on the banking sector. Section 3 presents different approaches to measure the efficiency. Section 4 discusses the methodology of our model, sources of data, specification of inputs and output of the banking sector and construction of different variables. Section 5 gives the interpretation of the results on the cost structure of the banking sector. Finally, Section 6 consists of summary and concluding remarks.

2. Review of Literature

There exists huge literature empirically estimating the efficiency, scale economies, and technological progress. Review of few studies is presented here. Aly *et al. (*1990) analyzed the nature of technical, scale and allocative efficiency of banks in the United States. On average, the banks were found to be scale efficient while technical efficiency was found to be negatively related to product diversity, and positively related to the extent of urbanization. Yuergert (1993) made important contributions to the literature on efficiency in financial services. He used cross section data of 805 companies for the year 1989 and the translog cost function in estimation. His results showed that there was a substantial amount of X-inefficiency in the industry, but the difference across firm's size was insignificant. Zardkoohi and Kolari (1994) analyzed empirical estimates of scale and scope economies for 615 branch offices representing 43 saving banks in Finland for the year 1988. Their result suggested that there are economies of scale for individual branch offices. Favero and Papi (1995) analyzed efficiency of the Italian banking sector. They used both parametric and non-parametric methods to make a comparison between these two approaches on a sample of 174 Italian banks for the year 1991 and found that the Italian banking industry features high variability in all the cost and profitability indicators. Chang *et al.* (1998) conducted a comparative analysis of productive efficiency of foreign-owned multi-national

banks and US-owned multinational banks operating in the US for the years 1984-1989. Their results indicate that average inefficiency score of the US multi-national banks was significantly lower than the average inefficiency score posted by the foreign owned multi-national banks. Altunbas *et al*. (1999) estimated the impact of technical change on the costs of European banks using the stochastic cost frontier. The data set of 3779 banks, based in 15 European countries, for the year 1989 to 1996 was used. The results suggest that the annual rate of total cost reduction, attributable to technical change, to be very strongly correlated with the bank size. Chen (2001), using data from 1988-97, found banks' X-efficiency had substantially increased in Taiwan's deregulated banking market. Hassan and Marton (2003) concluded that bank reforms in Hungary improved X-efficiency scores between 1993 and 1998. Hao et al. (2001), using data from 1985-1995, reported that financial reforms in Korea had little or no significant effect on banks' X-efficiency. Isik and Hassan (2002) found that following liberalization (1988-1996), Turkish banks' X-efficiency worsened over time, as did Hardy and Patti (2001), when they computed the X-efficiency of all Pakistani banks during a period of deregulation, 1993-1998. There are only few studies measuring banks efficiency for Pakistan banking sector. Musleh-ud-Din *et al*. (1996) examined the scale and scope efficiency of the Agriculture Development Bank of Pakistan. Their result showed that the bank's production technology exhibits both overall and product-specific economies of scale. Hardy and Emilia (2001) estimated profit, cost, and revenue to measure the efficiency of Pakistani banks. Their results suggest that much of the benefits of reform were passed on to consumers of the banks output and those supplying the banks with inputs. Both public and private banks made progress in improving cost efficiency and that private banks seemed more successful in expanding their revenue base and in this way regaining profit in Pakistan. Limi (2003) examined the changes in technical efficiency of Pakistani banking

industry after the structural reform started in 1990s. His result show that the impact of the structural adjustment programs varies among banks. Some banks are found to have improved their technical efficiency during the reform period, while the efficiency improvement of other banks was ambiguous. Kiani (2005) investigated empirically the technical efficiency of commercial banks operating in Pakistan and made efficiency comparisons between the domestic and foreign banks. Her results indicate that the domestic banks operating in Pakistan are relatively less efficient than their foreign counterparts.

3. Approaches

Different approaches have been used to measure the cost efficiency for banking industry. Earlier, financial ratios were used to measure the banks performance. The problem with this approach is that it relies heavily on the bench mark ratios, which could be misleading. Furthermore these ratios don't capture the long term performance (Sherman and gold, 1985). Farrell (1957) introduces the basic framework for measuring inefficiency, which is defined as deviation of actual from optimum behavior. The frontier establishes the optimum benchmark against which deviations are calculated. What macroeconomic theory tells us is that a production plan is efficient if there is no way to produce more output with given input or with decreased input leaving output unchanged. However production function is usually unobservable. Duality theory (Shaphard 1970) indicate that under certain conditions (i.e. homogeneity of degree one and concavity in prices) the properties of production function can be studies through cost or profit function. In theory, production plan and cost levels are derived from rational and efficient decisions, hence all firms perform at their production frontier. But in practice it is not the case, due to many factors (e.g. poor production plan, inefficient decision due to errors, managerial inability etc.), a firm is producing inside frontier and is therefore not efficient. Most commonly

used technique to measure efficiency is frontier analysis method which can further be divided in parametric and non-parametric approaches. The parametric approach includes Stochastic Frontier Analysis (SFA), the Free Disposal Hull, Thick Frontier, and Distribution Free Approach (DFA). While non-parametric approach is Data Envelop Analysis (DEA). All of these approaches have their own merits and demerits. The SFA was developed independently Aigner et al (1977). The primary advantage of this approach is to separate the random noise from inefficiency components. The main criticism on this approach is that the distributional assumptions to be used are overly restrictive in estimation using a single year's data (Allen and Rai, 1996). However, this assumption can be avoided by using panel data. The Distribution Free Approach (DFA) developed by Schmidt and Sickles (1984) uses panel data with assumption of constant inefficiency over time. The main advantage of non-parametric i.e. DEA is that it permits analysis of small size. The disadvantage of this approach is that it measure efficiency in relative term.

4. Methodology and Data

(a) Methodology and Estimation Procedure

This study uses panel data and assumes that inefficiency varies across the observations and over the time, therefore use of stochastic econometric frontier approach is appropriate. The cost frontier is obtained by estimating a Fourier- flexible cost function with component error term.

The cost function can be written as

$$ln\, C_i = f(p_k, y_i) + \varepsilon_i \qquad i = 1, \ldots, n \qquad (1)$$

where C represents total costs, y_i represents various products or services produced; p_k represents the prices of inputs used, and ε represents a random disturbance term, which allows the cost function to vary stochastically. The uncertainty in the cost function can be further decomposed as

$$\varepsilon_i = u_i + v_i \qquad (2)$$

In Equation (2), The error component u_i ($u_i \geq 0$), which represents efficiency, is assumed to be distributed independently of v_i. The term v, represents random term.

We assume that the banks use inputs, $x = (x_1, x_2, ..., x_n)$, available at fixed prices, $p = (p_1, p_2, ..., p_n)$, to produce the output y. For our purpose, we take the Fourier-flexible cost function as under:

$$\ln C = \alpha_0 + \sum_i \alpha_i \ln Y_i + \sum_k \beta_k \ln p_k + \theta_1 t + \sum_k \tau_{kt} t \ln p_k + \sum_i \phi_{it} t \ln Y_i +$$

$$\frac{1}{2}\sum_i \sum_j \alpha_{ij} \ln Y_i \ln Y_j + \frac{1}{2}\sum_k \sum_h \beta_{kh} \ln p_k \ln p_h + \sum_i \sum_k \delta_{ik} \ln Y_i \ln p_k +$$

$$\frac{1}{2}\theta_2 t^2 + \sum_i \left[\eta_i \cos\left(z_{it} + \lambda_i \sin z_{it}\right)\right] + \sum_i \sum_j \left[\eta_{ij} \cos\left(z_{it} + z_{jt}\right) + \lambda_{ij} \sin\left(z_{it} + z_{jt}\right)\right] + \varepsilon_i$$

(3)

where, C= total cost, Y_i= ith output, p_k = kth input price, z_i=adjusted value of $\ln y_i$[2] ε_i = disturbance term. For a cost function to be well behaved, it must be homogeneous of degree 1 in prices for each level of output. It implies the following restrictions on the cost function.

$$\sum_k \beta_k = 1 \qquad (4)$$

$$\sum_k \beta_{kh} = \sum_h \beta_{hk} = \sum_i \delta_{ik} = \sum_i \phi_{it} = 0 \qquad (5)$$

The symmetry on the cross-price effect implies $\alpha_{ij} = \alpha_{ji}$ and $\beta_{kh} = \beta_{hk}$

(i) X-efficiency measure

In a competitive environment, a firm is considered as x-efficient if it systematically incurs lower cost relative to other firms. Several techniques have been proposed for estimating x- efficiency. Our study utilizes the Berger (1993) distribution free method. This approach collapses the x-efficiency and random error component into a single variable. As shown by Berger, the residual of the equation () can be transformed so that the minimum is zero, that is

$$\hat{\varepsilon}_{ti} = \min(\hat{e}_{ti}) - \hat{e}_{ti} \text{ ---------- (6)}$$

By taking the exponential of equation (6), the resulting efficiency measure

$$x_{efi} = \exp(\hat{\varepsilon}_{ti}) \text{ ----------(7)}$$

is normalized to fall between zero and one.

[2] The formula for Zi is $0.2\pi - \mu.a \ln y$, where $\mu = (0.9.2\pi - 0.1.2\pi)/(b-a)$ and (a,b) is range $Log\, Y_i$.

(ii) Economies of Scale and Technological Progress

Overall scale economies measure the relative change in a firm's total cost for a given proportional change on all outputs. Economies of scale can be estimated as follow:

$$\hat{\rho} = scale = \sum_i \frac{\partial(\ln C(p,y,t))}{\partial \ln y_i}$$

$$= \sum_i \left[\alpha_i + \sum_k \alpha_{ik} \ln y_{kt} + \sum_j \delta_{ij} \ln p_{jt} + \phi_i t \right] + \mu_i \sum_i \left[-\eta_i \sin(z_{it}) + \lambda_i \cos(z_{it}) \right]$$

$$+ 2\mu \sum_i \sum_k \left[-\eta_{ij} \sin(z_{it} + z_{kt}) + \lambda_{ik} \cos(z_{it} + z_{kt}) \right] \text{----------(8)}$$

Scale measures are estimated for each bank in the sample at its respective output level y1and y2. If $\hat{\rho}$ is less than one, then banks are operating below the optimal scale levels and can reduce costs by increasing output further. If $\hat{\rho}$ is greater than one, then banks should reduce their output level to achieve optimal input combinations.

The technological progress is the other factor that influences the cost in addition to input prices and output levels. To capture the impact of technological progress, we include the linear and quadratic time trend in the cost function specification and allow them to interact with other exogenous variables. The effect of technological changes on aggregate cost can be calculated as follows:

$$\hat{T} = \frac{\partial \ln C(p,y,t)}{\partial t} = \theta_1 + \theta_2 t + \sum_i \phi_i y_{it} + \sum \theta_k p_{jt} \qquad (9)$$

The negative value of $\hat{T}$ implies that technological progress exists. The first two terms on right hand side of equation (9) represents the pure technological change, while third term is associated with scale augmenting technological change.

(b) Data and Variable Construction

We use three basic inputs for the banking sector, which are labor, capital, borrowed funds... We take two outputs, measured as loans and advances and investment. The outputs are defined as Y_1 = Loans and Advances, and Y_2 = Investment. The input Prices are defined as p_1= total admin cost / total deposits, p_2 = total interest paid / total deposits, p_3 = occupancy cost / total deposits. The cost of capital is assumed to be numeraire.

Our sample includes 29 banks, eighteen domestic banks and eleven foreign banks, the period covered is from 1998-2005[3]. For the purpose of estimation, we use balanced panel data. The required time series data was obtained from the State Bank of Pakistan's various issues of annual *Banking Statistics of Pakistan*

5. Empirical Results:

In this section we present the parameters estimates of our cost function given in equation (3). The parameters estimates are given in table 1 below.

[3] The banks included in this study are given in appendix.

Table 1: Parameters Estimates of Equation (3)

Variables	Coefficients	Estimates	Std. Error	T-values
Const.	C	-836.3	327.1	-2.56
lP1	β_1	0.67	0.34	1.97
lP2	β_2	0.04	0.46	0.086
lY1	α_1	1.65	0.43	3.837
lY2	α_2	1.37	1.017	1.347
T	θ_1	-0.08	0.060	-1.37
T2	θ_2	-0.003	0.003	-1.01
lY1ly1	α_{11}	-1.26	1.01	-1.24
lY1ly2	α_{12}	-0.69	0.237	-2.94
lY2ly2	α_{22}	-1.107	0.92	-1.206
lY1lP1	δ_{11}	-0.040	0.098	-0.406
lY1lP1	δ_{12}	0.098	0.091	1.077
lY2lP1?	δ_{21}	0.031	0.087	0.35
lY2lP2	δ_{22}	0.159	0.086	1.84
lP1lp1	β_{11}	-0.022	0.160	-0.14
lP1lp2	β_{12}	-0.71	0.236	-3.04
lP2lp2	β_{22}	0.722	0.159	4.52
lY1T	ϕ_1	0.0038	0.01	0.266
lY2T	ϕ_{21}	-0.0035	0.014	-0.255
lP1T	τ_1	-0.018	0.042	-0.427
lP2T	τ_2	-0.04	0.027	-1.46
CSZ1	η_1	1.18	1.03	1.145
CSZ2	η_2	1.33	0.84	1.58
SNZ1	λ_1	2.06	2.29	0.89
SNZ2	λ_2	0.86	0.76	1.13
CSZ11	η_{11}	0.55	0.52	1.05
CSZ12	η_{12}	0.059	0.51	0.12
CSZ22	η_{22}	1.38	0.73	1.89
SNZ11	λ_{11}	1.54	1.92	0.80
SNZ12	λ_{12}	-1.66	1.07	-1.55
SNZ22	λ_{22}	1.08	0.83	1.31

Note: The estimates are obtained using OLS technique.

After having parameters estimates, the x-efficiency, scales economies, and technological progress are estimated using equations (7), (8), and (9) respectively. The implication of these results, shown in table 2, is discussed based on average values obtained for 29 commercial banks

in the sample for eight time periods. The efficiency was lowest in 2001 and highest in 2004 for all groups. The average efficiency score is lower (48%) for domestic banks than the average efficiency score for all banks (54%) for all periods; it is higher for foreign banks (66%), and almost same for seven big banks (53%)[4]. This implies that smaller domestic banks are least efficient (all big banks are domestically owned). However, the average efficiency score for Pakistani commercial banks is lower than other countries (for example India, Turkey).

The scale economies exist for all groups of banks for each period though it is lesser as compared to x- inefficiency (which is one minus efficiency). Scale economies are lowest in year 2005 and highest in year 2000 for all groups. These are lower for big banks (10%) than the average scale economies for all banks (15%) for all periods; it is higher for foreign banks (22%), and for domestic banks it is (12%). This shows that scale economies of small banks, especially for foreign banks are higher.

As for technological progress, which indicates the possible contribution of technical advances in reducing average costs, our results suggest the existence of technological progress for all groups of banks for each period. It was lowest (0.3%) for big bank in 2003/04 and highest (3.9%) for foreign banks in 2005. Again technological progress is slower (0.5% on average) for domestic banks relative to foreign banks (2.2% on average).

[4] The seven big banks, namely Allied bank, Askari bank, Bank Al-Falah, National bank of Pakistan, Muslim Commercial bank, Habib bank, and United bank. The banks with market share greater than average are categorized as big banks

Table 2: Efficiency, Scale Economies, and Technological Progress of Banks

	Efficiency				Scale Economies				Technical Progress			
years	All banks	Domestic banks	Foreign banks	Big banks	All banks	Domestic banks	Foreign banks	Big banks	All banks	Domestic banks	Foreign banks	Big banks
1998	0.54	0.49	0.65	0.53	0.15	0.128	0.212	0.112	-0.006	-0.005	-0.009	-0.005
1999	0.53	0.48	0.65	0.54	0.16	0.128	0.221	0.110	-0.011	-0.008	-0.019	-0.008
2000	0.53	0.47	0.65	0.54	0.16	0.129	0.225	0.109	-0.013	-0.010	-0.020	-0.011
2001	0.52	0.46	0.64	0.51	0.15	0.123	0.215	0.107	-0.013	-0.01	-0.021	-0.011
2002	0.54	0.48	0.66	0.53	0.14	0.113	0.213	0.098	-0.014	-0.009	-0.026	-0.009
2003	0.54	0.49	0.65	0.54	0.14	0.108	0.223	0.094	-0.010	-0.005	-0.019	-0.003
2004	0.56	0.49	0.71	0.53	0.14	0.105	0.223	0.090	-0.010	-0.004	-0.022	-0.003
2005	0.53	0.47	0.66	0.52	0.13	0.101	0.212	0.089	-0.020	-0.012	-0.039	-0.012
Ave	0.54	0.48	0.66	0.53	0.15	0.120	0.220	0.101	- 0.012	-0.005	-0.022	-0.008

Based on results discussed above we infer the existence of cost inefficiency, scale economies, and technological progress for all group of banks. Given the difference in the nature of management practices of Pakistani and foreign banks, we specify Fourier-Flexible cost function to characterize the efficient frontier for commercial banks in Pakistan. This specification allows the data a large degree of flexibility in choosing the global shape of the cost frontier and avoids the problem associated with local approximations such as, Translog.

As results suggest that the scale economies of small banks, especially for foreign banks are higher. More over the requirement of Basel accord is that Capital Adequacy ratio must be 8% of the risk weighted Assets. There two approaches for calculating risk weighted average, namely standard approach and internal rating approach. The second approach is more beneficial for banks but requires higher fixed cost investment in equipments, employees expertise, and development of software etc. therefore, given high fixed cost, only larger banks go for internal rating approach. In addition to these, state bank of Pakistan has asked the banks to raise their

capital gradually to 6 billions by 2009. All these suggest that the mergers of the banks are more likely to take place.

Therefore, we need to analyze whether merger of the banks would result into monopolistic behavior. For this we see whether higher concentration ratio has any impact on the interest rate spread. In Table 3, we see that market share of big five banks shows a declining trend but average interest rate spread shows much dispersed picture[5]. The spread shows fluctuations, it increases up to 2001, then declines and is high in 2005. The average spread for the foreigner bank is larger as compared to domestic banks. But the average spread for big banks (which are domestically owned) is significantly high relative to all domestic banks. However, it is nearly half of the foreign banks (which are relatively small). This shows a lack of competition in the banking sectors. It is not due to monopolistic behavior but may due to risk perceptions as well as lack of information.

Table 3: Concentration Ratio and Average Interest Rate Spread

years	Concentration Ratio	Interest Rate Spread			
		All banks	Dom banks	Foreign banks	Big banks
1998	0.72	2.60	0.13	8.39	4.59
1999	0.73	9.71	0.49	10.31	5.58
2000	0.72	11.75	0.59	12.93	5.76
2001	0.69	12.91	0.65	13.52	6.86
2002	0.61	9.38	0.47	8.93	5.92
2003	0.58	7.30	0.36	6.03	4.50
2004	0.56	6.94	0.35	5.87	4.09
2005	0.58	9.15	0.46	7.81	6.25

[5] The five big banks, namely allied bank, National bank of Pakistan, Muslim Commercial bank, Habib bank, and United bank Constitute on average above than 60% of market share.

The difference in the spread, between big and small domestic banks, is mainly due to following reasons;

- Access to low cost funds as big banks have larger number of branches are even represented rural areas.
- Low risk perception as the big banks were previously owned by public sector (National bank of Pakistan is still in public sector)
- Overhang from past continues as the bank-customer relations continue from past (even some less literate people may not know about the privatization of these banks).

The difference in the spread, between foreign and small domestic banks may be because these are performing different functions.

6. Summary and Conclusion

This study aims at investigating empirically the x-efficiency, scale economies, and technological progress of commercial banks operating in Pakistan. We also make comparisons between the domestic, foreign banks, and big banks using data for 29 banks from 1998 to 2005 operating in Pakistan.

Our results indicate that the domestic banks operating in Pakistan are relatively less efficient than their foreign counterparts. The average efficiency score is lower for domestic banks

than the average efficiency score for all banks for all periods; it is higher for foreign banks, and almost close to average for big banks. This implies that smaller domestic banks are least efficient. The scale economies exist for all groups of banks for each period though lesser as compared to x- inefficiency. The economies of scale for big banks are lower than the average economies of scale for all banks for all periods; it is higher for foreign banks, and lower for domestic banks. This shows that scale economies for small banks, especially foreign banks are higher. Results also show that market share of big five banks is declining over the period but average interest rate spread shows fluctuations. This negates any relationship between the two. The average spread for the foreigner bank is larger as compared to domestic banks. But the average spread for big banks (which are domestically owned) is significantly high relative to all domestic banks. However, it is nearly half of the spread for foreign banks (which are small banks). This shows a lack of competition in the banking sectors. The main conclusions that can be drawn from these results are that mergers are more likely to take place especially in small banks. If the mergers do take place between small domestic banks and foreign banks, these will reduce cost due scale economies as well as x-efficiency (because foreign banks are x-efficient relative to small domestic banks). Even if mergers do take place between small and big banks, cost will reduce with out conferring any monopolistic power to these banks. This will also help in stability of the financial sector, which is one of the concerns of State Bank of Pakistan (SBP). So the best policy option for SBP is to encourage mergers, while keeping a check on interest spread, so that the benefits from reduction in cost due to mergers are passed on to depositors and borrowers.

References

Akhter, M. Hani (2002),"X-efficiency Analysis of Commercial Banks in Pakistan: A Preliminary Investigation", The Pakistan Development Review, 41 (winter) 567-580.

Allen, L. and A. Rai (1996) "Operational Efficiency in Banking: An International Comparison", Journal of Banking and Finance, 20, 655-672.

Altunbas, Y., E.P.M. Gardener, P. Molyneux, and B. Moore (2001), "Efficiency in European banking", European Economic Review, 45, 1931-1955.

Aly, H.Y., R. Grabowski, C. Pasurka, and N. Rangan (1990), "Technical, Scale and Allocative Efficiencies in US Banking: An Empirical Investigation", *Review of Economics and Statistics,* **72**(2), 211-217.

Chang, C.E., I. Hasan, and W.C. Hunter (1998), "Efficiency of Multinational Banks: An Empirical Investigation", *Applied Financial Economics,* **8**, 689- 696.

Chen, T.Y. (2001), "An estimation of X-inefficiency in Taiwan's banks", Applied Financial Economics, 11, 237-242.

Collins, S. (2002)," International financial integration and growth in developing countries: Issues and implications for Africa", in African Economic Research Consortium: Plenary Session. Vol. 13, Supplement 2. London: Oxford University Press

Cordella, T. and E.L. Yeyati, (1998), "Financial opening, deposit insurance and risk in a model of banking competition", CEPR Discussion Paper no. 1939.

Din, Musleh-ud-, Ejaz Ghani, and Sarfraz K. Qureshi (1996), "Scale and Scope Economies in Banking: A Case Study of the Agriculture Development Bank of Pakistan", *The Pakistan Development Review,* **35** (3), 203-213.

Farrel, M. J. (1957) "The Measurement of Productive Efficiency", Journal of the Royal Statistical

Society, 120, 253-281.

Favero, C.A., and L. Papi (1995), "Technical Efficiency and Scale Efficiency in Italian Banking Sector: A Non-Parametric Approach", *Applied Economics*, **27**, 385-395.

Galbis, V. (1977)," Financial intermediation and economic growth in less- developed countries:

A theoretical approach", Journal of Development Studies, 13 – 2: 58-72.

Goldsmith, R.W. (1969),"Financial structure and development",. New Haven, CT: Yale

University Press.

Gurley, J., & Shaw, E. (1955), "Financial aspects of economic development" American

Economic Review 45, 515-538.

Hao, J., W.C. Hunter, and W.K. Yang (2001), "Deregulation and efficiency: the case of private

Korean economy: Hungarian experience", Journal of Banking and Finance ,27, 12, 2249-

2271.

Hardy, D.C. and E.B. Patti (2001), "Bank reform and bank efficiency in Pakistan", IMF Working

Paper, WP/01/138.

Hartmann, P, (2004),” The impact of financial infrastructure transformation on monetary policy execution – the Namibian experience”, Keynote Address at the Perago User Group Conference. BIS Review 53. South Africa:

Hellman, T.F., K.C. Murdock, and J.E. Stiglitz, (2000), “Liberalization, moral hazard in banking, and prudential regulation: are capital requirements enough?”, American Economic Review, 90, 147–165.

Isik, I. and M.K. Hassan (2002), “Technical, scale and allocative efficiencies of Turkish banking industry”, Journal of Banking and Finance, 26, 719-766.

Kiani, Adiqa (2005),”A comparison of Domestic Vs Foreign Bank using Stochastic Frontier Approach”, The Lahore journal of economic vol.10, No. 2 55-74.

Limi, Atsushi (2003),”Efficiency in the Pakistani Banking Industry: Empirical Evidence after the Structural Reform in late 1990s”. The Pakistan Development Review, 42 (Spring) 41-57.

Luccheti, R., Papi, L., & Zazzaro, A. (2000),” Banks’ efficiency and economic growth: a micro-macro approach. Italy:”, Universita di Ancona.

Matutes, C. and X. Vives, 2000, Imperfect competition, risk taking, and regulation in banking, Euro- pean Economic Review, 44, 1–34.

Ngalande, E.E. (April, 2003),” The importance of financial system modernisation in Africa”, Keynote Address at the Perago User Group Conference. BIS Review 27 South Africa.

Schmidt P. and R. C. Sickles (1984), "Production Frontier and Panel Data", Journal of Business and Economic Statistics, 2, 367-374.

Shephard, R. (1970)," Theory of Cost and Production Functions", Princeton, NJ: Princeton University Press.

Sherman ,h and f, gold(1985), "bank branch operation efficiency: evaluation with data envelopment analysis" journal of banking and finance 9:297-215.

State Bank of Pakistan, 1998-2005, *Banking Statistics of Pakistan*, Karachi.

Stulz, R. (2001)" Does financial structure matter for economic growth? A corporate finance perspective", In Demigürç-Kurt, A. & Levine, R. (Ed). (2001). Financial structure and economic growth: A cross- country comparison of banks, markets and development. Massachusetts: MIT Press.

Yotopolous, P.A., Lau, L.J., (1973)," A Test for Relative Economic Efficiency: Some Further Results", American Economic Review 63:1, pp. 214 -- 223.

Yuergert, A.M. (1993), "The Measurement of Efficiency in Life Insurance: Estimates of a Mixed Normal Gamma Error Model", *Journal of Banking and Finance,* 17, 483-496.

Zardkoohi, and Kolari (1994), "Branch Office Economics of Scale and Scope Evidence from Saving Banks in Finland", *Journal of Banking and Finance*, 18, 421-432.

Appendix : Banks included in the study			
Serial No.	Domestic Banks	Forien Banks	Big Banks
1	Allied bank	Al-Baraka Bank	Allied Bank
2	Askari Bank	Abn Amro bAnk	Askari Bank
3	Bank Al-Habib	American Express	Habib Bank
4	Bolan Bank	Omnan International Bank	Bank Al-Falah
5	First Women Bank	Bank of Tokyo	Muslim Commercial Bank
6	Habib Bank	Citi Bank	National Bank of PAKIST
7	Bank Al-Falah	Deutsche Bank	United Bank
8	Metropolitan Bank	Habib Zurich	
9	Muslim Commercial Bank	Hong Kong Bank	
10	National Bank of Pakistan	Rupali Bank	
11	Prime Commercial Bank	Stand Charted Bank	
12	Sonery Bank		
13	Union Bank		
14	United Bank		
15	Faysal Bank		
16	Bank of Punjab		
17	Bank of Khyber		
18	PICIC Commercial Bank		