

Competition and market contestability of banks: Evidence from emerging financial market

Muntazir HUSSAIN¹, Zaheer ABBAS², Usman BASHIR³

¹International Islamic University, Faculty of Management Sciences, muntazirjan@gmail.com

²International Islamic University, Faculty of Management Sciences, zaheerabbas@iiu.edu.pk

³International Islamic University, Faculty of Management Sciences, bbashir.usman@gmail.com

Abstract. The study is an attempt to investigate the nature of competition and market contestability of 35 Pakistani banks for the period of 2007-2011 by employing Panzar and Rosse (PR-model). The test of competition overall sample (2007-2011) suggest that banks in Pakistan in state of monopolistic competition and market is in equilibrium. The sub sample (2007-2009) result of competition and equilibrium are similar as for sample period (2007-2011) suggesting that revenue produced during this period is state of monopolistic competition. Finally the results of sample period (2010-2011) suggest that banks in Pakistan are in state of perfect competition however, the market is not in long-run equilibrium. The results have interesting policy implications; it is suggested to encourage the foreign banks presence to improve the competitive condition of banking industry so that to ensure the exit and entrance of banks in the industry to increase the competition and produce the variety of product to improve banks performance and customer satisfaction.

Keywords: Bank Competition, Market contestability, Market Equilibrium

1 Introduction

The nature of competition in banking industry and its contribution to economic and financial stability, growth, improvement of quality services has been the hot topic of discussion of the researcher. However, the severe need to explore this topic was felt after global financial and economic crises. The need to explore the nature of competition in banking sector was felt due to number of reasons. The bank competition contribute on enhance the quality of services. The competing banks put their efforts to gain maximum share of profit. If the market is competitive then profit earning without quality of services would be impossible. The competition leads innovation. The relationship of bank competition to economic stability and growth can be found in work of (Vives, 2001). Competing banks provides better loan facility and borrower (individual and institutional) can have better access to loan. Better available finance can result in promote investment and may lead economic growth. The pros and cons are disused in various studies. However, the argument is no yet clear.

The link of competition, economic stability, growth and quality of services is given by theory of economics called "Theory of Market Contestability". Baumol (1982) argues that there are small numbers of contestants. Markets behave in competitive way due to the pressure of new entrants. The theory assumes that the products are identical and market is in equilibrium. Due to fear of pressure of new entrants in the market urge the existing firm to produce the quality products. The firm must

produce the efficient and economical products to survive in the market. When the firm raises its prices the potential new entrant will enter the market by setting comparatively low prices to capture the market. If the competing firm who has raised the prices does not respond in time, then the new entrant will distort their profit and take the market share. If the competing firm respond and adjust the prices then firm will run out of market. Any disturbance in equilibrium will cause entry of new entry. Thus the competition brings stability of market and contributes to the quality financial services.

Lerner (1934) argues that theoretical model of market competition considers the direct measure of competition “markup above cost” for testing the competition in banking industry. However, due to shortage of private data of banks limits to study the bank competition as suggested by theory. Majority of studies use various proxies for testing the bank competition. Thus indirect measure of bank of bank competition is practical. Two types of model can be seen in financial intermediation literature for testing the bank competition indirectly. Structural model of bank competition uses the most famous proxy for bank competition call “Herfindal-Herchman Index (HHI)” for measuring bank competition. The HHI is basically the bank concentration ratio. High concentration more the bank will be competitive (Mason, 1939; Bain, 1951). This model of measurement of the bank competition is highly criticized for its weakness. The market concentration and structure is not true measure of bank competition. Structure and concentration can miss the true measure of market power and competition (Shaffer, 1993, 1989, 2004; Shaffer & Disalvo, 1994; Claessens & Leaven, 2004). The second model is non-structural model. This model considers the bank specific variables and bank entry, existence of foreign banks etc.

We are using non-structural model based on Panzar-Rosse (Rosse & Panzar, 1977; Panzar & Rosse, 1982, 1987) approach to test the nature of market competition in banking sector of Pakistan. We have checked the market contestability theory for Pakistan. Furthermore, the size and presence of foreign impact checked is also checked.

The study is of extreme significance as the banking industry in Pakistan is considered the economy strong side and all banks compete for their activities. This competition can be seen in its basic role which they play in the economy. Generally speaking the Bank role in Pakistani economy can be categorized into two important aspects based on the functions the banks perform; primary and secondary functions. The bank primary function includes accepting deposit and advances. Bank provides current deposit, fixed deposit, saving deposit and recurring deposit to serve the customer under the head of accepting deposits. Bank advances includes overdraft, cash credit, loan and discounting of bills. Secondary function like agency function and utility function facilitates transfer of funds, periodic payments, and collection of checks, portfolio management, periodic collections, overdraft, lockers, underwriting, and social welfare programs. These banks compete for these activities applying various strategies. The presence of foreign banks and local bank competing for maximum share would determine the nature of competition. If the bank is competitive, then it would lead to provide better financial services and financial stability.

Our contribution lies in two halves; first we have applied the Rosse-Panzar approach to check the nature of competition in banking industry of Pakistan. This method is for the first time used in the literature related to Pakistan. Secondly, indirect approach is used by using various proxies. The presence of foreign banks and size effect is also incorporated to check the competition in banking industry. The study includes all commercial banks and foreign banks in Pakistan. The study is organized in the four sections. Section 1 gives the brief introduction, literature review in section 2, section 3 contains model. Finally, results and conclusion are given in section 4.

2 Literature Review

This portion of study gives the brief review of studies conducted by other researcher on different aspects of competition. The literature covers four important aspects of competition. First aspects of literature give the general effects of presence of competition in banking industry where the researchers have discussed the bank competition theoretically. What can be the possible effects of competition in banking industry? The second aspect consists of studies who studied the bank competition empirically. They applied various models on secondary data and arrive at the possible effects of bank competition. The third aspect of literature consists of the researchers who have tested the “Theory of Market Contestability”. The fourth aspect consists of the researcher who tested the nature of competition, where the banks applies various pricing strategies to earn under monopoly or perfect competition or monopolistic competition.

Generally speaking the competition in market can improve the quality of service, efficiency and performance of competing firms. However the relationship is complex. Vives (2001) tested the relationship among the stability, growth, performance and bank competition. He argues that the competition may improve the performance of competing firms but the nature of competition and relationship of these variables is more complex than we thought. Firm access to financing can be improved by the market power (Petersen & Rajan, 1995).

As far as the empirical studies literature is concerned we found numerous studies on the topic of competition. The researcher considers the bank concentration as indicator of competition. Berger and Hannan (1991) estimated the relationship of bank concentration in market and performance for U.S.A. The data taken into account was from 1983-1985. He concluded that larger market share of bank produce greater efficiency. More specifically, the banks that have greater share are more efficient. To some researcher suggest that the bank consolidation is the key factor that affects the access to financing (Gilbert, 1984; Berger, Demsetz & Strahan, 1999).

Like the bank consolidation which is considered as the major role in competitive environment other factors like the bank regulation and bank specific structure also have the impact on the competitive environment and also determines the performance of banks. The researcher links the regulatory environment to competition and performance. Bath, Caprio and Levine (2001) surveyed the bank regulation and restriction in large sample of countries of the world. They noted down the exit and entry requirement of the banks in various countries. The data collected was used for the exploration of link of the regulatory requirements and the efficiency of banks. The extra regulatory requirements increase the overhead expenses of the bank and result in increased cost and indirectly decrease the profits. The revolutionary article published in 2001. Barth, Caprio and Levine (2001) concluded that more tight entry requirement less would the bank efficiency. Furthermore, the foreign bank presence was considered as the main variable that increases the competition. If the regulatory restriction are so harsh were the foreign banks are not able to enter then it cause the limit competition and increase fragility of banking system.

Researcher links the foreign bank presence is one of the determinant of bank competition and efficiency of domestic banks. Classens, Demirguc-Kunt and Huizinga (2001) investigated the entry of foreign banks entry and domestic bank efficiency. He concludes that domestic bank efficiency can be improved by the entry of new banks. Berger, Demirguc-Kunt, Laeven and Levine (2004) investigated the relationship of concentration, bank regulation and efficiency of bank. He concluded that more

concentrated banks are less efficient. He puts the restriction, and argues that this would be true only for rich countries where banks are free (with less restriction) and have developed system.

The literature related to test of “Theory of Market Contestability” argues that there are large numbers of banks that compete for profits in the market. If bank go for high profits above the average market level then the new entrants will capture the market share by setting the prices comparatively low. The test of competition under the theory of market contestability is modeled by two different approaches. The first approach is call structural approach which is based on (Bresnahan, 1982; Lau, 1982). Such model uses the basic idea of market equilibrium where the marginal revenues become equal to marginal cost. The price strategy of the banks depends on the market equilibrium. If the firm wan to earn profit then it considers the equilibrium condition to set the prices such that revenue exceeds the cost. This model is used as direct measure of competition in the market and also determine the nature of competition.

The second approach is call Panzar-Rosse (PR) model which is given by (Rosse & Panzar, 1977; Panzar & Rosse, 1982, 1987). This model of measure of measure of competition links the bank input and output. More specifically the bank cost as input and output as profit. The outputs are dependent on input. The whole model is based on bank revenue equation. Most of researcher use reduced form of such equation to estimate the input and output of banks. It is basically the sensitivity of bank revenue when bank cost change. If one percent of bank revenue change what would happen to its cost under various market condition such as perfect competition, monopoly, oligopoly and monopolistic competition. The PR developed a statistics called “H-Statistics” to measure the nature of competition among the banks.

In finance literature we found numerous studies that use PR model to measure the nature on competition in banking sector of various countries. Studies base on PR model show mixed results. Nathan and Neave (1989) studied the nature of competition among the banks in Canada from 1982-1984 and concluded that the Canadian banks are operating under monopolistic competition. Shaffer (1983) studied the banking competition for New York for the period of 1979, rejected the hypothesis of perfect competition, monopoly and oligopoly. He argues that a bank in New York operates under monopolistic competition. Molyneux, Lloyd-William sand Thornton, (1994) studied the nature of competition in banking system of five countries (France, Germany, Italy, Spain and UK) for the period of 1986-1989 and concluded mixed results. He found monopoly for Italian banks and monopolistic competition for France, Germany, Spain, and UK. Vesala (1995) tested nature of competition for Finland for the period of 1985-1992 and concluded that a bank in Finland operates under monopolistic competition. Molyneux, Thornton and Lloyd-Williams (1996) studied the banking competition for Japan for the period of 1986-1988. They argues that the bank in Japan were in monopoly in 1986 and monopolistic competition in 1988. Coccoresse (1998) studied the nature of banking competition in Italy and concluded that the Italian banks operate under monopolistic competition for sample period (1988-1996). De Bandt and Davis (2000) studied the bank competition for three countries France, Germany and Italy for period of 1992-1996. He argues that large banks in all countries operate under the monopolistic competition and small banks of Italy are in monopolistic competition. The small banks in France and Germany are in monopoly. Hondroyiannis, Sarantis and Papapetrou (1999) studied the banking system and competition of Greece for the period of 1993-1995 and concluded that bank in Greece are in monopolistic competition. Bikker and Groeneveld (2000) tested the banking competition in fifteen European countries for the period of 1989-1996 and concluded that all bank are in monopolistic competition. Bikker and Haaf (2002) studied bank competition in twenty three industrialized countries for period of 1988-1998. They observed monopolistic competition in whole sample countries, however, monopoly of small banks in Australia and Greece. Large bank of the

sample were in monopolistic competition in general and with some exception where they observed perfect competition.

3 Data and Research Methodology

3.1 Data

The data is taken from “State Bank of Pakistan” website. The state bank of Pakistan issue annual financial statement of all banks for all banks on the website. The data includes all banks operating in Pakistan including foreign banks, commercial banks, saving banks, investment banks etc., total number of banks 38 where 7 banks are foreign banks operating in Pakistan. Data set includes from 2007 to 2011. We have used panel annual data for five year of all banks operating in Pakistan. We have dropped the two banks as their data was incomplete for whole study period. Thus we have thirty six banks. Thus the final sample consists of 185 banking years.

3.2 Methodology

We used PR-approach (Rosse & Panzar, 1977; Panzar & Rosse, 1982, 1987) to explore the nature of competition in Pakistani banking industry. PR-approch suggests that banks use various pricing strategies to capture the required cost and profit operating under various market conditions. The market situation can be monopoly, perfect competition, monopolistic competition, oligopoly or natural monopoly where the market in pierce competition. PR-approach use bank revenue reduced form equation to capture the possible effects of change in bank revenue as response to change in cost. If we call the cost as input prices and revenue as output prices then we can say that degree to which the output prices are sensitive to input prices. This sensitivity of output price as response to change in input prices is called “PR-H-statistics”. The PR-H-Statistics will define the nature of competition as suggested by PR-approach.

We have developed the relationship of the variables on the basis of PR-approach based on the reduced form bank revenue equation. The equation (1) and (2) is estimated by applying bank specific fixed effect model. In order to test the competitive environment of Pakistani banking industry in the context of PR-approach (modified by Claessens & Leaven, 2004) we can write the situation as,

$$\ln(IR_{it}) = \alpha + \beta_1 \ln(IE_{it}) + \beta_2 \ln(PE_{it}) + \beta_3 \ln(OE_{it}) + \gamma_1 \ln(ET_{it}) + \gamma_2 \ln(NLT_{it}) + \gamma_3 \ln(TA_{it}) + \delta D + \mu_i + \varepsilon_t \quad (1)$$

Where “i” and “t” represents bank and year respectively.

- IR_{it} = Gross Interest revenue divided by Total Assets which is used as proxy for bank Output prices
- IE_{it} = Interest Expense divided by Total Deposits which is used as proxy for input cost
- PE_{it} = Personal Expenses (Salaries of staff) divided by Total Assets which is used as proxy for input cost of labor.
- OE_{it} = Operating Expenses and administrative Expenses divided by Total Assets as a proxy for cost of fixed assets
- ET_{it} = Equity divided by Total Asset
- NLT_{it} = Net loan divided by Total Asset
- TA_{it} = Natural Log of Total asset used as proxy for size effect
- D = Year dummy

μ_i = bank specific fixed effect

The PR-H-Statistics is defined as sum of coefficients of IE, PE and OE i.e.

$$(H = \beta_1 + \beta_2 + \beta_3).$$

The “H-Statistics” can have the value less than or equal to zero, between the zero and one, or equal to one.

If the value of “ $H \leq 0$ ” would mean that banking industry in Pakistan operates under monopoly or short run oligopoly.

When the “ $H=1$ ” then we would say that the banking industry is in state of perfect competition, natural monopoly.

If we found “ $0 < H < 1$ ” then we can say that banks in Pakistan are operating under monopolistic competition.

In case of first type of market environment where “ $H \leq 0$ ” we would expect the negative relationship of bank revenues and cost, meaning that if there is increase in cost of input then the marginal cost will decrease the amount of equilibrium production and ultimately the revenues which is generated from the that production.

In case of second market situation where “ $H=1$ ” we expect positive relationship (1% change in cost will bring one 1% change in revenues) between cost and revenues, meaning that increase in input cost will increase the equilibrium production and ultimately the revenues. In case of perfect competition the bank will try to increase their revenues by the same proportion as their cost increases. If one bank fails achieve this objective his survival in the market will be difficult and efficient bank will acquire the weak bank. When the bank in economy decrease in number then supply of services will decreased and results in increased revenues.

The third case where H-statistics lies between zero and one is given by state of monopolistic competition as the revenues does not increase or decrease with that proportion with which the cost has increased. We call the revenues as decreasing function of demand elasticity. On the basis of above discussion we have the following hypothesis.

Hypothesis 1: H0: $H=0$

Hypothesis2: H0: $H=1$

Hypothesis3: H0: $0 < H < 1$

As equilibrium condition is considered necessary of PR-approach. Therefore, we tested the equilibrium condition by the following equation.

$$\ln(ROA_{it}) = \alpha + \beta_1 \ln(IE_{it}) + \beta_2 \ln(PE_{it}) + \beta_3 \ln(OE_{it}) + \gamma_1 \ln(ET_{it}) + \gamma_2 \ln(NLT_{it}) + \gamma_3 \ln(TA_{it}) + \delta D + \eta_i + \varepsilon_{it} \quad (2)$$

The entire variables are same as in equation (1) except return on asset which is equal to Income before Taxes divided by total assets. The equilibrium is checked by the value of equilibrium statistics (E-Statistics) which is given by “E-Statistics= $\beta_1 + \beta_2 + \beta_3$. if the sum of these co-efficient is equal to zero would mean that market is in long-run equilibrium. Alternatively, if “ $E < 0$ ” mean disequilibrium. The statistical significance of E-statistics is checked by applying the F-test.

4 Results

We have divided the results into three main categories on the basis of division of data. Separate equations have been estimated for three categories, the test of competition and test of equilibrium. The data division includes fixed effect model estimation from 2007 to 2011 (whole sample period). Secondly, sub sample from 2007 to 2009 and finally from 2010 to 2011. The results of test of equilibrium and test of competition for first category (from 2007-2011) are reported in Table 1 and Table 2. Results of sub sample (2007-2009) are reported in Table 3 and Table 4. Finally results of test of competition and equilibrium for the last category (2010-2011) are reported in Table 5 and Table 6. Each table contains the details of variable, fixed effect model test, H-statistics and our basic hypothesis.

4.1 Test of Competition and Test of Equilibrium for Sample Period 2007-2011

As suggested by PR-Model the basic results are the interpretation of H-statistics which is given by sum of elasticity of cost inputs given in equation (1).

The H-statistics is calculated by

$$H = \beta_1 + \beta_2 + \beta_3$$

and statistical significance is checked by F-test.

Similarly, the equilibrium statistics (E-Statistics) is given by

$$E = \beta_1 + \beta_2 + \beta_3$$

in equation (2) and to check its statistical significance we apply F-test.

Now we proceed to discuss the competitive condition and equilibrium test of all three categories of data.

4.1.1 Test of Competition for Sample Period 2007-2011

The results are reported in Table 2. Before we go for the formal investigation of the test of competition we present the secondary result of fixed effect model reported in bottom of Table 2 ($H_0: \eta_i=0$ $F(34,122)=2.669366^*$ (P-Value=0.0000)).

The results show that we reject the null hypothesis and accept the alternative at 5% level of significance. It explains that bank specific fixed effect exist in the data we can estimate the fixed effect model. The results reported of the ($R^2 = 0.794383$) show that the explanatory variable are very much capable of explaining the 80% of dependent variable. The explanation of individual variable coefficients and its statistical significance is not our primary objective and for the sake of brevity we have reported these results only in this sample period only (2007-2011). All individual variables of the equation (1) are statistically significant at 5% level of significance. The positive and significant coefficients of the variable (IE), (PE), and (OE) shows that higher price of inputs funds (input elements) produce higher revenue for banks. The statistically significant and negative coefficient of

(ET) indicates that banks whose equity is lower and these banks are more risky and as result produce more revenues. If we look at variable (TA) is statistically significant and positive at 5% level of significance, indicates that the larger the bank produce more revenues than smaller banks. Finally, the positive and significant coefficient of (NLT) (at 5% level of significance) indicates that the banks who provide larger loan produce high revenues.

Now we come to our basic results (H-statistics and our basic hypothesis) reported in the bottom of Table 2. As for as our basic hypothesis are concerned we are rejecting the null hypothesis at 5% of level in both cases (H0: H=0) and (H0: H=1). But we fail to reject the null hypothesis (H0: 0<H<1). Thus it means that the H-value lies between zero and one.

For the statistical significance of these hypotheses we have used the F-test. The F-statistics and corresponding p-value are reported at the bottom of Table2. The H-statistics value reported in the Table 2 is 0.375 indicating that the banks in Pakistan are in state of monopolistic competition for the period of 2007-2011 as the revenues does not increase with that proportion with which the cost has increased. We call the revenues as decreasing function of demand elasticity. This phenomenon has interesting effects on bank revenues in a short-run and long run differently. In the short run the bank may earn abnormal profits when it has low average cost than its average revenues. However if the bank average cost is more than its average revenues the bank will experience losses. But in the long-run the bank has somewhat different behavior. If the banks earn short-run abnormal profits, will attract other bank to enter the market as a result the supply will increase and prices will lower adjusting the abnormal profits to normal. For the banks who experience the losses in short run will quiet the market and supply will decrease as a result the prices increase enough to get the profits in long run. Furthermore if the competitor bank produce differentiated products (expands outputs) can cause the leading profitable banks to share its profits due to the supply effect. As the output put (expanded supply of differentiated products by competitors) supply increase can lower the prices can influence the leading profitable banks and new entry with expanded supply of products can take the profits from existing competitors (or can take customer from competing bank shrinking the demand). Banks that can have quality products at this point of time may act like monopolists. However in the tested bank market we have both the foreign banks presence and merger and acquisitions, resisting violating this situation with employing expanded supply of differentiated products. Thus the combining the short run and long run effect of such competition the market remain in state of equilibrium.

4.1.2 Test of Equilibrium for Sample Period 2007-2011

The equilibrium test is conducted after estimation of equation (2). The results are reported in Table 1. According to PR-model specification the equilibrium statistics (E-statistics) is given by $(E = \beta_1 + \beta_2 + \beta_3)$ in equation (2) and its statistical significance is checked by F-test.

The result presented in table 1 shows that fail to reject the null hypothesis (H0:E=0) at 5% level of significance level suggesting that market is in equilibrium. The secondary result (H0: $\eta_i=0$ F(34,122)= 3.534639* (P-Value=0.0000)) of fixed effect model is statistically significant at 5% significance level suggesting that the fixed effect model best to explain the characteristics of such data. Finally the (R2 = 0.659393) suggest that the independent variable cause 65% variation in ROA.

4.2 Test of Competition and Test of Equilibrium for Sample Period 2007-2009

4.2.1 Test of Competition for Sample Period 2007-2009

A result reported in Table 4 provides the details of nature of competition in Pakistani banks for sample period 2007-2009. The hypothesis given in bottom of Table 4 ($H_0: H=0$) and ($H_0: H=1$) both are rejected at 5% level of significance but we are unable to reject ($H_0: 0 < H < 1$) suggesting that the H-statistics value lies between zero and one. Hence we are unable to reject the null hypothesis that banks in Pakistan are competing monopolistically.

The statistical significance is checked by F-test and their coefficients along with p-value are given in Table 4. When we sum up the elasticity of input cost variable ($H = \beta_1 + \beta_2 + \beta_3$) in equation (1) we found the value of H-statistics equals to (0.509). The value is reported in Table 4. This value also confirmed that the banks in Pakistan are in state of monopolistic competition. The result of fixed effect test are also significant at 5% level of significance suggesting that fixed effect model is best to estimate such type of data.

4.2.2 Test of Equilibrium for Sample Period 2007-2009

The result of test of equilibrium for the sample period 2007-2009 is reported in Table 3. The result show that the we are unable to reject the null hypothesis ($H_0: E=0$) at 5% level of significance suggesting that market is in long run equilibrium for sample period 2007-2009. The F-statistics and corresponding p-value are reported in Table 3. The null hypothesis of redundant fixed effect test is rejected at 5% level of significance. The R-squared value is 0.72 indicating that the independent variables are very much capable of explaining the variation in ROA.

4.3 Test of Competition and Test of Equilibrium for Sample Period 2010-2011

This section has somewhat interesting results reported in Table 5 and Table 6 (Table 5 for competition and Table 6 for equilibrium test). The results reported in Table 5 shows that we are rejecting the null hypothesis ($H_0: H=0$) but we could not reject the null hypothesis ($H_0: H=1$) at 5% level of significance. The F-statistics and its corresponding p-value are given in the bottom of Table 5. Thus on the basis of such results we can argue that the banks in for period of 2010-2011 are seem to be in state of perfect competition. It we look at the value of H-statistics reported in Table 5 we would notice that it is about 1.082531 confirms that market situation are in perfectly competitive it seems that (1% change in cost will bring one 1% change in revenues). Increase in input cost will increase the equilibrium production and ultimately the revenues. In case of perfect competition the bank will try to increase their revenues by the same proportion as their cost increases. If one bank fails achieve this objective his survival in the market will be difficult and efficient bank will acquire the weak bank. When the bank in economy decrease in number then supply of services will decreased and results in increased revenues. Although, the model is good as it has the R-squared value 0.60 and fixed effect test coefficient are also significant at 5% level of significance, yet we have a problem. The results reported in Table 6 the test of equilibrium we rejected the null hypothesis that ($H_0: E=0$) meaning that market for the sample period of 2010-2011 are in state of dis-equilibrium. So we would need to handle the result with caution. However, such result one might expect in country like Pakistan because of privatization, incorporation of new technology and especially the merger and acquisition of banks

taken place in study period. As whole the equilibrium model is good having R-squared value 0.93 and fixed effect redundant test coefficient is also significant.

5 Conclusion

Study investigated the competition and contestability of 35 banks from 2007 to 2011. The study applied the Panzar and Rossee (1987) model to test the competition and market equilibrium of Pakistani banks. Separate equation of competition and equilibrium are estimated. We keep the interest revenue and return on asset as dependent variable in these equations respectively. These equations also include the bank specific control variable. All the equations estimated are estimated on the basis of bank specific fixed effect model. Furthermore, the data is divided into three halves for sake of estimation, i.e., 2007-2011, 2007-2009 and 2010-2011.

Test of competition and equilibrium equation for sample period 2007-2011 confirms the presence of monopolistic competition among Pakistani banks and market is in long run equilibrium. The result of sub sample 2007-2009 are somewhat similar to that of 2007-2011 which show that we could not reject the null hypothesis of monopolistic competition for the said sample period. The market is also in long run equilibrium. However, the result of sub sample 2010-2011 confirms that the banks are in state of perfect competition but market is not in equilibrium enforcing us to handle the result with cautions.

As for as secondary result and the model specification, individual variable are concerned, fixed effect model is significant in all equations. The R-squared value and other criteria of best model are fulfilled.

The results of individual variable description are given only for the whole period (2007-2008). The results given in (2007-2011) sample period all the individual variables are significant (both the input cost variable and banks specific variable). The input price of funds has the positive relationship with the banks revenue. The equity and revenue relationship is negative suggesting that a risky bank has produced more revenues. The size variable has positive relationship with the revenues suggesting that the larger banks are well capable of earning high revenues as compared to small banks. The banks that has larger loan giving facility earn higher revenues.

6 Appendix

Table 1 Test of equilibrium of sample period 2007-2011

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.162785	0.038164	-4.265377	0.0000*
IE	-0.000668	0.004056	-1.644100	0.1027
PE	-0.000739	0.005446	-2.155559	0.0331*
OE	-0.000715	0.004751	-0.150468	0.8806
ET	0.013803	0.002895	4.767147	0.0000*
NLT	0.001340	0.006858	0.195457	0.8454
TA	0.007502	0.002182	3.438778	0.0008*
D8	-0.006717	0.004386	-1.531525	0.1282
D9	-0.005651	0.004785	-1.180978	0.2399
D10	-0.004899	0.004720	-1.038070	0.3013
D11	0.003530	0.005092	0.693311	0.4894

R2 0.659393
H0: $\eta_i=0$ F(34,122)= 3.534639* (P-Value=0.0000)
H0: E=0 F(1, 122)= 20.65516* (P-Value=0.3155)

*indicates variable is significant at 5% significance level

Table 2 Test of competition of sample period 2007-2011

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.400066	0.449217	-5.342780	0.0000*
IE	0.118323	0.047737	2.478665	0.0146*
PE	0.106194	0.064102	1.656650	0.0002*
OE	0.151469	0.055924	2.708475	0.0077*
ET	-0.033248	0.034082	-0.975528	0.0312*
NLT	0.280616	0.080718	3.476485	0.0007*
TA	0.058258	0.025679	2.268693	0.0250*
D9	0.162743	0.056319	2.889633	0.0046*
D8	0.116325	0.051621	2.253430	0.0260*
D11	0.269948	0.059937	4.503824	0.0000*
D10	0.147069	0.055552	2.647386	0.0092*

R2 0.794383
H0: $\eta_i=0$ F(34,122)=2.669366* (P-Value=0.0000)
H0: H=0 F(1, 122)= 21.49271* (P-Value=0.0000)
H0: H=1 F(1, 122)= 45.79215* (P-Value=0.0000)
H0: $0 < H < 1$ fail to reject
H-statistics 0.375

*indicates variable is significant at 5% significance level

Table 3 Test of equilibrium of sample period 2007-2009

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.402956	0.275990	-1.460038	0.1495
IE	-0.020028	0.009186	-2.180419	0.0332*
PE	-0.007604	0.007291	-1.042932	0.3012
OE	0.002358	0.006368	0.370196	0.7125
ET	0.018067	0.005946	3.038320	0.0035*
NLT	0.010975	0.018554	0.591503	0.5564
TA	0.021123	0.015354	1.375685	0.1740
D08	-0.007222	0.005686	-1.270235	0.2089
D09	-0.004644	0.007072	-0.656651	0.5139

R2 0.728920
H0: $\eta_i=0$ F(33,60)= 2.786103* (P-Value=0.0003)
H0: E=0 F(1, 60)= 2.370109* (P-Value= 0.1289)

*indicates variable is significant at 5% significance level

Table 4 Test of competition of sample period 2007-2009

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.353128	1.875407	-1.787947	0.0388*
IE	0.413441	0.062418	6.623734	0.0000*
PE	0.035560	0.049546	0.717715	0.0477*

OE	0.061781	0.043275	1.427663	0.0533*
ET	0.069651	0.040406	1.723791	0.0899
NLT	0.341060	0.126080	2.705113	0.0089
TA	0.141725	0.104336	1.358353	0.005*
D08	0.041457	0.038637	1.072981	0.2876
D09	0.064475	0.048053	1.341751	0.1847

R2 0.64383

H0: $\eta_i=0$ F(33,60)= 7.131167* (P-Value=0.0000)

H0: H=0 F(1, 60)= 2.334911* (P-Value= 0.0318)

H0: H=1 F(1, 60)= 4.219752* (P-Value= 0.0443)

H-statistics 0.509

*indicates variable is significant at 5% significance level

Table 5 Test of competition of sample period 2010-2011

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.417791	2.747756	-1.607781	0.0195*
IE	0.716432	0.113779	6.296713	0.0000*
PE	0.367082	0.343911	1.067374	0.052*
OE	-0.000983	0.350372	-0.002805	0.9978
ET	0.032689	0.051188	0.638600	0.5285
NLT	0.169723	0.194067	0.874558	0.3895
TA	0.282632	0.160897	1.756600	0.003*

R2 0.60344

H0: $\eta_i=0$ F(33,27)= 10.565376* (P-Value=0.0000)

H0: H=0 F(1, 26)= 2.291602* (P-Value= 0.0318)

H0: H=1 F(1, 26)= 0.078951* (P-Value= 0.7809)

H-statistics 1.082531

*indicates variable is significant at 5% significance level

Table 6 Test of equilibrium of sample period 2010-2011

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.847079	0.237831	-3.561687	0.0014*
IE	0.010025	0.009848	1.018017	0.3177
PE	0.029646	0.029767	0.995921	0.3281
OE	-0.033955	0.030326	-1.119642	0.2727
ET	0.022302	0.004431	5.033732	0.0000*
NLT	0.041984	0.016797	2.499420	0.0188*
TA	0.050998	0.013926	3.661964	0.0011*

R2 0.933818

H0: $\eta_i=0$ F(33,27)= 6.939077* (P-Value=0.0000)

H0: E=0 F(1, 27)= 11.97928* (P-Value= 0.0018)

*indicates variable is significant at 5% significance level

7 References

- Bain J S (1951): Relation of profit rate to industry concentration: American manufacturing, 1936–1940. *The Quarterly Journal of Economics*, 65(3): 293-324.
- Barth J R , Caprio G & Levine R (2001): *The regulation and supervision of banks around the world: A new database* (Vol. 2588). World Bank Publications.
- Barth J R, Caprio J G & Levine R (2001): Banking systems around the globe: Do regulation and ownership affect performance and stability?. In *Prudential supervision: What works and what doesn't* (pp. 31-96). University of Chicago Press.
- Hannan T H & Berger A N (1991): The rigidity of prices: Evidence from the banking industry. *The American Economic Review*, 81(4): 938-945.
- Berger A N, Demirgüç-Kunt A, Levine R & Haubrich J G (2004): Bank concentration and competition: An evolution in the making. *Journal of Money, Credit and Banking*, 433-451.
- Berger A N, Demsetz R S & Strahan P E (1999): The consolidation of the financial services industry: Causes, consequences, and implications for the future. *Journal of Banking & Finance*, 23(2): 135-194.
- Baumol W J (1982): Contestable markets: an uprising in the theory of industry structure. *American economic review*, 72(1):1-15.
- Bresnahan T F (1982): The oligopoly solution concept is identified. *Economics Letters*, 10(1): 87-92.
- Bikker J A & Groeneveld J M (2000): Competition and concentration in the EU banking industry. *Kredit und Kapital*, 33(1): 62-98.
- Bikker J A & Haaf K (2002): Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of Banking & Finance*, 26(11): 2191-2214.
- Claessens S, Demirgüç-Kunt A & Huizinga H (2001): How does foreign entry affect domestic banking markets?. *Journal of Banking & Finance*, 25(5): 891-911.
- Claessens S & Laeven L (2004): What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking*, 563-583.
- Coccorese P (1998): Assessing the competitive conditions in the Italian banking system: some empirical evidence. *QUARTERLY REVIEW-BANCA NAZIONALE DEL LAVORO*, 173-192.
- De Bandt O & Davis E P (2000): Competition, contestability and market structure in European banking sectors on the eve of EMU. *Journal of Banking & Finance*, 24(6): 1045-1066.
- Gilbert R A (1984): Bank market structure and competition: a survey. *Journal of Money, Credit and Banking*, 16(4): 617-645.
- Hondroyiannis G, Lolos S & Papapetrou E (1999): Assessing competitive conditions in the Greek banking system. *Journal of International Financial Markets, Institutions and Money*, 9(4): 377-391.
- Lau L J (1982): On identifying the degree of competitiveness from industry price and output data. *Economics Letters*, 10(1): 93-99.
- Lerner A P (1934): The concept of monopoly and the measurement of monopoly power. *The Review of Economic Studies*, 1(3): 157-175.
- Nathan A & Neave E H (1989): Competition and contestability in Canada's financial system: empirical results. *Canadian Journal of Economics*, 576-594.
- Molyneux P, J Thornton and Lloyd-Williams D M (1996): Competition and market contestability in the Japanese commercial banking market. *Journal of Economics and Business* 48: 33–45
- Mason E S (1939): Price and production policies of large-scale enterprise. *The American Economic Review*, 29(1): 61-74.
- Petersen M A & Rajan R G (1995): The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics*, 110(2): 407-443.
- Rosse J N & Panzar J C (1977): *Chamberlin vs. Robinson: an empirical test for monopoly rents*. Bell Laboratories.
- Panzar J C & Rosse J N (1982): *Structure, conduct, and comparative statistics*. Bell Telephone Laboratories, Incorporated.
- Panzar J C & Rosse J N (1987): Testing for" monopoly" equilibrium. *The Journal of Industrial Economics*. 443-456.
- Shaffer S (1989): Competition in the US banking industry. *Economics Letters*, 29(4): 321-323.
- Shaffer S (1993): Can megamergers improve bank efficiency?. *Journal of Banking & Finance*, 17(2): 423-436.
- Shaffer S & DiSalvo J (1994): Conduct in a banking duopoly. *Journal of Banking & Finance*, 18(6): 1063-1082.
- Shaffer S (2004): Comment on" What Drives Bank Competition? Some International Evidence" by Stijn Claessens and Luc Laeven. *Journal of Money, Credit and Banking*, 36(3): 585-592.
- Shaffer S (1983): The Rosse-Panzar statistic and the Lerner index in the short run. *Economics Letters*, 11(1): 175-178.
- Vesala J (1995): *Testing for competition in banking: Behavioral evidence from Finland*. Helsinki: Bank of Finland.
- Vives X (2001): Competition in the changing world of banking. *Oxford Review of Economic Policy*, 17(4): 535-547.