MEASURING COMPETITION IN BANKING INDUSTRY: EVIDENCE FROM LATIN AMERICAN ECONOMIES

Abdul Rafay[1], Gabriel Franco[2] and Usman Javed Gilani[3]

Abstract

This study investigates the speed at which the banking sector of Latin American countries adjust to equilibrium levels in the long run. For this purpose partial adjustment process to Panzar and Rosse H-Statistics is used. Markets adjust towards the long-run equilibrium in a non-instantaneous manner. In order to estimate the structure of market the adjustment speed is of crucial importance. In this paper, an empirical model on the basis of partial adjustment model is developed to measure this convergence speed. Empirical results from the Latin American economies suggest that the transition and speed of adjustment towards the long-run equilibrium varies from market to market depending on the profit deviation from market averages. It is suggested that profit deviations should be monitored by the banking regulators and all banks in Latin America should keep an eye on optimization to remain competitive and sustainable in the long run.

Keywords: Banking, Competition, Efficiency, H-Statistics, Partial Adjustment Model.

JEL Classification: G210

Introduction

It is evident that competition is the most important factor that leads to the emergence of new products/services and growth of existing products/services. Due to competition it is vital for organizations to minimize the product prices without any compromise on quality. Inefficient organizations that Do not adopt the policy of optimization automatically fail to compete.

Performance of business is always considered a dependent variable for the competition that exists in the respective market. The performance of banking industry in any country is considered as the backbone of its financial system that leads to economic stability (Guzman, 2000). Banks around the globe are also facing the same issue of competition for the products/services that are being offered. Efficiency of highly competitive banking industry is greater than less competitive banking industry.

[1] Professor of Finance & Accounting, University of Management & Technology (UMT), Lahore, Pakistan. Email: rafay.rafay@gmail.com
[2] Research Analyst, Instituto de Bancario, Brazil. Email: g.franco@idb.com.br
[3] Lecturer, University of Management & Technology (UMT), Lahore, Pakistan. Email: ujgilani@gmail.com

According to the partial adjustment model, banks try to adjust their profit levels in future if some deviation in their profit is observed as compared to market profits. This process moves the market from the state of in-equilibrium to equilibrium. On the other hand, competitive environment is interpreted as the duration of this adjustment by the markets.

There had been little discussion about the speed of adjustment of banking industry towards equilibrium in the long run. Moreover market concentration is also significant as it makes the banking industry more stable. The relationship between market power (concentration) and efficiency needs investigation due to negligible literature regarding their combined optimization.

Objective of the study

The research on banking competition in Latin American economies is negligible. The study serves two objectives: Firstly, to introduce a dynamic adjustment process to Panzar and Ross (PR) Model that addresses the issue of biasness in revenue equation. Secondly, the study measures the competition levels within large and small banks of Latin America.

Literature Review

Banking Competition and Efficiency

Literature on competition and efficiency of banking industry is widely available and is continuously growing. Boot and Thakor (2000) identifies the link between the banking competition and the ease of access for customers towards banking product/services. The problem of holding up cost normally arises in less competitive environment (Petersen & Rajan, 1995). Holding up cost can be effectively controlled when there is a high competition and the customers easily access the banking products/services. Besanko and Thakor (1992) investigated that due to more competition during previous decades, the global banking industry is forced to cut its intermediation cost. This measure helped the banks to enhance the rate of growth by reducing the cost of capital. Small and Medium Enterprises (SMEs) avail significant financing facility from banking sector. Most of the SMEs are opaque in nature that leads to low access to lending in case of high market power of banking institutions. Improved technology and better information may offset these negative effects. However Hauswald and Marguez (2003) argued that competition is partly endogenous to the banks' investment in technology and information enhancement tools. Some other models (Dell' Ariccia & Marquez, 2004, 2005) show ambiguous results regarding the causality between banks' stability, access, competition and technology.

An effective monetary policy is also a major cause of improved efficiency and effectiveness of banking industry (Cecchetti, 1999). Several empirical studies are conducted that confirm this strong link (Collender & Shaffer, 2003; Jayaratne & Strahan, 1996). It is observed that the relationship

of efficiency and concentration in highly competitive banking sector and less competitive banking sector shows different behavior (Goddard & Wilson, 2009; Prasad & Ghosh, 2005; Bikker Haaf, 2002). Casu and Girardon (2006) used H-statistics for measuring banking competition for the sample of fifteen EU countries and measured banking efficiency using the non-parametric approach DEA (Data Envelopment Analysis). Results showed no relationship between banking competition and efficiency. In order to find out any relationship between banking efficiency and competition, Weill (2004) studied a sample of twelve countries of European Union. Stochastic Frontier Approach (SFA) was used for estimating of banking efficiency levels. Efficiency and competition showed a negative relationship.

A study carried out for five European countries that include Italy, the UK, Spain, Germany and France for the period 1986-1989, shows monopolistic competition in these banking markets (Molyneux et al., 1994). Using the PR model, the study was the first of its kind in Europe. The result clearly depicted absence of integration in major European countries due to capital controls and tight supervisory role of regulators. Bikker and Groeneveld (1998) carried out a study on sample of European countries for the period 1989–1996. The study used novel approach in measuring competition. Different weights were allocated to sample banks. The percentage share of each bank in the total banking assets is used to compute the weights. Results suggested steady competition during this period. In another study, Staikouras et al. (2006) suggested that larger banks in EU face more competition as compared to smaller banks.

Bikker and Haaf (2002) studied the competition levels of twenty three OECD countries for the period 1988-1998. The results suggested monopolistic competition and depicted that large banks faced stronger competition as compared to small banks. This phenomena was also confirmed by the study of De Bandit and Davis (2000). Using data of seven Latin American countries Levy Yeyati, E. et al.(2007) studied the evolution of competition levels and its impact on banking market concentration levels. Their results indicated monopolistic competition. The results also concluded that banking consolidation in Latin America did not have any significant impact on competition levels instead they found an inverse relation between various factors.

Gischer and Stiele (2004) suggested monopolistic competition in German savings banks during the period 1993-2002. Significant evidence was not found regarding the fact that big banks perform better than their counterparts. For the period from 1994 to 2001, Claessens and Laeven (2004) studied banking competition analysis using H-statistics. Sample included fifty countries from developed and developing world. Their results suggested that market structures describe the monopolistic competition in a better way. Furthermore, the H-statistics is regressed on country specific characteristics to establish relationship between variables that shape the market structure. Rafay and Gilani (2016) carried out a detailed comparative study of banking competition in intercontinental markets of US, EU and Australia New Zealand (ANZ). Results suggested that banking markets in all three continents are working under monopolistic competition environment,

with no significant difference in H-statistics. During the period from 1996 to 2015, Khan and Hanif (2017) explored twenty four commercial banks of Pakistan. Results of balance panel data analysis depicted that market structures are perfectly competitive and that monopolistic characteristics exist in Pakistani banking sector.

Panzar and Rosse Banking Competition Model

The model of banking competition model by Panzar and Rosse (1982, 1987, 1997) is a widely used model for the measurement of the degree of banking competition. Cross sectional data is used for this purpose that focuses on, among other factors, revenues from input prices. Table 1 shows H-statistic ranging between 0 – 1 which is the total of elasticity of the reduced form revenues. The null hypothesis shows monopolist competition and can be rejected if , which is based on the assumption that the transition between two equilibrium points is instantaneous. This paper discussed the effect of non-instantaneous adjustment on the index H.

Table 1
Range of H-Statistics

Estimated H	Competitive Environment
$H = 1$	Perfect competition
$0 < H < 1$	Monopolistic competition free entry (Chamberlinian equilibrium)
$H \leq 0$	Monopoly equilibrium

Data description

Panel data set (unbalanced) for thirteen Latin American countries is used for the purpose of analysis. The data is extracted from Bank Scope database for the period 1990-2018. The adjusted PR model is used to estimate the speed at which the Latin American banking market adjusts itself to long-run equilibrium market structure.

The Empirical Model

Following revenue equation is used to estimate H-statistic:

$$\ln(\frac{TR_{i,t}}{TA_{i,t}}) = \alpha + \beta_1 \ln(W_{1,i,t}) + \beta_2 \ln(W_{2,i,t}) + \beta_3 \ln(W_{3,i,t}) +$$

$$\gamma_1 \ln(Y_{1.i.t}) + \gamma_2 \ln(Y_{2,i,t}) + \gamma_3 \ln(Y_{3,i,t}) + \varepsilon_{i,t} \quad \text{.....(1)}$$

The revenue equation 1 includes dependent variable in terms of Total Revenues and Total Assets Ratio (Rafay & Gilani, 2016).

$W_{1,i,t}$ = Total interest expenses ÷ Total deposits (proxy for input price of deposits)
$W_{2,i,t}$ = Personnel expense ÷ Total assets (proxy for labor cost)
$W_{3,i,t}$ = Other operating expenses ÷ Total assets (proxy for input price and other fixed capital)
$W_{1,i,t}$ = Equity ÷ Total assets
$W_{2,i,t}$ = Net loans ÷ Total assets, and
$W_{3,i,t}$ = the total assets.

Control variables for specific effects of banks are explained by $Y_{1,i,t}$, $Y_{2,i,t}$ and $Y3_{,i,t}$. The total elasticity of factor prices is defined as H-statistic in PR model. In view of this, the derivation of H-statistic can be:

$$H = \beta_1 + \beta_2 + \beta_3 \quad \text{.....(2)}$$

The partial adjustment model is based on the accelerator model of economic theory. Following model is set up to study the dynamics of banking competition. The partial revenue equation using the partial adjustment model is depicted as:

$$R_{it} = R_{i,t-1} + \lambda(R^*_{it} - R_{i,t-1}) = (1-\lambda)R_{i,t-1} + \lambda R^*_{it} \quad \text{.....(3)}$$

In the above equation 3 two latent variables namely $R^*_{i,t}$ and λ are used that are directly observable. is the revenue equation in long-run equilibrium and defined as a function of factor input prices and bank specific variables Y.

$$R^*_{it} = \beta_1 ln(W_{1,i,t}) + \beta_2 ln(W_{2,i,t}) + \beta_2 ln(W_{3,it}) +$$
$$\gamma_1 ln(Y_{1,it}) + \gamma_2 ln(Y_{2,it}) + \gamma_3 ln(Y_{3,it}) + \varepsilon_{it} \quad \text{.....(4)}$$

All three variants of revenue equation are used in this dynamic model. λ is defined as a function of deviated profits and can be written in linear form as follow:

$$\lambda = \gamma_1 + \gamma_2 DP_{i,t} \quad \text{.....(5)}$$

The speed of adjustment is the function of firm deviated profits from normal market profits. Deviated profits are defined as squared deviation of market net interest income to total assets from the sample average of market net interest income to total assets.

$$DP_{i,t} = \frac{NetInterestIncome_{i,t}}{Total\text{Assets}_{i,t}} - \frac{\overline{NetInterestIncome_{i,t}}}{Total\text{Assets}_{i,t}}^{2} \quad \text{.....(6)}$$

It is evident that the speed of adjustment will also be high in case of high deviated profits or

market is in state of dis-equilibrium. Market becomes more attractive due to consistent profit deviations from normal market profits that directly affect speed adjustment coefficient. As a result market quickly moves back to equilibrium state.

$$R_{i,t} = \left(1-\gamma_1-\gamma_2 DP_{i,t}\right)R_{i,t-1} + \left(\gamma_1+\gamma_2 DP_{i,t}\right)\left\{\begin{array}{l}\beta_1 ln\left(W_{1,i,t}\right)+\beta_2 ln\left(W_{2,i,t}\right)+ \\ \beta_3 ln\left(W_{3,i,t}\right)+\gamma_1 ln\left(Y_{1,i,t}\right)+\gamma_2 ln\left(Y_{2,i,t}\right)+\gamma_3 ln\left(Y_{3,i,t}\right)+\varepsilon_{i,t}\end{array}\right\} \quad \text{.....(7)}$$

Effect of adjustment speed in PR revenue is considered in equation (7) which means that if the deviation in profit is high, λ will have more effect on coefficients of prices of factor input. Conversely, if markets are in equilibrium or deviated profits are equal to zero, coefficients of prices of factor input will not be effected by λ.

Results

The competition level in Latin American banking industry falls under monopolistic competition as all countries have H-statistic . The null is rejected that is H > 1 or H < 0 with 95% confidence interval. Uruguay, Chile, and Bolivia have the highest H-statistics 0.90, 0.79 and 0.75 respectively. Alternatively, it is depicted that countries with 0 < H-statistics < 1 values are having a monopolistic market structure. Peru and Brazil have the least competitive banking industry. In Latin American banking industry, large banks in Paraguay and Surinam have the highest H-statistics, 0.90 and 0.80 respectively, suggesting monopolistic competition. On the other hand, large banks in French Guiana and Ecuador have more competitive environment as they have lowest H-statistics 0.36 and 0.40 respectively. Small banks in Guyana and Paraguay have monopolistic competition environment with H-statistic 0.90 and 0.89 respectively. Small banks of Peru and Ecuador have more competitive environment as they have lowest H-statistics 0.45 and 0.48 respectively. Results (Table 3) summarized the fact that bank size is important in its operational activities, which ultimately affected the market competition in banking sector as a whole (Rafay & Gilani, 2016).

For both scaled and un-scaled revenue equations, the FE estimator produces H-statistics between zero and one for all the countries. However the GMM produces higher H estimates than FE estimator. Table 4 depicts FE results whereas GMM estimation are shown in Table 5. Uruguay have a higher λ value of .90 which indicated the banking markets with higher H-statistics (representing markets competition close to perfect competition) also have higher speed of adjustment. Such results are in line with the hypothesis that markets with perfect competitions adjusted themselves towards equilibrium more quickly as compared to markets with less competition (Rafay & Gilani, 2016). On the other hand, Peru and Brazil banking markets have λ value 0.22 and 0.33 respectively and both were facing monopolistic competition. Similarly, adjustment speed of large banks was slower than small banks as shown in Table 4. All these results are in accordance with the research of Freixas and Ma (2014) that high competition leads to financial stability.

Concluding Remarks

This paper concluded two important aspects about banking markets of Latin America. Firstly, enough evidence is available for non-instantaneous adjustment in Latin American markets. Secondly, a relationship also exists in these markets between competition level and market adjustment rate to the long run equilibrium. Regarding policy implications, it is clearly evident that concentration is favored at the expense of competition resulting in higher inefficiency costs. In view of the foregoing, it can be suggested that profit deviations should be monitored by the banking regulators. Moreover all large and small banks should keep an eye on optimization to remain competitive and sustainable in the long run. Studying the competition levels and rate of adjustment towards the long-run equilibrium may provide insight about the global banking industry and its trends which can also be used to avoid the potential financial crises, an issue that is left for future research.

Table 2
Average profit Deviation

Countries	Profit deviation
Brazil	2.24
Colombia	2.06
Argentina	1.15
Peru	1.17
Venezuela	4.5
Chile	2.22
Ecuador	1.65
Bolivia	4.44
Paraguay	5.87
Uruguay	5.28
Guyana	2.78
Suriname	4.03
French Guiana	1.57

Table 3
Un-scaled revenue equation with lambda coefficient

	Large banks		Small banks		Overall	
Countries	**λ**	**H-statistic**	**λ**	**H-statistic**	**λ**	**H-statistic**
Brazil	0.46	0.66***	0.48	0.75***	0.33	0.15***
Colombia	0.51	0.51***	0.87	0.69***	0.68	0.64***
Argentina	0.71	0.68***	0.52	0.75***	0.49	0.71***
Peru	0.36	0.58***	0.90	0.45***	0.22	0.69***
Venezuela	0.74	0.54***	0.74	0.68***	0.38	0.25***
Chile	0.17	0.49***	0.65	0.79***	0.79	0.66***
Ecuador	0.62	0.40***	0.79	0.48***	0.69	0.79***
Bolivia	0.74	0.50***	0.78	0.57***	0.75	0.57***
Paraguay	0.15	0.90***	0.83	0.89***	0.69	0.75***
Uruguay	0.74	0.44***	0.88	0.73***	0.90	0.81***
Guyana	0.72	0.75***	0.75	0.90***	0.46	0.77***
Suriname	0.32	0.80***	0.70	0.82***	0.55	0.65***
French Guiana	0.40	0.36***	0.88	0.59***	0.52	0.49***

Table 4
FE estimation with scaled and un-scaled revenue equation

	Scaled revenue equation						Un-scaled revenue equation					
	Large banks		Small banks		Overall		Large banks		Small banks		Overall	
Countries	**H-statistic**	**S.E**	**H-statistic**	**S.E**	**H-statistic**	**S.E**	**H-statistic**	**S.E**	**H-statistic**	**S.E**	**H-statistic**	**S.E**
Brazil	0.18	*0.06*	0.57***	*0.06*	0.42***	*0.06*	0.45***	*0.07*	0.49***	*0.06*	0.46***	*0.03*
Colombia	0.42	*0.11*	0.39***	*0.20*	0.52***	*0.10*	0.52***	*0.11*	0.66***	*0.22*	0.59***	*0.08*
Argentina	0.70	*0.18*	0.74***	*0.15*	0.70***	*0.19*	0.70***	*0.19*	0.69***	*0.11*	0.71***	*0.05*
Peru	0.63	*0.10*	0.66***	*0.01*	0.45***	*0.09*	0.54***	*0.10*	0.75***	*0.03*	0.56***	*0.01*
Venezuela	0.52	*0.03*	0.61***	*0.04*	0.65***	*0.05*	0.45***	*0.06*	0.62***	*0.02*	0.70***	*0.08*
Chile	0.61	*0.04*	0.79***	*0.05*	0.88***	*0.05*	0.51***	*0.08*	0.70***	*0.03*	0.68***	*0.06*
Ecuador	0.49	*0.11*	0.79***	*0.02*	0.75***	*0.16*	0.65***	*0.09*	0.69***	*0.03*	0.75***	*0.02*
Bolivia	0.28	*0.06*	0.82***	*0.09*	0.66***	*0.08*	0.36***	*0.11*	0.51***	*0.10*	0.54***	*0.06*
Paraguay	0.80	*0.22*	0.65***	*0.19*	0.33***	*0.25*	0.10***	*0.25*	0.88***	*0.15*	0.22***	*0.05*
Uruguay	0.82	*0.22*	0.44***	*0.26*	0.40***	*0.29*	0.15***	*0.29*	0.86***	*0.15*	0.36***	*0.06*
Guyana	0.60	*0.31*	0.72***	*0.10*	0.52***	*0.35*	0.44***	*0.18*	0.78***	*0.09*	0.45***	*0.08*
Suriname	0.55	*0.16*	0.79***	*0.05*	0.59***	*0.19*	0.75***	*0.19*	0.58***	*0.05*	0.60***	*0.03*
French Guiana	0.59	*0.10*	0.81***	*0.08*	0.45***	*0.15*	0.66***	*0.04*	0.62***	*0.30*	0.61***	*0.01*

Table 5
GMM Results for scaled and un-scaled revenue equation

	Scaled revenue equation		Unscaled revenue equation	
Countries	**H-statistic**	**S.E**	**H-statistic**	**S.E**
Brazil	0.65***	*0.08*	0.90***	*0.10*
Colombia	0.59***	*0.06*	0.64***	*0.08*
Argentina	0.74***	*0.19*	0.75***	*0.05*
Peru	0.79***	*0.06*	0.70***	*0.06*
Venezuela	0.59***	*0.31*	0.71***	*0.09*
Chile	0.44***	*0.09*	0.29***	*0.10*
Ecuador	0.69***	*0.13*	0.89***	*0.11*
Bolivia	0.59***	*0.07*	0.65***	*0.08*
Paraguay	0.79***	*0.31*	0.79***	*0.06*
Uruguay	0.52***	*0.26*	0.56***	*0.09*
Guyana	0.70***	*0.06*	0.69***	*0.11*
Suriname	0.61***	*0.04*	0.52***	*0.26*
French Guiana	0.72***	*0.08*	0.61***	*0.08*

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