Assessing the Competition in the Jordanian Banking Sector by Using Panzar-Rosse Approach

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Abstract

This paper aimed at assessing the levels of competition in the Jordanian banking sector, using the so called Panzar-Rosse model. The study used a sample of 13 Jordanian commercial banks listed on Amman Stock Exchange during the time period 2009-2015.Pooled data regression was used to measure the level of competition among Jordanian banking. The major findings indicated that the computed H statistic for the sample was 0.3111, indicating that the Jordanian banking sector is under monopolistic competitive nature, but still close to the monopoly market with high concentration and low competition among banks.

Keywords: Competition, Panzar-Rosse Model, Total Revenues Function, Jordanian Banking Sector, Commercial Banks.

1. Introduction

The relationship between economic growth and the degree of financial system development has attracted great deal of debate among researchers. Following the early work of Gurley and Shaw (1955), Goldsmith (1969)and McKinnon (1973) which highlighted the importance of the financial system growth for economic growth. Many researchers argued that the financial sector development affecting positively economic growth(Levine, 2005). Montiel (2003) indicated that financial system contributes to economic growth in three ways. First, by creating incentives for accumulation of physical and human capital, allocating capital to the most productive activities, and decreasing the amount of resources used in the process of intermediation.

As a major part of financial system, the banking sector undertakes the intermediation role by channeling funds from surplus units to deficit units (Adrian and Shin, 2010). Gromb and Vayanos (2010) argued that the intermediation role of banks enhance the efficiency of financial system and foster economic growth. Nevertheless, the global banking industry has witnessed many successive developments that resulted from globalization and liberalization of financial services. These developments has increased the number of banking and non-banking financial institutions, and imposed intensive competition on banks from both banking and non-banking financial institutions.

However, the study of competition in the banking sector requires examining the market structure to identify market's characteristics and describe the type of competition prevailing in the market. According to this examination, the market could be perfect competition market, or monopoly market, or monopolistic competition market (Bikker and Haff, 2002).

The Jordanian banking sector comprises 25 banks at the end of 2015, of them 16 Jordanian banks and 9 foreign banks. Many studies argued that the competition in the Jordanian banking sector is weak. Al-Jarrah(2010) found that the Jordanian banking sector operating under conditions of monopolistic competition. Demirguc-Kunt and Peria (2010) indicated that the Jordanian banking sector is considered highly concentrated as the share of assets held by the largest three banks reached to 70%.In this paper we will use the Panzar-Rosse model, a non-structural approach, to examine the degree of competition in the Jordanian banking sector during the period 2009-2015.

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2. Theoretical Explanations of Competition

There are two structural approaches for examining competition, The Structure-Conduct-Performance (SCP) approach and the efficiency approach: efficient-structure (ES) approach. The SCP approach assumes that a highly concentrated market causes collusive behavior among larger banks, resulting in superior market performance. On the other hand, the ES approach assumes that the efficiency of larger banks working in concentrated markets enhances their performance, causing a positive relationship between profitability and concentration (Al Shatti, 2014).

However, many researchers highlighted the theoretical and empirical deficiencies of the structural approach and indicated their inadequate explanation of the relationship between competition and performance. Accordingly, many researchers suggested new versions of non-structural approaches such as Iwata model, the Bresnahan model, and the Panzar and Rosse (P -R) model (Al-Jarrah et al., 2012).

The Non-structural approaches, such as contestable market theory (CMT) Of (Baumol, 1982), stress that a concentrated industry can behave competitively if the barriers for new entrants to the market are nonexistent or low, therefore the performance of banks is highly related to the market structure in which they operate. Within the same context, Panzar and Rosse (1987) introduced their approach to examine various industries competitiveness through "H statistic." The Panzar and Rosse (PR) approach relies on the assumption that banks will employ different pricing strategies in response to changes in input costs depending on the market structure in which they operate.PR suggested "H statistic" to measure the competitive structure of the industry.

H statistic can be defined as the sum of the elasticity of the reduced form (equilibrium) revenues with respect to input prices. Thus, H statistic measures the percentage change in a bank's equilibrium revenues caused by one percent change in input prices (Yildirim and Philippatos, 2003).

Al-Jarrah (2010) indicated that the economic interpretation of the H statistic is as follows:

- If the market is characterized as monopoly, H statistic value is less than or equal to zero. This is because that the monopolist's revenue will respond in the opposite direction to a change in input prices, thus reducing equilibrium output and revenue.
- If the market structure is a conjectural variations short-run oligopoly, the H statistic value is negative.
- If the market structure is perfectly competitive, the H statistic is equal to one. This is because the increase in factor prices induces an equal change in total revenues.
- If the market structure is monopolistic competition, the H statistic will lie between zero and one because revenues will increase less than proportionally to changes in input prices.

3. Literature Review

Yildirim and Philippatos (2003) analyzed the evolution of competitive conditions in the Banking industries of fourteen Central and Eastern European (CEE) transition economies using firm-level data. The results of the competition analysis suggested that the banking markets of CEE countries cannot be characterized by the bipolar cases of either perfect competition or monopoly over 1993-2000 except for FYR of Macedonia and Slovakia. Furthermore, the analysis of competitive structure revealed initially a decreasing trend between 1993 and 1996 and a subsequent increasing trend in competitive conditions after 1996.

Gelos and Roldos (2004) concerned about the market structure in emerging markets banking systems and found that market competition in banking sector was not decrease due to a significant process of bank merger and acquisition wave during 1990s. They also suggested that lowering barriers to entry have prevented a decline in competitive pressures.

Perera et al (2006) applied Panzar and Rosse test and found a monopolistic competition in banking sector of during the period 1995 to 2003. They also compared the competition in traditional market-based products market and fee and commission based products markets. Under their investigation, Bangladesh and Pakistan had nature that is more competitive in traditional market-based products markets, while Indian and Sri Lankan competition was greater in fee and commission based products market.

Demirguc-Kunt and Peria (2010) proposed a framework to analyze competition in the Jordanian banking sector. They pursued a multi-pronged approach to analyze competition including (a) an examination of the extent to which the market was contestable, (b) an evaluation of the behavior of bank spreads, and (c) an assessment of nonstructural and direct measures of bank competition such as the H-statistic and the Lerner Index.

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The results indicated that although concentration had declined, competition in the country was low and has decreased over time.

Hamza (2011) investigated the market structure of banking industry in Tunisia during the period 1999 to 2008, and evaluated the degree of competition. He employed non-structural methodology put forward by Panzar and Rosse (1987), the so-called H-statistic. The estimated H statistics for the whole sample periods were positive (0.67 and 0.71) and the Wald test for the market structure of monopoly or perfect competition was rejected, implying that the banks in Tunisia earned their revenue in the condition of monopolistic competitive environment. Gajurel and Pradhan (2012) analyzed the market concentration and competition in Nepalese banking sector. They found a decreasing trend and low level of market concentration in the period of 2001 – 2009. They also indicated more competition in interest-based market than fee-based market.

Bikker et al. (2012) showed that neither a price equation nor a scaled revenue function yields a valid measure for competitive conduct. Moreover, even an unsealed revenue function generally requires additional information about costs and market equilibrium to infer the degree of competition. Their theoretical findings were confirmed by an empirical analysis of competition in banking, using a sample of more than 100,000 bank-year observations on more than 17,000 banks in 63 countries during the years 1994 to 2004.

Leon (2014) argued that many studies have attempted to investigate the determinants and implications of competition in the banking industry. He divided the literature on the measurement of competition between the structural and non-structural approaches. He indicated that structural approach infers the degree of competition from the structure of the market, while the non-structural approach assesses the degree of competition directly by observing behavior of firms in the market. He reviewed the most frequently-used structural and non-structural measures of competition in banking, and highlighted their strengths and weaknesses, especially for studies based on a limited number of observations.

Le(2014) measured the market concentration using the banks concentration ratio (CRk) and the Hirschman-Herfindahl index (HHI) and tested for the market competition in Vietnamese banking sector under Panzar – Rossse approach by an unbalanced panel data of 33 commercial banks for the period from 2004 to 2013. He found high-concentration in the Vietnamese banking sector although it is experiencing a decreasing trend. The test for market competition indicated monopolistic behavior of Vietnamese commercial banks. He also found that the state-owned commercial banks and foreign banks were superior in the competition with joint-stock commercial banks and domestic banks. Kasman and Kasman (2015) analyzed the impact of competition and concentration on bank stability in the Turkish banking industry over the period 2002–2012.

The Boone indicator and the efficiency-adjusted Lerner index were used as proxies for competition, while the non-performing loans (NPL) ratio and Z-scores were used as proxies for bank stability. The results indicated that competition is negatively related to the NPL ratio but positively related to the Z-score. The results also indicated that greater concentration has a positive impact on the NPL and a negative impact on the Z-score.

Simatele (2015) examined the relationship between bank structure, performance, and competition in the South African banking industry. He applied the Panzar-Rosse approach to bank level data for the period 1997 to 2014 to assess the competitive environment in the South African banking industry. He estimated a revenue equation to obtain the H statistic. He found that competition has increased over time. The estimated H statistic suggested that banks operate in monopolistically competitive market structure. He also found that the increased concentration arising from the currency crisis in 2001/02 does not reduce the level of competition.

Uddin and Suzuki (2015) aimed at assessing the market structure of the banking sector of Bangladesh, and its changes over the years. They used different concentration ratios and the Panzar-Rosse algorithm for measuring competition. Their findings reported a reduction in concentration and an increase in competition in the banking sector of Bangladesh. They also found that banks were facing more competition in the credit market than in the deposit market. In addition, the level of competition was higher in interest based regular banking market than in fee based non-banking market.

Kashiet al (2015) investigated the competitive condition of the Iranian banking industry over the period 2005-2010 using the H-statistic proposed by Panzar and Rosse. To calculate H statistics, a reduced form of revenue equation was estimated. The calculated H statistics for the whole sample period was 0.71.The extent of H statistics and the result of Wald test indicated that the structure of Iranian Banking sector is neither monopoly nor competition, it was a monopolistic competition.

Finally, Vardar (2015), addressed the impacts of bank competition on the risk-taking behaviors of banks in Turkey over the period 2002-2012. After estimating H-statistic as a measure of competition and regressing this measure and other explanatory variables on the bank risk indicators, the paper concluded that competition has a negative impact on the financial fragility of Turkish banks, indicating that banks in a more competitive market tend to take lower level of risk.

4. Data And Methodology

4.1. Data

The number of Jordanian commercial listed on Amman Stock Exchange reached to 13 banks at the end of 2015. For the empirical analysis, the study sample comprised all Jordanian commercial banks during the period 2009-2015. Data were collected from the annual reports of Jordanian commercial banks.

4.2. Methodology

We apply the Panzar-Rosse (P-R) model to measure competition in the Jordanian banking sector. According to Panzar and Rosse (1987), the banks' competitive behavior is primarily determined by the comparative static properties of reduced-form revenue function. Mensi (2010) indicated that the P-R model is based on the fact that banks employ different strategies based upon the price in response to changes in input costs of the market structure in which they operate.

Based on P-R model, the H-statistics is calculated from the reduced form revenue equation, and is equal to the sum of elasticity's of bank revenue with respect to the input prices (Casu and Girardone, 2006). Following the methodology of (Kashi et al., 2015) and (Vardar, 2015), in this study, the H-statistics is calculated for a pooled bank sample using the revenue equation, as shown in the following equation:

$$\ln TR_{i,t} = \beta_1 P1_{i,t} + \beta_2 P2_{i,t} + \beta_3 P3_{i,t} + \theta_1 \ln EQ_{i,t} + \theta_2 \ln Size_{i,t} + \theta_3 \ln LOAN_{i,t} + \theta_4 \ln DEP_{i,t} + \varepsilon_{i,t} \qquad \dots (1)$$

where in denotes the natural logarithm; TR is the ratio of total revenue over total assets for bank i and year t; P1 is the ratio of interest expenses over total assets as a proxy for input price of funds; P2 is the ratio of personal expenses over total assets as a proxy for cost of labor; P3 is the ratio of other operating expenses over total assets as a proxy for cost of capital; EQ is the ratio of equity over total assets; SIZE is the total assets; Loan is the ratio of total loans over total assets; DEP is the ratio of total deposits over total assets, and ε is the error term.

The main indicator, H-statistic, is calculated as a sum of elasticity of revenue by price of input factor $(H=\beta1+\beta2+\beta3)$. A negative value of H indicates that the banks is operating in monopolistic market, whereas H = 0 indicates that input prices are not correlated with industry returns. When H = 1, the banking market is perfectly competitive and if 1 >H> 0, the market is considered a monopolistic competition (Vardar, 2015).

A critical feature of the H-statistic is that the tests must be undertaken on observations that are in a long-run equilibrium. This suggests that, in equilibrium, rates of return should be uncorrelated with input prices (Matthews et al., 2007).

According to (Molyneux et al., 1994), (Yu Sun, 2011) and (Aktan & Massood, 2010), the test for equilibrium can be calculated using the same total revenue function, but after replacing the dependent variable (total revenue) with the return on assets (ROA) (Kashi et al, 2015), as shown in the following equation:

$$\ln ROA_{i,t} = \beta_1 P1_{i,t} + \beta_2 P2_{i,t} + \beta_3 P3_{i,t} + \theta_1 \ln EQ_{i,t} + \theta_2 \ln Size_{i,t} + \theta_3 \ln LOAN_{i,t} + \theta_4 \ln DEP_{i,t} + \varepsilon_{i,t} \dots (2)$$

In this equation, if H-statistic $(H=\beta1+\beta2+\beta3)$ is equal to zero, then this indicates a long run equilibrium. A value of H less than or greater than zero, indicates disequilibrium.

Table 1: Variables Description

Variable Name	Abbreviation	Description	References
Total Revenue	TR	Total Revenue / Total Assets	Kashi et al. (2015); Vardar (2015); Babicet al (2015); Casu and Girardone (2006); and Mkrtchyan (2005)
Return on Assets	ROA	Net Income / Total Assets	
Priceof Funds	P1	Interest Expenses / Total Deposits	
Cost of labor	P2	Personal Expenses / Total Assets	
Cost of Capital	P3	Other Operating Expenses / Total Assets	
Equity Ratio	EQ	Shareholders' Equity / Total Assets	
Bank Size	SIZE	Total Assets	
Loans to Total Assets	LOAN	Total Loans / Total Assets	
Deposits to Total Assets	DEP	Total Deposits / Total Assets	

5. Empirical Results

5.1. Summary Statistics

Table 2 shows the summary statistics of study's variables in absolute numbers (before calculating the natural logarithm as indicated in the model).

Based on this table, we can note that the average of total revenues to total assets ratio (TR) reached to 4.4%, with a relatively low standard deviation of 0.80%. Average return on assets (ROA) for all banks during the period 2009-2015 amounted 1.2%, with a standard deviation of 0.52%. Both dependent variables seem to follow normal distribution as shown by Skewness, kurtosis and Jarquebera statistics.

The ratio of interest expenses to total deposits (P1) averaged 3.2% during study period, and the personal expenses to total assets (P2) amounted 1.03%, while the ratio of other operating expenses to total assets reached to 0.73%. However, the above indicators reflect the ability of Jordanian commercial banks to keep their input prices at the minimum levels without any dramatic changes during study period.

The average equity ratio for Jordanian commercial banks reached to 14.14%, while the average size of banks stood at JD 3.74 -13824. Loans to total assets ratio amounted 45.9%, whereas deposits to total assets reached to 65.7%.

It should be noted that there is a significant difference between mean and median value for bank size, and a huge gap between maximum and minimum value with high standard deviation, indicating a high concentration in the Jordanian banking sector.

Table 2: Summary Statistics of Study's Variables

	TR	ROA	P1	P2	P3	EQ	SIZE	LOAN	DEP
Mean	0.0440	0.0128	0.0324	0.0103	0.0073	0.1414	3740000000	0.4590	0.6574
Median	0.0427	0.0139	0.0309	0.0095	0.0074	0.1397	1900000000	0.4699	0.6551
Maximum	0.0595	0.0205	0.0518	0.0169	0.0106	0.2196	26600000000	0.5877	0.7699
Minimum	0.0275	-0.0017	0.0185	0.0054	0.0044	0.0967	347000000	0.3148	0.4844
Std. Dev.	0.0084	0.0052	0.0091	0.0028	0.0015	0.0242	6250000000	0.0683	0.0592
Skewness	0.2968	0.2464	-1.0086	0.8148	0.1802	0.4313	2.8533	-0.2081	-0.1966
Kurtosis	2.1346	2.0353	3.7080	2.8676	2.3835	3.1867	9.7741	1.8813	2.5380
Jarque-Bera	4.1762	4.4493	17.3286	10.1363	1.9335	2.9537	297.4766	5.4022	1.3956
Probability	0.1239	0.1081	0.0002	0.0063	0.3803	0.2284	0.0000	0.0671	0.4977
Observations	91	91	91	91	91	91	91	91	91
Cross sections	13	13	13	13	13	13	13	13	13

5.2. Regression Results

Table 3 shows the market equilibrium test that is required to use P–R model. The H – statistic takes a value of (0.3201). Using Wald test with the null hypothesis being market equilibrium (E = 0), the p-value was significant at 1% level, indicating that Wald test failed to reject the null hypothesis. Accordingly, we can use P–R model to estimate the concentration and competition in the Jordanian banking sector appropriately.

Table 3: Equilibrium Test for P-R model with (ROA)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.5207	0.8460	-2.9795	0.0038
Ln P1	-0.3098	0.0560	-5.5326	0.0000
Ln P2	0.9921	0.2681	3.7012	0.0004
Ln P3	-0.3623	0.2264	-1.6004	0.1133
Ln EQ	0.5603	0.2023	2.7697	0.0069
Ln SIZE	0.0137	0.0230	0.5976	0.5517
Ln LOAN	-0.5607	0.2510	-2.2343	0.0282
Ln DEP	-0.5211	0.3615	-1.4415	0.1532
Regression Statistics				
R-squared	0.3722			
Adjusted R-squared	0.3192			
S.E. of regression	0.4686			
Durbin-Watson stat	2.1856			
F-statistic	7.0287			
Prob(F-statistic)	0.0000			
H - statistic	0.3201			
Wald test (E=0)	3.6042			
p - value	0.0576			

* White diagonal standard errors & covariance (no d.f. correction)

This table shows the results of equilibrium test for Panzar Rosse model. Dependent variable: ROA = Return on assets. Independent variables: P1 = price of funds (interest expenses to total deposits), P2 =cost of labor (personal expenses to total assets), P3= cost of capital (other operating expenses to total assets), EQ = equity ratio (Shareholders' Equity to total assets), SIZE= total assets, LOAN = total loans to total assets, DEP = deposits to total assets (total deposits to total assets). Ln = natural logarithm.

Table 4 shows the estimated parameters of P-R model for the equation where the dependent variable is total revenue. The H – statistic takes value between zero and one (0.3111), indicating a monopolistic competitive nature in the Jordanian banking sector. The null hypothesis of monopoly competitive nature (H = 0) and perfect competition in banking sector (H = 1) tested by Wald test are rejected with statistically significance. Hence, empirical findings suggest that the Jordanian commercial banks are competing in a monopolistic competitive nature.

It is worth mentioning that higher H – statistic value indicating higher degree of competition in the banking sector. The H – statistic for Jordanian commercial banks reached to 0.3111, suggesting a high concentration and low competition among the Jordanian commercial banks. The findings of this paper are very similar to the findings of (Le, 2014; Kashi et al., 2015; and Babic et al., 2015).

Table 4: Regression Results for P-R model with (TR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.5425	0.3326	-1.6311	0.1067
Ln P1	-0.2774	0.0376	-7.3858	0.0000
Ln P2	0.5112	0.0620	8.2514	0.0000
Ln P3	0.0773	0.0553	1.3960	0.1664
Ln EQ	0.2055	0.0635	3.2371	0.0017
Ln SIZE	-0.0236	0.0144	-1.6448	0.1038
Ln LOAN	-0.0191	0.0784	-0.2435	0.8082
Ln DEP	-0.1786	0.1076	-1.6596	0.1008
Regression Statistics				
R-squared	0.8405			
Adjusted R-squared	0.8271			
S.E. of regression	0.1048			
Durbin-Watson stat	1.8918			
F-statistic	62.4842			
Prob(F-statistic)	0.0000			
H - statistic	0.3111			
Wald test (H=0)	24.77853			
p - value	0.0000			
Wald test (H=1)	121.5321			
p - value	0.0000			

* White diagonal standard errors & covariance (no d.f. correction)

This table shows the estimation results for Panzar Rosse model, and the estimated H-Statistic. Dependent variable: TR = Total revenues. Independent variables: P1 = price of funds (interest expenses to total deposits), P2 =cost of labor (personal expenses to total assets), P3= cost of capital (other operating expenses to total assets), EQ = equity ratio (Shareholders' Equity to total assets), SIZE= total assets, LOAN = total loans to total assets, DEP = deposits to total assets (total deposits to total assets). Ln = natural logarithm.

6. Conclusion

This paper empirically investigates the levels of competition in the Jordanian banking sector during the period 2009-2015. Pooled data regression is used to empirically test Panzar-Rosse model for a sample of 13 Jordanian commercial banks. Empirical findings reveal that the Jordanian banking sector is under monopolistic competitive nature, but still close to the monopoly market with high concentration and low competition among banks. The H statistic computed for the sample is 0.3111. The Wald test rejects the hypothesis for the market structure of monopoly or perfect competition at the 1% significance level, indicating that that total revenues of Jordanian commercial banks appear to be earned in conditions of monopolistic competition during the sample periods.

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