Geliş Tarihi / Received: 19.04.2017
Kabul Tarihi / Accepted: 03.05.2017

Sayfa / pp: 20-34

MEASURING THE MARKET POWER OF THE BANKING SECTOR IN TURKEY*

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TÜRKİYE BANKACILIK SEKTÖRÜNDE PAZAR GÜCÜNÜN ÖLÇÜLMESİ

Asst. Prof. Onur DEMİREL
Suleyman Demirel University
FEAS, Department of Economics
onurdemirel@sdu.edu.tr

Prof. Selim Adem HATIRLI
Suleyman Demirel University
FEAS, Department of Economics
selimhatirli@sdu.edu.tr

Abstract

The banking sector serves like a backbone for other sectors and the economy as a whole to operate effectively. Therefore, market structure of the banking sector should be followed closely and regulated. In this context, in the study the market structure of the deposit sub-sector of Turkish banking sector is determined through the estimation of market power. For the estimation, Bresnahan-Lau Model is utilised and a non-linear system of equations comprising of two equations is developed. The system is estimated simultaneously with the 2-SLS method and with quarterly data for the period 2000-2013. According to the estimation results the market power and the market structure of Turkish banking sector is determined as 0.11 and monopolistic competition, respectively.

Keywords: *Market power, Banking sector, Bresnahan-Lau model, Market structure, Turkey.*

Öz

Bankacılık sektörü diğer sektörlerin ve bir bütün olarak ekonominin etkin biçimde işlemesi için bel kemiği niteliğindedir. Dolayısıyla bankacılık sektörü piyasa yapısının, yakından takip edilmesi ve düzenlenmesi gerekir. Bu bağlamda çalışmada Türkiye bankacılık sektöründe mevduat alt sektörünün piyasa yapısı, pazar gücünün ölçümü ile tespit edilmiştir. Pazar gücünün ölçümü için Bresnahan-Lau Modeli kullanılmış ve 2000-2013 yıllarına ait çeyrek dönemlik veriler kullanılarak iki denklemli doğrusal olmayan bir denklem sistemi geliştirilerek 2-SLS yöntemi kullanılarak eş-anlı olarak tahmin edilmiştir. Tahmin sonuçlarına göre Türkiye bankacılık sektörünün pazar gücü 0,11; piyasa yapısı ise tekelci rekabet olarak tespit edilmiştir.

Anahtar Kelimeler: *Pazar gücü, Bankacılık sektörü, Bresnahan-Lau modeli, Piyasa yapısı, Türkiye.*

* The paper is prepared from the Ph. D. dissertation of Onur Demirel titled "Türkiye'de Bankacılık Sektöründe Pazar Gücü Araştırması" that is supported by Suleyman Demirel University, Scientific Research Projects Coordination Unit: Project No: 3635-D1-13.

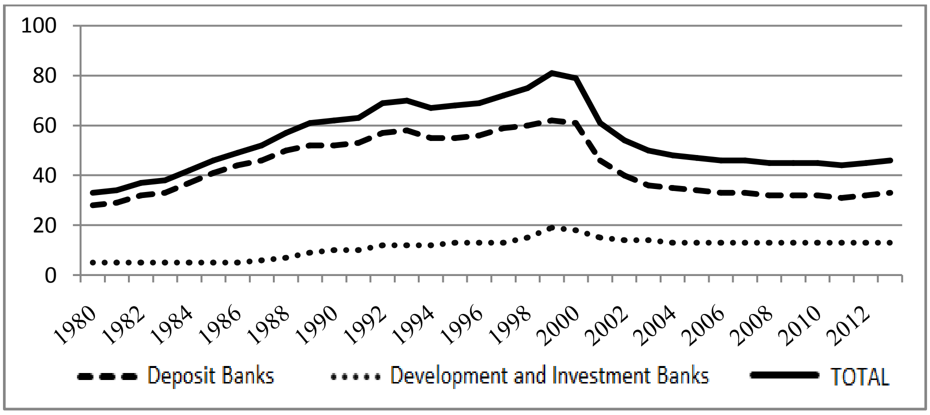
1. INTRODUCTION

Banking sector has its institutional origins from Babel in the years 2000 B.C. and then it was a sector comprising of intermediary establishments fulfilling holding or borrowing and also lending or keeping activities for any object (Artun, 1983: 11-12). Therefore, for directing savings to proper and efficient investments, the existence of a steady and reliable banking system is a crucial condition. This condition requires the regulation and supervision of the market power and hence the market structure, competitiveness and efficiency, profitability, transparency, reliability and stability of the banking sector for the stability of the economy as a whole.

This essentialness of the banks for the whole economy necessitates the determination of market power and hence the market structure in those countries having more than 1 (state of monopoly) bank. As can be seen from Figure 1, the number of banks operating in Turkey was on the rise during the 1980-1999 period (except for the 1994 crisis), but on the fall following 1999. Among the reasons of the rise in the number of banks between 1980 and 1990 are the high public borrowing requirement, limitless deposit protection, high profit margins and ease of taking bank licensing (Göndoğdu, 2011: 118). On the other hand, following the 1994 and 2000-2001 economic crises, the confiscations, dissolutions, and mergers and acquisitions (M&A) particularly caused by the activities of the Saving Deposit Insurance Fund (SDIF) lowered the number of banks. Due to the 1994 and 2000-2001 crises, the number of banks fell to 67 from 70 in 1993 and to 54 from 81 in 1999, respectively. In the post 2002 period the number of banks as of March 2015 fell to 47 due to the increased competition and M&A. 34 of them are deposit banks and 13 of them are development and investment banks. 3 of 34 deposit banks are public banks, 11 are private banks, 13 are foreign capital private banks, 6 are the branches of foreign capital banks in Turkey and 1 is the bank within the scope of SDIF. 3 of 13 development and investment banks are public banks, 6 are private and 4 are foreign capital banks.

The low level of competition in the banking sector due to the low number of banks (or due to any other reason) causes the banks to become price setter from being price taker. This, in turn, causes cost increases for those enterprises watching for an opportunity to expand. On the other hand, low interest on deposits due to the low level of competition canalises savings into non-productive areas and hence causes inefficiencies in the economy (Yağcılar, 2010: 32; Öksüzler and Bayır, 2013: 69). In this context, it is aimed in the study to determine the market power and hence the market structure of banking sector in Turkey for the period 2000-2013 by using quarterly data.

Figure 1: Number of Banks Operating in Turkey (1980-2013)



Source: Arranged through the data set titled “Bank and Branch Statistics” attained from the official website of the Banks Association of Turkey (BAT). (http://www.tbb.org.tr/tr/banka-ve-sektor-bilgileri/banka-bilgileri/banka-ve-sube-sayilari/70, Last Access: 09.05.2014).

Although there are similar studies prepared for this aim in the literature, the methods, the periods examined and the model assumptions used in these studies may differ. Substantial part of these studies on Turkish banking sector utilises the Panzar-Rosse Model. Abbasoğlu et al. (2007); Classsens and Leaven (2004); Çelik and Kaplan (2010); Çelik and Ürünveren (2009); Emek (2005); Gelos and

Roldos (2004); Günalp and Çelik (2006); Gündoğdu (2011) and Karabay and Okay (2012) are some of these studies. On the other hand, Aydoğan (1990); Süslü and Baydur (1999) and Yayla (2007) make research on the market power in Turkish banking sector by using concentration ratio while Korkmaz (2010) uses the Bresnahan Model developed in Shaffer (1989) and TBB (2012) the Bresnahan Model developed in Bikker (2003)[1].

The use of Bresnahan-Lau Model[2] that is the most robust method theoretically; the use of more recent (data for 2000-2013 period) data than Korkmaz (2010) with 14 observations and TBB (2012) with 40 observations; and the use of quarterly data (hence 56 observations) while others uses annual data make the study different in the literature and for the Turkish banking system.

2. MATERIAL AND MODEL DEVELOPMENT

Various methods utilised for the determination of market power can be collected under two main groups: structural and non-structural models.

In **structural models** concentration ratios play a central role. While doing it, the models establish a deterministic relationship between concentration and competition.

On the other hand, **non-structural models** base the estimation of competition on econometric models instead of concentration (Bikker and Haaf, 2000: 2-4). These econometric models generate different models according to the way they handle the subject.

The deterministic acceptation in structural models, has given its place to testable models over time. For example, the worldwide M&A in the banking sector experienced in recent years have decreased the number of banks and increased the concentration in the banking sector. This concentration increase has created two contradicting effects. On the one hand, the increased concentration has increased the market power of banks and hence the competition level in the market has decreased while increased concentration, on the other hand, has created economies of scale, decreased the cost of enterprises and increased their efficiencies (Casu and Girardone, 2006: 442). In short, M&A may generate an ambiguous process in the banking sector due to these two contradicting effects. Therefore, in order to determine which effect is greater the structural models based on theoretical discourses, hypotheses and acceptances are insufficient; so non-structural models based on New Empirical Industrial Organisation Theory (NEIO) are utilised. Because, structural models measure concentration through the concentration indices they utilise, that is they determine market structure and then, in accordance with their hypotheses assign the level of competition. However complicated market structure-competition level relationship causes these hypotheses to conflict. This difficulty has caused the creation of new hypotheses for explaining different situations[3].

These hypotheses trying to explain contradicting results, try to legitimate structural models on the one hand and indicate the weakness of the explanatory power of these models. This, in turn, has mediated the creation of non-structural models in the light of NEIO. Non-structural models are models that are built on a basic model and may differ because of their specifications. In this context, due to micro level data requirement and as it is not as developed as Bresnahan-Lau Model (Demirel, 2014: 114 and Perera et al., 2006: 792), Iwata Model has give way to other models. The firm (bank) level data requirement of Panzar-Rosse (PR) and its long term equilibrium assumption (and non-execution of the related tests) have made Bresnahan-Lau Model more preferable[4].

The most crucial advantage of Bresnahan Model is that in addition to the use of individual bank data, like Iwata Model, it can also use industry aggregate data (Shaffer, 1989: 321; Greenberg and

[1] For the periods examined and a summary of the results attained please refer to Demirel, 2014: 129-30.
[2] For a discussion on the differences, advantages and disadvantages, and the comparison of them please refer to Demirel, 2014: 57-129.
[3] For example, Hicks's "Quiet Life Hypothesis" (1935) and Demsetz's "Efficient Structure Hypothesis" (1974).
[4] For a comparison P-R Model and Bresnahan Model please refer to Shaffer 2004a: 298; Shaffer 2004b: 586-7; Aktan and Masood, 2010: 135, and Demirel, 2014: 123.

Simbanegavi, 2009: 14; Shaffer, 2001: 84). In other words Bresnahan Model may use both bank-specific (panel) and industrial (time series) data. Other advantages are the unbiasedness of market power parameter (λ) due to the model specification and the parameters, and that there is no obligation of equal market power among banks (Shaffer, 1993: 51, 53).

As an oligopolistic model, Bresnahan - Lau Model was first introduced by Bresnahan (1982) and Lau (1982), and afterwards developed by Bresnahan (1989).

Bresnahan (1982: 87-9) developed a model that attains the equilibrium market price and production level through the intersection of supply and demand curves. This development meets the expectation of Mason on the measurability of demand curve. In his study Mason (1939: 70) criticizes about the non-measurability of market demand with the then available knowledge, hence he criticizes that the relationship between market structure and price/competition/policy to be understood is estimated instead of being measured. At this point Bresnahan Model fills the gap that is indicated by Mason through the measurement of demand econometrically.

In the model while consumers are price takers, producers are divided into two groups: namely price takers (perfect competition) or non-price takers (imperfect competition or monopoly). Under these assumptions a typical demand function is identified as Q = D (P, Y, α) + ε. Here, Q, P, Y, and α represent the quantity, price, exogenous variable and demand parameters to be estimated, respectively. Supply function may differ according to whether producers are price takers or not. If the producers are price takers, then P = MC and P = c (Q, W, β) + ε; on the other hand, if the producers are not price takers (price is not equal to marginal cost) then MC = MR_p and P = c (Q, W, β) – λ h (Q, Y, α) + ε. In these equations W represents the supply side exogenous variables while β represents the parameters of supply function. As a result MR = P + h ( ) and MR_p = P + λ h ( ). In h ( ), there are the demand parameters (α) and exogenous variables (Y) as they affect MR (Shaffer, 1993: 51; Bikker and Bos, 2008: 32).

$$p^* + f'(Y)\sum_i \left(\frac{dY}{dY_i}\right)\left(\frac{1}{n}\right)Y_i - \sum_i \frac{w_i \frac{dX_i^*}{dY_i}}{n} = 0 \qquad (1)$$

In the equation above, if λ_i is redefined as $(dY/dY_i)/n = \left(1 + d\left(\sum_{i\neq j} Y_j\right)/dY_i\right)/n$, and if all the banks are assumed equal, then $\lambda = \lambda_i$ and equation 1 can be expressed as follows:

$$p^* = -\lambda f'(Y)Y + W \qquad (2)$$

W is the weighted input prices at the above equation. Here banks maximise their profits by equating their marginal costs (MC) and perceived marginal revenue (MR_p). Perceived marginal revenue is equal to demand price in competitive equilibrium and to industry's marginal revenue in collusion (Shaffer, 1993, 51; Claessens and Laeven, 2004: 567).

In empirical applications of the model usually demand function, Q = D (P, Y, α) + ε, and supply function P = c (Q, W, β) – λ h (Q, Y, α) + η are used and estimated simultaneously. After all, the model can be utilised as a short term model for the determination of market power of an average bank (i.e. any bank when all the banks are equal and identical) empirically. In the model the conjectural variation parameter ($\lambda = (1 + d\sum_{i\neq j}\frac{x_j}{dx_i})/n$ and 0≤λ≤1) is attained through the simultaneous estimation of market demand and supply curves based on the industrial time series data (Bikker and Bos, 2008: 32).

Here λ is a new parameter measuring market power. If **λ = 1**, it indicates a monopolistic market structure; if **λ = 0**, then perfect competition and if it is **between 0 and 1**, it means oligopoly. At Cournot equilibrium λ = 1/n. λ that indicates the level of market power is also an indicator of the relative deviation of the total level of output from perfect competition equilibrium (Shaffer, 1993: 51; Shaffer, 2001: 84; More and Nagy, 2004: 18).

In the model, under the assumption that in the market there are n banks supplying a homogeneous product, the profit function of the i^{th} bank, which is an average bank, is as follows:

$$\pi_i = Pq_i - c_i\left(q_i, EX_{S_i}\right) - F_i \qquad i = 1, \dots, n \tag{3}$$

Here, π, P, q, c, EX_S and F represent profit, output price, output quantity, variable costs, external variables that affect *marginal cost but not industrial demand function*, and fixed costs, respectively. n represents total number of firms while i, represents the values for the i^{th} firm.

The market demand function may be expressed as Marshallian or Hicksian demand function. The implicit forms of Marshallian and Hicksian (equation 4) demand functions are as follows, respectively:

$$P = f(Q, EX_D) = f(q_1 + q_2 + \cdots + q_n, EX_D) \quad and \quad Q = f(P, EX_D) \tag{4}$$

Here, EX_D represents the exogenous variables that *affect industrial demand function but does not affect marginal cost*. If the first derivative of equation 3 is taken for the profit maximisation of the i^{th} bank;

$$\frac{d\pi_i}{dq_i} = p + f^{'}(Q, EX_D)\frac{dQ}{dq_i}q_i - c_i^{'}\left(q_i, EX_{S_i}\right) = 0 \tag{5}$$

is derived. If the average of Equation 5 is taken for all the banks;

$$p + f^{'}(Q, EX_D)\frac{dQ}{dq_i}\frac{1}{n}Q - \sum_i \frac{c_i^{'}(q_i, EX_{S_i})}{n} = 0 \tag{6}$$

is derived. Therefore, the output price is equal to p as follows:

$$p = -\lambda f^{'}(Q, EX_D)Q + \sum_i \frac{c_i^{'}(q_i, EX_{S_i})}{n} = 0 \tag{7}$$

In equation 7, $\lambda = (\frac{dQ}{dq_i})/n = (1 + d\sum_{i \neq j}\frac{q_j}{dq_i})/n$. Therefore, λ is a function of the conjectural variation of the average bank in the market (Bikker, 2003: 5-6).

Conjectural variation coefficient is defined as the anticipated change in the outputs of the remaining banks in the industry when i^{th} bank alter its output quantity. Conjectural variation coefficient is used to find how changes in exogenous variables that alter the market share of an average bank in the model would affect the price and output quantity decisions of banks and hence their competitiveness. Therefore, the estimation of conjectural variation coefficient reveals the market structure under which the banks make decisions (TBB, 2008: 119).

As price equals marginal cost (P=MC) for the average bank under *perfectly competitive market*, λ=0 holds. Under perfectly competitive market, as prices are assumed to be exogenous for the firm, an increase in the output quantity of a firm, in line with equation 7, causes a similar decrease in other firms' outputs. The *Cournot equilibrium* describes non-cooperative optimisation when economic agents influence each other's actions without explicit cooperation. Under such equilibrium, the conjectural variation coefficient for the i^{th} firm ($d\sum_{i \neq j}\frac{q_j}{dq_i}$) would be equal to zero. Therefore, Cournot Model is based on the assumption that when one firm changes its output level, the other firms would not *retaliate*, hence λ=1/n. Under perfect collusion/cartel λ=1[5]. All the values of λ between 0 and 1 represent imperfect competition (Bikker, 2003: 6-7). The values close to zero indicate a market structure close to perfect competition, while values close to 1 refer to monopoly.

From this point of view, in order to construct an empirical model the functions revealing the demand and supply relations should be derived. In this context, a linear demand function may be defined with reference to equation 4:

[5] Under perfect collusion, an increase in the output of one colluder firm leads to a proportional increase in the output of all other colluders. Hence, $\lambda = \frac{1 + d\sum_{i \neq j}\frac{q_j}{dq_i}}{n} = \frac{1 + \frac{(q - q_i)}{q_i}}{n} = \frac{Q}{q_i n} = 1.$

$$Q = \alpha_0 + \alpha_1 P + \alpha_2 EX_D + \alpha_3 P * EX_D + \varepsilon \tag{8}$$

In the above equation; Q, P and EX_D refer to aggregate output level of the industry, market price and the vector of exogenous variables, respectively.

For the rotation and the shift of total demand function to occur, the interaction terms must be included into the model (Bresnahan, 1982: 91, Bikker, 2003: 11). Lau (1982) indicates that in order λ to be determined, (at least one) interaction term(s) should be statistically significant. On the other hand, if the number of exogenous variable included into the model increases, the number of interaction terms increases faster. For instance, when the number of exogenous variable is 1, the number of interaction term is also 1; however, if it becomes 2, 3 and 4, the number of interaction terms increases to 3, 6 and 10, respectively. On the other hand, as only 1 interaction term is adequate, in order for easiness, high degree of freedom and low multicollinearity problem, lower number of interaction terms, even only one interaction term is usually preferred (Bikker, 2003:11).

Following the specification of demand, the MC function should also be estimated for the model to be constructed. The MC function for the i^th bank ($c_i'\left(q_i, EX_{S_i}\right)$ in equation 5) can be specified as follows:

$$MC_i = \beta_0 + \beta_1 Q_i + \beta_2 EX_{S_i} + v_i \tag{9}$$

Here, Q_i and EX_S refer to output level and exogenous variables that affect *marginal cost but not industrial demand function*, respectively.

If the total demand function (equation 8) is rearranged; the following equation is derived:

$$P = \frac{1}{\alpha_1 + \alpha_3 EX_D}[Q - \alpha_0 - \alpha_2 EX_D - \varepsilon] \tag{10}$$

If both sides of equation 10 is multiplied with Q (P*Q=TR), then the total revenue equation is attained:

$$TR = \frac{1}{\alpha_1 + \alpha_3 EX_D}[Q - \alpha_0 - \alpha_2 EX_D - \varepsilon]Q \tag{11}$$

If the derivative of TR equation according to Q is taken, the marginal revenue (MR) equation is attained:

$$MR = \frac{dTR}{dQ} = \frac{1}{\alpha_1 + \alpha_3 EX_D}[Q - \alpha_0 - \alpha_2 EX_D - \varepsilon] + \frac{\lambda\, Q}{\alpha_1 + \alpha_3 EX_D} = P + \frac{\lambda\, Q}{\alpha_1 + \alpha_3 EX_D} \tag{12}$$

In equation 12, it is possible to divide MR into two as real MR and perceived MR (PMR) as aforementioned: $MR = P + h(Q, EX_D, \alpha)$ and $PMR\ (\lambda) = P + \lambda h(Q, EX_D, \alpha)$. Here λ is a new parameter to be estimated and h ( ) is the semi-elasticity of market demand ($\frac{Q}{dQ/dP}$). Therefore, λ represents how much do the firms would perceive the difference between demand and MR functions. The perceived MR is equal to demand price under perfect competition and so λ=0. On the other hand, the perceived MR is equal to industry MR under monopoly or perfect collusion and so λ=1 (Shaffer, 1993: 51).[6]

As the market equilibrium occurs at the point where MR and MC intersect the following equation can be derived:

$$P + \frac{\lambda\, Q}{\alpha_1 + \alpha_3 EX_D} = \beta_0 + \beta_1 Q_i + \beta_2 EX_{S_i} + v_i \tag{13}$$

If P is left alone in equation 13, the following equation can be derived:

$$P = -\lambda \frac{Q}{\alpha_1 + \alpha_3 EX_D} + \beta_0 + \beta_1 Q_i + \beta_2 EX_{S_i} + v_i \tag{14}$$

[6] From here on, instead of MR(λ), MR is used for convenience.

In this stage, in order the market power of an average bank, λ, to be determined, equations 8 and 14 should be estimated simultaneously. The simultaneous estimation of equations 8 and 14 would enable the measurement of the market power in Turkish banking sector. In this context, linear real total deposit demand (RTD) and interest rate for time deposit (ITD) functions are modelled as follows:

$$RTD = \alpha_0 + \alpha_1 ITD + \alpha_2 RGDP + \alpha_3 UR + \alpha_4 WBIR + \alpha_5 (ITD * UR) + \alpha_6 (ITD * WBIR) + \alpha_7 (ITD * RGDP) + \varepsilon \quad (15)$$

$$ITD = \beta_0 + \beta_1 RTD + \beta_2 RIE + \beta_3 RPE + \beta_4 DRIE - \lambda \frac{RTD}{[\alpha_1 + \alpha_5 UR + \alpha_6 WBIR + \alpha_7 RGDP]} + \nu \quad (16)$$

The explanations for all the variables used in the model are given in Table 1 below.

Table 1: Variables Used, Abbreviations and Methods of Calculation

	Variable
RTD	Real Total Deposits (Million TL)
ITD	The Interest Rate for TL Time Deposits up to 3 Month Maturity (%)
RGDP	Real GDP (Expenditure Method-1998 Prices-Million TL)
UR	Unemployment Rate (%)
WBIR	Weighted Bill-Bond Interest Rate (%)
RIE	Total Real Interest Expense
RPE	Total Real Personnel Expense
DRIE	Dummy Variable (for the periods 2001.1, 2001.4, 2006.3, 2008.4, 2012.1, 2013.4 it is 1 and for others it is 0)

Note: CPI represents Consumer Price Index (2003=100).

The total deposits utilised for the calculation of total real deposits (RTD); the interest rate for TL time deposits up to 3 month maturity (ITD); real GDP (RGDP); unemployment rate (UR) and weighted bill-bond interest rate (WBIR) are attained from the Electronic Data Delivery System (EDDS) of the Central Bank of the Republic of Turkey (CBRT). The data for ITD for the period 2000.1-2001.4 are attained from the Statistical Office of the European Union (EUROSTAT) and monthly data are converted to quarterly data; and the data for UR for the period 2000.1-2004.4 are attained from the "The Labour Force of Non-institutional Population by years and gender" Table of Turkish Statistical Institute (TSI). When weighting the WBIR data attained from EDDS, seasonal and real data are omitted and weighted averages of others are taken. The data for RIE and RPE are filtered from the statement of profit and loss tables of Turkish Banking Regulation and Supervision Agency (BRSA). The data is derived by filtering cumulative data, then they are adapted in order to attain quarterly data. RIE and RPE is the total of the sum of expenses in TL and foreign exchange (FX). Finally, those statements of profit and loss prepared in accordance with inflation accounting in the post-December 2001 period are used. The data for total deposits, interest expenses and personnel expenses are deflated with the CPI of TSI. In addition, a dummy variable (DRIE) is defined for the maximum extremes of RIE (1 for 2001.1, 2001.4, 2006.3, 2008.4, 2012.1, 2013.4 and 0 for others). In the empirical model, aggregated 3-month macro data for the period 2000-2013 are utilised for the banks (commercial, development and investment, and participation) operating in Turkey. Therefore, total number of observations is 56.

3. RESULTS AND DISCUSSION

The system consisting of the demand (equation 15) and supply (equation 16) equations are estimated by using BFGS (Broyden, Fletcher, Goldfarb, Shannon) algorithm that is the default Gauss algorithm (Altman et al., 2004: 67) and a non-linear two-Stage Least Squares (2-SLS) method with the Shazam software and the results attained are given in Table 2.

Table 2: The Results of Empirical Model

Variable	Coefficient	Std. Deviation	t-Ratio
Constant	439.14	37.35	11.758*
ITD	3,861.4	766.09	5.040*
RGDP	11.214	0.31677	35.403*
UR	4,558.7	417.07	10.930*
WBIR	-166.97	153.18	-1.090
ITD*UR	-138.4	49.278	-2.809*
ITD*WBIR	23.517	3.2022	7.344*
ITD*RGDP	-0.32501	0.039676	-8.192*
Constant	63.063	6.8926	9.149*
RTD	-0.000166	0.0000375	-4.420*
RIE	0.000651	0.0007207	0.903
RPE	-0.009189	0.0081628	-1.126
DRIE	-1.7095	2.632	-0.650
λ	0.10875	0.02283	4.764*

Note: * represents %1 significance level.

For the econometric validity of the result obtained it is necessary to check for diagnostic test statistics. In this context, the first statistics to be checked is the determination coefficient (R^2) which is the concordance between the observed values and estimated values and is 0.7954 for the demand relationship (equation 15) and is 0.8229 for the supply relationship (equation 16). Therefore, the observed-estimated concordance is quite satisfactory.

One of the most frequent problems for the econometric models using time series data is the autocorrelation. The existence of autocorrelation turns the confidence intervals based on t and F distributions, hypothesis tests and the coefficient of determination into unreliable statistics (Gujarati and Porter, 2009: 452; Gujarati, 2011: 97). Therefore, first of all, the model is tested for autocorrelation with Breusch-Godfrey (BG) method (Gujarati, 1999: 425-426). In this context, *as quarterly data is used* in the model, the autocorrelation test is performed with 4-lagged error terms and the LM test values for equation 15, representing demand conditions and for equation 16, representing supply relations are found to be 38.95 and 47.57, respectively. As these values are lower than the χ^2 critical value (63.1671) it is determined that there is no autocorrelation problem in the series, and error terms are distributed normally. The determination of the absence of autocorrelation in both models indicates that the t-values for the variables in the model are reliable.

According to the t-values obtained, 10 of the 14 variables in the model are found to be statistically significant at 1%. For the model empirically specified to be valid, the coefficients of the ITD in the demand equation and of the interaction terms (ITD*UR; ITD*WBIR and ITD*RGDP), namely α_1 and $\alpha_5, \alpha_6, \alpha_7$, should be statistically significant. In this context the coefficients of $\alpha_1, \alpha_5, \alpha_6$ and α_7 are statistically significant at 1%, as shown in Table 2.

According to the estimation results the coefficient of the interest rate for time deposits (ITD) in the demand equation (equation 15) is found to be 3,861.4. Therefore, an increase in interest rates would make time deposits more attractive, money demand would fall, savings would increase and hence time deposits would increase (Shaffer, 1993: 55; Bikker, 2003: 12). In this context, because of the positive relationship between ITD and RTD the expected sign of the coefficient of α_1 is positive. The coefficient that is found to be statistically significant at 1% has a positive effect on real total deposits (RTD), as expected. Since ITD and RTD are specified as % and million TL in the data set, a 1 unit (1%) increase in ITD would increase RTD by 3.86 billion TL. The elasticity of ITD is found to be 0.457 so increases in time deposit interest rates would cause less increase in time deposits, i.e. the effect of ITD on RTD is inelastic. Literature review also gives similar results. For example, in his study for Europe, Bikker (2003) finds the effect of time deposit interest rates on the quantity of deposits positive (the coefficient is 1.994) and statistically significant at 1%. Again, in their study on Hungary, More and Nagy (2004) explore positive (coefficient 18.366) and statistically significant (at 1%) relationship between interest rate and total deposits at the deposits sub-sector. Canhoto (2004) also determines a positive and significant relationship for the deposit sub-sector in Portugal.

Another variable in the demand equation is the RGDP, representing real gross domestic product. The coefficient of RGDP is found to be 11.214 that is statistically significant at 1% and has a positive sign as expected. As marginal propensity to save would increase due to increased national income or as investments would increase due to increased welfare a positive relationship between RGDP and RTD is expected (Shaffer, 1993: 55; Bikker, 2003: 12). Hence the expected sign of α_2 is positive. The elasticity of RGDP is found to be 1.16 so a 1% increase (decrease) in real national income would cause an increase (decrease) of 1.16% in real total deposits. Since the income elasticity of deposits is larger than zero, time deposits in Turkey are a normal good. The literature supports the relationship. For instance, in their studies Bikker (2003) and Canhoto (2004) determine positive relations between national income and deposits and the results are statistically significant at 1% and 5%, respectively.

The coefficient of unemployment rate (UR) is estimated to be 4,558.7 and found to be statistically significant at 1%. Yet, the effect of unemployment rate on total deposits is ambiguous as on the one hand high unemployment rate causes the risk to become unemployed and direct people to saving, but on the other hand increasing unemployment causes savings to melt. Because of these two contradicting effects (Bikker, 2003: 12) the expected sign of α_3 may be negative or positive. In the model the coefficient is found to be positive. That is, an increase in UR in Turkey causes an increase in total deposits due to an increase in deposits as a precaution against the risk of becoming unemployed. Nevertheless, there are studies in the literature that determine inverse relationships. For instance, in his study Bikker (2003) determine a negative and statistically significant (at 1%) relationship between unemployment rate and time deposits. This result indicates that in contrast with the precautious behaviour in Turkey, people in Europe use their deposits during unemployed periods.

For people time deposits are not the only option of saving/investment. As bills and bonds are the other options, they are the substitutes of time deposits. So, an increase in the return of bills/bonds would decrease the demand for time deposits. That is the expected sign of the coefficient of WBIR (α_4) representing the weighted rate of bills and bonds is negative (Bikker, 2003: 12) and is estimated as -166.97 in the model. Although the coefficient has the expected sign, it is statistically insignificant. A 1 unit (1%) increase in bill/bond interest rates would decrease real total deposits by 166.97 million TL. The literature supports the finding. For example, in his study Bikker (2003) determines a negative and statistically significant (at 1%) relationship between the interest rates for public securities and time deposits.

The rest of the demand equation contains interaction terms. As they (α_5, α_6 ve α_7) contain non-linear interactions, they may have negative or positive signs (Bikker, 2003: 12). The estimation results indicate that the coefficients of the interaction terms (ITD*UR, ITD*WBIR and ITD*RGDP) are -138.4; 23.517 and -0.325, respectively and have, in turn, negative, positive and negative effects on RTD. All the interaction terms are significant at 1%. Therefore, the model is theoretically valid.

If equation 16, representing the supply relations is examined, it is seen that the coefficient of real total deposits is found to be 0.000166. With an increase in total deposits, due to the law of demand, the interest that banks would pay for new deposits would fall, i.e. there is a negative relation between RTD and ITD. According to the model results, the coefficient (β_1) is found to be negative as expected and statistically significant at 1%. Accordingly, 1 unit (a million TL) increase in RTD decreases time deposits (ITD) by 0.000166%. In other words, when time deposits increase by 1 billion TL, time deposit interest rate would decrease by 0.17%. In other studies in the literature negative relations are determined between time deposits and interest rates. In their studies, Bikker (2003), More and Nagy (2004) and Canhoto (2004) find negative relations for European, Hungarian and Portuguese deposit markets, respectively.

Another variable in the supply equation is interest expenses (RIE). As items of MC, interest expenses (RIE) and personnel expenses (RPE) increase the costs of banks. Therefore, it is expected that they decrease the interest rate of time deposits paid by the banks (Bikker, 2003: 13). Hence, the expected signs of β_2 and β_3 are negative. According to the model results, the coefficient of RIE is not significant and does not have the expected sign. If the effect of RIE on time deposit interest rates (ITD) is examined, it is seen that a 1 unit (1 million TL) increase in interest expenses would increase ITD by 0.00065%. In other words, a 1 billion TL increase in RIE would raise ITD by 0.65%.

On the other side, although the coefficient of personnel expenses (RPE) has the expected sign, it is not statistically significant. It may be caused by the fact that RPE has a so low share in total expenses (on average 11.53%) and so its effect may be limited. In the literature, it is seen that there are studies determining negative or positive relations between personnel expenses and time deposit interest rates. For instance, while Bikker (2003) and More and Nagy (2004) determine negative relations between time deposit interest rate and wages, Canhoto (2004) finds positive and significant relations in some of the models in the study and negative and significant relations in other models in the same study.

Finally, the coefficient of λ, constituting the main goal of the study as it measures the market power is estimated to be 0.10875. λ indicates the relationship between total deposits and time deposit interest rate. As the quantity of time deposits that the banks collect (RTD) increases, the interest rate that the banks would pay (ITD) would fall. So there is a negative relationship between RTD and ITD. Therefore, the expected sign of λ is positive (because of the negative sign in front of it in the model) (Bikker, 2003: 12). Besides, theoretically λ should also be between 0 and 1. The coefficient estimated, 0.10875, is positive as expected; between 0 and 1 and statistically significant at 1%. As aforementioned, 0 represents a perfectly competitive market structure while 1 represents monopoly. In this context, the estimated value of λ, approximately 0.11, indicates that the deposits sub-sector in Turkey perform under imperfect competition. Although this market power coefficient represents that the banking sector in Turkey operates under imperfect competition, the current market structure is closer to perfect competition, not monopoly. This, in turn, can be interpreted as an indicator for monopolistic competitive structure of the banking sector in Turkey.

If the literature is examined in terms of market power, it may be seen that those studies on Turkish banking sector and using the Bresnahan model find quite distinct results. For instance, in the study of TBB (2012: 127-128), for the years 1970-2009, it is found to be 0.89 on average. On the other hand, if the examined period is divided, it is found to be 0.49 for the post-2000 period. In his study, Korkmaz (2010) estimates λ as 0.00896 for the period 1990-2008. The reasons of these distinct results are that the periods examined are different, the sub-sectors differ and the methods/specifications diverge. In this study, as quarterly data is used and a different model is specified the coefficient of market power differs from other studies' estimations.

If the literature on foreign countries is examined, it is seen that in his study on Italian credits sector Coccorese (2002) determines λ as 0.4182 and 0.3692 with two- and three-factor models. Therefore, it arises that the banking sector in Italy operates under imperfect competition. In his study on Portuguese deposit market Canhoto (2004) finds λ as 0.60 (the average of 12 distinct models). Hence deposit markets operate under imperfect competition also in Portugal. It is seen that in their study on credits sector in South Africa Simnabegavi et al. (2012) finds λ as 0. However, they interpret their model with caution as the reliability of their data set is a bit poor. Still they compare South Africa with a group of countries including Turkey. In another study, Bikker (2003) determines λ as 0 for the deposit market in Europe. So Bikker shows that the banking sector in Europe operates under perfect competition. Toolsema (2002) also determines λ as 0 for Dutch credit market, but the coefficient is not statistically significant. He also states that the perfect competition result may prevail only for credit sector but the banking sector as a whole may not operate under perfect competition.

The estimated market power coefficient, 0.11, and the monopolistic competition market structure for the deposits sub-sector in Turkish banking sector is compatible with the studies performed on Turkey and use the P-R Model. If these studies[7] are examined, it is seen that 8 studies out of 9 studies prepared for Turkish banking sector determine monopolistic competition. On the other hand, these studies should be checked for long term equilibrium. Consequently, the market power and market structure result obtained are largely consistent with the Bresnahan applications and even with other methods performed for Turkey and other countries.

4. CONCLUSIONS

In the study aiming to examine the competitiveness in Turkish banking sector in the period 2000-2013, the market power of the banking sector in Turkey is estimated to be 0.11 and the market structure is determined to be monopolistic competition. This, in turn, refer both to that the economic crises experienced and the restructuring process applied in Turkey has been turned into a success story and to a goal of less market power statistics in order to attain fever market power and higher competition in the sector.

The coefficient estimated (0.11) for the deposits sub-sector of banking in Turkey indicates a level of competition between the market power in developed countries where competition is harsh and the market power in those countries where competition is relatively low, banking related regulations and supervisions are weak and economy is unstable. This estimation result implies both a development for the banking sector in Turkey (increased competition) and a goal in order to have similar competition structure with developed countries.

The increase in competition attained in the banking sector is the result of the liberal transformation implemented in the post-1980 period and the re-structuring reforms applied after the 2000s. If this process is examined in detail, it is seen that in the background of this development there are various problems. In this context, during and following the liberalisation process, the high need of domestic borrowing, bad management of the process by some banks and bad intentions for abusing limitless deposit protection have caused serious bottlenecks and crises in Turkish economy. The 1994, 2000 and 2001 crises have had serious economic and social costs. Among these costs, recession, decrease in the trust in the banking system, the costs of bank and firm bailouts/mergers/liquidations, and negative effects of the crises on firm owners and their families may be considered.

In order to overcome this process in the post-2000 period, Turkey has applied various programs, particularly Disinflation Program, Transition to the Strong Economy Program, banking Sector Restructuring Program and Financial Restructuring Program (İstanbul Approach). These programs are the top players in attaining the success story. On the other hand quite high costs of these programs should be kept in mind. In total $47.2 billion has been spent but only 45.27% of this cost can be recovered. If this figure is compared with developed and even developing countries, it is seen that Turkey had to bear a tremendous cost and this cost could be decreased with a better management of the process.

Despite all these problems, the restructuring process has reconstructed the trust into the banking sector in Turkey, has furnished the growth of banking sector, has increased strength against crises, has turned the transparency into the basic principle and has turned the banking sector into one of the best operating sector in Turkey. With these new structure and 49 banks in competition, Turkish banking sector is the basic sector supporting the operability of the economy through bringing those having fund surplus and fund gaps together, reinforcing and increasing the investments. With such features the sector is not a locomotive but the network of railways on which all the sectors operate.

[7] For the studies and their results please refer to Demirel, 2014: 129-130.

On the other hand, 0.11 still indicates some market power and this ratio is higher than those in developed countries; hence the level of competition in Turkey is relatively lower. Low level of competition implies high profitability in the sector and a growth potential of the sector in Turkey. The growth of banks means decreasing costs due to economies of scale, increasing efficiency and competition, and hence decreasing market power and profitability. In a banking sector following this process, it is obvious that market power would fall. At the end of this process the ratios to be attained would be the ones that today's developed countries have. Therefore, the market power coefficient (0.11) of Turkish banking sector signals a competition level to be increased. The increase may be attained not only with the increase in regulation and supervision but also with the economic growth and its results such as the transformation of production and consumption, and the increase in savings.

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