Determinants of Net Interest Margins in Turkish Banking System: A Panel Data Analysis

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Abstract

This study aims to investigate the determinants of net interest margin within the Turkish banking system and to determine their effects on the banking sector.The econometric study has been carried out with macroeconomic data and quarterly financial data of 23 banks with state-owned, privately-owned and foreign banks that are operating between 2003 and 2015. Panel data analysis was used and results were evaluated together with the survey conducted before the study. The results show that the net interest margins of banks started to decrease especially after the crisis of 2009 and the effect of non-interest income and operational costs on bank profitability has increased.

Keywords: Turkish Banking Industry, Net Interest Margin, Panel Data Analysis, Dealership Model.

JEL Classification: G21, G10, L11

Türk Bankacılık Sisteminde Net Faiz Marjı Belirleyicilerinin Tespit Edilmesi: Panel Data Analizi

ÖZ

Çalışma, Türk Bankacılık sisteminde net faiz marjı belirleyicilerinin tespit edilmesini ve bankacılık sektörü üzerindeki etkilerini araştırmayı amaçlamaktadır. Ekonometrik çalışma, Türkiye'de 2003-2015 yılları arasında sürekli olarak faaliyet gösteren kamu, özel ve yüzde yüz yabancı sermayeli toplam 23 bankanın çeyrek dönem mali verileri

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ve makro ekonomik veriler ile gerçekleştirilmiştir. Çalışmada panel veri analizi yöntemi kullanılarak sonuçlar, ekonometrik analizden önce sektör temsilcileri ile yapılan anket sonuçları ile birlikte değerlendirilmiştir. Sonuçlar göstermektedir ki; 2009 krizinden sonra bankaların net faiz marjları azalmaya başlamış, faiz dışı gelirler ile oparasyonel maliyetlerin banka karlılığı üzerindeki etkisi artmıştır.

Anahtar Sözcükler: Türk Bankacılık Sektörü, Net Faiz Marjı, Panel Veri Analizi, Tacir Modeli

JEL Sınıflaması: G21, G10, L11

1. Introduction

The banking sector in Turkey is one of the most important parts of the financial system as in the other developed and developing countries. This is due to the intermediary function of the banks whose main task is to bring funders and fund demanders' needs at the same point. In developing countries, banks are indispensable because they are the most important sources of funding for the economy. In Turkey, 1.73 trillion TL of the GDP, which is realized as 2.58 trillion TL in 2016, was financed by bank loans. The asset size of the banking system was realized as 2.86 trillion TL in the same year, this is also 105% of GDP. Realized financial figures reveal the importance of the banking system in Turkish economy.

Regulations in the banking system emerged as a consequence of the domestic and foreign financial crises that were experienced especially after the 1980s. The financial crises which occurred in November 2000 and February 2001 are the most significant banking crises directly resulting from the banking system but also targets entire economy in Turkey. Even if there were different sources of the financial crises in 2000 and 2001, banking system's poor equity structure, bad asset components, and fraudulent management decisions played an important role on that the crisis' growing and spreading throughout the economy. In the following periods, the necessity of rehabilitating the banking system occurred in order to protect the economy from similar effects thus the "Banking Sector Restructuring Program" entered into force in May 2001. In November 2005, the Banking Law No. 411 and various regulations were enacted at a later date, in this way surveillance and audit activities in the banking system were expanded.

In the banking system, which gained a healthy appearance in the following years, profitability and efficiency level increased, and as a result, foreign capital inflows increased. Between 2002 and 2011, many domestic banks were sold to international banking chains or partnership agreements were signed. The banking system crisis, which started in 2008 with subprime mortgage loans in the United States, adversely affected the entire World economy. The impact of the crisis spread to other developed countries in a short period of time, especially in Europe, which had adversely affected the banking system for many years. Compared to other developed and developing countries, the impact of the crisis was limited in Turkey, and it did not cause any structural problems except for the narrowing of the loans. This robust structure seen in the Turkish banking system is interpreted as a positive result of 2001 and 2005 banking regulations.

Heavy destruction caused by the weak banking system in the economy in 2000 and 2001 crises, and robust posture of Turkish Banks compared to other developing country banks in 2008-2009 crises, revealed indispensable importance of a strong banking to the economy. Banks are profit making institutions as well as its basic intermediary functions. The intense technological developments experienced by the banking system in recent years, intense competition caused by acquisition and mergers brought by financial liberalization, structural regulations for consumer rights, reduce the banking income and put pressure on the profitability of the banks.

All these developments increase the number of the research aiming to determine the profitability and determinants of it in the banking system. While using many parameters and calculations in determining the profitability of the bank, one of the most important and frequented way of them is to determine the net interest margin. The net interest margin in banks is calculated by dividing the difference of interest expenses and interest income, into the total assets of the bank or only the interest-earning assets.

The net interest margin in the banks, which are the primary function to undertake intermediary functions between funders and fund seekers, is a performance indicator of the basic banking activities. Net interest margin at the optimum level; both determines the continuity of the bank as an enterprise as well as features the basic financial and social cost of the economic system because it constitutes the basic financing cost.

The determination of net interest margin has been examined by Ho and Saunders in 1981 for the first time in the economic literature. In the following years, the net interest margin was calculated by many economists as the most important parameter of profitability in banks and other financial institutions. Since NIM is one of the determinants of profitability in banks, it has been the subject of research as an independent variable in the analysis of income and profitability. The main reason for the increase in the researches to identify the determinants of the net interest margin in recent years is the direct and significant effect of the net interest margin on the profitability of the bank.

Many models have been developed for determining the net interest margin; these can be divided into two parts as the Dealership model and the Microeconomic Banking Firm model. The most research topic among related models is Dealership model suggested by Ho and Saunders (1981). The Dealership Model was developed in the following years, with the most striking contributions; Angbazo (1997), Maudos and Guevara (2004), Valverde and Fernandez (2005). The Banking Firm model is also enriched by Wong (1997).

In this study, determinants of the net interest margin are based on the Dealership model and the researches of Maudos and Guevara (2004), Angbazo (1997), Valverde and Fernandez (2005) and Wong (1997) are adapted to Turkish banking sector. The regression model, established by following the literature, was tested with dynamic panel data methods in order to identify the determinants of the net interest margin. Empirical study includes the quarterly data of 23 commercial banks operating in Turkey between 2003 and 2015 continuously. All nominal values used in the analysis have been adjusted with 2003 prices. The banks, included in the study are three groups; state-owned banks, foreign banks and privately-owned banks. The reason for the division of data into groups in this way is to determine the factors more accurately in relation to bank ownership.

In the research, one-to-one interviews were conducted with the treasury department managers of three banks from public, private and foreign banks; answers were made about which factors affect NIM. The responses obtained were used in the selection of the variables used in the model and to determine the compatibility between the literature and the application.

Studies on determination of net interest margin in Turkey have been included on a large-scale in profitability or productivity studies, unfortunately independent studies are limited. In Turkish banking literature, Yasemin Türker Kaya (2002), Hakan Atasoy (2007), Fatih Kansoy (2012), Gamze Göçmen (2005) and Ahmet Uğur and Hakan Erkuş (2010) examined NIM as a dependent variable.

By analyzing the net interest margin and determinants, it is aimed to give the parties a perspective that is centered on cost and profitability for the functioning of the Turkish commercial banking system. The parties to the study are bank managers, sector representatives, appraiser institutions, financial consultancy centers, investment institutions, brokerage houses, the Central Bank, the BRSA and other regulatory agencies and individual investors. It is aimed to determine how the commercial banks manage their net interest margins and what factors are effective on the net interest margin values especially after the reorganization of the banking system 2001 - 2003 period in Turkish banking system.

2. Literature Review

The first theoretical study to investigate the factors that determine interest margins was carried out by Ho and Saunders in 1981. Ho and Saunders; models as an extension of the Hedging Hypothesis and the Expected Utility Approach. This model, called the Dealership Model, became a reference model over time in understanding the determinants of the bank's net interest margin. In their work in 1981, Ho and Saunders tested the Bank Net Interest Margin determinants with a two-stage regression model using the three-month balance sheet and income table data of 197 commercial banks operating in the US between 1976 and 1979.

In the first step, Net Interest Margin is tested with bank-specific variables. The bank's specific variables include the ratio of non-interest assets to total assets, the capital ratio, and the ratio of non-refundable loans to total assets. The constant obtained from the regression in the first step is the measure of the "theoretical interest margin" (Pure Spread) for that country's banking system. In the second stage, the constant has an effect on the determinants of the theoretical interest margin of the market structure. Bank-specific variables affecting net interest margins are; the level of the operational expenses of the bank, capital, mature credit provisions, collateral and liquid assets, implicit interest payments, opportunity costs of provisions and default premium.

In the dealership model it is assumed that a bank is a dealer who acts as an intermediary between borrowers and funders at different times in the credit market and who avoids risk. In the model, banks regulate interest rates to balance the asymmetrical timing of credit demand and deposit supply. The most important factor that influences the size of the bank's interest margin in the model is the uncertainty of the transaction caused by the asymmetric timing of the demand for the deposit and the demand for the loan. Due to the relatively inflexible supply of credit demand and deposits, banks prefer to set high-interest margins using market forces. Banks take their deposits at random intervals and then use these funds to meet randomly incoming credit demands. The "pure spread" between the loan and deposit rates is the price of the risk arising from the uncertainty of the bank's loan and deposit demands.

According to the results of Ho and Saunders (1981); Net Interest Margin of banks directly is related to the risk aversion of the bank, the size of the bank's assets, the market structure of the banking sector, and the volatility of credit and deposit interest rates. The main criticism of the model proposed by Ho and Saunders (1981) is its failure to see the bank as a firm with a specific production function associated with the fulfillment of intermediary services. The existence of cost inefficiency associated with the production process between the banks has a detrimental effect on the net interest margin.

Dealership Model has been expanded over time by including cross elasticity of demand among bank products by Allen (1988) and the default risk by Angbazo (1995). In the following years, it was also developed by Saunders and Schumacher (2000), Brock and Suarez (2000), Drakos (2003) and Doliente (2005). The Dealership model was recently developed by Maudos and Guevera (2004). The expanded dealership model partially meets criticism by adding the role of operational costs and providing a detailed description of the relationship between risk and margin.

Another alternative approach to the work on the net interest margin is based on the original Firm Theoretic Model of Klein (1971) and Monti (1972). This model is a static model of which the supply of deposits and the demand for credit are exchanged simultaneously in the market. How interest margin will be optimally determined and how it will be adapted to the changes in the banking sector has been formulated on the basis of the microeconomic banking firm theory. The aim of the model is to

determine the optimal bank interest margin and the factors affecting this margin within the microeconomic firm theory. The model predicts a bank that avoids the risks however exposures to credit risk and interest rate risk. Credit risk exists because the banks are facing non-payment of the loans. Banks do not know in advance how much of their loans will be repaid (Kit Pong Wong 1997) Interest rate risk is the result of the funding of fixed rate loans partially with deposits have variable interest rates and maturity mismatching.

Zarruk (1989) presented the theoretical model of Net Interest Margin for a banking firm that maximized the expected profits. Under the assumption of risk avoidance, it is shown that the interest margin of a bank rises depending on the size of the bank's capital and reduction of the fluctuation in deposits. Higher capital amount leads to increase in bank interest margins. At the same time, the model shows that the deposit insurance premium will not necessarily lead to an improvement in the asset quality of the bank (Zarruk 1989). Zarruk and Madura (1992) showed that the level of deposit insurance, capital adequacy and increased credit losses had negative effects on the net interest margin in the circumstances of uncertainty arising from credit losses (Zarruk and Madura, 1992). Angbazo (1997) developed similar theoretical and empirical models with a data set consisting of banks operated from 1989 to 1993. Angbazo added credit risk to the NIM model under the assumption of microeconomic banking firm theory. For US commercial banks, NIM has also found a function of default and interest rate risk (Angbazo 1997).

Wong (1997) similarly expanded the original work by including many uncertainty sources. Wong has obtained a number of comparative statistics under reasonable assumptions about the bank's lending preferences. The findings helped to understand that optimum net interest margin was related to the increase in market strength, the increase in operational expenses, the increase in credit risk, and the increase in interest rate risk. The results are largely supported by the empirical evidence on bank interest margin behavior by Ho and Saunders (1981), McShane and Sharpe (1985) and Angbazo (1995). Empirical studies showed the Dealership Model and Microeconomic banking firm model reached the same results even though the two models used different methods.

2.1. International literature on NIM

Another study comes into prominence in the literature after Ho and Saunders (1981) is the regression analysis conducted by Angbazo in 1997. The study attempted to identify the determinants of interest margins for different American commercial banks between 1989 and 1993. In the study, Angbazo tested the hypothesis that banks with higher credit risk and higher exposure to interest rate risk would seek higher interest margins. Angbazo expanded the Ho and Saunders (1981)'s Dealership Model by adding credit risk, interest rate risk and the interaction between these risks into the model. Some of the variables used in determining the interest rate margins in the model are; Credit Risk, Implicit interest payments, interest rate risk, Lerner Index (LI is the direct indicator of market power), Operational costs, Opportunity cost of provisions and Bank Capital (BC: At the same time, it is also a sign of risk aversion.)

Angbazo demonstrated that net interest margins are positively affected by credit risk during periods of increased risk, by the way these effects vary depending on the scale of the banks. Interest margins of large-scale banks operating intensively in the money market are more affected by credit risk. In the study, it was also found that default risk, leverage and management quality had a positive effect on the net interest margins of the banks.

In 1999, Demirgüç-Kunt and Huizinga conducted the first cross-country Panel Data Study, using the banking system data of eighty developed and developing countries, covering 1988-1995. Demirgüç-Kunt and Huizinga (1999) applied a one-step regression technique with a dependent variable and a number of explanatory variables of the net interest margin. The results showed that bank taxation and regulatory variables, financial structure variables and legal and institutional variables determined bank profitability and net interest margins in addition to the bank specific characteristics.

Demirgüç-Kunt, Laeven and Levine (2004), in their studies analyzed the impacts of banking regulations, market concentration and inflation on NIM using data of 72 countries and over 1400 banks from different development levels between 1995 and 1999. It was shown that the banking regulations, market concentration rate and inflation in the banking sector positively affected interest margins and general expenses. Aliaga-Diaz and Olivero (2005) used the quarterly data from

1979 to 2005 to examine the US banking sector's net interest margins against conjunctival macroeconomic movements. In the period, they found that the bank liquidity level, capital amount and asset size of large banks to total banking sector asset size were significant influences on NIM during conjunctival movements.

Saunders and Schumacher (2000) used the dataset of six European countries between 1988 and 1995 to analyze the effects of the deposit interest rate constraints, the ratio of required deposit reserves, capital to assets ratio and the interest rate fluctuations on NIMs of banks. A two-stage regression model was applied in the study following Ho and Saunders (1981). It has been determined that the variance of interest rates on deposits, required reserve ratio, capital to total assets, implicit interest payments, opportunity costs, market power and interest rate variability are all related to net interest margins. The results of Saunders and Schumacher showed; more segmented or restrained banking sector increase the monopoly of existing banks and lead to higher interest spreads.

Maudos and Guevara (2004), added the operational costs to the original Dealership model (Ho and Saunders,1981). They analyzed the determinants of net interest margins of the European banking sector (Germany, France, UK, Italy and Spain) using a one-step panel data estimation method instead of the two-step regression method and included the Lerner index values as an indicator of direct competition in the industry. The results showed that the Lerner Index (LI), Opportunity Cost (OC), Risks Avoidance Scale (RA), Internal Rate of Return (IRR), Loan Risks (CR), Implied Interest Payments (IIP) had a positive relationship with net interest margins. The results are consistent with the Dealership model. On the other hand, Quality of Management (QM) and Transaction Volume were found to be negatively related to the net interest margin. Contrary to the past studies, there was no statistically significant effect of the opportunity cost of deposits on interest margins. Maudos and Guevara found that the operational costs had a statistically significant effect on NIM. In particular, banks with higher average operational costs apply higher net interest margins to cover transaction costs.

Drakos (2003) measured the effectiveness of banks by taking the data of 283 banks from Eastern Europe countries between 1993 and 1999. Net Interest Margin was selected as an efficiency indicator. Two-step regression analysis was applied to the study. In the study; capital

ownership of banks, liquidity risk, non-payment risk for loans, interest rate risk and leverage ratio variables on the interest margin are tested. Drakos found that the NIM had fallen considerably after the transition to the free market economy in Eastern Europe. It emphasizes that state-owned banks started to apply substantially lower margins, which is a sign of the inefficiency of past implementations.

In 2005, Valverde and Fernandez examined the effects of market power on net interest margin under different bank specializations using the bank data from seven European countries (Germany, Spain, France, Netherlands, Italy, UK and Sweden) between 1994 and 2001 years. Catao (1998) in his study, used banking data from 1992 to 1997 in Argentina to analyze the high-interest margins related to tax rate, required reserve costs, operational costs, non-performing loans, exchange rate risk and market structure. Brock and Rojas-Suarez (2000) in their study that covered the years between 1988 and 1997 for seven Latin American countries (Argentina, Bolivia, Chile, Colombia, Mexico, Peru and Uruguay), found the capital-to-asset ratio had no effect on interest margins but the liquidity ratio and cost ratio each of them was found to be positively correlated with the net interest margin. They also implied that high operating costs, growth in non-performing loans and macroeconomic conditions raised interest margins.

Khediri and Khedhiri (2011) analyzed the determinants of net interest margin for Tunisian banks in 2011 using the fixed effect method and panel data set. The results showed that operational costs, opportunity cost of reserved deposits, implicit interest payments and bank capital affected net interest margins on a large scale and positive direction, management quality also largely affects margins in a negative direction. Allen (1988) developed the original Dealership Model by added heterogeneous loans and deposits to the model, and suggested that the pure spread could be reduced as a result of product diversification. In the model, net interest margins were found to be positively correlated with default risk, core capital, management quality, but negatively correlated with liquidity risk.

2.1. Turkish Literature on NIM

Yasemin Türker Kaya (2001) analyzed the determinants of net interest margin in the Turkish banking sector for 1986-2000 years by used the differential data between monthly ex-ante loan and deposit interest rates in the study conducted for BRSA in 2001. The ratio of the

total assets of the sector to the amount of M2 money supply used as a proxy for the bank sector's depth and competitiveness and was found negatively correlated with NIM, the current account balance variable was positively correlated with NIM, the ratio of securities to total assets and the tax variable were positively correlated with BNIM. In 2002, Kaya examined the determinants of the Turkish banking sector's three profitability measures (NIM, ROA, ROE) using the panel data set of 44 banks from 1997 to 2000 quarterly. In the work, original two steps dealership method was conducted and it was found that the bank-specific and macroeconomic variables affected the profitability measures. In the first stage, NIM showed a negative and statistically significant relation with bank-specific variables such as equity, liquidity, personnel costs and the share of the bank in the sector and showed positively relation with the ratio of deposit to total asset size. In the second step, the constant coefficients from the regression analysis in the first step were taken as the pure NIM values and were associated with macroeconomic variables. Pure NIM was statistically significant and positively correlated with the macroeconomic variables used in the regression such as inflation and public debt balance.

Hakan Atasoy (2007) studied the determinants of NIM and profitability in the Turkish banking sector using the annual panel data set and from 1990 to 2005. In his study, three different sets of explanatory variables; bank-specific, macroeconomic and financial structure variables were used. Panel data regression results of Atasoy showed that equity, provision expenses, size of the assets and the non-interest expenses from the bank-specific variables, were positively related to NIM, however fixed assets was negatively related to NIM. Inflation from the macroeconomic variables positively affected NIM besides the growth rate affected negatively. The concentration ratio and the ratio of the Istanbul Stock Exchange (ISE) market value to the national income from the financial structure variables were found negatively correlated with NIM. Fatih Kansoy (2012) studied the variables considered to affect net interest margins in the commercial banking system taking into account ownership structure. The quarterly data set was used in the study between 2001 and 2012. According to the study results; transaction diversity, credit risk and transaction costs are the most important variables affected the interest margin. Price stability and bank productivity have been found to have a negative effect on the interest margin. Credit risk, bank size, market structure and inflation variables have different effects

on the net interest margin depending on the ownership structure of the bank. The determinants such as implicit interest payments, transaction diversification and transaction costs are independent of the bank's ownership structure. Ahmet Ugur and Hakan Erkuş (2010) also studied the determinants of net interest margin in Turkey. A two-stage regression model of Ho and Saunders (1981) was applied in the study. The results of the panel data analysis showed that the bank's market share and the quality of management were positively correlated with the negative direction, operational costs, risk avoidance level and the bank's margin with the net interest margin. It was also found that foreign banks had higher net interest margin. In the second stage, the theoretical spread (pure spread) was regressed by macroeconomic variables. The results of the regression showed that only the inflation rate was significant in explaining the theoretical spread.

2.2. Banking Sector in Turkey

In Turkey Banking Sector totally 52 banks were operating as of December 2015. 34 of 52 banks were deposit banks, 13 of them were development and investment banks and the rests were participation banks. 5 of the deposit banks were state owned, 9 were privately-owned and 21 were foreign-owned banks. The number of banks operating under the Savings Deposit Insurance Fund was 1. In 2016, Vakıf Participation Bank Inc. was established to operate in the field of Participation Banking, and the number of participation banks increased to 6. When the net interest margins of banks in the banking sector are examined in the last five years, it is seen that the interest margin, which has increased to 5.44% in 2012, has decreased to 4% by the end of 2015. Interest-bearing assets, which grow faster than interest income, have a significant effect on it. Factors affecting the interest margin will be tested through the econometric model. The decline in the net interest margin negatively affects the net profitability of the banks.

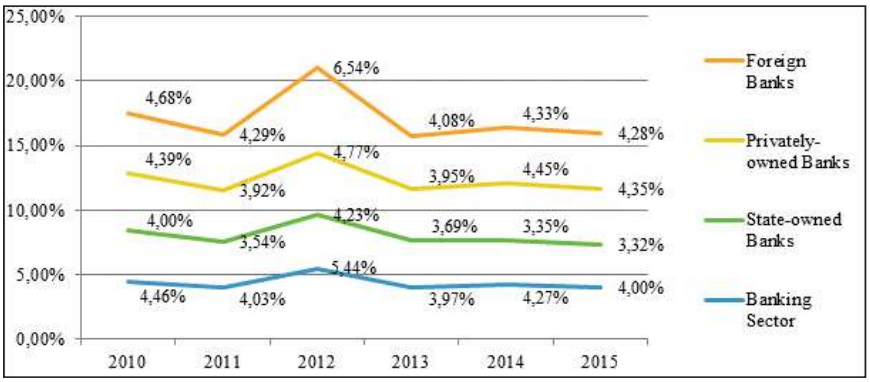

Chart 1: Net Interest Margins in Banking Sector (Source: TBB,BDDK)

One of the most important reasons for the decline in profitability in the banking sector in 2015 is the increase in non-performing loans. According to the data of 2015, the ratio of non-performing loans to total loans increased by 0.3%. The NPL ratio of private sector banks increased from 2.4% to 2.8% and foreign-owned banks to 4.4% from 4.1%. NPL ratio of state banks remained at the same level. In the last five years, there has been a steady decline in non-interest income in the banking system. While the ratio of non-interest income to assets in 2010 was 2% for the whole sector, in 2015 the ratio decreased to 1.2%. The banks most affected by the decline in the non-interest income are domestic private banks. Non-interest income of private banks, which was 2.5% in 2010, decreased to 1.3% in 2015. The most decisive cause of the decline in non-interest incomes is the BRSA's regulations which restricting non-interest income of banks and the decisions made by consumer arbitration committees over the last five years against banks.

3. Empirical Model

Empirical model to be used in order to determine the NIM in Turkish Banking System is based on the theoretical structure of the Dealership Model which introduced by Ho and Saunders (1981), then enriched by Angbazo (1997), Maudos and Guevara (2004) and Valverde and Fernandez (2005) and Microeconomic Banking Firm Model lastly enriched by Wong (1997).

There are two empirical approaches derived from the original Dealership Model of Ho and Saunders (1981). The first one is the single-step approach and the second one is two-step approach. Most of the

econometric studies have implemented the single-step dealership model because of their simplicity. Among these McShane and Sharpe (1985) and Angbazo (1997) have significant contributions to the literature.

The two-step approach involves a two-step regression analysis. The first step controls the effect of the variables explaining the net interest margin. In the first step, bank-specific internal factors are often used to explain the NIM. The result obtained from the first step, the constant term of the regression analysis, gives the theoretical margin (pure margin). In the second stage, the relationship between the variables presented in the theoretical model and the theoretical margin (pure margin or pure spread) is analyzed. Maudos and Guevara (2003), Ho and Saunders (1981) and Saunders and Schumacher (2000) used two-step regression analysis in their studies.

According to Maudos and Guevara (2003), a two-stage approach is the best result when there is sufficient time-series length to predict the theoretical margin. Ideally this period is between 10 and 20 years. For this reason, two-stage method has been recommended to be used with caution. In econometric models based on the microeconomic banking firm model, a one-stage regression model is applied. Considering the microeconomic banking firm model and the Dealership Model to reach similar results with different methods, the Dealership Model which is more widely used in the literature is taken as a basis in our study. The model is estimated by single step regression analysis considering the time series length. On the basis of the model we use in the empirical study there is the assumption that all banks operating as sellers in the credit market are the economic units such that are risk avoided and rationally managed. There is only one term which banks can set interest rates without issuing credits and collecting deposits at the beginning of previous period.

Since the Bank is obliged to meet deposit offers and credit requests coming in at different times, the Bank, should be optimally adjusted the Loan interest rate (rL) and deposit interest rate (rD) to minimize the borrowing cost from money market and interest rate risk arising from excessive loan demand or insufficient deposit supply. The interest rates set by the bank include a certain margin according to the money market interest rate "r".

$$rD = r - a \tag{1}$$

$$rL = r + b \quad (2)$$

Here, "a" is the negative margin used in determining the deposit interest rate according to the money market interest rate, and "b" is the additional margin used in determining the loan interest rate according to the money market interest rate. Accordingly, interest margin or spread "S" is determined as follows.

$$S = rL - rD = a + b \quad (3)$$

This margin or spread is intended to cover the credit and interest rate risks that the bank has exposed. In other words, it functions as collateral.

The bank's initial wealth is the remaining assets after deducting its liabilities. Bank's assets are Loans and Net money market assets, Bank's liabilities are its deposits. This equation is shown below.

$$W0 = L0 - D0 + M0 = I0 + M0 \quad (4)$$

L0 = Initial Loans

Do = Initial Deposits

I0 = L0 - D0 = Bank's net credit inventory.

M0 = Net money market assets at the beginning.

The strong point of this model, developed by Maudos and Guevara, is to include the production costs incurred during the intermediary process between loan and deposit in the model. Ho and Saunders (1981) neglected this production level. Thus, the model incorporates the factors that microeconomic firm models predicted into the process.

The operating costs of the bank depend on the deposits collected (C (D)) and the loans provided (C (L)). Thus, the net credit inventory can be expressed as follows.

$$C(I) = C(L) - C(D) \quad (5)$$

Maudos and Guevara have created the bank's optimization problem as follows, assuming deposits and loans are obtained according to the following Poisson Process:

$$Pr_D = \alpha_D - \beta_D a \text{ ve } Pr_L = \alpha_L - \beta_L b \quad (6)$$

The problem of the bank's optimization can be written as;

$$W_T = (1 + r_{I+} Z_I) I_0 + M_0 (1 + r + Z_M) - C(I_0) \quad (7)$$

$Max_{a,\beta}$ EU (ΔW) = ($\alpha_D - \beta_D a$) Δ EU(W_D) + ($\alpha_L - \beta_L b$) Δ EU(W_L)

EU (ΔW): Bank's expected maximum utility.

When taken "a" and "b" from the equation aiming to maximize the assets of the bank, the optimum margin or spread is formulated as follows.

Spread (s) = $a + b$ = ½ * [(α_D / β_D) + (α_L / β_L)] + ½ * [(C(L) / L) + (C(D) / D)] –

¼ * [U''(W) / U'(W)] (L + 2L_0)+ (L+D)+2(M_0 – L) (8)

The variables included in the model proposed by Maudos and Guevara were added to the following variables used by Angbazo (1997), Valverde and Fernandez (2005) and Wong (1997).

1) Fees and Commission Income - FCI
2) Liquidity Risk - LR
3) Currency Risk - VOLCUR
4) Inflation - INF
5) Growth - GDP

In the empirical part, 15 variables are used in the model and the empirical model to be estimated is as follows.

$$NIM_{it} = C_i + \beta_1 FCI_{it} + \beta_2 OC_{it} + \beta_3 EQUITY_{it} + \beta_4 CR_{it} + \beta_5 SIZE_{it} + \beta_6 IIP_{it} + \beta_7 RESERVES_{it} + \beta_8 QM_{it} + \beta_9 LR_{it} + \beta_{10} HHI_{it} + \beta_{11} VOLINT_{it} + \beta_{12} CBINT_{it} + \beta_{13} VOLCUR_{it} + \beta_{14} INF_{it} + \beta_{15} GROWTH_{it} + \varepsilon_{it}$$

Net Interest Margin - (NIM)

The net interest margin is defined as the ratio of the difference between the interest income and the interest expenses to the interest-earning assets. This equality also reflects the productivity of the bank. This difference between the bank's brokerage income and the cost of its output includes information about the bank's pricing policy, financial structure, investments, asset/liability management, the structure of the industry and the risk management structure.

Independent Variables

A) Bank-Specific Internal Variables

Internal variables are bank-based factors that appearing the bank's balance sheet, income statements, other financial indicators and performance.

1) Implicit interest payment - (IIP): IIP is defined as the ratio of operational costs of non-interest incomes to total assets. Due to competition in the market, banks also make hidden payments to the depositors such as the free issuance of some services, apart from the interest payments. It is expected that implicit interest payments and net interest margin will be in a positive relation.

2) Operational Costs - (OC): Operational costs variable, which gained significant weight with Wong in the microeconomic banking firm model, was first shown in the theoretical model by Maudos and Guevara (2004) in the Dealership Model. In our study, operational costs are defined as the ratio of the operational costs to the total assets, and a positive relationship is expected with NIM.

3) The opportunity cost of required reserves - (RESERVES): Required reserves are deposits held at the central bank in order to meet deposit demand of depositors. The opportunity cost of required reserves is calculated as the ratio of the total assets of the required reserves held in the Central Bank. A positive relationship is expected between the required reserves and the NIM.

4) Credit Risk – (CR): It is defined as the ratio of the provisions, set aside for the non-performing loans to total loans. The lending function of the banks exposes the banks with the risk of non-repayment. For this reason, banks are expected to receive additional interest premiums as credit risk rises. Thus, it is expected that there will be a positive relationship between NIM and credit risk.

5) Quality of Management – (QM): The quality of management is calculated as the ratio of operational costs to gross revenues. It is expected that banks with low QM will have higher income and higher NIM. The negative relationship is expected between management quality and NIM.

6) Liquidity Risk – (LR): Banks that do not have sufficient liquidity are pricing the loans and deposits with adding risk premium against

liquidity risk. In our study, the methodology of Maudos and Guevara was followed and the ratio of total liquid assets to total assets was taken as a measure of the liquidity risk. As the decrease of the liquidity increases the liquidity risk; banks tend to raise NIM thus negative relationship is expected between these two variables.

7) Degree of Risk Aversion – (EQUITY): Ho and Saunders (1981) and Maudos and Guevara (2004) stated that riskier banks will work with a larger NIM to finance higher capital amounts. The variable of risk avoidance grade in the model represented as EQUITY is expected to positively affect the NIM.

8) Fees and Commission Income – (FCI): Valverde and Fernandez (2005) modeled the impact of the diversification effect provided by fees and commission generating activities on NIM. Following Valverde and Fernandez (2005) we will test the model to see if the Fee and Commission income has positive or negative effect on NIM.

9) Credit Size - (SIZE): The model predicts that interest margins are an increasing function of the average volume of bank activity. It is expected that the bank will be able to apply higher interest margins as the higher volatility of activity assumes greater potential losses. There is a positive correlation between loan volume and net interest margin.

B) External Variables Relating to Financial Structure

External factors reflect market and macroeconomic conditions that are not related to the management of the bank and affect the performance and activity of the bank.

1) Market Structure – (Herfindahl Index-HHI): In our study, we used the Herfindahl-Hirchman Index, which is the most used variable in the literature, to measure the market structure variable by following the Maudos and Guevara's methodology. The Herfindahl-Hirchman Index value is the sum of the squares of the market shares of the banks and is represented by HHI in the model. The increase in market share allows banks to be stronger in the credit and deposit market and increases the price-fixing power of banks. For these reasons, it is expected that the variables will affect the NIMs in the positive direction.

2) Interest rates risk – (VOLINT): According to the literature, the interest rate risk is negatively related to the average maturity of the assets. If the bank has more net short-term active positions, the interest rates are lower and therefore require a lower net interest margin. Following

Maudos and Guevara (2004), interest rate variability in the interbank market and interest rate decisions of the Central Bank were taken as the interest rate risk indicator.

a) CBRT average overnight borrowing interest rates for three months.

b) Quarterly standard deviation of O/N (Overnight) TRLIBOR interest rate on the interbank market.

O/N interest rates are taken as data in the measurement of inter-bank interest rate volatility since the maximum transaction is realized as O/N in the interbank market. The short-term borrowing rate is used to keep the liquidity in the money market and inflation under control by CBRT. Overnight borrowing interest rate which set by CBRT is expected to affect NIM negatively/positively because it affects loan and deposit interest rates.

3) Currency Risk - (VOLCUR): One of the key indicators affecting the whole of the sector with many indicators of Currency risk being used is the volatility of the currency in quarterly periods. As an indicator in the study, USD exchange rate changes were taken at quarterly intervals. As the volatility of the currency increases, the banks are demanding a higher NIM, and accordingly, a positive relationship is expected between currency risk and NIM.

C) Macroeconomic Variables

1) Inflation - (INF): Inflation is expected to affect NIM in the positive direction, according to studies conducted in the literature. The inflation data is obtained from the data set "Consumer Price Index - Change from the same month of the previous year (%) (2003 = 100) (Monthly)" published on the official website of TURKSTAT. Inflation rates in the Dataset are given as annual rates of change on a monthly basis according to 2003 values. In our dataset, the inflation rate for 3 months was taken as average.

2) Growth - (GDP): Economic growth positively affects the banks' assets and has a risk-reducing effect. It is expected that the GDP growth rate, which is frequently referred to in the literature as macroeconomic explanatory variables, is negatively associated with NIM. The GDP rate dataset were obtained from the official website of TURKSTAT. The dataset includes the GDP growth rates between the first quarter of 2003 and the fourth quarter of 2015 according to 1998 prices.

Qualitative research

In the research, one-to-one interviews were conducted with the treasury department managers of three banks from public, private and foreign banks; answers were made about which factors affect NIM. The responses obtained were used in the selection of the variables used in the model and to determine the compatibility between the literature and the application. Questionnaire questions are presented in Table 1 at Appendix 1. The variables that the sector representatives stated that they had the most impact in determining the Net Interest margin; Management Decisions, Credit Risk, Basel Criteria, Operational Costs and Interest Rate Risk. In general, it is stated that the internal factors of the bank are effective in determining NIM. According to the treasury managers, macroeconomic factors such as growth and inflation have no effect on decision of NIM.

4. Data

Data which used in the empirical analysis contains the financial figures of 23 banks continuously operating between 2003 and 2015 in Turkey. Macroeconomic variables were obtained from the CBRT and the Turkish Treasury's online database. Banking sector and bank-related data were obtained from the Banks Association of Turkey's online database. 49 banks were operating during the research term in the banking sector in Turkey. 13 of them are investment and development banks with domestic and foreign capital. Investment and development banks are not included in the data set since they are outside of our work. Apart from that, the 6 foreign banks operating just as branches in Turkey, considering that NIM choice will vary according to the management of the foreign decision NIM, removed from the dataset. Another 6 banks which were transferred to Savings Deposit Insurance Fund of Turkey (TMSF) and was not operating continuously from 2003 until 2015, removed from the dataset. The banks included in the study are divided into three groups as state-owned deposit banks, foreign deposit banks and privately-owned deposit banks. The reason for the division of data into groups in this way is to ensure that the factors determining the NIM are more accurately determined according to bank ownership. The banks used in the analysis are listed at Table 2 in the Appendix 2.

In literature, the econometric model used to determine the factors affecting the NIM is estimated by using the Least Squares Method with Cross-section analysis or panel data analysis. Solely application of the

cross-section analysis allows the correlation between variables to be determined only at the same time. For this reason, the method is static. The current value of the dependent variable can also be affected by the historical data of the explanatory variables and the dependent variable. For this reason, the relationship between the factors affecting NIM is dynamic. The panel data analysis is a dynamic estimation method. This means that the method contains both the multiple time series and the cross section series. In this study panel data analysis is used to identify the determinants of the net interest margin in the Turkish banking system. Dynamic panel data model is tested with STATA and interpreted together with the survey results. All variables used in the Panel Data Analysis are shown at the Table 3 in Appendix 3.

5. Finding and Discussions

In econometric models, dynamic panel data models are formed when past period data of variables are included as independent variables in the model. In the model, presented in this study, a lagged value of the Net Interest Margin dependent variable is included as an independent variable in the model. Accordingly, the model is autoregressive dynamic panel data model.

5.1. Baseline Results

The generalized method of moments which developed by Arellano and Bond (1991) is a method used when the error terms are autocorrelated. In this method, the dynamic fixed effect model in first difference is tested by generalized the least squares method which transformed with instrumental variables. Wherefore autocorrelation and heteroscedasticity problems are present in the model, it is appropriate to make the estimation with the generalized moment method. For the parameter estimators to be effective in the GMM it is required that second order autocorrelation doesn't exist. For this purpose, the autocorrelation test of Arellano and Bond is widely applied (Guris, 2015).

In the model, Arellano-Bond autocorrelation test is applied. According to the results there is first-order autocorrelation but the probability value for second-order autocorrelation is not significant. Thus, there is no autocorrelation in the second order and the model provides meaningfulness. In the method of GMM, after the instrumental variables are determined, the validity of these variables is investigated by the Sargan test proposed by Arellano-Bond. If more than one instrumental

variable is used for a parameter; whether this instrumental variable will exactly replace the corresponding variable is to be tested by over identifying restrictions test. According to the Sargan test results, the H_0 hypothesis is rejected because the P value is less than 0.05 or 0.01, thus the model does not have over definition constraints. The dynamic panel data model is estimated by the generalized method of moments and the coefficients, z and P values related to the model are given in Table 4. Significance levels with % 1, 5% and 10% are showed with *, ** and *** respectively.

Table 4. GMM Results of the Entire Banking Sector

Dependent Variable		NIM		
Independent Variable		NIM(L1) FCI EQUITY OC CR SIZE IIP RESERVES QM LR HHI VOLINT CBINT VOLCUR INT GROWTH		
Periods		2003:1 – 2015:01		
Units		23		
Wald Chi-Square (15)		1255.68		
P		0,0000		
Variable	Coefficient	SD	Z	P
NIM L1	.2405882	.0230168	10.45	0.000*
FCI	2.366768	.1468082	16.12	0.000*
EQUITY	.0572754	.0168679	3.40	0.001*
OC	-.2292073	.0233892	-9.80	0.000*
CR	.0956697	.0197046	4.86	0.000*
SIZE	-.0024588	.001617	-1.52	0.128
RESERVES	-.0083987	.0206284	-0.41	0.684
QM	-.0062375	.0011335	-5.50	0.000*
LR	-.0099824	.007361	-1.36	0.175
HHI	.0000386	.0000385	1.00	0.316
VOLINT	.2135647	.1271925	1.68	0.093***
CBINT	.0004123	.0001725	2.39	0.017**
VOLCUR	-.0390844	.0316491	-1.23	0.217
INF	.0035244	.0003041	11.59	0.000*
GROWTH	.0005179	.0001849	2.80	0.005*

Note: IIP is dropped because of co-linearity

The model explaining the determinants of the net interest margin is based on the quarterly data set of 23 banks, macroeconomic data and market data between 2003 and 2015. The model is dynamic because of the number of periods and reciprocal relationships it contains. The dynamic panel data model, in which the one-time lagged value of the net interest margin is included as an independent variable, is estimated by the GMM method.

According to GMM estimation results, NIM (L1), FCI, EQUITY, OC, CR, QM, VOLINT, CBINT, INF, GROWTH independent variables are the variables that explain the model with 1%, 5% and 10% significance.

Comparing the results with the literature, the following inferences are made.

FCI: Fee and commission income affects positively the NIM with 2,366 coefficient in the dynamic model. The result obtained is consistent with the literature. The results show the banks that effectively manage net interest margins effectively manage their fees and commissions as well. Demirgüç-Kunt ve Huizinga (1999 ve 2000), Angbazo (1997), Saunders ve Schumacher (2000), Valverde ve Fernandez (2005),Tunay ve Silpar (2006a ve 2006b) used the non-interest income or fee and commission income in determination analysis of NIM.

EQUITY: The EQUITY variable, which is calculated dividing total equity into total assets, is an indicator of the bank's risk aversion degree. According to the literature, it is expected that the EQUITY will affect net interest margin in positive direction. Demirguc-Kunt and Huizinga (1999 and 2000), Angbazo (1997), Saunders and Schumacher (2000), Maudos and Guevara (2004), Valverde and Fernandez (2005), Doliente (2005), Naceur and Goaied (2003) and Atasoy (2007) used capital ratio to explain the net interest margin. The EQUITY variable is found positively related to the net interest margin at 1% significance level with coefficient of 0,057. The result is consistent with the literature.

OC: The OC is the ratio of the operational costs to the total assets and it is used to measure the weight of operational costs in the bank. According to the literature, the bank's operational costs affect the NIM in the positive direction. Despite the common literature, the results of the GMM model show that OC is in a negative relation with NIM. According to the statistical estimation OC variable is expected to affect the NIM negatively with a coefficient of 0,229. According to Ho and Saunders

(1981), bank interest margins are positively correlated with operational expenses and are negatively related to bank size. Barajas, Steiner and Salazar focused on net interest margin in a developing country such as Colombia at their work in 1999. They showed that NIM was a function of operational costs, financial taxes, market power and credit quality. Maudos and Guevera (2004), using a model similar to the model of Saunders and Schumacher; have developed a model that clearly takes into account the operational costs. Maudos and Guevara have shown that banks with higher average operational costs implement a higher net interest margin in order to cover the transaction costs. Wong (1997) found that the optimum bank interest margin was positively associated with an increase in market power, an increase in operational costs, an increase in credit risk and an increase in the interest rate risk.

CR: Credit Risk is measured by the ratio of non-performing loans to total loans is an indication of how well the bank manages its credit risks. It is seen as a proxy of the default risk on which the banks are exposed. There is a positive relationship between NIM and CR in literature. According to the model, the CR affects the net interest margin by 0.095 in a positive direction. The result obtained is consistent with the literature.

QM: The independent variable of QM, which is determined by the costs to income ratio, affects the bank's net interest margin in a negative way according to the literature. Statistical results reveal the Quality of Management affects the net interest margin negatively with coefficient of 0,0062. The result obtained is consistent with the literature. Ahmet Uğur and Hakan Erkuş (2010) show that management quality has a negative effect on net interest margin. Maudos and Guevara (2004) show that Management Quality (QM) is negatively correlated with Net interest margin.

VOLINT: The VOLINT variable, which is proxy of the degree of volatility of short-term interest rates in the interbank market, is correlated positively with the net interest margin according to the literature. In the dynamic model, the net interest margin is affected positively by O/N interest rate volatility with 0,213 coefficients. The result obtained is consistent with the literature.

CBINT: The CBINT variable investigates the effect of the changes in the central bank overnight borrowing interest rate on the NIM. In

the dynamic model, CBINT variable have an effect on NIM in positive direction with coefficient of 0,0004.

INF: It has been determined that the INF variable that determines the relationship between changes in quarterly CPI rates and NIM, affects the NIM only by 0.004% with 1% significance. The positive relationship between them is consistent with the literature. Demirguc-Kunt and Huizinga (1999 and 2000), Demirguc-Kunt, Laeven and Levine (2004), Brock and Rojas-Suarez (2000), Afanasieff, Lahecer and Nakane (2001), Ben-Khedhiri, Casu and Rahim (2005) , Kaya (2002), Tunay and Silpar (2006a and 2006b) and Atasoy (2007) used inflation and growth rates as explanatory variables. Studies have shown a positive correlation between INF and NIM.

GROWTH: The relationship between the annual GDP growth rate and NIM changes is found significant in the dynamic model with a 1% significance degree. However, the coefficient of correlation is low at 0.0005 values. In previous studies a negative relationship was found between GDP and NIM in the developed countries however positive or negative relationship can be seen in the developing countries in the literature. In this study, a low correlation was found in the positive direction.

5.2. Results of Ownership Structure

Commercial banks operating in Turkey are divided into three sections according to their capital structure in investigating the factors affecting the net interest margin. The study includes three state-owned banks, ten privately-owned and ten foreign banks. The panel data model has been retested with industry dummy variables in order to be able to determine the effect of the banks' capital structures on the net interest margin. Three sector dummy variables were used as State, Private and Foreign. The study covering 49 periods between 2003 and 2015 has also added year dummy variables to see if there are any changes in terms of periods. The results of the tests made with the GMM model are in the Table 5 at Appendix 4. With the dynamic panel data model, the data is tested both with and without sector dummies. According to the test result, the capital structure of the banks is not effective in the net interest margin decisions of the deposit banks in the Turkish banking system. Pre-tests are carried out before the GMM model is tested.

6. Conclusion

The model attempting to determine net interest margin in Turkish banking system is dynamic because of the number of periods and reciprocal relationships it contains. The dynamic panel data model, in which the one-time lagged value of the net interest margin is included as an independent variable, is estimated by the GMM method.

The results show that between 2003 and 2015 years, considering the data of 23 commercial and deposit banks, following factors significantly affected the NIM values in Turkish Banking system. These factors are Fee and Commission Income (FCI), Risk aversion degree (EQUITY), Operating Costs (OC), Non-performing Loans (CR), Managerial Quality (QM), Interest Rate Risk (VOLINT and CBINT) and macroeconomic factors (INF and GROWTH). In the analysis made to determine the effects of the capital structure of the banks on the net interest margin decisions separately, any effect of the differences according to the capital groups of the banks cannot be determined.

It is seen that factors other than Operational Costs are consistent with the literature. Founding negative relationship between the operational costs and the net interest margin distinguishes the study from other studies both domestic and abroad. The Operational Costs (OC) variable, which is determined as the ratio of the operational costs of the bank to the total assets, is used to measure the operational costs effect on NIM. According to the literature, the bank's operational costs affect the NIM in the positive direction. Despite the common literature it is found that OC is in negative relation with NIM. The result is incompatible with the literature.

Erol, Hasan (2007) used operational costs in his study that investigated net interest margin and profitability in Turkish Banking Sector. It was determined that operational cost variable had only positive effect on net interest margins at small and medium scale banks however it had no significant effect at other bank groups. Fatih Kansoy (2012) studied determinants of NIM for 23 banks in the period of 2001-2012 and found a significant and positive relationship between operational costs and NIM. According to the study banks with high operational costs reflect these costs to their customers by increasing loan interest rates or decreasing time deposit interest rates.

The reason why there is a positive relationship between net interest margin and operational costs is that banks should transfer their expenses arising from high operational costs to customers by increasing interest rates. According to the results; in Turkish banking system, banks cannot reflect the operational expenses by increasing their interest rates. One of the possible reasons for this; banks have to keep interest rates at a certain rate due to legal regulations in recent years. Additionally due to the high inter-bank competition, it may not be easy to transfer their operational costs to interest rates.

As a result of the research, it is seen that; net interest margin between 2003 and 2015 performed better than other developing countries in parallel with the economic growth. Although it contracted slightly with the impact of the 2009 crisis, it was determined that it recovered with the structural measures taken after 2011. Domestic interest rates, which have been increasing in recent years due to the increase in inflation and low growth figures, suppress the net interest margin.

Examining the realizations of the net interest margin between 2003 and 2015, it is seen that the entire banking sector works with an average net interest margin of 4.86% in the last twelve years. In the same period private banks worked with the highest NIM values besides public banks worked the lowest margins. Net interest margin decreased from 5.93% to 4.03% in 2010 and 2011 respectively with the impact of the global crisis in 2009. Net interest margin in Turkish banking system performed well below the last twelve-year average after 2012. In general, it is determined that private banks have the best performance of NIM and foreign banks comes after the private banks and the state banks have traditionally worked with low net interest margin.

Evaluating on the whole, it is seen that the net interest margin in Turkish commercial banking system has decreased in recent years and thus cost and profitability control have gained more importance. Net interest margin started to decrease in Turkey especially after 2009 crisis as in the global banking system and the most important factor in this decrease is the rising the funding costs. Increasing funding costs and falling interest margins naturally affect the profitability of the banking system negatively. In the study, it has been determined that the banks that have been affected most from the rising domestic funding costs are the banks with foreign capital. The falling net interest margin can be met

by state banks with their high interest-free deposit source. Private Banks used non-interest incomes for this purpose.

In recent years, intensive central regulations in the banking system are another factor that negatively affects the profitability values. The upper limit of the interest rates applied by the banks, limiting the number of credit card installments, limiting the individual borrowing amounts, canceling the account maintenance fee received from the individual accounts, opening the application path to the Consumer Arbitration Committee regarding the return of the file expenses received from the consumer loans; are important legal regulations that reduce interest and non-interest income in the banking system.

According to the results of the research, foreign banks are not able to perform well in terms of profitability values. As a result, some foreign banks have closed their SME banking operations due to exposed high credit risk. After 2011, it was observed that the interest of foreign financial institutions in Turkish banking system decreased and the intensive acquisitions and mergers seen between 2002 - 2007 years also fall gradually. The downward trend in net interest margin values in the Turkish banking system is a warning signal in terms of the healthy functioning and stability of the banking system. In order to maintain the healthy growth of the banking system and ensure the continuation of foreign capital inflows to the sector; It is important to analyze the factors affecting the net interest margin and so profitability values by the parties. The result emphasizes the importance of operational costs in the banking system and suggests that bank management should carefully monitor OC in the following periods due to the Basel 3 criteria.

Making new researches on variables determined as determinants of net interest margin, detailing the research on the basis of scales, segments and regions will enable the parties to gain a broader view and to examine the issue in a multidimensional manner.

REFERENCES

Aliaga-Diaz, R. & Olivero, M. P. (2011), The Cyclicality Of Price-Cost Margins In Banking: An Empirical Analysis Of Its Determinants. Economic Inquiry, 49 (1), pp.26-46.

Angbazo, L. (1997).Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking. Journal of Banking & Finance. 21, 55-87.

Allen, L. (1998). The Determinants of Bank Interest Margins: A Note. The Journal of Financial and Quantitative Analysis, 3(2), 231-235.

Atasoy, H. (2007) Türk Bankacılık Sektöründe Gelir-Gider Analizi ve Karlılık Performansının Belirleyicileri. Uzmanlık Yeterlilik Tezi, TCMB.

Berger, A. N, Iftekhar, H. & Zhou, M. (2009). Bank ownership and efficiency in China: What will happen in the world's largest nation? Journal of Banking and Finance, 33(1), 113–130.

Brock, P. L., & Suarez, L. R. (2000). Understanding the behavior of bank spreads in Latin America', Journal of development Economics, 63(1),113-134.

Catao, L. (1998) Intermediation spreads in a dual currency economy: Argentina in the 1990s. IMF Working Paper, No. 98/90, International Monetary Fund, Washington.

Demirgüç-Kunt, A. & Huizinga H. (1999) Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. The World Bank Economic Review, 13(2), 379-408.

Demirgüç-Kunt, Aslı & Huizinga, H. (2000) Financial Structure and Bank Profitability', Policy Research Working Paper; No: 2430, World Bank, Washington, DC, 1-15.

Demirgüç-Kunt, A., Laeven, L. & Levine, R. (2004) Regulations, Market Structure, Institutions, and the Cost of Financial Intermediation. Journal of Money, Credit and Banking, 36(3), 593-622.

Doliente, S. J. (2005) Determinants of Bank Net Interest Margins of Southest Asia. Applied Financial Economics Letters. 1, 53-57.

Drakos, K. (2005) Assessing the success of reform in transition banking 10 years later: an interest margins analysis. Journal of Policy Modeling. 25, 309-317.

Erol, H. (2007). Bankalarda Net Faiz Marjının Belirleyicileri, Risk Duyarlılığı ve Politika Önerileri. Uzmanlık Yeterlilik Tezi, Türkiye Cumhuriyet Merkez Bankası Bankacılık Ve Finansal Kuruluşlar Genel Müdürlüğü, Ankara.

Hawtrey, K. & Liang, H. (2008) Bank interest margins in OECD countries. North American Journal of Economics and Finance. 19, 249–260.

Ho, T. S. Y. & Saunders, A. (1981) The Determinants of Bank Interest Margins: Theory and Empirical Evidence. The Journal of Financial and Quantitative Analysis. 16(4), 581-600.

Göçmen, G. (2005). Bankacılık Sektöründe Net Faiz Marjını Belirleyen Faktörler: Türkiye Uygulaması (1990-2000). İşletme Bölümü Yüksek Lisans Tezi, Süleyman Demirel Üniversitesi.

Güriş, S. (2015). Stata ile panel veri modelleri. Der Yayınevi, İstanbul.

Kansoy, F. (2012). The Determinants Of Net Interest Margin İn The Turkish Banking Sector. Does Bank Ownership Matter? BDDK Bankacılık ve Finansal Piyasalar, 6(2).

Kasman, A., Tunc, G., Vardar, G. & Okan, B. (2010). Consolidation and commercial bank net interest margins: Evidence from the old and new European Union members and candidate countries', Economic Modelling, 27 648–655.

Kaya, Y. T. (2001). Türk Bankacılık Sisteminde Net Faiz Marjının Modellenmesi. Bankacılık Düzenleme Ve Denetleme Kurumu, MSPD Çalışma Raporları, No: 2001/4.

Kaya, Y. T. (2002). Türk Bankacılık Sektöründe Karlılığın Belirleyicileri 1997-2000. Bankacılık Düzenleme Ve Denetleme Kurumu, MSPD Çalışma Raporları, No: 2002/1.

Khediri K. B. & Ben-Khedhiri, H. (2011) Determinants of bank net interest margin in Tunisia: a panel data model. Applied Economics Letters, 18 1267–1271.

Klein, M. A. (1971) A Theory of The Banking Firm, Journal Of Money, Credit And Banking, 3(2). 205-218.

Lerner. E. M. (1981). Discussion: The Determinants of Bank Interest Margins: Theory and Empirical Evidence. The Journal of Financial and Quantitative Analysis, 16(4), 601-602.

Madura, J. & Zarruk,E.R.(1995) Bank Exposure to interest rate risk: a global perspective, Journal of Financial Research. 18(1), 1-13.

Maudos, J. & Guevara, J. F.(2004) Factors Explaınıng The Interest Margın In The Bankıng Sectors Of The European Unıon, Journal of Banking & Finance, 28(9) 2259–2281.

Maudos, J. & Solís, L. (2009). The determinants of net interest income in the Mexican banking system: An integrated model. Journal of Banking & Finance, 33(10),1920-1931.

McShane, R. W. & Sharpe I. G. (1985) A time series/cross section analysis of the determinants of Australian trading bank loan/deposit interest margins: 1962-1981, Journal of Banking & Finance, 9(1), 115-136.

Saunders, A. & Schumacher,L. (2000) The determinants of bank interest rate margins: an international study, Journal of International Money and Finance, 19, 813–832.

Uğur, A. & Erkuş H. (2010) Determinants Of The Net Interest Margins Of Banks in Turkey', Journal of Economic and Social Research 12, pp.101-118.

Valverde, S. C. & Francisco Rodriguez F. (2007) .The determinants of bank margins in European banking. Journal of Banking & Finance 31, 2043–2063.

Wong, K. P. (1997) On the determinants of bank interest margins under credit and interest rate risks. Journal of Banking & Finance 21, 251-271.

Zarruk, R., (1989), Bank spread with uncertain deposit level and risk aversion. Journal of Banking and Finance, 13, 797-810.

Zarruk, Emilio R & Jeff Madura (1992) Optimal Bank Interest Margin under Capital Regulation and Deposit Insurance. The Journal of Financial and Quantitative Analysis, 27(1) 143-149.

Appendices

Appendix 1.

Table 1. Questionnaire

Gender	□ Female	□ Male			
Graduation	□ Bachelor Degree	□ Post-Graduation	□ Doctorate		
Professional Experience	□ 1–5 Years	□ 6–10 Years	□ 11–15 Years	□ 16–20 Years	□ Above 20 Years

Question No	**Question**
1.	What are the Impacts of Net Interest Margin of the banks on Banking System?
2.	What are the factors that you think affect the Net Interest Margin in Deposit Banks?
3.	In what way do the Factors Affecting the Net Interest Margin have differences and similarities in State, Private and Foreign banks?
4.	What are the Effects of Changes in the Net Interest Margin on Your Bank?
5.	Which methods are used by your bank to control the factors affecting the net interest margin?

DEFINITIONS	
Net Interest Margin	Net interest margin is the ratio of the difference between interest income and interest expenses to interest earning assets.
Predicted Factors Affecting Net Interest Margin	**Definitions**
Fee and Commission Income	Ratio of net fee and commission income to total assets
Degree of Risk Aversion	Ratio of bank equity to asset size
Operational Costs	Ratio of bank operational cost to bank asset size
Credit Risk	Ratio of nonperforming loans to total loan amount
Credit Size	Bank's total loans.
Implicit Interest Payments	The ratio of operational expenses related to non-interest income to total assets
Opportunity Cost of Required Reserves	The ratio of liquid reserves to total assets
Quality of Management	Ratio of Total Cost of the Bank to Total Revenue
Liquidity Risk	Ratio of Liquid Values to Assets
Concentration in Banking Sector	Ratio of Market share of banks in the sector
Interest Rate Risk	Volatility of Over-night and quarterly TRLIBOR
	The average monthly value of the Central Bank's overnight borrowing interest rate
Currency Risk	Three-month average volatility value of US Dollar
Inflation	Consumer price index
GDP Growth Rate	

Appendix 2.

Table 2: Banks used in the Data

Commercial and Deposit Banks Classified by Ownership		
State-owned Deposit Banks	Privately-owned Deposit banks	Foreign Deposit Banks
Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	Akbank T.A.Ş.	Alternatifbank A.Ş.
Türkiye Halk Bankası A.Ş.	Anadolubank A.Ş.	Arap Türk Bankası A.Ş.
Türkiye Vakıflar Bankası T.A.O.	Fibabanka A.Ş.	Burgan Bank A.Ş.
	Şekerbank T.A.Ş.	Citibank A.Ş.
	Tekstil Bankası A.Ş.	Denizbank A.Ş.
	Turkish Bank A.Ş.	Deutsche Bank A.Ş.
	Türk Ekonomi Bankası A.Ş.	Finans Bank A.Ş.
	Türkiye İş Bankası A.Ş.	HSBC Bank A.Ş.
	Yapı ve Kredi Bankası A.Ş.	ING Bank A.Ş.
		Turkland Bank A.Ş.
		Türkiye Garanti Bankası A.Ş.

Appendix 3.

Table 3: Variables in the Model and Descriptions

Variables	Proxy	Description	Estimated Relation
Net Interest Margin	NIM	Net interest margin is the ratio of the difference between interest income and interest expenses to interest earning assets.	
Internal Variables			
Fee and Commission Income	FCI	Ratio of net fee and commission income to total assets	Positive / Negative
Degree of Risk Aversion	EQUITY	Ratio of bank equity to asset size	Positive
Operational Costs	OC	Ratio of bank operational cost to bank asset size	Positive
Credit Risk	CR	Ratio of nonperforming loans to total loan amount	Positive
Credit Size	SIZE	Bank's total loans.	Positive
Implicit Interest Payments	IIP	The ratio of operational expenses related to non-interest income to total assets	Positive
Opportunity Cost of Required Reserves	RESERVES	The ratio of liquid required reserves to total assets	Positive

Quality of Management	QM	Ratio of Total Cost of the Bank to Total Revenue	Negative
Liquidity Risk	LR	Ratio of Liquid Values to Assets	Negative
External Variables on Financial Structure			
Herfindahl-Hirchman Index	HHI	The sum of the squares of market shares of banks in the sector	Positive
Interest Rate Risk	VOLINT	Quarterly standard deviation of Overnight and quarterly TRLIBOR	Positive
	CBINT	The average monthly value of the Central Bank's overnight borrowing interest rate	Positive / Negative
Currency Risk	VOLCUR	Three-month average volatility value of US Dollar	Positive
Macroeconomic External Variables			
Inflation	INF	Quarterly Consumer price index	Positive
Growth	GROWTH	Annual GDP Growth Rate	Negative

Appendix 4.

Table 4. GMM Regression Results of Ownership Shadow Variables

Variable	Coefficient	Standard Deviation	Z	p
NIM L1	.2140736	.0225144	9.51	0.000
FCI	2.360031	.1448793	16.29	0.000
EQUITY	.0618279	.0166385	3.72	0.000
OC	-.2643329	.0227352	-11.63	0.000
CR	.1260043	.0191386	6.58	0.000
SIZE	-.0014402	.0015916	-0.90	0.366
IIP	Dropped because of co-linearity			
RESERVES	-.0169103	.0203347	-0.83	0.406
QM	-.0067876	.0011169	-6.08	0.000
LR	-.0104776	.0072642	-1.44	0.149
HHI	.0000442	.000038	1.16	0.245
VOLINT	.2083234	.1255216	1.66	0.097
CBINT	.0005992	.0001689	3.55	0.000
VOLCUR	-.061486	.03113	-1.98	0.048
INT	.0038629	.0002976	12.98	0.000
GROWTH	.0005696	.0001824	3.12	0.002
STATE	0	(Dropped)		
PRIVATE	0	(Dropped)		
FOREIGN	0	(Dropped)		