The Determinants of Net Interest Margin in the Turkish Banking Sector. Does Bank Ownership Matter?

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Abstract

This research presented an empirical investigation of the determinants of the net interest margin in Turkish Banking sector with a particular emphasis on the bank ownership structure. This study employed a unique bank-level dataset covering Turkey`s commercial banking sector for the 2001-2012. Our main results are as follows. Operation diversity, credit risk and operating costs are important determinants of margin in Turkey. More efficient banks exhibit lower margin and also price stability contributes to lower margin. The effect of principal determinants such as credit risk, bank size, market concentration and inflation vary across foreign-owned, state-controlled and private banks. At the same time, the impacts of implicit interest payment, operation diversity and operating cost are homogeneous across all banks.

Keywords: *Bank, Turkish Banking System, Interest Rate Margin*

JEL Classification: *C33, E40, G21*

Özet - Türk Bankacılık Sektöründe Net Faiz Marjının Belirleyicileri. Mülkiyet Yapısı Etkili midir?

Bu çalışmada Türkiye'deki ticaret bankacılığında net faiz marjını etkileyen faktörler bankaların mülkiyet yapısı dikkate alınarak incelenmiştir. Çalışmada kullanılan çeyrek dönemlere ait veri seti 2001-2012 dönemine aittir. Net faiz marjının belirleyicilerini ve bunların mülkiyet yapısına göre etkilerini araştırmak üzerine farklı ekonometrik metotlar kullanılarak elde edilen sonuçlar şöyledir: işlem çeşitliliği, kredi riski ve işlem maliyetleri en önemli faiz marjı belirleyicilerden olup fiyat istikrarı ve banka verimliliğinin faiz marjı üzerinde negatif etkisi olduğu saptanmıştır. Önemli net faiz marjı belirleyicilerden kredi riski, bankanın büyüklüğü, piyasa yapısı ve enflasyon mülkiyet yapısına göre farklı etkiler gösterirken zımni faiz ödemeleri, işlem çeşitliliği ve işlem maliyetleri gibi belirleyiciler mülkiyet yapısından bağımsız etkiye sahip olduğu anlaşılmıştır.

Anahtar Kelimeler: *Banka, Türk Bankacılık Sistemi, Faiz Marjı Oranı*

JEL Sınıflaması: *C33, E40, G21*

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1. Introduction

Many studies have found that financial development and efficiency have strong relations with economic conditions. Levine and Zervos (1998) show that the financial dynamics play a positive role on economic growth. Also, Calderon and Liu (2002) conclude that improvement in the financial system brings economic growth. This is especially true for Turkey where banking sector has been improving for ten years after the 2001 banking crisis with parallel its GDP growth rate. For instance, as far as our calculation, from the last quarter of 2001 to the first quarter of 2012, the ratio of total banking market assets to GDP increased by 51 per cent. It means that banks started to play a dominant and increasingly significant role in the financial system of Turkey.

In the recent credit crunch faced by the world, global financial giants announced substantial losses and some of them went bankrupt or were nationalised. In contrast to this, the Turkish banking sector declared considerable profits (Aysan et al. 2009). This situation is interpreted as a success of the Turkish Banking sector and also triggered a fundamental discussion on the efficiency of the Turkish banking industry (Financial Times, 2010). In this case, the Net Interest Margin[2] (hereafter NIM) as a significant component of the efficiency and the profitability of the banking sector (Demirguc-Kunt and Huizinga, 1999) needs to be investigated and understood with its major determinants in Turkey, in order to gain a clear perspective.

Although other studies have dealt with the competition structure, performance and profitability of the Turkish banking sector (for example, see Aysan and Ceyhan, 2008) or some Turkish banks who have been included in several cross-country studies (see Demirguc-Kunt and Huizinga, 1999; Aysan et al. 2009; Kasman et al. 2010;) which examined the NIM on the Turkish banking system using the static estimation model. The relatively little research or no special research on the determination of NIM in Turkey has created a gap in the NIM literature. Therefore, the principal motivation of this study is to fill this gap. This research, to the best of knowledge, will provide the first dynamic estimation of the NIM and take the structure of bank ownership into account in particularly. Furthermore, the previous studies used limited samples of the Turkish banking sector which are available on international databases such as the BankScope. However, this study uses rich and specific dataset for every single bank and also the data

[2] Net Interest Margin is defined as net interest income over total assets

sample of this study is based on seasonal data covering the whole Turkish banking sector while previous studies mostly used yearly datasets.

1.1. Research Questions:

What are the key determinants of the Net Interest Margin in the Turkey Banking sector?

The contemporary literature suggests that the determinants of NIM are numerous and differ across the regions, countries and even the structure of ownership. The determinants of NIM can be divided into three parts I) bank-specific, II) industry-specific, and III) macroeconomic specific. Some studies claim that the macroeconomic determinants have the most crucial effects on the determination of the NIM, whereas a substantial number of studies argue that the bank-specific and industry-specific factors are very important factors that affect the margin. Therefore, to answer or investigate this question is vital to gain a clear perspective for the NIM in Turkey. It is important because understanding the drivers of the NIM is valuable both from a macro and micro view (Liebeg and Schwaiger, 2006). From a macro or an economic stability perspective, it is helpful for a monetary authority to understand whether the increasing or decreasing NIM is mainly attributable to the microeconomic factors or the macroeconomic conditions. For example, if one of the crucial components of the NIM is determined by the volatility of nominal interest rate instead of the competition structure of the banking sector, the government authority ought to focus on how to provide a stable macroeconomic environment to decrease the cost of financial intermediation services. On the contrary, if the main element of NIM is market power, the public policy should be aimed at promoting competition in the banking sector. Regarding the micro vision, specifying the main foundations behind the moving (widening or tightening) of the NIM might enable investors to evaluate potential changes in the NIM in Turkey. For these reasons, this study targets to offer a better understanding of the elements that drive the NIM and to contribute some noteworthy policy insights regarding the macro and micro perspectives.

Are intercepts and the effects and coefficients of the determinants the same for all ownership structures?

In the literature, the source of interest revenue and the costs vary by bank ownership structure. The ownership structure of bank may play different a role on performance or profits of bank. Consequently, the strategies and incentives related to the NIM might differ by the bank ownership. For instance, Drakos (2003), Martinez Peria and Mody (2004) and Williams (2007) claimed that the foreign ownership has a negative significant effect on the NIM, whereas, Demirguc-Kunt and Huizinga (1999), Schwaiger and Liebeg (2008) and Fungacova and Poghosyan (2011) have found a positive relationship. On the contrary, Claessens et al. (2001) and Dabla-Norris and Floerkemeier (2007) argued that there is no significant relationship between the ownership structure and the NIM.

On the other hand, such discussions assume that the coefficient of determinants and their effects on the interest margin are the same for all different bank structures. However, in this research, it is assumed that the intercepts and the coefficient of the determinants may differ for all banks with different ownership form. Therefore, the aim of answering above question is to make a contribution to this controversial debate by investigating the Turkish Banking sector.

The rest of the study will be organised as follows; Section II reviews the existing literature. Section III describes data sources and discusses the variables and provides the empirical model and methodology. Section IV provides empirical results. Section V consists of the robustness test and its results and finally the last section concludes.

2. Literature Review

The contemporary literature of the determinants of the NIM has been elaborated in Ho and Saunders` (1981) pioneering study. In their dealership model, they assume that a bank is a risk averse dealer in the loan market and it acts as an intermediary between fund lenders and the borrowers. Their theoretical model claims that the NIM is mainly contingent upon four main factors: the risk aversion degree, the market structure, the banking transaction magnitude and the divergence of the interest rate on credits and deposits.

Ho and Saunders (1981) set a two-step estimation approach using 100 main US banks from 1976 to 1979 for seasonal periods. In the first step of estimation, authors regress the individual banks` NIM against the banks specific characteristics such as risk aversion, and the implicit interest payment. The second step involves the estimation of pure spread that is explained by the market structure and macroeconomic variables.

Lerner (1981) criticised the model of Ho and Saunders (1981). He argued that the model fails to consider the potential heterogeneity across the banks. Maudos and Fernandez de Guevara (2004) responded by extending the dealership model. They incorporated the operating cost into the initial model and supplied an elaborative explanation of the relation between the riskiness and the NIM. In particular the new model distinguishes between sector risk and loan risk in addition to separating potential factors that affect the NIM.

The empirical studies in the literature attempting to analyse the bank interest margin vary on a large number of countries sample (see Demirguc-Kunt and Huizinga, 1999) to a single country examples (see Fungacova and Poghosyan, 2011). Also some studies examine particularly developed countries (Maudos and Fernandez de Guevara, 2004) and the emerging countries (Martinez Peria and Mody, 2004) moreover; there are also some regional studies like the Central Eastern European countries (Claeys and Vander Vennet, 2008).

2.1. Studies on Developed Countries

Studies focusing on developed countries for the determinations of NIM are generally parallel with the theoretical structure of the Ho and Saunders (1981) model. Angbazo (1997) by using the US data for the period 1989-1993 added the credit risk and the interest risk into the model. This study indicates that the interest margin has a negative relation to the liquidity and competition, whereas positive relation in the case of management quality, market power and gross income volatility. Similarly, Saunders and Schumacher (2000) apply the two step model for the US banking system and the bank data for the six European countries for the 1998-95 period. Results show regulatory issues and macroeconomic conditions have crucial effects on the NIM for the banking sectors of those countries.

Maudos and Fernandez de Guevara (2004) make a very influential contribution to the NIM literature. As mentioned above, Maudos and Fernandez de Guevara (2004) have responded to the critics of Lerner (1981) on the pioneering Ho and Saunders`s (1981) model by expanding the theoretical model through including operating cost as a determinant of the interest margin with their empirical study for the five European countries banking industries in the period 1992-2000. Maudos and Fernandez de Guevara (2004) claim that the banking intermediation is reflected by the operating cost as a function of the deposit taken and credit granted. For this reason they conclude that the banks have to cover their operating cost by charging higher interest margin. Except the operating cost, they also conclude that interest rate and credit risk, capital adequacy, implicit interest payment and management efficiency have a positive relationship with the NIM.

Similar to Maudos and Fernandez de Guevara (2004), Carbo and Rodriguez (2007) have made a significant contribution to the original model. They improve the model by incorporating both conventional and non-conventional operations of the bank in order to observe the impact of diversification on the NIM by considering multi-output model for seven European countries. The evidence of their dynamic estimation model suggests that the specialisation in non-conventional operations induces a narrowing in margin and a widening in the market share as a result of cross-subsidisation. Finally, their results show a negative relation between the GDP growth and interest margin.

Hawtrey and Liang (2008) carry out another study on fourteen OECD countries, the According to the study of Hawtrey and Liang`s (2008) the bank interest margin is negatively affected by management quality and positively affected by the credit risk and implicit interest margin. Whereas, Williams (2007) claims that there is a negative relation between credit risks and the NIMs in Austrian banking industry. Some selected studies on developed countries for the NIM is provided in Table 9.

2.2. Studies on Developing Countries, Regions and a Large Sample of Countries

The empirical studies on the determination of the NIM in developing countries have controversial results compared to developed countries. For this reason Brock and Rojas-Suarez (2000) argued that the generally true methods for developed countries cannot be valid for less developed countries. For example, covering a large sample of countries around the world Demirguc-Kunt and Huizinga (1999) have analysed the

determinants of NIMs by employing bank level data for 80 countries for the years 1988-95 and they have found out that the effect of the banking ownership on the NIM is different for developed countries compared to the developing ones. They claim that in developed countries, domestic banks realise higher interest margins than foreign banks, in contrast in the developing countries foreign banks realise higher margins than the domestic banks. Their evidence suggests that macroeconomic and regulatory factors have substantial effects on the interest margin.

In parallel with Demirguc-Kunt and Huizinga's (1999) results, the study of Martinez Peria and Mody (2004) for seven Latin American countries show that the foreign banks in these countries are able to exhibit lower margins and also lower the cost down to less than the cost of domestic banks. This is also suggested by Drakos (2003) for the Central Eastern European (CEE) Countries. In contrast to Drakos (2003); Schwaiger and Liebeg (2008) argue that foreign banks apply higher spread than the domestic banks, even though their work is on the CEE Countries. Clayes and Vander Vennet (2008) examine the effects of macroeconomic environment, industry specific features and bank specific characteristics on the NIM in the CEE countries for the years 1994-2001.

Maudos and Solisa (2009) improve the model with their study on the Mexican banking industry and their results suggest that the operating costs and liquidity ratio have a positive and significant effect on the NIM. Another country-based study is on Russia, carried out by Fungacova and Poghosyan (2011) and they provide the first evidence on the determinants of NIM in terms of the bank ownership effect. Their findings show that the level of margin varies over domestic, public and foreign banks. Gounder and Sharma (2012) show that NIM is positively associated with the implicit interest margin, operating cost and the market share, whereas the management quality and liquidity ratio is negatively related. Table 10 and Table 11 provide some information for the studies on the interest margin of developing countries and international cross-countries.

3. Empirical Approach and Data

3.1.Data Information

This study uses three different types of data for analysing the NIM of the Turkish Banking System. The first one is the bank-specific data, which was obtained from the Banks Association of Turkey[3]. The second one is that the industry-specific data which reflects the main features of the Turkish Banking industry. This study uses some market-specific data, such as Herfindahl Index, and it was obtained from the Banks Association of Turkey. The last data illustrates the macroeconomic environment of Turkey at a particular period, such as the

real GDP growth and inflation. The Macroeconomic data was obtained from the Central Bank of Republic of Turkey. To eliminate the direct impact of the 2000 and 2001 economic and banking crises, the quarterly dataset of this study ranges from the last quarter of 2001 to the first quarter of 2012 and includes twenty-three commercial banks.

This dataset has three major advantages when compared to the most previous studies. First, the dataset covers almost all of the commercial banks in the sector, in contrast many previous studies have used the Bankscope dataset, which has a selection bias since the Bankscope dataset includes only the main players and excludes the small players. Secondly, the dataset of this study consists of quarterly data, not annually, and this allows us to interpret changes over four quarters. Lastly, all banks in the dataset use the same accounting and regulatory regime and the same type of balance sheet. These advantages prevent potential distorting influence in the analyses. Table 1 and Table 2 give the data statistical summaries and the cross correlation matrix information, respectively.

[3] The Banks Association of Turkey is a professional organization, which is a legal entity with the status of a public institution, established pursuant to Article 19 of the Banks Act. The purpose of the Association is to represent the rights and interests of the banking sector and to work for the growth and healthy functioning of the banking system, and strengthening of competition power and preventing unfair competition in the market and to develop the banking profession in Turkey. (Obtained from http://www.tbb.org.tr/)

Table 1 Statistical Summarises

Variable		Mean	Std. Dev.	Min	Max	Observations	
	overall	1.487816	3.495887	-15.63	73.19	N =	966
NIM	between		0.6039982	0.5188096	3.617143	n =	23
	within		3.445564	-14.66099	74.15901	T =	42
	overall	14.02816	7.9716	-3.27	91.61	N =	966
RA	between		4.917234	8.998333	25.65524	n =	23
	within		6.355668	-3.727081	82.97006	T =	42
	overall	7.484793	13.53232	0	125.37	N =	966
RBD	between		6.147282	0	27.47619	n =	23
	within		12.12189	-17.0814	116.2993	T =	42
	overall	1.35911	1.817866	-7.44	27.39	N =	966
OC	between		0.7687254	0.6142857	4.371429	n =	23
	within		1.654933	-10.45232	24.37768	T =	42
	overall	6.77559	0.8070413	4.39	8.23	N =	966
LOGTA	between		0.7546791	5.678571	7.876429	n =	23
	within		0.3255354	5.487018	7.567018	T =	42
	overall	35.13304	19.96611	2.9	271.93	N =	966
LQR	between		14.5994	17.4431	80.80833	n =	23
	within		13.94843	-23.48148	283.8952	T =	42
	overall	60.84358	97.95532	-1498.74	1831.51	N =	966
MNGMT	between		19.09906	33.81048	118.4469	n =	23
	within		96.15596	-1556.343	1794.468	T =	42
	overall	0.4709524	4.19636	-52.58	82.45	N =	966
IIP	between		1.588256	-4.450476	5.587381	n =	23
	within		3.897955	-47.65857	77.33357	T =	42
	overall	26.8682	477.3923	-99.9	14266	N =	966
DPZTG	between		81.31062	3.003333	387.596	n =	23
	within		470.7153	-451.0378	13905.27	T =	42
	overall	0.3808137	0. 873648	- 6.471	12.21	N =	966
DVRSTY	between		0.2504861	0.2933333	0.8980952	n =	23
	within		0.8384796	-10.29756	7.204586	T =	42
	overall	10.88214	0.6431784	9.94	12.23	N =	966
HHI	between		0	10.88214	10.88214	n =	23
	within		0.6431784	9.94	12.23	T =	42
	overall	5.091905	5.865137	-14.74	12.59	N =	966
GDP	between		0	5.091905	5.091905	n =	23
	within		5.865137	-14.74	12.59	T =	42
	overall	14.84524	14.97712	4.35	70.37	N =	966
INF	between		1.445601	8.213809	15.14667	n =	23
	within		14.91017	4.048571	70.06857	T =	42

Table 2 Cross Correlation Matrix

	NIM	RA	RBD	OC	LOGTA	LQR	MNGMT	IIP	DPZTG	DVRSTY	HHI	GDP	INF
NIM	1												
RA	0.3016	1											
RBD	0.053	-0.0679	1										
OC	0.3069	0.483	0.0543	1									
LOGTA	-0.1271	-0.4742	0.0233	-0.3621	1								
LQR	-0.0329	0.1865	-0.1585	0.0604	-0.1876	1							
MNGMT	-0.0729	-0.0693	0.0746	0.2632	-0.0851	0.0182	1						
IIP	0.6598	0.1484	0.0769	0.2995	-0.1157	-0.1078	0.0715	1					
DPZTG	-0.0954	0.1275	-0.0256	0.1057	-0.0709	0.0923	0.0106	-0.0772	1				
DVRSTY	0.0088	0.0318	0.0655	0.1242	-0.0886	0.1238	-0.1462	0.0643	0.0771	1			
HHI	0.1163	0.1167	0.3865	0.2363	-0.338	0.0343	0.0009	0.0393	0.0199	0.092	1		
GDP	-0.1398	-0.0347	-0.0866	-0.0068	-0.0157	-0.0068	0.0354	-0.0665	0.019	0.0158	0.1181	1	
INF	0.2267	0.0816	0.4697	0.1976	-0.2634	0.0779	-0.0414	0.1036	-0.0104	0.0808	0.6605	-0.2462	1

3.2. Empirical Strategy

3.2.1. Static Panel Estimations

At first, this study starts with Pooled Ordinary Least Squares (POLS) estimation for static model. The OLS estimators are assumed that they are consistent when all independent variables are not correlated with the error term. However, the fact that this assumption can be violated in the case of that there are unobserved bank specific impacts or independent variables might be correlated with the error term for example, endogeneity problem.

The empirical model of this study for conventional cross-section regression is as follows:

$$NIM_{it} = \xi + \delta`[X]_{it} + \mu_i + \quad _{it} \qquad (1)$$

where NIM_{it} is the NIM of bank *i* at time *t*, ξ is a constant term, $_{it}$ is an independently distributed error term with $E[_{it}]=0$ also μ_i is an unobserved bank specific effects which is not correlated the error term. X represents the set of independent variables as follow

$$[X]_{it} = \sum_{k=1}^{K} \beta_k \, PIM_{kit} + \sum_{l=1}^{L} \psi_l \, BS_{lit} + \sum_{m=1}^{M} \lambda_m \, MME_{mt} \qquad (2)$$

β_k is the *K* coefficients of the pure interest rate margin (PIM), ψ_l is the *L* coefficients of the bank specific (BS) determinants and λ_m is the *M* coefficients of the market specific and macroeconomic specific determinants that are constant over all banks in a given time.

When performing the POLS regression, this study does not take into unobserved bank specific effects account for the model (1). Hence, heterogeneity of the bank specific might be appearing of the estimated parameters. For these reasons, this study estimates the model incorporates unobserved bank specific effects by Fixed and Random Effect methods. Combining the bank specific effects has many advantages. For instance, it permits accounting for specific effects. After that, in order to decide between POLS and Random Effect as an estimation method the Breusch and Pagan`s LM test is used.

H_o: Irrelevance of unobserved bank specific effects.
H_A: Relevance of unobserved bank specific effects.

Rejecting the null hypothesis implies that the POLS is not proper method for estimation and vice versa. Also, to test the misspecification between the Random Effect and Fixed Effect methods the Hausman test is used. All these tests can be seen at Table-3

Table 3 Breusch and Pagan LM Test and the Hausman Test

Breusch and Pagan Lagrangian multiplier test for random effects

nim[bank,t] = Xb + u[bank] + e[bank,t]

Estimated results:

	Var	sd = sqrt(Var)
nim	12.22123	3.495887
e	5.688468	2.385051
u	0	0

Test: Var(u) = 0
chibar2(01)= 0.00
Prob > chibar2 = 1.0000

Hausman Test:

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	FE	RE	Difference	S.E.
RA	0.0983051	0.0899186	0.0083865	0.0090755
RBD	-0.0218149	-0.0163944	-0.0054205	0.0035252
OC	0.1534389	0.1340568	0.0193821	0.0212533
LOGTA	0.8344819	0.4128493	0.4216326	0.4947269
LQR	-0.0098446	-0.0000604	-0.0097842	0.0037754
MNGMT	-0.0034422	-0.0038052	0.0003629	0.0001565
IIP	0.5413269	0.5075372	0.0337897	0.0066844
DPZTG	-0.0005357	-0.000503	-0.0000327	.
DVRSTY	0.303785	0.227847	0.075938	0.0273022
HHI	0.181056	0.0527558	0.1283002	0.1784059
GDP	-0.0262233	-0.0294011	0.0031778	.
INF	0.0445018	0.0394428	0.005059	0.0019645

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 333.71
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

3.2.2. Dynamic Panel Estimation

The static models are not able to investigate the potential dynamism. To capture the tendency of the NIM and to be persistent over time this study considers that the current values of the NIM might be determined by their previous values (Carbo and Rodrigues, 2007). This study therefore estimates the following dynamic model, with the lagged dependent variable among the regressors. In dynamic framework, this study`s model can be re-written in the following form

$$NIM_{it} = \xi + \Psi_1 NIM_{it-1} + \delta`[X]_{it} + \mu_i + \ _{it} \quad (3)$$

for *i*= 1, …, *N* and *t* =2,…,*T* where $\mu_i + \ _{it}$ has the standard error component structure;

- $E[\mu_i]=0$
- $E[_{it}]=0$) (4)
- $E[_{it}\ \mu_i]=0$

for *i*= 1, …, *N* and *t* =2,…,*T*

In order to eliminate bank specific effect the first difference is taken;

$$NIM_{it} - NIM_{it-1} = \xi + \Psi_1 (\ NIM_{it-1} - NIM_{it-2}) + \delta`[X_{it} - X_{it-1}] \ + (_{it} - \ _{it-1}) \quad (5)$$

The lagged dependent variable $(\ NIM_{it-1} - NIM_{it-2})$ and the error term $(_{it} - \ _{it-1})$ are correlated with each other which indicates that the explanatory variables are likely endogenous. The econometric presumptions indicate that the error term is not serially correlated and the explanatory variables are weakly exogenous. Thus, the moment conditions based upon difference estimator is employed by dynamic GMM estimator for equation (3)

- $E\ [NIM_{it-k}\ (_{it} - \ _{it-1})\ ]=0$ for t=3,… T, k≥2 (6)

- $E\ [(X_{it-k}\ (_{it} - \ _{it-1})\ ]=0$ for t=3, … T, k≥2 (7)

This can be written the matrix presentation as;

$$K=\begin{bmatrix} y_{i1} & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 0 & y_{i1} & y_{i2} & \cdots & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & y_{i1} & \cdots & y_{iT-2} \end{bmatrix}$$

Where *K* is the instruments matrix corresponding to the endogenous variables and y_{it-s} denominates NIM_{it-k} for equation (6).

Nevertheless, the first estimator is not free from bias and imprecision. Hence, in order to alleviate the possible bias and imprecision , as Blundell and Bond (1998) mentioned that a new estimator that unites a system in the difference estimator can be used if the regressors have limited time period that is known as "the Blundell and Bond system GMM". The econometric presumption is that the difference in the explanatory variables and the bank specific effect are uncorrelated. Thus, the stationary features are;

For equation (3);

$$E\left[(NIM_{it+p})(\mu_i)\right] = E\left[(NIM_{it+q})(\mu_i)\right] \text{ and } E\left[(X_{it+p})(\mu_i)\right] = E\left[(X_{it+q})(\mu_i)\right] \quad \forall\, p \text{ and } q \qquad (8)$$

The additional moment conditions;

$$E\left[\Delta NIM_{it-k}(\mu_i + {}_{it})\right] = 0 \quad \text{for } k = 1 \qquad (9)$$

$$E\left[\Delta X_{it-k}(\mu_i + {}_{it})\right] = 0 \quad \text{for } k = 1 \qquad (10)$$

Now, the GMM methods can be used for model in order to estimate the consistent and efficient parameter by putting account the moment condition for Equation (6), (7), (9) and (10) for the determination of the NIM model. According to Baltagi (2008) and Blundell and Bond (2000) while the Fixed Effect (FE) estimation model is downward biased, the Pooled OLS (POLS) estimation methods is upward biased. However, the system GMM method is set between the lower bound of the FE and the upper bound of the POLS estimation. The system GMM methods accounts for endogeneity and by employing the lagged dependent variables in the levels and in differences (Dietrich and Wanzenried, 2011). Also the system GMM estimator checks for unobserved potential heterogeneity and for the persistence of the dependent variables. Hence, this research considers the system GMM method as an efficient estimator.

Finally, to control the health of estimation method this study performs some tests. In order to reject the null hypothesis of joint insignificance coefficients this study uses the Wald test. For the validity of the instrument in the system GMM this study applied two specification tests. First is the Sargan test which is used to for the emphasising over identifying restrictions is valid. Second is the Arellano-Bond test which is to investigate the hypothesis that residual term is serially uncorrelated.

3.3. Explanatory Variables

3.3.1. Pure Interest Margin Variables

Risk Aversion: The ratio of equity to the total assets as a proxy for the bank risk aversion or bank-capitalisation ratio. For instance, high-capitalised banks are generally thought to be safer and less risky than lower capitalised banks with higher interest rates for credits. Therefore, it is expected that the risk aversion has a positive impact on the NIM. On the other hand, Brock and Franken (2003) argued that there is a negative correlation between the NIM and the risk aversion. Because the less capitalised banks have more incentives to take more risks, the consequence is higher margin in order to obtain higher return. As a result the impact of risk aversion is not clear

Credit Risk: This study calculates the credit risk or the ratio of bad debt using the ratio of non-performing loan to the total loan. It is believed that if this ratio rises due to the health of the bank assets, it will deteriorate the banks, and will generally raise their interest rate to compensate this cost. A positive relationship is expected between the NIM and ratio of bad debt.

Operating Cost: Operating costs are simply defined as the ratio of operating expenses to the total bank assets. Demirguc-Kunt and Huizinga (1999) claimed that banks with high operating cost are willing to pass this cost to their customers. Therefore, it is clear that banks experiencing high operating cost are predicted to have high interest margins; hence, operating cost has a positive effect on the NIM.

Bank Size: Bank size is captured by the logarithm of bank`s total assets. Ex-ante, the relationship between the bank NIM and bank size is ambiguous. The general perception is that the governments are not willing to permit large banks to fail, -too big to fail-for this reason big banks might take a position that has high-risk but high returns. Hence, the sign of the relationship between bank size and the NIM is predicted to be positive.

On the other hand, some studies (for example Demirguc-Kunt and Huizinga, 1999; Leaven and Levine 2007) argue that big banks generally apply lower interest margins relatively to the smaller ones because of the scale efficiencies.

3.3.2. Bank Specific Variables

Liquidity Ratio: Liquidity ratio is proxied in relation to the liquid assets to total assets. The characteristics of the liquid assets tend to yield lower return (Aysan et al. 2009). For this reason, the banks have high amount of liquid assets that are more likely to have less interest income. Thus, the predicted sign of liquid assets is negative.

Efficiency-Management Quality: Management quality is defined as the operating expense to total revenues. This relation is also used to measure the impact of management quality on the bank profitability. The operating expense is accepted as a necessary cost to create unit gross revenue. Therefore, the banks with high management efficiency are able to create and invest in high profitable assets. Hence, an increasing ratio means decreasing management efficiency, thus, a lower NIM, and as a natural result, the relationship between management efficiency and banks NIM is negative.

Implicit interest payment: Implicit interest payment is expressed as the difference between the non-interest cost and other operating revenue over total assets. The sign of the implicit interest payment is not clear. While Maudos and Fernandez de Guevara (2004); and Maudos and Solisa (2009) have found a positive impact, Liebeg and Schwaiger (2006) and Gounder and Sharma (2012) have found a negative relationship.

Deposit Growth Rate: The deposit growth rate is measured by the quarterly growth of bank deposits. It is expected that the banks with high growth rate of deposit are able to decrease its NIM because of the economics of scale. Deposits growth rate depends on many different factors such as the number of branches and management quality. A negative relationship associated with deposit growth rate and the NIM is expected

Operation Diversity: The ratio of non-interest revenue to total operating income captures the operating diversity. This proportion suggests the information of non-traditional banking activities. If this ratio is high for a bank, this means that that bank focuses the non-conventional banks operation such as fee based activities. This is important especially during the crises and uncertainty. This variable is used by many

other studies. For example, Lin et al. (2012) for Asian banks, Carbo and Rodriguez (2007) for European banks, Liebeg and Schwaiger (2006) for Austrian banks. These operations are known to be less risky than interest-based operations, thus the interest return operations are of high risk but have high returns, vice versa. For instance, Demirguc-Kunt and Huizinga (1999) showed that non-interest assets have less returns than the interest based assets. In order to diversify the operation, banks need a wide network and high-qualified employees and also bear some other expenses. Thus, the expectation is that operation diversity has a negative relationship with the NIM.

3.3.3. Macroeconomic and Market Variables

Competitive Structure: To capture the competitive structure of the banking industry, the Herfindahl–Hirschman Index (HHI) is used. The HHI is defined as the sum of the squares of the market share of the individual bank assets in the total banking assets in a given time (in this case: quarterly). It is generally accepted that the high market concentration reflects less competition and enables banks to have monopolistic power over the interest rates. Therefore, most studies expect the sign of the estimated coefficient of the HHI to have a positive sign. On contrary, some studies (for example, see Boone and Weigand, 2000) argue that the NIM and market concentration have a negative relationship. For example, their evidence shows that a higher bank concentration could be the consequence of a strong competition in the banking market, which would offer an opposite relationship. As a result, the overall impact of industry concentration on the NIM is not clear and still waits to be answered empirically.

The Real GDP Growth: To measure the effect of the business cycle on the NIM, this study controls for the real GDP growth. The impact of the GDP growth on the NIM varies over countries; therefore the expected sign is not clear. While Khawaja and Din (2007) have found a negative relationship between the GDP growth and the NIM in Pakistan, Liebeg and Schwaiger (2006) have suggested a positive relationship for Austrian banking sector. In parallel with these findings, Silva et al, (2007) suggest that the relationship is ex-ante, ambiguous.

Inflation: As a macroeconomic uncertainty indicator, this study uses inflation variable to measure the impact of macroeconomic uncertainty on the NIM. Due to difficulty of anticipating the inflation rate for the next period, banks generally prefer to hold a safe position such as investing in government bonds instead of lending loan. Because an

unpredicted inflation rate may raise costs, there is a reason for imperfect interest rate adjustment. Therefore, in a high volatile economic environment, banks might charge higher interest margin for lending to cover the potential risk and this study expects a positive relationship between inflation and the NIM.

Table 4 Definition of Variables and Their Expected Effect on the Net Interest Margin

Variables	Notation	Definition	Expected Sign
Net Interest Margin %	NIM	Net interest income divided by total assets	
Risk Aversion %	RA	Equity over total assets	?
Credit Risk %	RBD	Non-performing loan over total loan	+
Operating Cost %	OC	Operation cost over total assets	?
Bank Size	LOGTA	Logarithm of total assets	?
Liquidity Ratio %	LQR	Ratio of liquid assets to total assets	-
Management Quality %	MNGMT	Total expenses over total generated revenues	-
Implicit Interest Payment %	IIP	Net non-interest income over total assets	+
Deposits Growth %	DPZTG	Quarterly growth of deposits	-
Operation Diversity %	DVRSTY	Non-interest income over operating income	-
Herfindahl Index %	HHI	Herfindahl index for assets	+
Real GDP Growth %	GDP	Quarterly real GDP growth	?
Inflation %	INF	CPI growth rate	+

4. Empirical Results

4.1. Overall Results

This section has been divided into two parts. The first part provides the findings of the whole sample and the second part shows the results of the separate estimations by bank ownership structure. To investigate the hypotheses, this study estimates four different models with using proper econometric tests to decide appropriate estimation technique. Table-5 summaries the regression results employing different techniques. The column (1) shows the Pooled OLS (POLS) result, since, the POLS does not allow to accounting unobserved bank specific effect, the within Fixed Effect (FE) and GLS-Random Effect(RE) methods are executed. The column (2) and (3) provide these results

respectively. The results of RE estimation are consistent with the results of the POLS. To investigate the relevance of bank specific effects, the LM test provides that this study rejects the null hypothesis, which is the POLS is a proper method to provide the relationship between the NIM and its determinants. This means that the FE or the RE should be used instead of the POLS in cases of static estimation methods. To decide the Fixed or Random Effect, the Hausman test technique is used and the result which is in favour of FE Model. All these tests results are summarise in Table-5.

Nevertheless, such static models do not allow us to investigate the potential dynamism, thus, performing the dynamic GMM estimator in this regard seems a best alternative, and the column (4) shows the results of the GMM estimation. This hypothesis considers that the lagged value of the NIMs might have a significant effect on the current value of the NIM. As it can be seen from the first and the second rows` result in column (4) on the Table-5, the lagged dependent variables have a significant effect on the current values of the NIM. Additionally, we also provide the Sargan test for over-identifying restrictions and the results prove that our specification is well modelled. Furthermore, the results of the Arellano-Bond test for checking serial correlation support to our model. The following results of variables are based on the baseline specification which uses the GMM estimation method.

Risk Aversion: On the contrary of a number of studies (see Claeys and Vander Vennet, 2008; Maudos and Solisa, 2009; Flamini et al. 2009; Fungacova and Poghosyan, 2011) the results of this study surprisingly have shown that the correlation between risk version and the NIM is insignificant even its coefficient is positive. Higher risk aversion ratio implies that banks set higher margin due to positive relationship.

Credit Risk: Surprisingly, the relationship between credit risk and the NIM is not positive as predicted. However, it has a significant impact on the NIM. A positive and significant relationship implies that the NIM decreases as the quality of credit falls and the banks with large credit risk might raise margin in order to solve such problems. The result is inconsistent with Gounder and Sharma (2012)

Operating Cost: The coefficient of operating costs is positive and statistically significant. This means that the banks with higher operating expenses have higher NIM to compensate their operation expense. Hence, high operating costs are mostly passed

to customers to keep the banks` profit unaffected. The result of the operating cost is in line with Maudos and Solisa (2009)

Bank Size: The bank size does not seem to be a significant determinant of banks` NIM and have a negative sign. This study also used the banks` size variable for the logarithm of total loan, instead of the logarithm of total assets, but again failed to find any significant relationship between the bank size and NIM. Even the coefficient of the bank size is insignificant, the sign is negative and it means that big banks are assumed to set lower interest margin. This result is, again, inconsistent with many studies focusing on developing countries such as Tan (2012).

Liquidity Ratio: Results show that there is a negative relationship between liquidity ratio and the NIM. However, the magnitude of the impact is insignificant. This finding is in line with Hawtrey and Liang (2008) and Maudos and Solisa (2009).

Management Quality: This study`s result suggests that the management efficiency a negative and significant effect on the margin. This result implies that the banks with less management quality set higher interest margin. This relation can be interpreted as a beneficial condition for the bank`s client that higher management quality encourages banks to exhibit higher deposit rates and lower loan rates. This study`s result is consistent with Liebeg and Schwaiger (2006), Hawtrey and Liang (2008), Claeys and Vander Vennet (2008) Horvath (2009).

Implicit Interest Payment: Result has suggested that there is a statistically significant and positive relationship between the interest margin and the implicit interest payment. This relation implies that banks in Turkey might try to recover the implicit interest payment via margin setting (Gounder and Sharma,2012). Hence, the banks that set their services more implicitly through less compensation of liabilities exhibit a higher margin (Maudos and de Guevara, 2004). This finding is in line with Saunders and Schumacher (2000),

Deposits Growth: A significant and negatively relationship between the deposit growth and the NIM has been found. It means that the banks with the ability of collecting deposits of high rate exhibit lower interest margin.

Table 5 Regressions Results

VARIABLES	(1) POLS	(2) FE	(3) RE	(4) GMM
L.NIM	-	-	-	0.228***
				(0.0258)
L2.NIM	-	-	-	-0.0122***
				(0.00223)
RA	0.0899***	0.0983***	0.0899***	0.0115
	(0.0127)	(0.0156)	(0.0127)	(0.00777)
RBD	-0.0164**	-0.0218***	-0.0164**	-0.0343***
	(0.00690)	(0.00775)	(0.00690)	(0.00524)
OC	0.134**	0.153**	0.134**	0.0817***
	(0.0561)	(0.0600)	(0.0561)	(0.0107)
LOGTA	0.413***	0.834	0.413***	0.00962
	(0.120)	(0.509)	(0.120)	(0.147)
LQR	-5.98e-05	-0.00985*	-5.98e-05	-0.00200
	(0.00417)	(0.00563)	(0.00417)	(0.00176)
MNGMT	-0.00381***	-0.00344***	-0.00381***	-0.00620***
	(0.000885)	(0.000898)	(0.000885)	(0.000230)
IIP	0.508***	0.541***	0.508***	0.369***
	(0.0198)	(0.0209)	(0.0198)	(0.0138)
DPZTG	-0.000503***	-0.000536***	-0.000503***	-0.000344***
	(0.000166)	(0.000165)	(0.000166)	(1.71e-05)
DVRSTY	-0.228**	-0.304***	-0.228**	-0.379***
	(0.0933)	(0.0972)	(0.0933)	(0.0489)
HHI	0.0528	0.181	0.0528	0.221
	(0.182)	(0.255)	(0.182)	(0.151)
GDP	-0.0294**	-0.0262*	-0.0294**	-0.00215
	(0.0148)	(0.0147)	(0.0148)	(0.00205)
INF	0.0394***	0.0445***	0.0394***	0.0295***
	(0.00819)	(0.00842)	(0.00819)	(0.00599)
CONSTANT	-3.546	-7.657	-3.546	-1.354
	(2.250)	(5.830)	(2.250)	(2.261)
OBSERVATIONS	966	966	966	920
R-squared	0.535	0.538	0.535	
Sargan test (P value)	-	-	-	0.6743
A-Bond Test AR(1)	-	-	-	0.0226
A-Bond Test AR(2)	-	-	-	0.1157
Number of Banks	23	23	23	23

Note: The dependent variable is the Net Interest Margin (NIM).Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. (1) POLS is the Pooled OLS estimation; (2) FE, Within group fixed effect estimation; (3) RE, GLS random effect estimation, (4) System GMM, Blundell and Bond (1998).

Operation Diversity: The result suggests that the operation diversity and the NIM have a significant and a negative relationship. The result suggest that the banks engaging mostly in interest related operations, in other words the ones who take more risks and who are less diverse exhibit greater interest margins, vice versa. As a result, if a bank takes high risks, it gains more returns than a bank that takes less risks.

Competitive Structure (Herfindahl Hirschman Index): The coefficient of the Herfindahl-Hirchman Index is positive but insignificant. Hence, this result indicates that, ceteris paribus, the banks with high market do not exploit their market power on determining the interest margin in Turkey. This result is consistent with Flamini et al. (2009), and Fungacova and Poghosyan (20011).

The Real GDP Growth: This study, surprisingly, has not found any significant correlation between the real economic growth and the NIM.. Although the coefficient of the GDP is insignificant, its sign is negative which means that economic growth might keep interest margin low. This study`s result is in line with Claeys and Vander Vennet (2008).

Inflation: As expected the coefficient of inflation is positive and it affects the NIM significantly, which means that banks estimate the future movement in inflation accurately and hastily enough to adjust rates and interest margin (Flamini et al. 2009). This result can be explained with the mathematical expression. Assuming that Γ_D and Γ_L are the real interest rate on deposits and loan, respectively, as that the fisher equation holds, bank interest margin can be expressed in nominal value as:

$(1+\Gamma_L)(1+\pi) - (1+\Gamma_D)(1+\pi)$

This after manipulation gives:

$(\Gamma_L - \Gamma_D)(1+\pi)$

Where, π indicates the inflation rate. Therefore, the impacts of inflation on the nominal interest rates, deposits and loans do not cancel out for the reason of the cross product term, indicating a positive impact of inflation on the NIM (Flamini et al. 2009). Hence, our finding implies that banks adjust a higher interest margin in a higher inflation condition, vice versa. Also our finding is consistent Demirguc-Kunt and Huizinga (1999) and Maudos and de Guevara (2004).

4.2. Ownership Results

The possible effects of ownership on the NIM are investigated in this section. To obtain a clear and robust result, this study has subdivided sample into three parts according to ownership, foreign, state and private banks respectively, to analyse variations on the effects of the NIM determinants across ownership structure.

Also this can be seen on Chow Test results, which are provided by Table-6. According to Chow test results the coefficients do not have the same affect for the three ownership groups. For example, for foreign banks the rejection of the hypothesis (p-value <0.05) means that the foreign banks do not share the same the coefficient for the corresponding variable. Notice that the Chow test is highly significant for risk aversion, credit risk, bank size, operation diversity, market concentration and inflation for foreign banks. For state banks, risk aversion, bank size, operation diversity, market concentration and inflation is highly significant. However, for state banks all non of chow test is significant.

Table-7 summarises the findings for ten foreign banks, three state banks and sixteen private banks by comparing the main estimated results, which is in the column (4).

At the first glance, the results of private-owned banks are very similar to the main sample results in terms of both coefficients` signs and their effects on the NIM. All coefficients` of private banks and main sample sign are the same except the sign of risk aversion. This result verifies our hypothesis that the structure of the Turkish banking system is largely controlled by domestic private banks. Another common result is that the coefficients of the operating cost, management quality implicit interest payment and operation diversity variables and their significant effects on the NIM are consistent across all ownership groups. This result implies that all banks react similarly to changes in management quality, implicit interest payment ratio, operating cost and operation diversity when determining the NIM. Although the management quality has a significant effect on the NIM, its economic impacts are very small for all banks.

Table-6 Chow Tests

Chow Test for		Foreign Banks	State Banks	Private Banks
Risk Aversion	F(2, 942)	= 4.29	= 0.16	= 4.81
	Prob > F	= 0.014	= 0.8507	= 0.0083
Credit Risk	F(2, 942)	= 3.05	= 1.54	= 2.99
	Prob > F	= 0.0477	= 0.2142	= 0.0510
Operating Cost	F(2, 942)	= 0.24	= 0.04	= 0.50
	Prob > F	= 0.7884	= 0.9599	= 0.6056
Bank Size	F(2, 942)	= 11.62	= 0.07	= 6.88
	Prob > F	= 0.0000	= 0.9393	= 0.0011
Liquidity Ratio	F(2, 942)	= 0.14	= 0.04	= 0.29
	Prob > F	= 0.8667	= 0.9639	= 0.7474
Management Quality	F(2, 942)	= 0.08	= 0.03	= 0.52
	Prob > F	= 9186	= 0.9677	= 0.5953
Implicit Interest Payment	F(2, 942)	= 2.81	= 0.12	= 2.57
	Prob > F	= 0.0609	= 0.8829	= 0.0772
Operation Diversity	F(2, 942)	= 3.61	= 0.09	= 3.55
	Prob > F	= 0.0274	= 0.9183	= 0.0291
Market Concentration	F(2, 942)	= 14.02	= 0.12	= 8.68
	Prob > F	= 0.000	= 0.8902	= 0.0001
Real GDP Growth	F(2, 942)	= 1.49	= 0.31	= 0.63
	Prob > F	= 0.2255	= 0.7350	= 0.5336
Inflation	F(2, 942)	= 41.69	= 0.79	= 24.71
	Prob > F	= 0.00	= 0.4540	= 0.0000

Regarding the foreign ownership, the results have showed that the foreign banks are not similar to state and private banks in two aspects. The first distinctive feature of foreign banks is that the banks size positively and significantly affects only for the NIM of foreign banks. The positive and significant coefficient for the bank size implies that the big foreign banks set higher margins in the Turkish banking system. Second, the risk aversion (or capitalisation ratio) has a positive effect on only for the NIM of foreign banks. This indicates that foreign banks with higher capitalisation ratio tend to set higher NIM.

Considering the private domestic banks, this study has found an interesting result for private banks. Solely, the NIM of private banks is positively affected by alteration in market structure. The positive coefficient and significant effect for the market structure indicate that the private domestic banks exploit their special position in the industry by setting higher NIMs.

In terms of state banks, this study has also found some important results. One of them is that the liquidity ratio is a positive determinant of NIM only for state banks. In contrast to this study`s expectation, the effect of liquidity risk on NIM is positive for foreign banks. Another important result is that the effect of the rate of bad debt or credit risk. Credit risk has a negative impact on the NIM of foreign and private banks and a positive effect on for only state bank. The negative sign indicates a fierce competition on gaining the market share and thus, the results have showed that foreign and private banks are more willing to accept higher ratio of bad debt without increasing their interest margins for the sake of obtaining more market share in the sector.

Table-7 Estimation Results by Bank Ownership

VARIABLES	(1) FOREIGN	(2) STATE	(3) PRIVATE	(4) MAIN
L.NIM	0.256	0.200***	0.115***	0.228***
	(0.176)	(0.0521)	(0.0429)	(0.0258)
L2.NIM	-0.0294**	0.243**	0.0461	-0.0122***
	(0.0138)	(0.124)	(0.0468)	(0.00223)
RA	0.0264	-0.00692	-0.0125	0.0115
	(0.0246)	(0.0234)	(0.0166)	(0.00777)
RBD	-0.0890	0.0103***	-0.0313***	-0.0343***
	(0.125)	(0.00382)	(0.00549)	(0.00524)
OC	0.0213	0.182	0.0381	0.0817***
	(0.115)	(0.173)	(0.250)	(0.0107)
LOGTA	0.417**	-0.170	-0.0940	0.00962
	(0.175)	(0.193)	(0.175)	(0.147)
LQR	-0.00827**	0.00276***	-0.00656***	-0.00200
	(0.00400)	(0.000941)	(0.00138)	(0.00176)
MNGMT	-0.00617***	-0.00570**	-0.00780***	-0.00620***
	(0.00157)	(0.00241)	(0.00235)	(0.000230)
IIP	0.376***	0.0308	0.425***	0.369***
	(0.0555)	(0.104)	(0.0623)	(0.0138)
DPZTG	-0.000389***	0.00270	-0.000549	-0.000344***
	(0.000146)	(0.00244)	(0.00268)	(1.71e-05)
DVRSTY	-0.199**	-1.125***	-0.593***	-0.379***
	(0.0998)	(0.216)	(0.181)	(0.0489)
HHI	-0.0221	-0.0568***	0.0692*	0.221
	(0.446)	(0.0135)	(0.0412)	(0.151)
GDP	0.0168	-0.00392	-0.00844***	-0.00215
	(0.0232)	(0.00254)	(0.00270)	(0.00205)
INF	0.0847**	-0.00137	0.00672	0.0295***
	(0.0418)	(0.00711)	(0.00755)	(0.00599)
CONSTANT	-1.708	2.878*	1.939	-1.354
	(4.475)	(1.717)	(1.625)	(2.261)
Observations	288	120	498	920
Number of bank	10	3	16	23
Sargan test (P value)	0.3212	0.0278	0.4563	0.6743
A-Bond Test AR(1)	0.1284	0.0872	0.0062	0.0226
A-Bond Test AR(2)	0.2492	0.1783	0.2634	0.1157

***Note**:* The dependent variable is the NIM (NIM).Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

(1) FOREIGN is the foreign bank sample estimation; (2) STATE, is the state banks sample estimation (3) PRIVATE is the private sample estimation, (4) MAIN is the whole sample estimation.

Consequently, the results of the second estimation have showed that considerably variations exist in terms of the effect of the NIM factors across the ownership groups. Thus, it is crucial to take into the ownership structure account while investigating the effect of the interest margin determinants in Turkey. Otherwise, a possible disregarding may cause inaccurate conclusions.

5. Robustness Checks

This section analyses the robustness and sensitivity of our findings using six different robustness checks. A set of robustness tests is reported in Table-8**.** Firstly, this study dropped three banks from the main sample and re-estimated by employing the same variables and the same techniques. These banks are from different bank-ownership groups. Secondly, we dropped the whole state-owned banks from the sample and re-estimated the model same as the previous methods. Thirdly; we have re-estimated the model for only domestic private and state banks by excluding foreign banks from the whole sample. Fourthly, we employ an alternative measure of bank size. In the foundation model, logarithm of total assets was considered as the variable of bank size. However, this time, the bank size is measured by market share as Liebeg and Schwaiger (2006) used in their paper as a determinant of the NIM. Later, this study added a bank-specific variable which is the *credit size* as a determinant of the NIM (see, Aysan et al, 2009). Lastly, we added a macro-specific determinant of the NIM, which is the *interbank interest rate.*

Using different sample size and types this study has re-estimated the model with the same explanatory variables for column (1), (2) and (3). As a result, the sign of coefficients of the explanatory variables, except for the RA, LOGT and HHI (in only one case) are remarkably consistent over different sample size. Also their significances are very similar. Therefore, these three different samples specifications support that the results obtained for the baseline model are valid.

In addition, by employing an alternative bank size variable we re-estimated the model by using the same techniques and such results are reported in column (4). The last robustness check`s results are also consistent with the main results.

Finally, in the fifth and sixth robustness checks by including a bank-specific and a macro specific variable, respectively, into the model is also in favour of the validity of the results of this study. The results in the columns (5) and (6) are considerably parallel to each other such as all coefficients` sign are the same and their significant effects have too small variation with no exception. Consequently, all robustness tests using different variables and different sample size support the baseline estimation results. The coefficient sign of the explanatory variables and their magnitude on the NIM, and the main results also are in line with each other.

Table - 8 Robustness Tests

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	SSMPL	NOSTT	NOFRGN	NEWSIZE	CRDT	IIRATE
L.NIM	0.138***	0.216**	0.118***	0.207***	0.209***	0.209***
	(0.0340)	(0.0838)	(0.0409)	(0.0675)	(0.0684)	(0.0690)
L2.NIM	0.0330	-0.0140	0.0361	-0.0172	-0.0162	-0.0158
	(0.0400)	(0.0108)	(0.0422)	(0.0128)	(0.0126)	(0.0134)
RA	-0.00245	0.0137	0.000158	0.0106	0.0119	0.0125
	(0.0111)	(0.0144)	(0.0141)	(0.0139)	(0.0136)	(0.0139)
RBD	-0.0227***	-0.0559	-0.0274**	-0.0424	-0.0422	-0.0420
	(0.00814)	(0.0399)	(0.0110)	(0.0288)	(0.0290)	(0.0281)
OC	0.109	0.0905	0.0492	0.111	0.106	0.105
	(0.175)	(0.0738)	(0.231)	(0.0730)	(0.0728)	(0.0735)
LOGTA	-0.181*	0.0731	-0.162	------	0.0109	0.0263
	(0.108)	(0.178)	(0.144)	------	(0.142)	(0.201)
LQR	-0.00436**	-0.00313	-0.00511***	-0.00350	-0.00323	-0.00318
	(0.00185)	(0.00254)	(0.00132)	(0.00232)	(0.00290)	(0.00259)
MNGMT	-0.00846***	-0.00566***	-0.00843***	-0.00590***	-0.00590***	-0.00592***
	(0.00206)	(0.00161)	(0.00243)	(0.00168)	(0.00169)	(0.00161)
IIP	0.393***	0.377***	0.405***	0.377***	0.377***	0.377***
	(0.0494)	(0.0459)	(0.0574)	(0.0433)	(0.0435)	(0.0440)
DPZTG	-0.000154	-0.000326***	0.000786	-0.000328***	-0.000323***	-0.000322***

	(0.000815)	(7.15e-05)	(0.00232)	(7.20e-05)	(6.72e-05)	(6.28e-05)
DVRSTY	-0.627***	-0.355***	-0.632***	-0.368**	-0.363**	-0.364**
	(0.162)	(0.138)	(0.190)	(0.144)	(0.148)	(0.143)
HHI	0.0712	-0.0416	0.0544	-0.0525	-0.0572	-0.0585
	(0.0468)	(0.213)	(0.0433)	(0.213)	(0.193)	(0.168)
GDP	-0.00621***	-0.000954	-0.00596**	-0.00141	-0.000930	-0.000753
	(0.00206)	(0.00776)	(0.00265)	(0.00681)	(0.00687)	(0.00760)
INF	0.00695	0.0336	0.00888	0.0324	0.0325	0.0304
	(0.00582)	(0.0212)	(0.00693)	(0.0207)	(0.0216)	(0.0198)
MS	------	------	------	-0.00789	------	------
				(0.0315)		
CRDT	------	------	------	------	0.0161	------
					(0.484)	
IIR	------	------	------	------	------	0.00189
						(0.00812)
Constant	2.288**	1.041	2.402*	1.744	1.647	1.543
	(1.112)	(2.180)	(1.370)	(2.248)	(2.119)	(2.093)
Observations	800	800	618	920	920	920
Number of bank	20	20	19	23	23	23

Note: The dependent variable is the NIM (NIM). Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

6. Conclusion

This research has analysed how the pure-specific and bank-specific characteristics, and also macro and market-specific factors affect the NIM for almost all of the commercial banks in Turkey over the period from the last quarter of 2001 to the first quarter of 2012 with a particular emphasis on the role of the bank ownership by employing micro and macro level data.

Findings of this study clearly indicate that the NIM of a bank is mainly determined by the bank-specific characteristics such as management quality, operating cost, ratio of bad debt (credit risk), implicit interest payment, bank`s deposit growth rate and operation diversity, and also inflation as a macro-specific factor. Regarding management efficiency, this study finds that efficient banks exhibit lower interest margin and charge lower fees in favour of costumers. This result supports the hypothesis that management

quality can improve the financial intermediation system. Also, findings of this study suggest that implicit interest payment causes a higher interest margin since this determinant represents an extra cost for the banks. Furthermore, our research has found that ratio of bad debt (or credit risk) has a significant and negative impact on the bank margin. Thus, the banks with high credit risk level exhibit lower margin. Another important point is that high operating cost raises the interest margin since the banks with high cost may pass these expenses on to their clients by charging higher rates of interest on loan and providing lower rates for deposits.

Considering the external drivers related to the macroeconomic environment variables such as the real economic growth and the price stability on the determination of the NIM, we have found a strong and positive relationship between inflation and the NIM. It can be interpreted that high inflation rate contributes to a higher margin, thus; it has a deterioration impact on the financial intermediation system. In contrast, this study failed to find any significant relation between the GDP growth and the NIM.

The ownership-related findings have supported the hypothesis that the bank ownership has a strong impact on the determination of the NIM. Thus, bank ownership has a crucial role on the determination of the NIM and should not be disregarded.

Overall, the results of this study have showed that the NIM is a crucial element in order to maintain financial stability of Turkey. Hence, this study has some policy recommendations for both bank managers and the government authorities. On the side of bank managers, they should upgrade their management quality and decrease the operating cost, since both are significant determinant of the NIM. Also they should investigate on the new technologies such as enhancing the ATM network and encourage their customers to use online banking for the sake of reducing implicit interest payment, which is another major determinant of the NIM. On the side of government authorities, the price stability is one of the main determinants of the NIM because the high inflation decreases loan expansion by causing higher interest margin. Thus, monetary policy should target to control inflation very strictly by keeping a reasonable rate, in order to foster the strong financial intermediation system in Turkey.

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Appendix

Table 9 Selected Literatures for the NIM- Developed Countries

Authors	Angbazo	Saunders and Schumacher	Maudos and Fernandez de Guevara	Liebeg and Schwaiger	Carbo Valverde and Rodriguez Fernandez	Williams
Year	1997	2000	2004	2006	2007	2007
Journal/Working Paper	JBF	JIMF	JBF	OeNB	JBF	FMII
Risk Aversion	+	+	+	+	+	+
Credit Risk	+	NA	+	-	+	-
Operating Cost	NA	NA	+	+	+	+
Bank Size	NA	NA	-	-	NA	x
Liquidity Ratio	-	+	+	NA	NA	x
Management Quality	-	NA	-	-	NA	-
Implicit Interest Payment	+	NA	+	-	NA	+
Deposits Growth	NA	NA	NA	NA	NA	NA
Operation Diversity	NA	NA	NA	NA	NA	NA
Market Concentration	+	+	+	+	+	+
Real GDP Growth	NA	NA	NA	+	-	NA
Inflation	NA	NA	NA	NA	NA	NA
Ownership	NA	NA	NA	NA	NA	foreign(-)
Sample	USA	Germany, Spain, France, UK, Italy, Switzerland, USA	France, Germany, Italy, Spain, UK	Austria	Germany, Spain, France, the Netherlands, Italy, UK, Sweden	Australia
Estimation Methods	GLS	Cross-sectional OLS	Fixed Effect OLS	Dynamic GMM	Dynamic GMM	POLS, RE

Note: **+**, **-** and **x** denote positive significant, negative significant and insignificant, respectively. JBF: Journal of Banking and Finance. JIMF: Journal of International Money and Finance. OeNB: Austrian National Bank. FMII: Financial Markets, Institutions and Instruments.

Table 10 Selected Literatures for the NIM- Developing Countries

Authors	Drakos	Martinez Peria and Mody	Claeys and Vander Vennet	Schwaiger and Liebeg	Maudos and Solisa	Horvath	Fungacova and Poghosyan	Gounder and Sharma	Tan
Year	2003	2004	2008	2008	2009	2009	2011	2012	2012
Journal/Working Paper	JPM	JMCB	ES	OeNB	JBF	Czech JEF	ES	APE	IMF
Risk Aversion	+	x	+	+	+	-	+	+	+
Credit Risk	+	x	NA	+	-	+	-	+	NA
Operating Cost	NA	NA	NA	+	+	+	+	+	+
Bank Size	NA	NA	-	x	+	-	-	NA	-
Liquidity Ratio	-	+	NA	NA	+	NA	-	-	NA
Management Quality	NA	+	-	NA	-	-	NA	-	NA
Implicit Interest Payment	NA	NA	NA	+	+	NA	NA	+	NA
Deposits Growth	NA	NA	NA	+	NA	NA	NA	NA	NA
Operation Diversity	NA	NA	NA	NA	NA	NA	NA	NA	NA
Market Concentration	NA	+	+	+	+	x	-	+	+
Real GDP Growth	NA	x	+	+	NA	x	NA	NA	-
Inflation	NA	x	+	NA	NA	+	NA	NA	+
Ownership	foreign(-)	foreign (-)	NA	foreign(+) state(x)	NA	NA	+	NA	foreign(+)
Sample	CEE Countries	Latin America	CEE Countries	CEE Countries	Mexico	Czech Republic	Russia	Fiji	Philippines
Estimation Methods	GLS	Pooled OLS	RE OLS	FE OLS	FE/GMM	GMM	FE OLS	RE OLS	FE OLS

Note: **+**, **-** and **x** denote positive significant, negative significant and insignificant, respectively. JPM: Journal of Policy Modeling. JMCB: Journal of Money, Credit and Banking. ES: Economic System. OeNB: Austrian National Bank. JBF: Journal of Banking and Finance. JEF: Journal of Economic and Finance. APE: Applied Financial Economics. IMF: IMF Working Paper

Table 6 Selected Literatures for the NIM- Cross-Country Countries

Authors	Demirguc-Kunt and Huizinga	Hawtrey and Liang	Kasman et al.
Year	1999	2008	2010
Journal/Working Paper	WB Econ Review	NAJEF	Economic Modelling
Risk Aversion	+	+	+
Credit Risk	+	+	+
Operating Cost	+	+	+
Bank Size	NA	-	-
Liquidity Ratio	-	NA	NA
Management Quality	NA	-	-
Implicit Interest Payment	NA	+	+
Deposits Growth	NA	NA	NA
Operation Diversity	NA	NA	NA
Market Concentration	x	+	+
Real GDP Growth	+	NA	-
Inflation	+	NA	+
Ownership	foreign (+)	NA	NA
Sample	80 Countries	OECD Countries	EU Member and Candidates Countries
Estimation Methods	Pooled WLS	FE GLS	Pooled OLS

Note: **+, -** and **x** denote positive significant, negative significant and insignificant, respectively. WB: World Bank Economic Review. NAJEF: North American Journal of Economics and Finance.