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SON FİNANSAL KRİZİN BANKA KARLILIĞININ BELİRLEYİCİLERİ ÜZERİNE ETKİLERİ: TÜRK BANKACILIK SEKTÖRÜ ÖRNEĞİ

EFFECTS OF THE RECENT FINANCIAL CRISIS ON THE DETERMINANTS OF BANK PROFITABILITY: CASE OF TURKISH BANKING INDUSTRY

Dilek DEMİRHAN[1]

ÖZET

Yaşanan son finansal kriz dünyada birçok ülkenin finansal sistemleri üzerinde etkili olmuştur. Gelişmekte olan ekonomilerden olan Türkiye ekonomisi de bu krizden etkilenmiştir, ancak sözkonusu krizin özellikle bankacılık sektörüne etkilerini inceleyen çalışmaların sayısı kısıtlıdır. Bu nedenle, bu çalışmanın amacı son finansal krizin Türkiye'de faaliyet gösteren bankaların karlılıklarının belirleyicileri üzerine etkisini saptamaktır. Analiz dönemi Aralık 2003-Haziran 2012 dönemini kapsamakta olup, bu dönem kriz öncesi ve kriz sonrası olmak üzere ikiye ayrılmıştır. Kriz öncesi ve sonrası dönemlerde banka karlılığını etkileyen faktörleri saptayabilmek üzere sistem GMM tahmincisi kullanılmıştır. Sonuç olarak bulgular, Türk bankacılık sektöründeki bankaların karlılıklarının son finansal krizden önemli ölçü de etkilenmese de, krizin banka karlılığının belirleyicileri üzerinde birtakım etkileri olduğunu göstermektedir.

Anahtar Kelimeler: *Banka karlılığı, finansal kriz, GMM tahmincisi, dinamik panel*

[1] Yrd. Doç. Dr. Ege Üniversitesi, İİBF İşletme Bölümü , dilek.demirhan@ege.edu.tr.

ABSTRACT

The recent financial crisis had influenced the financial systems of many countries in the world. Turkish economy, one of the developing economies, has also been affected, but there are few studies investigating the effect of the recent financial crisis especially on the banking industry. Therefore this study aims to find out the impact of the recent financial crisis on bank profitability and its determinants in Turkey. In this respect, t-tests and dynamic panel estimation technique are used in the study. The analysis covers the period from December 2003 to June 2012, and it is divided into pre-crisis and post crisis periods. System GMM estimator is applied to be able to find out the determinants of bank profitability before and after the crisis. As a result, the findings reveal that profitability of banks in Turkish banking industry was not affected significantly by the recent financial crisis, but the crisis had some impacts on the determinants of bank profitability.

Keywords: *Bank profitability, financial crisis, GMM estimator, dynamic panel*

1.Introduction

Banks are making important contributions to the economy of a country by helping the transfer of savings into investments. Economies with strong banking systems are being able to grow and operate in less problematic and healthier way. Thus, the financial performance of the banking industry concerns and affects many different parties in an economy. One of the factors that can disrupt the operations of banks is financial crisis, which can have a great impact on their performance. Recent financial crisis which has started as sub-prime credit problems in US during 2007 has affected the financial sectors and so the banking industries of many countries. IMF has referred it as "the Great Recession" because of the sharp decline in the values of assets and prices of commodities, the collapse of a number of large banks and increase in the unemployment level (Moshirian, 2011).

As the most important financial intermediaries, banks and their financial performance have been affected in many ways during this great recession. Some of the studies tried to investigate those effects by investigating the impact of recent financial crisis on stock returns of banks. According to the findings of Shehzad and Haan (2013), who showed that the financial crisis impacted banks operating in industrial countries differently than banks in emerging countries, large banks' stock prices were affected more during the crisis. In another study, where the determinants of the relative stock return performance of large banks across the world during the period from the beginning of July 2007 to the end of December 2008 were investigated, it was emphasized that large banks with more Tier 1 capital, more deposits, less exposure to US real estate, and less funding fragility performed better. The findings of the same study also revealed that banks from countries with current account surpluses fared significantly better during the crisis, while banks from countries with banking systems more exposed to the US fared worse (Beltratti and Stulz, 2012). Aebi et al. (2012) analysed the influence of bank-specific corporate governance, and in particular ''risk governance'' characteristics on the performance of banks during the financial crisis. However they focused not only on stock returns of banks during financial crisis but also used ROE as a measure of bank performance. As a result they found that risk governance in general and the reporting line of the "Chief Risk Officer" in particular are important to the banks' crisis performance. They concluded that to be better prepared to face the next financial crisis, banks have to improve the quality and profile of their risk management function.

The studies mentioned above investigated the effects of the recent financial crisis on the stock return performance of banks; however there are few studies analysing the effects of recent financial crisis on determinants of bank profitability (Dietrich and Wanzenried, 2011). Based on this fact, this study tries to find the determinants of bank profitability before and after the financial crisis, so that the effects of the crisis on these determinants can be understood. ROA, but not stock prices,

are used as the performance measure for banks, because in Turkey, where the study focuses on, 12 of total 31 deposit banks are public.

The scope of the study covers Turkey, a member country of OECD (Organization for Economic Co-operation and Development) since 1961 and also the part of the EU (European Union) Customs Union since 1995. Being one of the most promising developing economies, Turkish economy grew with an average annual real GDP growth rate of 5.2% between 2002 and 2011 (IMF, 2012). In addition, according to OECD, it is expected to be one of the fastest growing economy of the OECD members during 2012-2014, with an annual average growth rate of 4,04 % (OECD, 2012).Also, the financial sector in Turkey is thought to be one of the least affected sectors in the last financial crisis. Although there was a sharp liquidity squeeze in the last months of 2008 in parallel with global conditions, no financial institutions collapsed or needed rescue, and no emergency package was required for the sector. It is known that the financial sectors of most of the emerging economies generally suffered less than the highly developed markets, but apart from this fact Turkish banking industry emerged from its own crisis in 2001 with strong regulation and internal control systems, which helped it to overcome problems easily with the recent global crisis (ISPA, 2010). However this does not mean that the Turkish economy was not affected at all. Turkey's budget deficit swelled to 23.2 billion Turkish liras ($15 billion) in the first half of 2009, 13 times higher than a year earlier. Therefore, in 2009, the Turkish Government introduced various economic stimulus measures to reduce the impact of the financial crisis, such as temporary tax cuts on automobiles, home appliances, and housing. As a result of these measures, the production of durable consumer goods increased by 7.2% (Kantar et al., 2012).

Given the above facts about Turkey, it would be interesting to investigate the determinants of the profitability of banks operating in Turkey. Despite there are studies analysing the factors affecting the profitability of banks in Turkey, to our knowledge there is no study which investigates these factors by comparing the pre and post crisis period. Therefore, this study aims to find out the internal and external determinants of bank profitability in Turkey, by dividing the analysis period into two: before and after the crisis. Quarterly bank data is used in the study starting from December 2003 until June 2012. Pre-crisis period covers December 2003 to September 2008, and post-crisis period covers December 2008 to June 2012. T-tests are used to display the effects of the crisis on the important variables and dynamic panel model is applied to find out the determinants of ROA in different periods. System GMM estimator is used in order to account for the potential endogeneity problem and profit persistency. The results of the study show that profitability of banks operating in Turkey was not affected significantly by the recent financial crisis. Non-interest revenues appeared to be the most important determinant of ROA in all periods, and according to the findings the importance of it increased after the crisis. In addition, capital adequacy became a positive significant

determinant of ROA in the post-crisis period, and interest revenue turned out to be insignificant after the crisis even if it was significant before.

The rest of the paper is organized as follows. Section 2 reviews the existing literature about determinants of bank profitability. Section 3 gives information about Turkish banking sector. Section 4 introduces the data, presents the econometric methodology and discusses the empirical results. We conclude in Section 5 and discuss directions for future research.

2. Literature Review

2.1. General Overview of the Literature about Determinants of Bank Profitability

A large body of research is devoted to the analysis of the banking industry in different aspects, and most of these studies tried to find out the determinants of bank performance. In analysing bank performance some studies focused on efficiency and used economics-based models, and some studies focused on profitability by using accounting-based models. But also there is a group of studies which used the two approaches together (Olson and Zoubi, 2011). The studies which focused on bank profitability generally tried to determine the factors affecting the profitability of banks, either in a single-country (Bourke, 1989; Berger, 1995; Williams, 2003; Kosmidou, 2008; Athanasoglou et al.,2008) or in number of countries (Demirgüç-Kunt and Huizinga, 1998; Pasiouras and Kosmidou, 2007; Chen and Liao, 2011). The aim of this study is to find out the determinants of ROA before and after the crisis, therefore accounting-based approach is used. Thus, only literature review about the group of studies which focused on accounting-based approach will be covered here.

In accounting-based studies different performance measures like Return on Assets (ROA), Return on Equity (ROE) and Net Interest Margin (NIM) have been used to represent bank performance in different papers, and internal (bank-specific) and external (macroeconomic) factors were taken as independent variables. In this group, initial researches on bank performance were devoted to the analysis of bank interest margins (Naceur and Omran, 2011). An early study was carried out by Ho and Saunders (1981) who developed a model of bank interest margin in which the bank was viewed as a dealer in the credit market acting as an intermediary between the demanders and suppliers of funds. As a result, they showed that this margin was depended on the degree of managerial risk aversion; the size of transactions undertaken by the bank; bank market structure; and the variance of interest rates. Their paper has constituted a theoretical framework for most of the empirical studies on bank interest margins which used and mostly extended the model proposed by them. For example Allen (1988) extended the model of Ho and Saunders (1981) by considering the case of loan heterogeneity. Angbazzo (1997) used the same model but included default risk and its interaction with interest rate risk. He found that bank interest margins reflected both default and

interest rate risk premium. Maudos and Guevara (2004) extended the model by adding operating costs and using direct measurements of the degree of competition in different markets. Valvarde and Fernandez (2007) developed a model which was based on that of Allen (1988) and different from her, they assumed that bank portfolios were composed of loans and non-traditional assets together with, deposits. There are also other studies which tested empirically Ho and Saunders (1981) model and its different extensions in different countries. (Claeys and Vennet, 2008; Hawtrey and Liang, 2008; Maudos and Solis, 2009; Lin et al., 2012; Fungacova and Poghosyan, 2011).

Apart from net interest margins, ROA and/or ROE were also used in accounting-based studies to account for bank performance. Among them, the studies by Bourke (1989) and, Molynex and Thorton (1992) were the pioneering ones. Some of the studies that followed their work have focused on a single country whereas the others used cross-country data to determine factors affecting bank profitability. One of the important studies that focused on a single country was carried out by Berger (1995), who searched for the relationship between capital and earnings of U.S. banks, and found a positive relationship between them. Also other studies have been carried out focusing on the determinants of bank profitability in a single country. In his study which has focused on foreign banks in Australia, Williams (2003) found that profits were negatively related to competitor market share and bank license status, whereas they were positively related to size and home GDP growth. More recently Kosmidou (2008) examined the determinants of performance of Greek banks during the period of EU financial integration, and concluded that individual bank characteristics explained a substantial part of the within-country variation in Return on Average Assets for Greek banks. Athanasoglou et al. (2008) also utilized data from the Greek banking sector, by searching for bank-specific, industry-specific and macroeconomic determinants of bank profitability. The results of their study revealed that bank-specific factors, excluding size, significantly affected bank profitability whereas industry variables were not important in explaining bank profitability. They also indicated that profitability of Greek banks was procyclical. Dietrich and Wanzenried (2010) have focused on the Swiss banks and analysed the determinants of bank profitability before and during the recent economic crisis. They showed that better-capitalized banks seemed to be more profitable and the cost-income ratio was relevant for the ROA before the crisis only, also the negative impact of the loan loss provisions relative to total loans was much stronger during the crisis.

Most comprehensive study that used cross-country data to explain determinants of bank profitability has been carried out by Demirgüç-Kunt and Huizinga (1998). In their study they used bank level data for 80 countries for the 1988-1995 period and found that capitalization was positively and reserves were negatively related to profitability. Also foreign ownership was found to be associated with higher interest margins and bank profitability. More recently, Pasiouras and Kosmidou (2007) examined internal and external factors affecting the performance of commercial

banks operating in the 15 EU countries over the period 1995-2001. According to their findings, performance of banks in these countries was not affected only by bank-specific variables but also by financial market structure and macroeconomic conditions. Another comprehensive study which is carried out by Chen and Liao (2011) used banking sector data from 70 countries to investigate the key factors in these countries that affect profitability of foreign banks when compared to domestic banks. They applied structural measures to analyse the long-term relationship between bank profitability and banking market structure. Also, Middle East and North Africa (MENA) countries were focused in the literature about bank profitability. For example, Olson and Zoubi (2011) estimated cost and profit efficiencies for banks in 10 MENA countries and compared the results with the accounting-based determinants of bank profitability as measured by ROA and ROE. Their study is also important in terms of the method they have used, as they combined aspects of both accounting-based and economics-based approaches.

The majority of the studies mentioned above used linear regression models and relied mostly on panel approaches using bank-level data. But there are also studies that have considered possible non-linear relationships. For example, in 1988 Whalen used quadratic regression model in his study to discover the potential non-linearity between competition and profitability, as a result he showed that there was a non-linear relationship between potential competition and bank profitability (Whalen, 1988). In a research paper which examined the relationship between corporate governance and bank performance also quadratic regression model was used to take non-linearity into account. Findings revealed that the relationship between capital adequacy ratio and ROE was non-linear and statistically significant (Tandelinin, 2007). Another study that considered non-linearity was carried out by Chen (2007) who used quantile regression to explore the determinants of profitability in U.S. bank holding companies. He demonstrated that profitability of U.S. bank holding companies were affected differently across the quantiles of profitability distribution. Finally, Barros and Borges (2011) used Fourier approximation in their study to detect for possible nonlinearities between the profitability variables and the explanatory variables, in which they analysed the determinants of profitability in Portuguese banking sector. The findings of their analysis suggested that all the explanatory variables they have used (productivity, size, capitalization and portfolio composition) presented a non-linear relationship with profitability.

2.2. Literature on the Profitability of Turkish Banking Industry

Turkish banking sector has also taken the attention of researchers studying on bank profitability. One of the early studies that focused on the performance of Turkish banking sector was written by Kaya (2001). She analysed the determinants of net interest margin by Ordinary Least Squares regression technique using monthly data. The regression results showed that higher reserve requirement led higher net interest margin and that there was a negative relationship between net

interest margin and total competition in Turkish banking sector. In a later study, Kaya (2002) has used panel data to discover the micro and macro determinants of profitability in Turkish banking sector. She discovered that micro determinants of Turkish commercial banks' ROA were capital, liquidity, personnel expenditures, loans, non-performing loans and deposits and macro determinants were inflation and budget deficits. The other comprehensive study on the profitability of Turkish banks was carried out by Tunay and Silpagar (2006) who also used panel data analysis. They analysed the determinants of ROA, ROE and NIM by classifying banks according to bank scale and ownership. Differently, Yıldırım (2002) first measured scale and technical efficiencies of Turkish banks by DEA and then examined the relationship between profitability and these two different definitions of efficiency. The findings suggested that efficient banks were more profitable. Aysan and Ceyhan (2007) also used both accounting-based and economics-based measures since they have regressed some performance indices (like technical input efficiency, Malmquist Total Factor Productivity Change (TFPC) Index and etc.) on the foreign–domestic dummy, number of branches, bank capitalization, loan ratio, ROE, dummies for the 1994 and 2001 crises and dummy for the reform period. As a result the number of branches was found to be negatively related but bank capitalization and loan ratio were positively related to efficiency change. However, ROE was not found to be statistically significant in explaining any of the efficiency measures. Another study that used both accounting and economics based approach was Abbasoglu et al.(2007)'s study, in which they first employed the cost frontier approach to calculate the efficiency of the banks, and then regressed ROA and ROE against efficiency measure and foreign dummy using panel regression. Based on the regression findings they have concluded that foreign banks reached higher profitability levels in the Turkish banking sector without having high efficiency scores. Recently Taşkın (2011) also used panel data analysis but added also off-balance sheet activities of the banks as an explanatory variable. According to her findings bank performance is mostly affected by bank-specific factors and macro-economic factors do not have statistically significant effects on the performance. Another study which also used panel data analysis (fixed effects) displayed that asset size and non-interest income has a positive and significant effect on bank profitability in Turkey. Same study also showed that credit portfolio and bad loans had a negative impact on bank profits (Alper and Anbar, 2011). Lastly, dynamic panel data was used by Uludag and Gokmen (2011), to find out the determinants of profitability in Turkish banking industry, covering the period between 1999-2009. According to their findings, bank size, cost management, personnel efficiency, non-interest expenses, market concentration and inflation are significant determinants affecting the profitability of Turkish banks.

3. General Overview of Turkish Banking Industry

Banking industry is the dominant factor in Turkish financial system having nearly 80% share in total assets of all financial institutions (BRSA, 2011). As of June 2012, 48 banks have been operating in Turkish banking sector. The table below summarizes the number and types of banks and their asset size in Turkish banking industry. There are currently 48 banks operating in Turkey and 31 of these banks are deposit banks. The dominance of the deposit banks in the industry can be seen easily in terms of both number and asset size. Deposit banks' assets constitute 91,27 % of all banks' assets in the industry. Participation (Islamic) banks follow deposit banks by a share of 4,79% of total assets. Even if they are larger in number than participation banks, asset shares of development and investment banks are smaller (3,94%).

Table 1: Banks in Turkey

Bank Type	Number	Assets
DEPOSIT BANKS	31	1.162.544
State-owned	3	352.612
Domestic (private)*	11	647.951
SDIF**	1	**
Foreign	16	161.981
DEVELOPMENT AND INVESTMENT BANKS	13	50.165
PARTICIPATION BANKS ***	4	61.029
TOTAL	48	1.273.738

Source: Banking Association of Turkey, 2012; BRSA, 2012

*One of the private deposit banks is "Adabank" which does not currently have active operations, so omitted from the sample

**The bank under Saving Deposit and Insurance Fund, not an actively operating bank, assets are included in group of state-owned banks

***Islamic banks

The history of banking industry in Turkey starts with the foundation of Istanbul Bank in 1847 during Ottoman Empire era. Until the foundation of secular Turkish Republic, foreign banks had been dominant in the sector. However, together with the announcement of Republic in 1923 significant, reforms were put into practice in many areas including economy and banking sector, giving rise to foundation of strong state-owned and private banks. The most important developments in Turkish banking sector have occurred following the liberalization policies after 1980 and as a result Turkish banks have been integrated into the international financial system. This period is widely accepted to be a crucial point in history of Turkish banking industry, because of the contributions of the liberation policies to the banking system. However, owing to macroeconomic fluctuations in 1990's the financial structure of Turkish banks have been disrupted and moreover the crisis in 1994 caused capital erosion in the sector leading to a serious shrinkage. Even if the Turkish banking sector

came through its problems after 1994 crisis and started to grow again in a short time, economic crisis in Far East and Russia together with the Marmara earthquake in 1999 affected the Turkish economy and as a result Turkish banking industry negatively. The most important developments in those years were the foundation of the "Banking Regulation and Supervision Agency (BRSA)" and "Saving Deposits Insurance Fund (SDIF)",to be able to increase regulation and transparency in the banking sector which was having serious problems. To take action against these problems 11 banks were transferred to Saving Deposits Insurance Fund and operation licenses of 3 banks were cancelled in 1999-2000 (Between 1997-2003, total number of banks which were transferred to SDIF was 22). However, problems in Turkish economy were continuing and a crisis broke out in February 2001 starting first from the financial system and then rapidly spreading to the real sector. In order to eliminate structural problems in economy and to strengthen the financial structure of the financial system "Program for transition to strong economy" was put into force in April 2001 . Due to the determined application of the fundamental principles of this program, substantial positive developments came about in banking system starting from 2002. Private banks strengthened their equity which they had lost significantly after 2001 crisis and banks failing to do this either merged with other banks or were transferred to SDIF. Also, state-owned banks were gone under restructuring process in which their losses were settled against government debt securities, and their financial structures were strengthened. (BAT, 2009). After this period, together with the macro economic and political stability, restructuring program in banking system strengthened the banks in the industry and made them to be able to focus on their financial intermediary function. Thus, the profitability of the banking sector, which was negative in 2001 crisis, started to increase after 2002. These positive developments in Turkish banking sector attracted also foreign investors in the industry, leading to a sharp increase of the foreign banks' share in the sector to about 40% (BRSA,2011).

The crisis experienced in 2001 helped Turkish banking industry to get stronger and healthier, which helped the sector to overcome the recent global crisis in a less problematic way. Although the global crisis has affected also the Turkish banking sector, this effect was rather limited compared to other countries. The underlying reasons of this limited effect were high capital adequacy ratio, a high asset quality, low currency and liquidity risks, which were the results of the restructuring program (BAT, 2009).

4. Emprical Analysis

4.1. Data and Variables

To investigate the determinants of bank profitability, the deposit banks operating in Turkey are selected as a sample. As mentioned before, the biggest portion (91%) of the assets of Turkish

banking industry belongs to deposit banks. Thus, selecting the deposit banks as a sample will contribute more to the investigation of profitability determinants in the banking industry. "Development and investment banks" and "Participation banks" are not included in the sample, just because not to damage the homogeneity, as these banks have different characteristics and operations than the deposit banks. According to Table 1, 31 banks in Turkey are deposit banks, and 2 of these 31 deposit banks are not operating actively, so they are not included in the sample. Therefore, 29 deposit banks constitute the sample of this study.

For bank-specific factors, data are taken from the statistical database of Banking Association of Turkey including quarterly data from December 2003 to June 2012. To be able to determine the effects of the recent financial crisis this time period is splitted into two: pre-crisis period and post crisis periods. The collapse of Lehman Brothers in September 2008 is an important milestone in the recent financial crisis, because after that date the crisis, which was originated in US, started to influence the other countries in the World. Therefore, pre-crisis period covers December 2003-September 2008, and post-crisis period covers December 2008-June 2012.

The dependent and independent variables used in the analysis are as follows:

4.1.1. Dependent Variables

The dependent variable chosen to represent the bank profitability in the model is Return on Assets (ROA), which shows the profit earned per 1 TL (Turkish Lira) of banks' assets. ROA shows how efficiently the bank uses its assets and it is the most common used measure of bank profitability in the related literature. Moreover, it is considered as the key ratio in evaluation of bank performance (Dietrich and Wanzenried, 2011). Therefore, the measure of bank profitability in this study is ROA.

4.1.2. Independent Variables

Independent variables are the internal and external factors that are thought to have a potential effect on ROA. The following variables are selected depending on the related literature and the characteristics of Turkish banking industry.

Internal Factors

This group of variables includes the bank-specific factors which are mostly under control of the bank managers.

-*Equity/Total Assets:* Equity over total assets ratio is used to represent the bank capital . Banks with higher capital ratio have less risk, but also expected to have low profitability. The arguments in favour of this negative relationship between bank capital and profitability are consistent with standard one-period models of perfect capital markets with symmetric information. However, once the assumptions of the one period model of perfect capital markets are relaxed, we can expect a

positive relationship between bank capital and profitability (Berger, 1995). The empirical findings about the effect of bank capital on bank profitability are also mixed but majority of them supports the positive relationship between capital and profitability (Berger, 1995; Demirgüç-kunt and Huizinga, 2000; Paisouras and Kosmidou, 2007; Athanasoglou et al., 2008; Kosmidou, 2008; Garcia-Herrero, 2009). Olson and Zoubi (2011) found a negative effect of bank capital on ROE and also Dietrich and Wanzenreid (2011) reported the same negative effect on ROA during the financial crisis period. Previous studies on Turkish banking industry revealed a positive effect of capital on bank profitability.

-*Overhead Costs/Total Assets:* Efficient cost management is also considered as an important factor affecting the profitability of banks. Having lower overhead costs by better cost management is expected to increase the bank profitability and most of the empirical findings support this negative relationship between overhead costs and profitability (Pasiouras and Kosmidou, 2007; Kosmidou, 2008; Athanasoglou et al., 2008; Dietrich and Wanzenreid, 2011). If the banks can pass on their operating expenses to their financial customers in terms of lower deposit rates and higher lending rates, then a positive effect of overhead on profitability can also be expected as the findings of Demirgüç-Kunt and Huizinga (2000) revealed.

-*Loan Loss Provisions/Total Loans:* The ratio of loan loss provisions to total loans is used to consider the effect of credit risk on bank profitability. It is important for banks to monitor the credits they have granted and also to be able to collect them back without any problem. A high loan loss provision has a negative effect on bank revenues which in turn can decrease profitability. For example findings of Kosmidou (2008) revealed a negative relationship between profitability and loan loss provisions. Dietrich and Wanzenreid (2011) also found a positive effect of loan loss provision on profitability during crisis. In contrast, Olson and Zoubi (2011) reported a positive relationship between ROA and loan loss provisions.

-*Total Loans/Customer and Other Funding*: The possibility to fail increases when the banks do not have enough liquidity and funding to meet their obligations. Therefore liquidity management can be considered to have a potential impact on bank profits. As a proxy for liquidity management the ratio of bank loans to customer and short-term funding is used in the analysis, which shows the relationship between comparatively illiquid assets and comparatively stable funding sources. The lower this ratio is more liquidity the bank has, so a positive relationship is expected between this variable and bank profitability (Pasiouras and Kosmidou, 2007)

-*Interest Income/Total Loans:* Besides granting loans it is also important for banks to collect satisfactory interest revenue from these loans, because interest income is one of the most effective factors in banks' income statements. To consider the effect of this factor on profitability interest income collected from outstanding loans is divided by total loans.

-*Market Share:* The ratio of total assets of a bank to the total assets of all deposit banks in the industry is used to represent the market share variable. It is also representing the relative size[2] of the bank. Generally market share is expected to be related to the profitability of banks and the relationship between market share and bank profitability can be positive when controlling for market concentration (Kurtz and Rhoades, 1992).

-*Interest Expense/ Customer and Other Funding:* One of the major expenses of deposit banks is the interest paid to deposit savers. Even if the rate of interest offered to deposit customers is largely based on the macroeconomic conditions, sometimes when the banks need additional funding they can increase their interest deposit interest rates higher than the other banks in the industry. This action can have a negative impact on net income, thus a reverse relationship is expected with this variable and bank profitability.

-*Non-interest Income/ Total Assets:* Banks can earn non-interest income from activities like deposit service charges, credit card fees, fees associated with electronic funds transfer, personal fund management, corporate money management and etc. Non-interest income is considered to be more stable than interest income and fee-based activities can reduce bank risk via diversification. There are some empirical findings which indicated that non-interest income increased and stabilized the bank profitability (Smith et al., 2003). Moreover this type of income has become important for banks with the increasing competition in the banking industry. Especially during and after the crisis, when the credit activities diminish, fee-based activities can be a critical source of revenue for banks. So, ratio of non-interest income to total assets is also added to the model as an independent variable.

External factors

External factors are industry-specific and macro-economic variables which can affect the profitability of banks.

Industry-specific variables

Concentration of the banking industry is one of the most common used independent variables in the studies that try to analyse the determinants of bank profitability, because if the industry is highly concentrated, banks can earn monopoly profits according to the structure-conduct-performance hypothesis (Kosmidou, 2008). In this study the ratio of total assets of biggest five banks to total assets of the banking industry is used as a measure of concentration. The data about concentration is taken statistical database of Banking Association of Turkey.

[2] Most common used measure of "Size" in the literature is the logarithm of the total assets of the bank. But when the variable was calculated as log of total assets for each bank, the results of the unit root test of this variable revealed the problem of non-stationarity. So market share is included in the model as a proxy for relative bank size.

There are also other industry-specific factors that are used in different empirical studies. One of them is the development level of the banking industry which is represented by the ratio of total assets of deposit banks to GDP. This development variable is also planned to be included in the control variables but the unit root test revealed the problem of non-stationarity, therefore it is omitted from the group of independent variables. The same problem was confronted with another industry specific variable which represents the foreign share in the industry. The ratio of total assets of foreign banks to overall assets of banking industry was also planned to be used as an independent variable, but omitted because of the non-stationarity problem.

Macro-economic variables:

The economic environment surrounding the banks can also be an effective factor of bank profits. Therefore *GDP Growth* and *CPI* (Consumer Price Index), taken from Turkish Statistical Institute, are also included in the model as control variables.

All the variables used in the model are summarized at Table 2.

Table 2: List of Variables

VARIABLES	NOTATION	DESCRIPTION
DEPENDENT VARIABLE		
Return On Assets	ROA	Net Income/Total Assets
INDEPENDENT VARIABLES		
Internal Factors		
Capital Adequacy	EQ	Equity/Total Assets
Cost Management	OC	Overhead Costs/Total Assets
Credit Risk	LLP	Loan Loss Provisions/Total Loans
Loans/Funds	LOFU	Total Loans/Customer and Other Funding
Income Generation	INTREV	Interest Income Collected From Loans/Total Loans
Interest Expense	INTEXP	Interest Expense/ Customer and Other Funding
Fee-Based Activities	NONINT	Non-interest Income/ Total Assets
Market Share	MSHARE	Bank's Total Assets/Overall assets of deposit banks
External Factors		
Concentration	C5	Total Assets of Biggest Five Banks/Overall Assets of Banks in the industry
Gross Domestic Product	GDP	GDP Growth
Inflation	CPI	Change in the Consumer Price Index

4.2. Model and Methodology

Following Athanasoglou et al. (2008), García-Herrero et al. (2009) and Dietrich and Wanzenreid (2011), the linear model which is illustrated below is used to investigate the determinants of bank profitability:

$$PRFT_{it} = c + \delta PRFT_{i,t-1} + \sum_{j=1}^{J} \beta_j X_{it}^{j} + \sum_{l=1}^{L} \beta_l X_{it}^{l} + \varepsilon_{it} \quad (1)$$

$PRFT_{it}$, is the profitability of bank *i* (i= 1,2,…,N), at time *t* (t=1,2, …, T), which is ROA . Lagged dependent variable $PRFT_{i,t-1}$, is also added in the model to be able to take the persistence of bank profits into account. The value of the coefficient of the lagged dependent variable shows the tendency of bank profits to persist. If the value is between 0 and 1, it means that profits persist but eventually return to their average level (Athanasoglou et al., 2008). X_{it}'s are independent variables that are grouped into internal factors X_{it}^{j} and external factors X_{it}^{l}. Finally, c is a constant term and ε_{it} is the disturbance (including two components: unobserved bank-specific effect and idiosyncratic error).

Fixed and random effects models are used mostly in the literature about the determinants of bank profitability. However when the lagged dependent variable is added to the model as an independent variable, the model gains a dynamic nature where it is more appropriate to apply dynamic panel estimation techniques. Also there is the problem of endogeneity in the above model especially for the capital adequacy (equity over total assets) and credit risk (loan loss provisions over total loans) variables, because banks with high capital ratios can be more profitable (once the perfect capital markets assumption is relaxed) and more profitable banks can retain earnings and increase their equity (Dietrich and Wanzenreid, 2011). At the same time, as Athanasoglou et al. (2008) outline, loan loss provisions should be modelled as a predetermined variable, since bank management adjusts provisions held for loan losses, the level of which is decided at the beginning of each period. Therefore to account for the dynamic nature of the model and the aforementioned endogeneity problem, it would be more appropriate to use dynamic panel estimation and apply "system GMM(Generalized Method of Moments) estimator"[3] which is developed by Arellano and Bover (1995), following García-Herrero et al. (2009) and, Dietrich and Wanzenreid (2011).

The system GMM estimator combines moment conditions for the differenced equation with moment conditions for the model in levels and is considered to be more efficient than the traditional GMM estimator utilising the moment conditions of the differenced model only (Windmeijer, 1998).

[3] "xtabond2" command is used in Stata 11.0 to solve the model. This command is developed by Roodman in 2003.

In addition, as Blundell and Bond (1998) argue it has superior properties in terms of small sample bias especially for persistent series. Thus it would be appropriate to use system GMM estimator to solve the model.

4.3. Findings

Once the variables (descriptive statistics for the variables are given at Table 3), model and the methodology are determined, the cross correlations between the independent variables are checked.

Table 3: Descriptive Statistics

Variable	Mean	Std.Dev.	Min.	Max.
ROA	.0182109	.0258505	.0258505	.2152267
EQ	.1632846	.1148997	.0365463	.9087133
OC	.0437418	.0256507	.0025597	.2535453
LLP	.0453354	.0855048	0	1.155861
LOFU	.5659129	.3102655	0	3.478221
INTEXP	.0821796	.0825218	.0023527	1.453411
NONINT	.0313302	.0468213	-.0707838	.608643
INTREV	.1274454	.0694989	0	1.232502
MSHARE	.0321989	.0470806	.0000532	.2062446
C5	.6166884	.0108185	.5951961	.6308903
GDP	0329537	.0905307	-.1113569	.2037529
CPI	9.17	2.474588	3.99	18.4

According to the cross-correlation matrix given at Table 4 below there are no statistically important relationships between the independent variables which can result in severe multi-collinearity problems. Therefore all the independent variables mentioned above can be used in the model without any problem. Secondly panels are tested for stationarity using unit root test. According to the Fisher test, the null hypothesis of non-stationarity is rejected for all variables, meaning all the panels used in the model are stationary[4].

Table 4: Cross-correlation matrix of independent variables

	EQ	OC	LLP	LIQUID	INTEXP	NONINT	INTREV	MSHARE	C5	GDP	CPI
EQ	1.0000										
OC	0.1558	1.0000									
LLP	0.2576	0.0829	1.0000								
LOFU	-0.2047	0.2252	-0.2177	1.0000							
INTEXP	0.2849	0.1054	-0.0103	-0.1598	1.0000						
NONINT	0.1475	0.3648	0.0094	-0.2108	0.4819	1.0000					
INTREV	-0.2358	0.1266	0.1160	-0.0386	0.0588	0.1321	1.0000				
MSHARE	-0.2158	-0.3523	-0.0007	0.0809	-0.0238	-0.1045	0.0615	1.0000			
C5	0.0501	-0.1106	-0.0117	0.1437	-0.1055	-0.1162	-0.0763	0.0113	1.0000		
GDP	-0.0535	-0.0409	-0.0083	-0.0084	-0.0695	-0.0426	-0.0681	-0.0021	-0.1936	1.0000	
CPI	-0.0114	0.2003	0.0867	-0.1724	0.2471	0.2236	0.0932	-0.0118	-0.3570	-0.1562	1.0000

[4] Results are available upon request.

Before panel estimations, t-test is applied to see if there are statistically important differences between the values of variables before and after the recent financial crisis. This analysis, which is testing the null hypothesis that there are no significant differences between the means of two groups, is carried on especially for the profitability and the bank-specific independent variables. The results of the test are summarized in Table 5 and the last three columns of the table show the p-values testing alternative hypotheses of H_a= mean (diff)<0, H_a=mean (diff)!=0 and H_a=mean (diff) >0 respectively.

Table 5: Results of t-test[1]

Variable	Group	N	Mean	Pr (T < t)[2]	Pr(|T| > |t|)[3]	Pr(T > t)[4]
ROA	Pre-crisis	580	.0180559	0.4099	0.8198	0.5901
	Post-crisis	435	.0184174			
EQ	Pre-crisis	580	.1559779	0.0114 **	0.0228**	0.9886
	Post-crisis	435	.1730268			
OC	Pre-crisis	580	.0481247	1.0000	0.0000*	0.0000*
	Post-crisis	435	.037898			
LLP	Pre-crisis	580	.0514335	0.9983	0.0034*	0.0017*
	Post-crisis	435	.0372045			
LOFU	Pre-crisis	580	.511394	0.0000*	0.0000*	1.0000
	Post-crisis	435	.6386049			
INTEXP	Pre-crisis	580	.0995136	1.0000	0.0000*	0.0000*
	Post-crisis	435	.0590675			
NONINT	Pre-crisis	580	.040132	1.0000	0.0000*	0.0000*
	Post-crisis	435	.0195946			
INTREV	Pre-crisis	580	.1375735	1.0000	0.0000*	0.0000*
	Post-crisis	435	.1139411			
MSHARE	Pre-crisis	580	.0316191	0.3254	0.6507	0.6746
	Post-crisis	435	.032972			

*significant at 1%, **significant at 5%, ***significant at 10%

[1] H_0=mean(diff)=0 where diff = ($mean_{pre\text{-}crisis} - mean_{post\text{-}crisis}$)

[2] H_a= mean (diff)<0; [3] H_a=mean (diff)!=0 ; [4] H_a=mean (diff) >0

According to the results of the t-tests given in Table 5, we can conclude that the profitability of the deposit banks in Turkey have not changed significantly by the recent financial crisis. T-test above shows that there is no statistically significant difference between ROA before crisis and ROA after crisis. However, we can see statistically significant differences in the values of other variables (except market share) in pre-crisis and post-crisis periods.

Equity/Total Assets and Total Loans/Customer&OtherFunding have increased in post-crisis period compared to the pre-crisis period. Reason of the increase in capital ratio is mostly because of the warning from BRSA to all banks about not to distribute dividends in 2008. The declaration of BRSA in 2008 has put some limitations on the dividend distribution of banks and these limitations continued in following years including 2011. On the contrary, Overhead Costs/Total Assets, Loan Loss Provisions/Total Loans, Interest Expense/ Customer&Other Funding, Noninterest Income/Total

Assets and Interest Income/Total Loans ratios have fallen after the crisis. These findings reveal that even if the financial crisis did not affect the capital strength and asset quality of Turkish deposit banks negatively, liquidity, interest income and noninterest income have been affected inversely. But it seems that the cost management efficiency of Turkish deposit banks have increased after the crisis. Also the ratio of interest expenses to deposits and other funds have fallen. This can explain how ROA was not affected despite the fact that interest income and noninterest income have decreased. We can make better comments after analysing the determinants of ROA before and after the crisis.

The last stage in empirical analysis is to find out the regression results for model (1). As mentioned before, system GMM estimator is used to solve the model by instrumenting EQ (Equity/Total Assets) and LLP (Loan Loss Provisions/Total Loans) together with the lagged dependent variable following Athanasoglou et.al. (2008). Firstly the model is solved for the whole period from December 2003 to June 2012, without dividing it into pre-crisis and post-crisis periods. Then the whole period is divided into pre-crisis and post-crisis periods, and the results for all three are given at Table 6. According to Table 6 one of the most important findings is that the lagged dependent variable is statistically significant across all periods. This finding is important because it shows the profit persistency in Turkish banking industry which justifies the use of dynamic panel model in this study. At the same time according to Wald tests for all models there are no problems in terms of goodness of fit and Hansen test indicates that over-identifying restrictions are valid. Arellano-Bond tests that average auto covariance in residuals of order 1 for the estimations of "all periods" and "pre-crisis" show a negative autocorrelation exist, but there are no second-order correlations in all. Arellano and Bond (1991) states that the first-order auto correlation does not imply inconsistency as long as there is no second-order correlation. As a result we can conclude that the model specification in this study does not have any problems.

Table 6: System GMM Results for determinants of ROA

VARIABLES	ALL PERIODS			PRE-CRISIS			POST-CRISIS		
	Coef.	Corrected Std.error.	p-value	Coef.	Corrected Std.error.	p-value	Coef.	Corrected Std.error.	p-value
ROA (-1)	***.6282***	***.1414***	***0.000****	***.6043***	***.0973***	***0.000****	***.6168***	***.0612***	***0.000****
EQ	.0334	.02620	0.203	.0133	.0085	0.120	***.0243***	***.0101***	***0.017****
OC	-.0289	.1296	0.824	-.0898	.1287	0.485	.0229	.1409	0.871
LLP	-.0082	.0166	0.620	-.0049	.0069	0.480	-.0288	.0244	0.239
LOFU	***.0044***	***.0027***	***0.094****	.0062	.0039	0.109	.0035	.0027	0.201
INTEXP	-.0191	.0151	0.208	.0004	.0081	0.956	-.0377	.0383	0.324
NONINT	***.1403***	***.0449***	***0.002****	***.1340***	***.0207***	***0.000****	***.2572***	***.0731***	***0.000****
INTREV	***.0161***	***.0098***	***0.098****	***.0180***	***.0093***	***0.052****	.0182	.0332	0.584
MSHARE	.0308	.0229	0.177	.0236	.0264	0.370	.0278	.0190	0.143
C5	.0039	.0541	0.943	.0663	.0642	0.302	-.0852	.0760	0.263
GDP	***-.0080***	***.0044***	***0.068****	-.0044	.0044	0.308	-.0154	.0109	0.158

CPI	-.0003	.0002	0.177	***-.0009***	***.0004***	***0.024*****	-.0003	.0002	0.182
CONS.	-.0050	.0324	0.878	-.0341	.0438	0.436	.0507	.0469	0.280
	Wald test: $\chi 2$ (12) =1186.82, p=0.000			Wald test : $\chi 2$ (12) = 4313.54, p=0.000			Wald test : $\chi 2$ (12) = 9008.40 p=0.000		
	Hansen test[1]:$\chi 2$(857)= 23.18,p=1.000			Hansen test[1]: $\chi 2$ (393) = 19.33, p=1.000			Hansen test[1]: $\chi 2$ (306) = 25.38 , p = 1.000		
	AR (1)[2] : z = -1.84 Pr > z = 0.066			AR(1)[2] z = -2.49 Pr > z = 0.013			AR (1)[2]:z = -1.54 Pr > z = 0.124		
	AR (2)[2]: z = 1.56 Pr > z = 0.118			AR (2)[2]: z = 1.02 Pr > z = 0.308			AR (2)[2]: z = 1.42 Pr > z = 0.157		

*significant at 1%, **significant at 5%, ***significant at 10%

[1]Test for over-identifying restrictions in GMM dynamic estimation, H_0:Over-identifying restrictions are valid

[2]Arellano–Bond test that average autocovariance in residuals of order 1, H_0: no autocorrelation

[3]Arellano–Bond test that average autocovariance in residuals of order 2, H_0: no autocorrelation

The above findings reveal that there are some differences between the estimation outputs of different periods. One of the independent variables which is also considered as endogenous is Equity/Total Assets ratio that represents capital adequacy of banks. Even if the capital ratio does not have any significant effect before crisis, it has a significant positive effect on ROA in post-crisis period. Also according to t-tests, it was revealed that there has been a statistically significant increase in equity over total assets ratio of banks in the post-crisis period, mostly because of the limitations of BRSA about the profit distribution. It seems that the higher capital strength of Turkish deposit banks helped them not to be affected from the negative impacts of the crisis especially in terms of ROA. Generally banks with higher capital adequacy are less prone to be affected by external threats since strong capital acts as a buffer. This positive effect of equity on Turkish deposit banks' profitability can be seen obviously in post-crisis period.

Among the internal (bank-specific) determinants, credit risk(loan loss provisions over total assets), overhead costs, interest expense and market share variables are found to have no impact on ROA in any of the periods.[5] Total loans over total deposits and other funds appears to be a significant (at 10%) determinant of profitability in the analysis covering the whole period, however it is not an important determinant when the period is divided into pre and post-crisis.

The only independent variable which is significantly important in each of the three analyses, together with the lagged dependent variable, is "Non-interest Revenues/Total Assets". This variable represents the revenues earned by the banks from fee-based activities other than granting loans. The coefficient of the variable is higher in post-crisis period, indicating that non-interest revenue has become more important determinant of profitability especially after crisis. It shows that deposit banks in Turkey should focus on fee-based activities together with loan granting activities. The other interesting finding is that, ratio of interest revenues earned from credits over total loans is not a

[5] Fixed effects model is also used to solve the model and according to its findings all of the bank-specific variables were found to have effect on ROA in the whole period. The findings of this model is not given in the study since the dynamic nature of the model is very obviously seen from the highly signigicant coefficient of lagged dependenrt variable. But the results can be shared upon request.

significant determinant of ROA in post-crisis period, even if it is an important one before crisis. This finding also emphasizes the importance of earning revenue from banking activities other than credits for deposit banks. The positive effect of non-interest revenue on profitability can be attributed to the increasing competition in Turkish banking industry as a result of foreign bank entrance. Especially after 2006, the entrance of foreign banks in Turkey increased sharply. The ratio of foreign banks' assets to total banks' assets were about 3% in 2003, but in 2012 it was about 17-18%. Among 29 deposit banks in our sample, 16 are foreign banks (has foreign share in equity over 50%). This relatively high ratio of foreign deposit banks in the industry is thought to have effects on competition which in turn can affect the determinants of profitability[6].

Findings regarding the impact of external factors (industry-specific and macroeconomic) show that concentration of the banking industry has no effect on ROA in any of the three periods. GDP growth seems to have a negative effect on profitability in the whole period, but we can observe no significant effect when we divide the period into pre and post-crisis. Inflation appears to have a small negative effect on ROA before the crisis; however it has no statistically significant effect in post-crisis period. It is interesting that no external factors found to be an important determinant of profitability in post-crisis period.

5. Conclusion

This study has analysed the determinants of bank profitability in Turkey by using quarterly data from December 2003 to June 2012. The analysis was carried on by dividing the whole period into pre-crisis and post-crisis periods, to be able to find out the effects of recent financial crisis on the determinants of bank profitability. To our knowledge, there is no study that has aimed to determine the effect of the 2008 crisis on the profitability determinants of banks operating in Turkey. System GMM (Generalized Method of Moments) estimator is preferred over fixed or random effects models to account for dynamic feature of the model and the potential problem about endogeneity. The system GMM estimator is considered to be more efficient than the traditional GMM estimator because it combines moment conditions for the differenced equation with moment conditions for the model in levels and also utilises the moment conditions of the differenced model only (Windmeijer, 1998). At the same time it has superior properties in terms of small sample bias especially for persistent series (Blundell and Bond, 1998). Thus, system GMM estimator is used in the study, by instrumenting capital as endogenous variable and loan loss provisions ratio as predetermined variable.

[6] "Foreign share" was also wanted to be included as an independent variable in the model, but because of the non-stationarity problem after unit root tests, this variable is omitted from the model.

To be able to understand if there are differences between the pre-crisis and post-crisis values of some important variables, t-tests were conducted before running the system GMM estimator. The results showed that profitability of banks operating in Turkey was not affected from the recent financial crisis, because there was no significantly important difference between the ROA before crisis and ROA after crisis. According to the findings, the crisis affected the capital strength and cost management of the banks positively, since the capital ratio was significantly higher and overhead costs ratio was significantly lower after the crisis. In contrast, it seems that liquidity and revenue generation ability of the banks diminished after the crisis because of the statistically significant drops in loans over customer and short-term funding, non-interest income and interest income. As a result we can conclude that even if the revenue generation ability was affected negatively, profitability of the banks were not affected significantly because of the increase in capital strength and cost management efficiency.

After the t-tests, system GMM was applied to analyse the determinants of the profitability in Turkish banking industry and to display the differences between profitability determinants before and after crisis. Therefore the model was first solved for the whole period covering December 2003 to June 2012, and then it was divided into pre and post crisis periods. The findings revealed that there are some differences among the determinants of bank profitability between different periods. Two determinants that were significant in each of the three periods were the lagged dependent variable and non-interest revenue over total assets. Highly significant coefficient of lagged ROA justified the use of dynamic panel model in the study and showed the persistency of profits in Turkish banking industry. Non-interest revenue over total assets ratio was also significant in all three periods and the coefficient of this variable was higher in post-crisis period showing the growing importance of fees earned from banking activities other than granting loans. Ratio of interest revenue earned from loans to total loans was found to be a significant determinant of ROA before crisis but it appeared to be insignificant in post crisis period. Moreover, equity over total assets ratio became a significant determinant of ROA after crisis even if it was insignificant before the crisis. These findings together with the results of t-tests showed that recent financial crisis affected the capital strength and revenue structure of banks and at the same time changed the impact of different revenue types and equity on ROA. Although non-interest revenue over total assets ratio has dropped after the crisis, the effect of it on ROA has increased in the same period. Banks operating in Turkey have already focused on earning non-interest income by charging more fees on credit cards, bank accounts, fund transfers and etc. In fact there has been a growing negative reaction against banks because of the high fees charged for the banking services. Thus, despite the fact that the non-interest income has become more important, banks should keep the balance between the

customers' demands and the fees. Also we can conclude that the banks should continue strengthen their capital if they want to be more profitable.

Macroeconomic and industrial indicators appeared to be insignificant in post-crisis period. However when the period was not divided into two, GDP was found to have a small negative effect on ROA (at 10% significance level). Moreover at pre-crisis period, CPI turned out to be a significant determinant of profitability with a negative but very low coefficient.

In other studies which have focused on Turkish banking industry, more internal and external factors were found to be significant determinants of profitability, as mentioned in literature review. However the method used in those studies were different than the one used in this study. In addition the analysis period in this study is as also different, quarterly data is used in the analysis and also the effect of the recent crisis is taken into account. Therefore we can conclude that this study makes contribution to the literature by exploring the effects of recent financial crisis on Turkish banking industry, which is seen as a promising sector having a potential to be a model for other emerging countries.

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