**NEAR EAST UNVERSITY**

**INSTITUTE OF SOCIAL SCIENCES**

**DEPARTMENT OF BANKING AND FINANCE**

# DETERMINANTS OF PROFITABILITY OF PUBLIC AND PRIVATE BANKS IN TURKEY: A MULTIVARIATE ANALYSIS

**IN ACCORDANCE WITH THE REGULATIONS OF THE GRADUATE SCHOOL OF SOCIAL SCIENCE**

**MASTER THESIS**

**REDAR ABDULKHLIQ QADER**

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**SUPERVISOR: DR. BERNA SERENER**


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# DECELERATION

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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# ACKNOWLEDGMENTS

# ABSTRACT

This paper investigates the determinants of profitability of public and private banks in Turkey. ROA, ROE and NIM models are estimated for both public and private banks with regards to six bank specific variables namely, capital adequacy, bank's size, assets quality, deposit ratio , liquidity ratio and interest income ratio. Time series data form the period January 1988 to December 2012 was used to estimate the models and this was computed on Standard OLS Formula. The results reveal that public banks have a high variability in net interest margin (NIM) and that private banks have higher ROA mean return and this concurs with the economies of scale theory. Based on regression coefficients of the estimated models, obtained results revealed that capital adequacy, bank's size, assets quality, deposit ratio and liquidity ratio have positive impact on both public and private banks' profitability. However, variable interest was seen to be a significant negative relationship with ROA, ROE and NIM for both public and private banks. Possible reasons suggest that high interest rates dissuade customers from transacting with banks as they seek cheaper alternatives. The other reasons suggest that high interest rates may cause loans to amount to bad debts. Empirical findings also indicate that other ways to increase profitability are to attract more saving deposits and invest these funds in more diversified loan portfolios.

Keywords: Banking Sector, Profitability, Turkey.

# ÖZET

Bu çalışma Türkiye'deki kamu ve özel bankaların verimliliklerinin belirleyicilerini araştırır. Öz sermaye karlılık oranı (ÖSKO), aktif karlılık(AK) ve net faiz marjı (NFM) modelleri hem kamu hem özel bankalar için altı belirleyici değişken olan; sermaye yeterliliği, bankanın büyüklüğü, varlıkların niteliği, mevduat oranı, nakde çevrilebilme ve faiz gelirleri oranı gözönünde bulundurularak ölçümlenmiştir. Modelleri ölçümleyip bilgisayara aktarmak için standart sıradan en küçük kare formülü(S.E.K) ve Ocak 1988 - Aralık 2012 arası verileri kullanılmıştır. Sonuçlar ortaya koyuyor ki kamu bankalarının net faiz oranlarında yüksek derecede değişkenliği ve özel bankaların da yüksek aktif karlılığı var ki bunlar da ekonomi ölçeği teorisi ile uyuşmaktadır. Ölçümlenen modellerin gerileme katsayılarına dayanarak, elde edilen sonuçlar sermaye yeterliliği, varlıkların niteliği, mevduat oranı ve nakde çevrilebilme oranının hem kamu hem özel bankaların karlılığında olumlu ve önemli bir etkisi olduğu gerçeğini ortaya çıkarmıştır. Yine de, değişken faizin öz sermaye karlılık oranı (ÖSKO), aktif karlılık(AK) ve net faiz marjı (NFM) ile kamu ve özel bankalar için önemli bir olumsuz etkileşime girdiği görülüyor. Muhtemel sebepler yüksek faiz oranlarının daha ucuz alternatifler arayan müşterilerin bankalar ile işlem yapmaktan kaçınmaları olarak gösteriliyor. Diğer nedenler ise yüksek faizlerin büyük oranda maliyetli borçlara yol açması. Bilimsel bulgular karlılığı artırmanın diğer yolları olaraksa daha fazla tasarruf mevduatı çekip bu birikimleri daha çeşitli kredi portföylerine yatırım yapmak için kullanmaya işaret etmektedir.

Anahtar kelimeler: Bankacılık sektörü, karlılık, Türkiye.

# Table of Contents

# LIST OF TABLES

# LIST OF FIGURES

# LIST OF ABBREVIATIONS

**ROA**          Return on Assets

**CA**           capital adequacy

**Size**         Bank's size

**LOAN**          Loans/assets ratio

**DEPOS**        Deposit/assets ratio

**LQD**           liquidity /assets ratio

**GDP**          Gross Domestic Product

**EMH**          Efficient Market Hypothesis

**IMF**          International Monetary Fund

**BIST**         Borsa Istanbul Stock Exchange

**CBRT**         Central Bank of Republic of Turkey

**BAT**          Bank Association of Turkey

**TRY**          Turkish new lira

**BRSA**         Banking Regulation and Supervision Agency

**FX**           Foreign Exchange

**ROE**          Return on Equity

**NIM**          Net Interest Margin

**Int**          Interest Income/ Interest expenses ratio

**SDIF**         Saving Deposit Insurance Fund of  Turkey

# CHAPTER ONE

## INTRODUCTION
### 1.1. Identification of the Problem

Numerous studies have been done regarding the factors affecting bank's profitability. Majority of these studies mainly focus on countries that had already emerged in financial markets like the United States (Arias and Scott, 2011). Additionally, even though there is no suspicion that the changes of the banking system of the country will reflect on bank's profitability, there is less agreement on which bank specific variables are more relevant to be regarded as variables that significantly affect the bank's profitability either in the short run or the long run.

The main objective of the study is to analyze the linkage between the public and private banking profitability (ROA, ROE and NIM) in Turkey and six bank specific variables namely, capital adequacy (CA), bank's size (LogSize), assets quality (LOAN), deposit ratio (DEPOS) , liquidity ratio (LQD) and interest income (INT). The study seeks to identify the relevant variables that bank policy makers should take in consideration when choosing sources of funds and potential investment positions of these funds.

### 1.2. Motivation and Contribution

The study will examine the Turkish public and private banks activities by identifying internal variables that affect this sector's profitability. The importance of choosing to study the Turkish banking sector is that it represents 114.1% of the Turkish GDP and accounts for approximately 87% of the financial system[1]. Moreover it was a major sector exposed to the 2002 financial crises and the restructuring process of the Turkish economy. This study aims to investigate the factors influencing the profitability of the Turkish public and private banks especially during the restructuring period of the Turkish economy from 2002 and 2007. My results shall be a contribution to the existing research regarding banks profitability determinants with emphasis on the Turkish public and private banks.

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[1] IMF Country Report No. 12/261, Turkey: Financial System Stability Assessment

## 1.3. Objectives of the Study

The essential objective of the study is to examine the relation between the profitability for the Turkish public and private banking sector.

The specific objectives are:

(i) To determine internal factors influencing the bank's profitability.

(ii) To detect the significant variables and how much they influence bank's profitability.

## 1.4. Research Hypotheses

The hypothesis that this study seek to verify are as stated below:

$H0_a$: There is no significant impact of bank size on ROA, ROE and NIM.

$H0_b$: There is no significant impact of liquidity risk on ROA, ROE and NIM.

$H0_c$: There is no significant impact of capital adequacy on ROA, ROE and NIM.

$H0_d$: There is no significant impact of deposit ratio on ROA, ROE and NIM.

$H0_f$: There is no significant impact of assets quality on ROA, ROE and NIM.

$H0_f$: There is no significant impact of interest income on ROA, ROE and NIM.

## 1.5. Research Methodology

The study will examine the relationship between Turkish public and private banks activities by identifying internal variables that affect particularly the banking sector profitability by employing yearly data for the period January 1988 to December 2013. This study uses the computer software E-Views for applying the econometric analysis. Multiple linear regressions are applied on the series.

## 1.6. Significance of the Study

The significance of this study can be derived from its findings and outcomes and from how successfully this study investigates the Turkish public and private banks profitability determinants. Additional significance and importance to this particular study is also comprehended from the importance of the Turkish banking sector and its vital role in the Turkish economy. Nevertheless this study serves as an attempt to

add to the growing body of empirical studies on the determinants of bank profitability with focus on the Turkish public banks.

I hope that findings of this study will help investors increase their profitability and decrease their risks when investing in banks. Moreover I expect to give a better understanding to the relation between profitability and internal factors of public and private banks of Turkey like liquidity ratio, banks size and capital adequacy ratio.

## 1.7. Structure of the Thesis

The thesis is composed of seven chapters. After this introductory chapter, the remainders of this thesis are organized as follow:

Chapter 2; puts the light on the chronology of the banking sector throughout the history of Turkey. Also shows the performance of the banking sector and how it got affected by the different policies that were applied. Finally the chapter illustrates the recent updates on the banking activities until 2013.Chapter 3; provide and discusses the theory of bank profitability in the financial literature. Starting with the Efficient Market Hypothesis (EMH) and ending with an explanation of the other related theories. Chapter 4; discusses the empirical finding of previous research that studied the influence of macroeconomic variables on stock market. These studies are divided into two groups. The first group shows studies applied on different countries in the world, the second group shows studies done on Turkish banking sector. Chapter 5; the aim of this chapter is to express the selected variables that are studied in this study and explain the applied econometric techniques that were used in the analysis. Chapter 6; the aim of this chapter is applying econometric techniques and discuss the result. Chapter 7; set out the main conclusions from this empirical research and suggest some recommendations for future research.

# CHAPTER TWO

**ECONOMIC OVERVIEW**

**2.1. Borsa Istanbul Stock Exchange**

BIST or Borsa Istanbul Stock Exchange is the only representative and only institution in which under its supervision exchanges of various securities is allowed. Its origin comes back to the early of 1986. BIST is governed by an executive council consistent of five members. The chairman and the chief executive are assigned by the government and the other four members are elected from representatives of development banks, commercial banks and brokerage houses. Borsa Istanbul Stock Exchange has its own budget where it finances its expenses from fees on transaction done in the market. Its revenue is not distributed to any other part where as it is to be reinvested or spent so cover expenses of the operation of BIST[2].

Although BIST was established recently, its establishment process did not come out of a sudden. It is said that an organized securities market has been in the Turkish market since the Ottoman Empire. It mainly attracted the European investors whom wanted more power in the falling Ottoman Empire. After the declaration of the Turkish Republic this securities market was enforced by new laws and under the new name of "Istanbul securities and foreign exchange Bourse" in 1929. Its purpose was to organize the fledging capital in the new Turkish economy[2].

Legislative and institutional improvement was put in the early 1980's in the Turkish capital markets. In 1983 a market board was elected in order to supervise and regulate the operations in the Turkish capital market. On the first page of an official local newspaper the "Regulations for the establishment and functions of securities exchange" were issued. These regulations were a main pillar in the latter on inaugurating the Istanbul Stock Exchange in 1985[2].

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[2]http://www.borsaistanbul.com/en

4

**2.2. Review of the Turkish Banking Sector**

**2.2.1. The Banking and Currency Crisis of Early 2000's**

Due to unfavorable political developments prior to Treasure auction and unsolved structural issues, the Turkish Lira faced a speculative attack on February 22, 2001, leading Turkey to sign another agreement with the International Monetary Fund (IMF) to restructure its economy in the name of "Transition to a Strong Economy". The program anticipated timely debt repayments, prevent further devaluation of the currency and support the solvency of the banking system. Prudent monetary and fiscal policies under a floating exchange rate regime and an enhanced social dialogue were the main pillars of the program. The program also targeted a strong reform of the financial system and the banking sector by restructuring public banks together with a regulation and supervision of private banks (Öğunç and Yılmaz, 2000).

After the declaration of the floating exchange rate regime, the main goals for the Central Bank of Republic of Turkey (CBRT) were to restructure the banking system and provide stability to the whole financial system by reducing uncertainty. In Mid 2001 the new Central Bank Law was approved by the Turkish parliament. This new law provided the transparency of monetary policy and accountability of CBRT by the establishment of a Monetary Policy Committee that guaranteed a memorandum of understanding. Also this new law prohibited the CBRT from extending short-term credit to the Treasury and other public enterprises (Brinke, 2013). In early 2002 the CBRT announced using two nominal anchors, monetary targeting and inflation targeting, to reduce prospective uncertainties. There were two main pillars of the new stabilization program: Inflation targeting and floating exchange rate regime. Inflation targeting was implemented implicitly until 2006 when explicit, formal, targeting took the role and in both pillars the short-term interest rate became the main policy instrument against inflation (Civcir, 2010).

A closer numerical look at the banking sector in the twin crisis span period, we find a drop in the number of commercial banks down to forty in 2002. While the number of branches also dropped from 7,807 in 2000 to 6,087 in 2002. Moreover eight banks were held over to the Saving Deposit Insurance Fund (SDIF) during 2001 (BRSA, 2007). The banking sectors total assets shrank to an amount of USD 115 billion, 26 per cent decrease. Never the less a series of mergers and liquidations made the

number of employees to also drop down to 123,271 in 2002. Consequently the non-performing loans which mean the unpaid loans from customers also soared to a 25.6 per cent of total loans by Commercial banks. More details are shown in table 2.1 and table 2.2.

**Table 2.1 Non-performing loans (gross) /Total loans (percentage)**

|  | 2000 | 2001 |
|---|---|---|
| Commercial banks | 12.6 | 25.6 |
| State-owned | 12.5 | 40.7 |
| Privately-owned | 6.2 | 17.8 |
| Banks in Fund | 70.6 | 199.7 |
| Foreign banks | 2.9 | 5.4 |
| Development and investment banks | 1.6 | 7.5 |
| **Total** | **11.6** | **23.2** |

Source:  BAT, Banks in Turkey (2002)

**Table 2.2 Number of Banks and Branches in the System**

|  | December 2000 | | December 2001 | | December 2002 | |
|---|---|---|---|---|---|---|
|  | **Bank** | **Branch** | **Bank** | **Branch** | **Bank** | **Branch** |
| **Commercial banks** | 61 | 7,807 | 46 | 6,889 | 40 | 6,087 |
| State-owned | 4 | 2,834 | 3 | 2,725 | 3 | 2,019 |
| Privately-owned | 28 | 3,783 | 22 | 3,523 | 20 | 3,659 |
| Banks in Fund | 11 | 1,073 | 6 | 408 | 2 | 203 |
| Foreign banks | 18 | 117 | 15 | 233 | 15 | 206 |
| **Development and investment  Banks** | **18** | **30** | **15** | **19** | **14** | **19** |
| State-owned | 3 | 11 | 3 | 4 | 3 | 4 |
| Privately-owned | 12 | 16 | 9 | 12 | 8 | 12 |
| Foreign banks | 3 | 3 | 3 | 3 | 3 | 3 |
| **Total** | **79** | **7,837** | **61** | **6,908** | **54** | **6,106** |

Source:  Compiled from BAT (2002)

### 2.2.2. The Period until the Global Crisis of 2008

Improvements in the economic performance, fall of inflation, the decrease in the Government's demand for funds and the new banking regulations which were rich of international standards all contributed positively on the Turkish banking sector (BAT, 2013). The most significant change on the Turkish banking sector in this period was both the growth and change in the balance sheet structure of the banking

system. The total assets were denominated by the Turkish Lira with a percent of 68 while only 32 percent was foreign currencies (see figure 2.2). This resulted from the increase of demand on Turkish Lira (TRY), as it appreciated against major foreign currencies in the same period. The most significant change was the growth of the loans portfolio and its diversification. As total loans to total assets continued to grow up to 50 percent compared to total deposits to total assets which were fluctuating around 62 percent until 2010 (see figure 2.1). In contrast loan risks increased during the 2007-2008 crisis as the GDP dropped by 47 percent also and interest rates fell dramatically to low levels. By the end of 2009 due to some changes taken by the Central bank like decreasing the interest rate, it was told that the banking sector is improvement was reflected in its sound and healthy balance sheets, sustained strong shareholders' equity and high trust in TRY (BAT, 2009).

**Figure 2.1 Banking sectors loans and deposits percentages of total Assets**
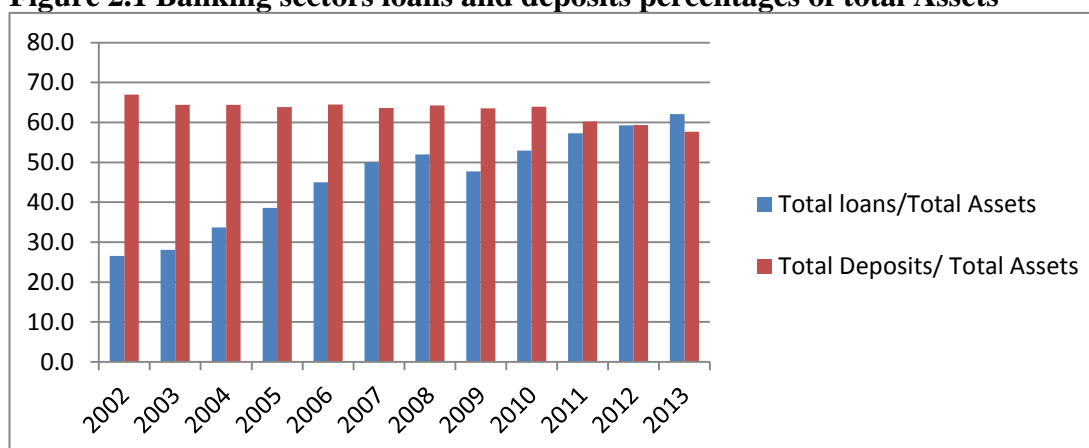


Source: Compiled from BAT (2013)

**Figure 2.2 Currency denomination of deposits in the Banking sector**
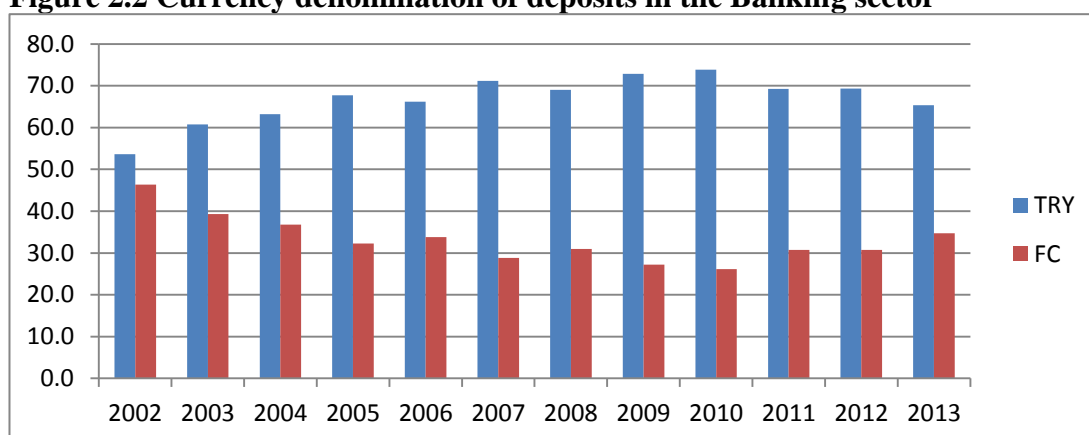


Source: Compiled from BAT (2013)

## 2.3. The Banking Sector up to the Recent Days

The Turkish banking sector by the end of 2013 had 49 banks denominated by 32 deposit banks. The sector contributed the growth positively and financial stability remained robust in Turkey. Banking sector, representing 87 percent of the financial sector in Turkey based on criteria such as capital adequacy, asset quality, liquidity, and profitability performed successfully. In 2013 total assets reached TRY 1,732 billion in domestic currency reflecting a growth of 26.4 percent. This growth was also illustrated in total loans as it grew by more than 30 percent (BAT, 2013).

Although deposits had the biggest share of liabilities in the banking sector, reaching an amount of 57.7 percent in 2013, this share is decreasing due to the opportunities for higher returns on alternative investment instruments, such as real estate and foreign exchange never the less, the sector is concentrated on security issues to finance the rapid growth in its assets and other sources of funding from abroad like international funds. According to Banking Regulation and Supervision Agency (BRSA) the sources of finance from abroad grew by 48.6 percent. This growth was a consequence of the upgrading of Turkey's credit rating to investment grade as this grade represented an important factor affecting the banking sector's improvement in this area (BRSA, 2013).

The soundness of the banking system and its profitability measured by the rate of non-performing loans in the balance sheet also remained low (see figure 2.3). The Banking sector's volume of non-performing loans increased to TRY 29.6 billion due to its policy of prudence and legal regulations (BRSA, 2013).

**Figure 2.3 Non-performing loans**
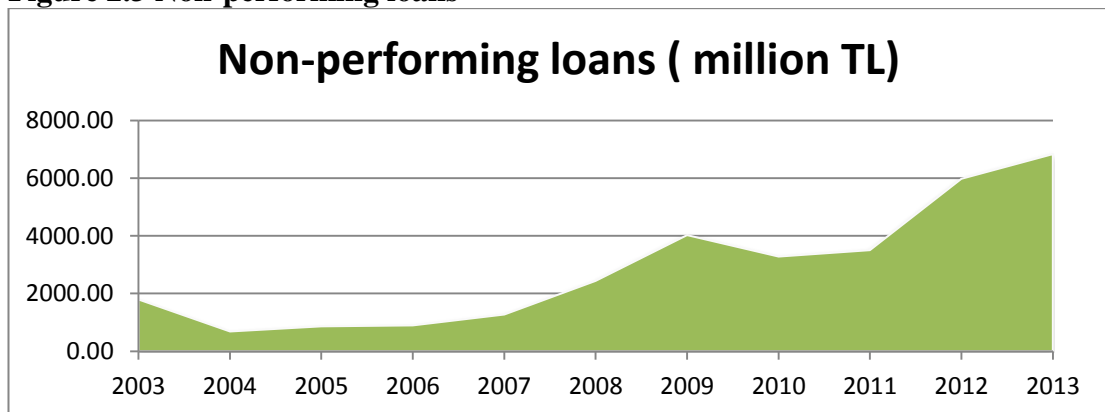


Source: Banking Regulation and Supervision Agency (BRSA, 2013)

Concerning the exposer to currency risks the net general foreign exchange position gave deficits of USD 581 billion, FX position gave deficits of USD 30 billion shown in table 2.3. The ratio of net foreign exchange position to shareholders equity stood at 0.5 percent (BRSA, 2013).

**Table 2.3 Net General Foreign Exchange position (USD million)**

|                                | 2012 | 2013 | Percentage change |
|--------------------------------|------|------|-------------------|
| Balance sheet FX position      |      |      |                   |
|   Assets             | 257  | 303  | 46.7              |
|   Liabilities        | 274  | 334  | 60                |
|   FX position        | -17  | -30  | -13.3             |
| Off- balance sheet FX position | 18   | 30   | 11.2              |
| Net FX position                | -2   | 1    | -2.1              |

Source: Banking Regulation and Supervision Agency (BRSA, 2013)

According to (BRSA, 2013), the banking sector's capital adequacy ratio which represents the bank's capital to its risk, the notable standing at 15.3%, bearing in mind the legal limit of 8% and the BRSA's capital adequacy ratio target of 12%. This means that the banking system did not abandoned preserving strong capital structure while supporting and funding the Turkish economy (see figure 2.4).

**Figure 2.4 Capital Adequacy Ratios**
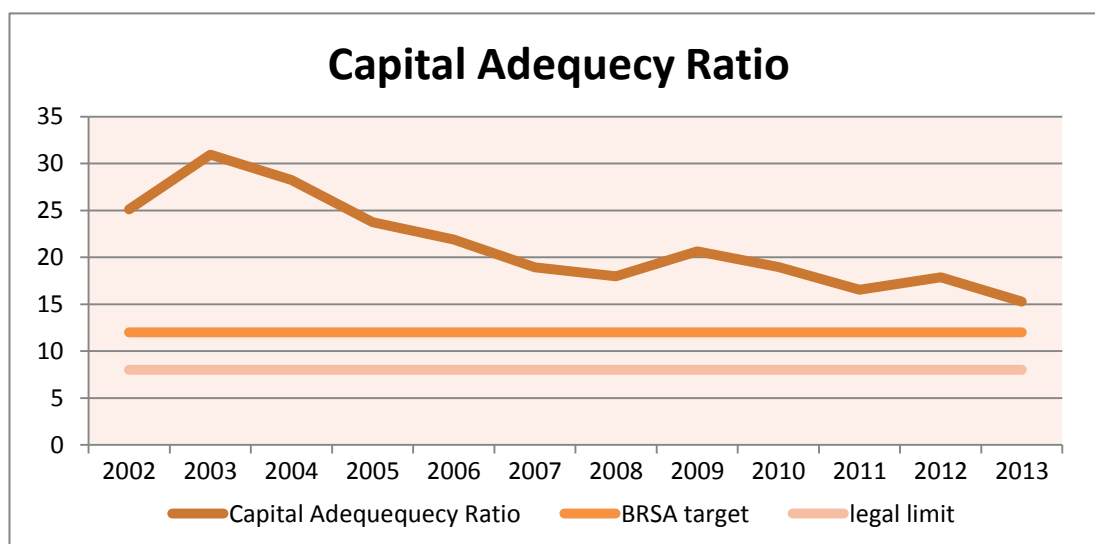
An overall look at the banking sector in 2013, we see that despite the current account deficit and the tightening monetary policy, the sector still increased its assets to GDP ratio and its rate of loan growth exceeded the central bank's reference level. A selected ratio is presented in table 2.4 below:

**Table 2.4 Turkish banking Sector: Selected Ratios (%)**

|  | **2011** | **2012** | **2013** |
|---|---|---|---|
| Total Assets / GDP | 93.8 | 96.8 | 114.1 |
| Loans/Deposits | 101.0 | 106.1 | 114.1 |
| NPL Ratio | 2.7 | 2.9 | 2.7 |
| ROE (Net Profit/Average Shareholders' Equity) | 15.5 | 15.7 | 14.2 |
| ROA (Net Profit/Average Total Assets) | 1.7 | 1.8 | 1.6 |
| CAR (Capital Adequacy Ratio) | 16.6 | 17.9 | 15.3 |

Source: Banking Regulation and Supervision Agency (BRSA, 2013)

The number of employees increased by 11.367 to 197,000 people thus was at record levels by December 2013(see figure 2.5). Almost 97 percent of bank employees were employed by deposit banks, and 3 percent by development and investment banks (BAT, 2013).

**Figure 2.5 Numbers of Branches and Employees**
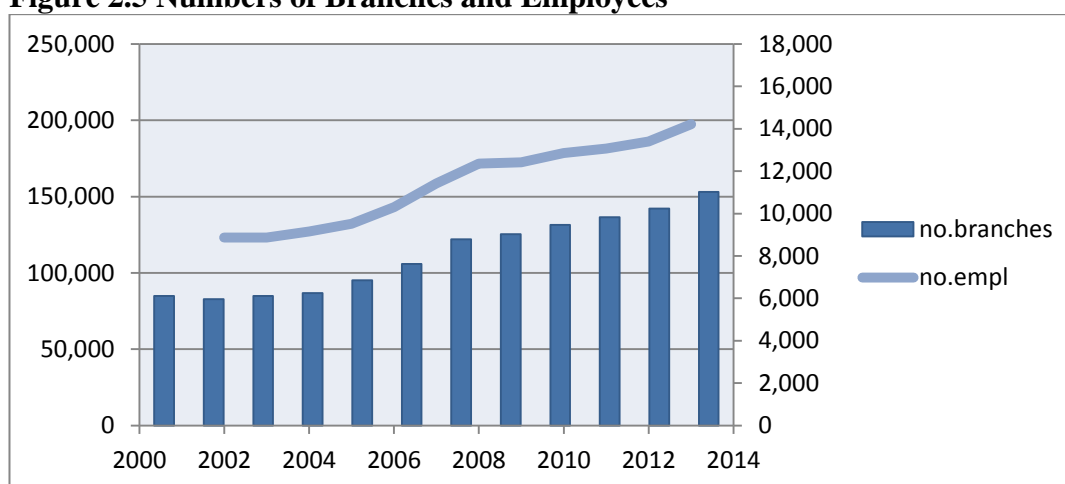


*Yearly Statistics - 1959-2013 Banking Association of Turkey

# CHAPTER THREE

## THEORETICAL LITERATURE

In the literature, bank profitability is usually represented by a function of internal and external factors in which effect banks profitability. Banks profitability is also usually denoted as Return on assets (ROA) and/or Return on Equity (ROE) and/or Net Interest Margin (NIM). The first part of profitability function consists usually of the internal determinants of the bank's profitability. These factors originate from the bank's balance sheet and banks profit and loss accounts, meaning they are factors related to the management of the bank and its reflection of its policies in its accounts. They are called in the literature micro or bank specific determinants. Such profitability determinants, not all but some are the level of liquidity, loan portfolio, capital adequacy, expenses management, equity structure and bank size.

On the other hand of the bank's profitability function is the external factors or determinants. These variables reflect the outside economic and legal atmosphere of the bank. Meaning they denote the influence the banks receives from outside and from any non-managerial source. External factors are inflation, GDP, money supply, liberalization degree, asymmetric information and so on[3].

Among the internal determinants is the banks size. This factor accounts to see how the bank deals with costs, risks diversification and product in terms of its size. According to the literature this variable can be positively or negatively related with banks profitability. It is believed that bank size is positive if there are significant economies of scale[3]. A negative relation, will result due to increase in diversification of risk which leads to lower credit risk and therefore lower returns. Other researchers Athanasoglou et al. (2005), Mamatzakis and Remoundos, (2003), Alper and Anbar, (2011), however, conclude that the bank's size has a positive influence on the bank's profitability but only to a limit, where after this limit it becomes negative due to bureaucratic and management reasons.

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[3]see (Akhavein et al. 1997; Bourke, 1989; Goddard et al., 2004)

Liquidity risk, arising from the possible inability of a bank to accommodate decreases in liabilities or to fund increases on the assets' side of the balance sheet, is considered an important determinant of bank profitability. The loans market, especially credit to households and firms, is risky and has a greater expected return than other bank assets, such as government securities. Thus, one would expect a positive relationship between liquidity and profitability (Bourke, 1989). It could be the case, however, that the fewer the funds tide up in liquid investments the higher we might expect profitability to be (Eichengreen and Gibson, 2001).

Changes in credit risk may reflect changes in the health of a bank's loan portfolio (see Cooper et al., 2003), which may affect the performance of the institution. Duca and McLaughlin (1990), among others, conclude that variations in bank profitability are largely attributable to variations in credit risk, since increased exposure to credit risk is normally associated with decreased firm profitability. This triggers a discussion concerning not the volume but the quality of loans made. In this direction, Miller and Noulas (1997) suggest that the more financial institutions are exposed to high-risk loans, the higher the accumulation of unpaid loans and the lower the profitability.

Even though leverage (overall capitalization) has been demonstrated to be important in explaining the performance of financial institutions, its impact on bank profitability is ambiguous. As lower capital ratios suggest a relatively risky position, one would expect a negative coefficient on this variable (for a thorough discussion see Berger, 1995b). However, it could be the case that higher levels of equity would decrease the cost of capital, leading to a positive impact on profitability (Molyneux, 1992). Moreover, an increase in capital may raise expected earnings by reducing the expected costs of financial distress, including bankruptcy (Berger, 1995b). Indeed, most studies that use capital ratios as an explanatory variable of bank profitability (e.g. Bourke, 1989; Molyneux and Thornton; 1992; Goddard et al., 2004) observe a positive relationship. Finally, Athanasoglou et al. (2005), suggest that capital is better modeled as an endogenous determinant of bank profitability, as higher profits may lead to an increase in capital (Berger, 1995b).

# CHAPTER FOUR

## EMPIRICAL LITERATURE

Empirical studies analyzing the determinants of bank's profitability or factors influencing the profitability ranged from developed economies to developing economies. According to Al-Tamimi, (2010) recent studies have been giving more attention to the study of emerging markets like Turkey.

Among the implemented previous studies regards this subject, the dependent variables representing the banks' profitability are namely: return on asset (ROA), return on equity (ROE), and net interest margin (NIM). One the other hand the independent variables or the determinants are classified between internal factors specifically bank determinant; capital adequacy, size, liquidity, and external factors specifically economy or structural determinants; inflation, money supply, economic growth, (Gul et al., 2011). In the next paragraphs we shall put the light on some previous implemented.

### 4.1. Studies Related To Different Economies

Mamatzakis and Remoundos, (2003), inspected the factors influencing the profitability of Greek commercial banks for 1989 to 2000 for 17 banks. Taking the return on assets ratio (ROA) and the return on equity ratio (ROE) as a measure of the bank's profitability, their results showed that along with the process of joining the European Union and the deregulation of the financial system in that period, improvements on the banking sector returns has been evident. Moreover they found that other major influencers on the profitability of Greek's commercial banks are management decisions factors.

Flamini et al, (2009), found that bank size of total assets, structure of its ownership and the diversification of its activities had a significant effect on the banks profitability. On the other hand the banks credit risk did not show much significance on profitability. Moreover the study also reported that the macroeconomic variables were all significant regards the bank's profitability. The study was implemented on a sample of 389 banks in 41 Sub-Saharan African countries.

Athanasoglou et al, (2006), analyzed the profitability of financial credit institutions over the period span of 1998 and 2002 for a panel dataset of South Eastern European countries. They examined a joint of all three bank, industry and macroeconomic profitability determinants. The founding's revealed that all the factors related to the bank characteristics were significant in effecting its profitability. All bank-specific determinants significantly affect bank profitability in the anticipated way. Among the macroeconomic variables, inflation was the only variable which showed a strong influence on banks profitability, in contrast GDP per capita did not evident any significant at all.

Rasiah, (2010), took the commercial banks in Malaysia and Singapore and tried to summarize the theoretical aspect of determinants of the profitability of commercial banks. In his paper the determinants were divided into two main categories. First the internal variables which included the bank's portfolio mix of investments and loans diversification, liquidity ratio, the capital structure of the commercial banks, liability composition, and total expenses. On the other hand the external determinants which reflected factors relating to the macro environment like the market's competition status, countries regulations and ease of activity, the economic inflation rate, GDP growth, and off course the  interest rate.

Al-Tamimi, (2010), made a comparison between profitability determinants of Islamic banks and profitability determinants of conventional banks in United Arab Emirates (UAE). He conducted his study for the period from 1996 to 2008 where in this period the Islamic banks in the UAE showed an increasing demand on their services despite the fact that Islamic banks held a small share of the total market. This small share served as a motivation for the comparison to the conventional banks. He used both ROA and ROE as proxies of the bank's profitability ratios and as for the independent variables or determinants of the bank's profitability he used GDP per capita, bank size, indicator of financial development, liquidity, credit concentration ratio, bank costs and bank's number of branches. His outcomes revealed that the Islamic banks profitability determinants were the bank costs and banks number of branches. On the other hand the conventional banks only liquidity and credit concentration were significant factors.

Krakah and Ameyaw, (2010), investigated the factors determining the profitability Ghana's commercial banks. Outcomes of the investigation reported that the bad debt or the unpaid loans did not have any significant effect on the commercial banks profitability despite its importance theoretically. Moreover the study also showed that other bank specific factors reflected a significance impact on Ghana's banks profitability, namely these factors were; bank's capital strength, non-interest income, size of the banks measured by total assets and the banks non-interest expenses.

Ilhomovich, (2009), took Malaysia as a case study from the period 2004 to 2008 and analyzed the performance of Malaysian domestic banks against Malaysian foreign banks. His findings revealed statistically that Malaysian domestic banks are more profitable than the foreign banks. Despite the fact that in reality foreign banks do have strong capital and nevertheless they offer lower costs banking services due to the competitiveness they generate in the Malaysian economy.

Scott and Arias (2011), aimed in his study to distinguish between the relevant determinants of profitability for the banking sector of the United States specifically. He applied an econometric model to the top five banks in the United States. The study revealed that all the selected indicators of banks profitability were positively significant when regressed on the known profitability measures such as the return of equity and the annual percentage changes in the external per capita income. These internal factors of size showed effectiveness and significance even in times of economic recessions.

Gul et al, (2011), conducted their study on the top fifteen commercial banks of Pakistan covering the period 2005 to 2009. They investigated the effect of internal factors like bank's assets size, bank's loan portfolio, bank's equity and the bank's deposits on the banks profitability. They also investigated the impact of external factors like economic growth inflation and market capitalization on the Pakistani banks. Return on Assets (ROA), Return on equity (ROE), net interest margin (NIM) and return on capital employed were all used as profitability proxies separately. Their study supported previous studies in which shown that both internal and external factors have significant influence on Pakistani banks profitability.

## 4.2. Studies Related To Turkey

Alp et al. (2010), aimed in their paper to pinpoint the internal determinants for the Turkish banks profitability during the period of 2002 and 2009. Their findings revealed that capital adequacy ratio along with the size of the bank's assets had a positive effect on their profitability. In contrast the liquidity ratio and the banks operating costs showed a negative relation with the Turkish banks.

Teker et al, (2011), measured the performance of 13 commercial banks of Turkey over the span period of 2003 to 2010. Dependent variables were the bank's annual net income and return on equity (ROE) separately. The main contribution is that the study did not limit the determinants to financial factors whereas it included nonfinancial factors such as effective management and leadership, customer satisfaction, advanced technology and more others.

Alper and Anbar, (2011), investigated Turkey's banking sector over from 2002 to 2010 by analyzing both bank specific determinants and macroeconomic determinants of the banking sectors profitability. The results indicated among the macroeconomic variables that only the real interest rate had positive and significant effect on the performance of banks while other variables were non-significant. In respect to the internal factors, the bank's non-interest income and total asset size affected the banking sectors profitability with a significant positive impact. However on the contrary, the banks size of portfolio and loans under follow-up showed negativity regards profitability of the banking sector.

Acaravci, (2012), employed Johansen and Juselius co-integration test to investigate the existence of a long relationship between the selected bank profitability determinants and bank profits in the Turkish economy. The analyzed banks were the three biggest banks among the state-owned, privately-owned and foreign banks in Turkey. This study was conducted over the period 1998 to 2011. Proxies of bank profitability were ROA, ROE and NIM. Internal factors were total credit, total deposits, liquid assets, wage and commission income, wage and commission costs and total equity separately as a ratio of total assets. External factors were GDP, inflation rate, exchange rate and interest rate. This study's findings showed that the

banks specific factors had more significance effect on the banks profitability ratios than the macroeconomic factors.

Other studies are summarized in the following table.

**Table 4.1 Summary of Previous Studies**

| Authors | Period studied | Dependent variable | Independent variables | Methodology | Country |
|---|---|---|---|---|---|
| Mamatzakis and Remoundos | 1989 to 2000 | ROA, ROE | Size, capital adequacy, ownership, cost structure, business risk, market structure, inflation, money supply growth | Time series and cross-section | Greece |
| Athanasoglou et al, | 1998 to 2002 | ROA, ROE | Capital, credit risk, productivity growth, operating expenses, size, ownership, concentration, inflation, cyclical output | GMM Panel model | South Eastern European countries |
| Athanasoglou et al, | 1985 to 2001 | ROA, ROE | Liquidity, credit risk, capital, operating costs, size, foreign ownership, market share, banking system reform,oncentration , inflation, economic activity | Dynamic panel data model | Greece |
| Ilhomovich | 2004 to 2008 | ROA, ROE | Capital adequacy, Asset quality, Management, Earnings and Liquidity | Ordinary least squares OLS | Malaysia |

| Authors | Period studied | Dependent variable | Independent variables | Methodology | Country |
|---|---|---|---|---|---|
| Javaid et al, | 2004 to 2008 | ROA | Assets, loans, equity, and deposits | Pooled OLS, Incremental Regression | Pakistan |
| Flamini et al, | 1998 to 2006 | ROA | Size, capital, credit risk, cost management, activity mix, market power, ownership, wealth, cyclical output, inflation, fuel price, commodity price, regulatory environment | Unbalanced panel | 41 Sub-Saharan Africa countries |
| Panda et al, | 1995 to 2012 | ROA, Total Revenue | GDP Growth Rate, Gross Domestic, Real Effective Exchange Rate Gross Domestic Saving, Interest rate, Broad Money, Inflation rate, and Capital Formation | Panel data model | India |
| Al-Tamimi | 1996 to 2008 | ROA, ROE | GDP per capita, size, financial development, liquidity, costs, number of branches, concentration | OLS | UAE |
| Abdelkader Derbali | 2003 to 2010 | NIM | Credit risk, concentration, market capitalization size | Panel generalized least squares (GMM) | Tunisia |
| Arias and Scott | 2007 to 2011 | ROA | ROA/GDP | Theoretical and empirical (Weighted Average model) | USA |

| Authors | Period studied | Dependent variable | Independent variables | Methodology | Country |
|---|---|---|---|---|---|
| Rasiah | 1988 to 1997 | ROA, ROE | liquidity, investment in securities and subsidiaries, loans, non-performing loans, and overhead expenditure, savings, current account deposits, fixed deposits, total capital and capital reserves, money supply interest rates, inflation rates, market growth | Pooled regression analysis | Malaysia and Singapore |
| Seok Weon Lee | 1994 to 2008 | ROA | Asset size, capital ratio, loan ratio, fixed asset to total asset, net interest margin, dummy variable for Asian crisis | Pooled panel analysis | Korea |
| Alp et al. | 2002 to 2009 | ROA | Bank size, credit risk, Liquidity, management efficiency and capital structure adequacy. | OLS | Turkey |
| Teker et al. | 2003 to 2010 | Financial performance index | Management Efficiency, liquidity, capital adequacy, assets quality, market value, growth Rate | Indexing model developed in this study | Turkey |

| Authors | Period studied | Dependent variable | Independent variables | Methodology | Country |
|---|---|---|---|---|---|
| Serbetli | 1998 to 2011 | ROA, ROE, NIM | Total credits, total deposits, total liquid assets, total wage and commission incomes, total wage commission expenses, the logarithm of total assets and total equity, all percentage of total assets | Johansen and Juselius co integration test | Turkey |
| Alper and Anbar | 2002 to 2010 | ROA, ROE, NIM | Asset size, capital adequacy, asset quality, liquidity, deposit and income-expenditure structure, GDP, inflation rate and real interest rate | Balanced panel data | Turkey |
| Acaravci | 1998 to 2011 | ROA, ROE, NIM | Total credit, total deposits, liquid assets, wage and commission income, wage and commission costs and total equity separately as a ratio of total assets. External factors were GDP, inflation rate, exchange rate and interest rate | Time series econometric, Johansen and Juselius co-integration test | Turkey |

| Authors | Period studied | Dependent variable | Independent variables | Methodology | Country |
|---|---|---|---|---|---|
| Atasoy | 1990 and 2005 | ROA | Total equity, Total assets, inflation rate, concentration ratio, and bank size, fixed and provisional costs to total assets. | OLS | Turkey |
| Arslan and Yaprakli | 1983 to 2007 | Total returns | Bank credits and inflation | Johansen co_integration analysis and error correction model | Turkey |
| AKBAŞ | 2005 to 2010 | ROA, ROE | Equity to total assets ratio, loan loss provisions to gross loans ratio, Liquid assets over short term liabilities, Total costs to total income, size, Index for Credit, Index for Assets, Index for deposits, GDP and Inflation | Panel data analysis | Turkey |
| Demirhan | 2003 to 2012 | ROA | Equity/ total assets, Overhead Costs/total assets, Loan Loss Provisions/Total Loans, Interest Income/Total Loans, Market Share, Non-interest Income/ Total Assets, GDP, Consumer Price Index, Concentration of the banking industry | Dynamic panel estimation , GMM estimator | Turkey |

| Authors | Period studied | Dependent variable | Independent variables | Methodology | Country |
|---|---|---|---|---|---|
| Uludag and Gokmen, | 1999 to 2009 | ROA, ROE | Bank size, cost management, personnel efficiency, non-interest expenses, market concentration and inflation | Dynamic panel data | Turkey |
| Bourke | 1973 to 1988 | ROA | Total equity, Total assets, inflation rate, concentration ratio, and bank size, fixed and provisional costs to total assets. | OLS | USA |
| Molyneux and Thornton | 1976 to 1991 | ROA | Bank size, cost management, personnel efficiency, non-interest expenses, market concentration and inflation | OLS | USA |
| Guru et al. | 1981 to 1998 | ROE | Equity to total assets ratio, loan loss provisions to gross loans ratio, Liquid assets over short term liabilities, Total costs to total income, size, Index for Credit, | PANEL | USA |

# CHAPTER FIVE

## DATA, METHODOLOGY AND ECONOMETRIC MODEL

The objective of this chapter is to express the selected variables that are studied in this study along with clarifying its reliable source and also explain the applied econometric techniques that were used in the analysis.

### 5.1. Data

Three models are estimated in this study, explaining the factors which determine the profitability of the Turkish public and private banks, and the data is collected particularly from deposit state-owned and private owned banks [4](see appendix). Three public banks and eleven private banks were analyzed the data sample covers the period span from 1988 to 2012. The selected ratios assets, liquidity, deposits, loans, capital adequacy and interest income are collected from the annual balance sheet reports, income statement reports published by the Banks Association of Turkey (BAT, 2013).

### 5.2. Selection of the Studied Variables
### 5.2.1. Bank-Specific Independent Variables
### 5.2.1.1. Asset Size

In most of the related literature studying Turkey [5] and in the finance literature in general, the variable which represents the firm's size is the firm's amount of total assets. In other words the firms or banks amount of total assets is used as a proxy for that firm's size. More specifically total asset is represented in the natural logarithm form (logsize) to make data more convenient for the analysis. The importance of this factor comes from the debate in the financial literature as if there is or not an optimal firm size in which at that point the firm is able to reach its maximum advantage from its size and turn it into profit.

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[4]http://www.tbb.org.tr/en/modules/banka-bilgileri/banka_Listesi.asp?tarih=6/5/2015
[5]Ozkul, (2001), Arslan and Yaprakli, (2008), Dinc, (2006), Tunay and Silpagar, (2006 a, b), Atasoy, (2007), Sayilgan and Yildirim, (2009), Kaya and Dogan, (2005), Alp et al, (2010), Kaya, (2002), Serbetli, (2008).

The general agreement in the finance literature is that a firm's size is positively related to its returns and profit. In our case where the firm is a bank rather than a normal merchandise firm, the literature suggest that a larger bank is likely to have a higher potential and opportunity to give out loans and other sources of credit. This opportunity diversifies the banks risks and never the less the bank's operations become more efficiency due to the economies of scale theory. Therefore the literature supposes a positive influence of size on bank profitability (Smirlock, 1985).

On the contrary due to agency costs, management bureaucratic procedures and other internal management reasons, extremely large banks exhibit a negative relationship with their profitability compared to their total amount of assets (Dietrich and Wanzenried, 2009). According to Vong and Chan 2009, small size banks exhibit a positive relationship with profitability ratios and large banks exhibit a negative relationship.

### 5.2.1.2. Capital adequacy

One of the most widely used financial ratios which exhibit the company's capital strength is its equity to total assets ratio. Capital adequacy or "capital to risk (Weighted) assets ratio" this ratio express the company's ability to absorb or cushion the risks of losses from the shareholders equity. According to the theory of financial capital structure an increase of debt financing in a particular range might lead to a decrease in the company's cost of capital and thereby increase its profitability. In an alternative way we can say that the rise of this ratio means the less the company needs to depend on external funding and this reduces costs of capital for the company. So the total equity to total assets ratio is expected to have a positive relationship with the bank's profitability (Bourke, 1989; Hassan and Bashir, 2003).

On the other hand, according to Staikouras and Wood 2003, the equity to assets ratio from an investment-risk perspective has a negative relationship with the total revenue of the company. This is assumed from the investment theory that lower risks results in lower returns. So an increase in the equity to assets ratio tends to reduce the risk of equity and therefore decreases the expected return on the company's shares bought by investors thus consequently decreasing market share price and market returns.

### 5.2.1.3. Liquidity ratio

Liquidity ratio abbreviated as (Liq) denotes the percentage ratio of the bank's liquid assets to its total assets. The higher this ratio the better it is for the bank because it expresses the bank's ability to meet daily withdrawals needs and cash expenses. This is proven by Bourke (1989) and others as they find in their studies that a significant positive relation exists between the selected bank's profitability ratio and the bank's liquidity ratio. However an excess of the bank's holdings of liquidity generates an opportunity cost, in other words the bank holds cash rather than the opportunity of investing this cash and generating returns from it as revealed by Unlike Bourke (1989), and Molyneux and Thorton (1992) studies showing a negative linkages between profit and the bank's liquidity ratio .

### 5.2.1.4. Loans

Loans give an expression of how the bank utilizes its assets by giving credit in the form of loans. According to Alper and Anbar (2011), this ratio is a major measure of the bank's assets quality. Since loans are the main way banks generate income this ratio gets its importance that it represents an income source of banks. It is expected to reflect a positive relationship with the bank's profitability as more loans means more given credit and more returns from this credit.

However, in some cases where the economy is not exhibiting sound productive capacity despite an increase in bank loans to the public, the bank's profitability may not increase. This is due to the increase in the bad debts or unpaid loans as a result of general economic problems. In situations where this is true the risk of the increase in the credit to assets ratio becomes a risk rather than an advantage.

### 5.2.1.5. Deposit

Denoted in this study as (DEPOSIT) expressed as a percentage of bank deposit to total amount of (liabilities/assets). Simply put, deposits are the main and least costly source of funds for any bank, so the higher this ratio is the higher the potential the bank has to use these funds with a low cost and generate income. So a positive relationship is anticipated. A bank's profitability in any case is measured by ROE or ROA or NIM or any other profitability proxy (Davydenko, 2011).

### 5.2.2. Dependent variables

In the literature, profitability of banks is generally measured by three main proxies. They all compare the banks net profits or amount of earning to something else, these profitability measures are given in details below.

### 5.2.2.1. Return on Assets (ROA)

Sources of funds for any company are either in the form of debt or equity. In other words any company's assets are comprised of these two sources of funds. As an investor the amount or efficiency in which the funds are used to generate income is an essential interest. The ROA ratio gives investors an overview of how effectively the company is utilizing its assets and converting it into earnings. The larger the ROA figure, the better. This is because the bank will be generating more money from the use of its assets.

### 5.2.2.2. Return on Equity (ROE)

ROE mathematically expressed as the percentage of the bank's net income to its total equity. This ratio indicates of how much is being earned from the utilization of the shareholder's equity (Guru et al., 1999).

### 5.2.2.3. Net Interest Margin (NIM)

Denoted as (NIM) is literally the bank's net interest income divided by the bank's total assets. From the name it is understood that it focuses on the earning generated by bank interest activities only despite any other non-interest earnings.

In the following table the method the previous ratios were calculated and how they were used in this study is illustrated along with their abbreviations. In table 5.2 the expected sign from the correlations between the independent variables and the dependent variables is expressed.

### 5.2.3. Income/Expenditure Structure

### 5.2.3.1. Interest Income/ interest expenses ratio

This ratio shows how the bank manages its income and expenses. It particularly reflects the percent of income from only interest earning activities to interest costs from such activities. Meaning that it gives a ratio of how much the bank generates income from interest activities compared to interest costs. Interest income may be generated from activities like offering loans, bonds, interests on money market instruments. The interest costs are paid due to loans given to the bank from other banks or the central bank, costs of other sources of funds. This ratio is positively related to the bank's profitability. Thus the greater the ratio the more the bank is generating interest income compared to interest costs.

**Table 5.1 Definitions and abbreviations of the variables**

|  | Variables | Formula | Symbol |
|---|---|---|---|
| **Dependent Variable** | **Profitability** | $Return\ on\ Assets = \dfrac{Net\ Profit}{Total\ Assets}$ | ROA |
|  |  | $Return\ on\ Equity = \dfrac{Net\ Profit}{Total\ Equity}$ | ROE |
|  |  | $Net\ Interest\ Margin = \dfrac{Net\ Interest\ Income}{Total\ Assets}$ | NIM |
| **Independent Variables** | **Assets Size** | Natural logarithm of Total Assets | Logsize |
|  | **Capital Adequacy** | $Total\ Equity/Total\ Assets$ | CA |
|  | **Liquidity risk** | $Total\ Liquid\ Assets/Total\ Assets$ | LQD |
|  | **Loans** | $Total\ Loans/Total\ Assets$ | LOAN |
|  | **Deposits** | $Total\ Deposits/Total\ Assets$ | DEPOS |
|  | **Interest** | $Interest\ Income/Interest\ expenses$ | LogIntr |

**Table 5.2 Expected Correlation signs with Dependent variables**

| Independent Variable | Expected Sign |
|---|:---:|
| Assets Size | (+) |
| Capital Adequacy | (+/-) |
| Liquidity | (+/-) |
| Loans | (+/-) |
| Deposits | (+) |
| Interest Income/ Interest expenses ratio | (+) |

(+) positive relation, (-) negative relation, (+/-) positive or negative relation.

## 5.3. Methodology and Econometric Model

In the previous part we explained the parties of our study by identifying the dependent variable and the independent variables. In second half of this chapter we will continue to clarify how we intend to link analytically between these variables in order to come to an outcome and interpret the statistical results of our study.

### 5.3.1. Descriptive Statistics

Descriptive statistics are one of the most firstly known quantitative analysis in social sciences. It is used to designate the most essential and basic characteristics of the collected sample data in a study. Descriptive statistics provide concise and easy to understand summaries of the analyzed data. Jointly done with simple graphical analysis, they represent the foundation of almost every basic quantitative analysis.

Since past information is useful in considering the expectations of future events, descriptive statistics therefore provide a historical account of the data's behavior by two main measures namely; central tendency measures [mean, median and mode] and variability or dispersion measures [standard deviation, the minimum and maximum values, kurtosis and skewness] (Mann, Prem S., 1995). In this study we will discuss the mean, maximum, minimum and sum of the variables as an initial understanding of our findings.

### 5.3.2. Pearson's Correlation Analysis

Correlation is a statistical measure that allows for the investigation of linear association between two or more quantitative variables. Pearson's correlation coefficient denoted as (r) measures the strength of the linear relationship among the studied variables. This formula assumes that the (r) value falls in the range of (+1) and (-1). A positive correlation means both variables increase and decrease simultaneously. On the other hand if negative correlation was indicated this clears that an increase in one variable will decrease in the other. Much consideration will not be placed on the significance of the correlation test since the models' significance will be tested the regression analysis, so only the direction of the correlation will be considered. The following is the mathematical expression of correlation formula.

$$r = \frac{\sum_{i=1}^{n}(X_i - X_{bar})(Y_i - Y_{bar})}{\sqrt{\sum_{i=1}^{n}(X_i - X_{bar})^2}\sqrt{\sum_{i=1}^{n}(Y_i - Y_{bar})^2}}$$

### 5.3.3. Multiple Regression Analysis

After taking an overlook at the data's properties using the descriptive statistics, the study conducts further analysis between the dependent variables and the selected independent variables by using multiple linear Ordinary Least Squares (OLS) regression. This analytical method gives an estimation of the parameters in the estimated linear regression model (Gujarati, 1998). The estimated coefficients represent the influence of the independent variables on the banks profitability proxy. E-Views version 7 of the software has been used. The t statistics test values show the level of significance of the estimated parameters. The adjusted $R^2$ represents the percentage of variation in the dependent variable (profitability ratio) as explained by the independent variables. The following regression models were estimated:

**Model 1: ROA= $\beta_0 + \beta_1 CA + \beta_2 S + \beta_3 L + \beta_4 Lo + \beta_5 Dp + \beta_6 INT + \beta_7 Dm + \mu$**
**Model 2: ROE= $\beta_0 + \beta_1 CA + \beta_2 S + \beta_3 L + \beta_4 Lo + \beta_5 Dp + \beta_6 INT + \beta_7 Dm + \mu$**
**Model 3: NIM= $\beta_0 + \beta_1 CA + \beta_2 S + \beta_3 L + \beta_4 Lo + \beta_5 Dp + \beta_6 INT + \beta_7 Dm + \mu$**

**Where dependent variables:**

ROA = Return on assets (Measure of profitability)

ROE = Return on equity (Measure of profitability)

NIM = Net interest margin (Measure of profitability)

**Independent variables**

CA= Capital Adequacy

S = Assets Size

L = Liquidity

LO = Loans

Dp = Deposits

INT= Interest income

$D_m$ = Dummy Variable (before 2000 = 0, after 2000 = 1)

$\beta_1$ , $\beta_2$, $\beta_3$, $\beta_4$, $\beta_5$, $\beta_6$= Slopes of the independent variables

$\beta_0$= constant

$\varepsilon_t$= Error Term

### 5.3.4. Auto-correlation test

In order to except the results of the regression analysis and not end up with biased parameters the data has to contain some characteristics according to OLS assumptions. One of these assumptions is that the data must be uncorrelated. Simply put Auto-correlation or serial-correlation is when the Error term in the relating to any observation expected model is influenced or subjective by the Error term relating to any other observation in the same model.

To detect for serial-correlation in our expected model the Breusch–Godfrey Serial Correlation LM test will be applied to test for autocorrelation in the errors of our regressed model.

The null hypothesis of this test is that there is no serial correlation of any order up to (Godfrey, L. G., 1978). What distinguishes this test from other test of detecting auto-correlation is that the BG test does not suffer from restrictions compared to other test such as the Durbin's *h* statistic test and is statistically more powerful.

Breusch and Godfrey[6]state that, if the below auxiliary regression model is fitted given the calculated residual sum of squares $R^2$,

$$\mu_t = \alpha_0 + \alpha_1 X_{t,1} + \alpha_2 X_{t,2} + \rho_1 \mu_{t-1} + \rho_2 \mu_{t-2} + \cdots \rho_\rho \mu_{t-\rho} + \epsilon_t$$

Then the following asymptotic approximation can be used for the distribution of the test statistic

$$nR^2 \sim X_\rho^2$$

When the null hypothesis holds, there will be no serial correlation of any order up to $\rho$ is. That is;

$$H_0 : \{ \rho_i = 0 \; for \; all \; i \}$$

### 5.3.5. Multi-Collinearity

The term multi-collinearity was first noted by Ragnar Frisch.[7]The original meaning of multi-collinearity is the existence of an exact and perfect linear relationship among the explanatory variables of an estimated regression model. For instance if there were a k number of variables regressed in some model with the explanatory variable $X_1, X_2, X_k$(where $X_1 = 1$ for all observations to allow for the intercept term), if the following condition is satisfied, the existence between the variables of perfect linear relationship is said to be:

$$\gamma_1 X_1 + \gamma_2 X_2 + \ldots + \gamma_k X_k = 0,$$

$where \; \gamma_1, \gamma_2, \gamma_k$ are constants and not all of them will be zero simultaneously.

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[6] Godfrey, L. G. (1978). "Testing Against General Autoregressive and Moving Average Error Models when the Regressors Include Lagged Dependent Variables". Econometrica 46: 1293–1302.
[7]Ragnar Frisch, Statistical Confluence Analysis by Means of Complete Regression Systems, Institute of Economics, Oslo University, publ. no. 5, 1934.

### 5.3.5.1. Practical Consequences of Multicollinearity[8]

In cases of near or high multicollinearity in the expected model, we may come across the following consequences:

I. The estimation of the parameters will not be precise due to the high variances and co-variances of the data.

II. Insignificant t-statistics of some or all the estimated coefficients.

III. The acceptance of an otherwise rejected null hypothesis due to wide confidence intervals of the t- statistics.

The presence or degree of multi-collinearity in this study has been detected by Pearson Correlation test. It's good to note that it's not about the presence or absence of multi-collinearity rather than the degree of the linear relationship between the variables (Gujarati, 1998)

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[8] Course in Econometrics, Harvard University Press, Cambridge, Mass., 1991, p. 249.

# CHAPTER SIX

## ANALYSIS RESULTS AND INTERPRETATIONS

### 6.1. Descriptive statistics for public banks

|              | ROA   | ROE    | NIM    | CA    | DEP   | SIZ      | LQD   | LON    | INT    |
|--------------|-------|--------|--------|-------|-------|----------|-------|--------|--------|
| **Mean**     | 1.59  | 22.3   | 48.703 | 7.90  | 40.1  | 9210909  | 42.88 | 36.57  | 155.76 |
| **Median**   | 1.78  | 22.13  | 64.1   | 8.33  | 39.86 | 3570680  | 36.92 | 39.88  | 147.8  |
| **Max**      | 3.06  | 57.92  | 114.02 | 11.5  | 49.7  | 3.76E+08 | 73.61 | 54.68  | 204.2  |
| **Min**      | -0.6  | -21.50 | -47.92 | 3.06  | 32.33 | 29492.06 | 18.29 | 13.79  | 113.6  |
| **Std. Dev.**| 0.99  | 17.20  | 38.43  | 2.40  | 4.83  | 1.17E+08 | 17.03 | 11.92  | 24.32  |
| **Skewness** | -0.62 | -0.152 | -0.61  | -0.43 | 0.30  | 1.16906  | 0.492 | -0.525 | .05402 |
| **Kurtosis** | 2.36  | 3.67   | 2.826  | 2.06  | 2.06  | 3.13224  | 0.492 | 2.21   | 2.394  |
| **Jar.-Bera**| 2.06  | 0.56   | 1.5    | 1.69  | 1.30  | 5.712808 | 1.980 | 1.788  | 1.598  |
| **Probability** | 0.35 | 0.76 | 0.453  | 0.42  | 0.51  | 0.057475 | 2.092 | 0.40   | 0.449  |
| **Sum**      | 39.7  | 557.4  | 1217.6 | 197   | 1004  | 2.30E+09 | 0.351 | 914.2  | 3894   |
| **Sum S.D.** | 23.7  | 7097.8 | 3545   | 138   | 561   | 3.31E+17 | 1071  | 341    | 14201  |
| **Observa.** | 25    | 25     | 25     | 25    | 25    | 25       | 25    | 25     | 25     |

Source: Eviews

### 6.2. Descriptive statistics for private banks:

|              | ROA   | ROE    | NIM    | CA    | DEP   | SIZ      | LQD   | LON    | INT    |
|--------------|-------|--------|--------|-------|-------|----------|-------|--------|--------|
| **Mean**     | 1.85  | 31.70  | 54.43  | 8.78  | 52.58 | 1.01E+08 | 41.1  | 58.53  | 139.07 |
| **Med**      | 2.25  | 19.90  | 58.2   | 9.34  | 52.32 | 4895634  | 39.32 | 60.83  | 132.62 |
| **Max**      | 3.90  | 80.00  | 95.64  | 11.67 | 60.98 | 4.28E+08 | 57.34 | 75.01  | 190.44 |
| **Min**      | -3.80 | -69.50 | -62.27 | 3.59  | 43.52 | 40626.23 | 25.29 | 25.12  | 109.73 |
| **Std.D**    | 1.89  | 32.01  | 33.96  | 2.17  | 3.89  | 1.25E08  | 9.35  | 14.97  | 24.14  |
| **Skew**     | -2.08 | -0.92  | -1.71  | -0.79 | -0.03 | 1.200065 | 0.28  | -0.77  | 0.67   |
| **Kurt**     | 6.72  | 5.07   | 6.78   | 2.70  | 3.10  | 3.416317 | 2.11  | 2.66   | 2.48   |
| **J.Bera**   | 32.43 | 8.02   | 27.01  | 2.67  | 0.01  | 6.181197 | 1.16  | 2.57   | 2.16   |
| **Prob**     | 0.00  | 0.02   | 0.000  | 0.26  | 0.99  | 0.045475 | 0.56  | 0.281  | 0.34   |
| **Sum**      | 46.20 | 792.60 | 46.2   | 219.53| 1314.4| 2.52E09  | 1027.4| 1463.3 | 3476   |
| **Sum Sq.D.**| 85.70 | 24592.1| 85.70  | 112.88| 36.70 | 3.75E+17 | 2097.6| 5380.4 | 13987  |
| **Obs**      | 25    | 25     | 25     | 25    | 25    | 25       | 25    | 25     | 25     |

Source: Eviews

From the given descriptive statistics it can be seen that private banks have a higher ROA mean return of 1.85 compared to 1.59 of public banks. Thus private banks can be said to be getting more returns from the use of the banks' assets compared to public banks. This can also be contributed by the amount of loans issued. Public banks issued a maximum amount of loans amounting to 54.68 million Turkish Lira compared to an amount of 75.01 million Turkish Lira issued by private banks.

Public banks have a high variability in net interest margin (NIM) denoted by a standard deviation of 38.43 while that of private banks is 33.96. It therefore means that public banks are exposed to more interest rate risk compared to private banks. Thus upward changes in interest will favorably benefit more public banks compared to private banks whereas a fall in interest rate will have more adverse effects on public banks compared to private banks.

It can also be noted that both public and private bank's ROA is negatively skewed but of different magnitude. Public banks recorded a negative Skewness in ROA of -0.62 while private banks registered a negative Skewness in ROA of -2.08. Extreme described by kurtosis (Kurt) events were experienced in the area on net interest margin (NIM) for both public and private banks. This implies that both banks experienced high NIM with figures of 3.67 and 6.78 respectively

## 6.3. Multi-Collinearity

|        | ROA   | ROE   | NIM   | SIZE  | CA   | DEPOSIT | INT  | LIQ  | LOANS |
|--------|-------|-------|-------|-------|------|---------|------|------|-------|
| ROA    | 1.00  |       |       |       |      |         |      |      |       |
| ROE    | 0.66  | 1.00  |       |       |      |         |      |      |       |
| NIM,   | 0.46  | 0.21  | 1.00  |       |      |         |      |      |       |
| SIZE   | -0.07 | -0.46 | 0.27  | 1.00  |      |         |      |      |       |
| CA     | 0.35  | -0.36 | 0.50  | 0.43  | 1.00 |         |      |      |       |
| DEPOSIT| 0.09  | -0.27 | -0.22 | -0.06 | 0.30 | 1.00    |      |      |       |
| INT    | 0.50  | -0.50 | 0.67  | 0.88  | 0.55 | 0.10    | 1.00 |      |       |
| LIQ    | 0.39  | -0.20 | 0.62  | 0.35  | 0.69 | 0.31    | 0.47 | 1.00 |       |
| LOANS  | 0.60  | -0.02 | 0.62  | 0.57  | 0.72 | 0.50    | 0.67 | 0.65 | 1.00  |

Source: Eviews Calculations.

Correlation matrix between independent variables is presented in Table 6.3. As seen in Table 6.3 there are fairly low data correlations among the independent variables, except between size and interest with a correlation coefficient of 0.88. Since the data is showing more values with low correlation coefficients that are less than 0.8, it can be concluded that the data does not suffer from the problem of multicollinearity.

## 6.4. Model Estimation

In this study we used Ordinary Least Squares regression (OLS) to estimate ROA, ROE and NIM models. Such models were estimated for both public and private banks. This section therefore analyses the three models for both public and private banks.

**Table 6.4: Model A.1 (ROA for public banks)**

| Variable: | Dependent variable: ROA | | | |
|---|---|---|---|---|
| | Coefficient | Std.Error | t-statistic | Prob |
| Constant | -21.48879 | 12.58534 | -1.707446 | 0.1059 |
| Logca | 3.138381 | 1.435359 | 2.186478 | 0.0431** |
| Logsiz | 0.272327 | 0.208523 | 1.305982 | 0.2090 |
| Loglon | 0.207826 | 0.471998 | 0.440312 | 0.6653 |
| Logliq | 0.692686 | 0.750597 | 0.922847 | 0.3690 |
| Logint | **-**0.744167 | 1.893128 | -0.393089 | 0.6991 |
| Logdep | 3.699014 | 3.502989 | 1.055959 | 0.3058 |
| Dummy | -1.699598 | 1.434415 | -1.184872 | 0.2524 |
| **R-squared** | 0.650096 | Prob(F-statistic) = 0.005257* | | |
| **Adjusted R$^2$** | 0.506018 | Number of observation = 25 | | |
| **F-statistic** | 4.512113 | Durbin Watson = 1.820532 | | |

Note: *, ** and ***indicate significance level of 1%, 5% and 10% respectively.

**Table 6.5: Model A.2 (ROA for private banks)**

| Variable: | Dependent variable: ROA | | | |
|---|---|---|---|---|
| | Coefficient | Std.Error | t-statistic | Prob |
| Constant | -63.38490 | 14.28677 | -4.436615 | 0.0004* |
| Logca | 1.649436 | 1.566500 | 1.052943 | 0.3071 |
| Logsiz | 0.309192 | 0.166532 | 1.856650 | 0.0808*** |
| Loglon | 4.788688 | 1.184989 | 4.041123 | 0.0008* |
| Logliq | 2.187286 | 1.281310 | 1.707070 | 0.1060 |
| Logint | **-**0.414073 | 1.956417 | -0.211649 | 0.8349 |
| Logdep | 8.482660 | 2.584287 | 3.282398 | 0.0044* |
| Dummy | -4.725262 | 1.405100 | -3.362937 | 0.0037 |
| **R-squared** | 0.889331 | Prob(F-Statistic) = 0.000001* | | |
| **Adjusted R$^2$** | 0.843762 | Number of observation = 25 | | |
| **F-statistic** | 19.51590 | Durbin Watson = 1.395958 | | |

Note: *, ** and ***indicate significance level of 1%, 5% and 10% respectively.

The ROA models for both public and private banks (A1 and A2) are significant at 1% significance level. However, the ROA model for private banks has more explanatory power compared to that of public banks with R-square values of 0.889331 and 0.650096 respectively. This therefore means that 88.93% variability in private bank's profitability is explained by capital adequacy, size, amount of loans issued, liquidity, interest rates and the amount of deposits. It also means that 65% variability in public bank's profitability is explained by capital adequacy, size, amount of loans issued, liquidity, interest rates and the amount of deposits.

**Table 6.6: Model B.2 (ROE for private banks)**

| Variable: | Dependent variable: ROE | | | |
|---|---|---|---|---|
| | Coefficient | Std.Error | t-statistic | Prob |
| Constant | -571.9896 | 215.8156 | -2.650362 | 0.0168** |
| Logca | 11.35607 | 23.66352 | 0.479898 | 0.6374 |
| Logsiz | 09.093939 | 2.515630 | 3.614974 | 0.0021* |
| Loglon | 54.39150 | 17.90042 | 3.038560 | 0.0074* |
| Logliq | 38.76065 | 19.35544 | 2.002582 | 0.0614*** |
| Logint | -29.75065 | 29.55359 | -1.006668 | 0.3282 |
| Logdep | 68.07394 | 39.03819 | 2.949707 | 0.0993*** |
| Dummy | -113.9059 | 21.22540 | -4.193535 | 0.0001 |
| **R-squared** | 0.911992 | Prob(F-Statistic) = 0.000000* | | |
| **Adjusted R$^2$** | 0.875754 | Number of observation = 25 | | |
| **F-statistic** | 25.16646 | Durbin Watson = 1.823559 | | |

Note: *, ** and ***indicate significance level of 1%, 5% and 10% respectively.

From the table above, it can be noted that the ROE models private banks (B2) is significant at 1% significance level. However, the ROE model for public banks failed to explain variability in profitability of public banks. Possible reasons maybe because of government regulation and subsidies (public banks usually operate with a social motive and are sometimes regarded as non-profit making). The ROE model yielded an R-square of 0.911992. This therefore means that 91.2% variability in private bank's profitability is explained by capital adequacy, size, amount of loans issued, liquidity, interest rates and the amount of deposits.

**Table 6.7: Model C.1 (NIM for public banks)**

| Variable: | Dependent variable: NIM | | | |
|---|---|---|---|---|
| | Coefficient | Std.Error | t-statistic | Prob |
| Constant | 277.3038 | 399.2753 | -0.868576 | 0.3972 |
| Logca | 39.83811 | 45.53737 | 0.874844 | 0.3939 |
| Logsiz | 9.788525 | 6.615480 | 1.479639 | 0.1573 |
| Loglon | 40.15459 | 14.497434 | 2.681559 | 0.0158** |
| Logliq | 62.66726 | 23.81301 | 2.631639 | 0.0175** |
| Logint | **-**202.8838 | 60.06029 | -3.378001 | 0.0036* |
| Logdep | 215.8289 | 111.1338 | 1.942063 | 0.0689*** |
| Dummy | 21.811332 | 45.50741 | 0.479336 | 0.6378 |
| **R-squared** | 0.760967 | Prob(F-Statistic) = 0.000288* | | |
| **Adjusted R$^2$** | 0.662542 | Number of observation = 25 | | |
| **F-statistic** | 7.731416 | Durbin Watson = 1.530235 | | |

Note: *, ** and ***indicate significance level of 1%, 5% and 10% respectively.

**Table 6.8: Model C.2 (NIM for private banks)**

| Variable: | Dependent variable: NIM | | | |
|---|---|---|---|---|
| | Coefficient | Std.Error | t-statistic | Prob |
| Constant | 821.0901 | 364.7674 | -2.860644 | 0.0379** |
| Logca | 58.28769 | 39.99562 | 1.457352 | 0.1632 |
| Logsiz | 6.247287 | 4.251869 | 1.469304 | 0.1600 |
| Loglon | 44.64822 | 30.25494 | 1.475733 | 0.1583 |
| Logliq | 69.05564 | 32.71418 | 2.110878 | 0.0499** |
| Logint | **-**136.4942 | 49.95091 | **-**2.7325566 | 0.0142** |
| Logdep | -188.7498 | 65.98158 | **-**2.860644 | 0.0108** |
| Dummy | -18.78865 | 35.87477 | -0.5237229 | 0.6072 |
| **R-squared** | 0.776675 | Prob(F-Statistic) = 0.000169* | | |
| **Adjusted R$^2$** | 0.684718 | Number of observation = 25 | | |
| **F-statistic** | 8.446043 | Durbin Watson = 1.494924 | | |

Note: *, ** and ***indicate significance level of 1%, 5% and 10% respectively.

The NIM models for both public and private banks (C1 and C2) are significant at 1% significance level. However, the NIM model for private banks has more explanatory power compared to that of public banks with R-square values of 0.776675 and 0.760967 respectively. This therefore means that 77.67% variability in private bank's profitability is explained by capital adequacy, size, amount of loans issued, liquidity, interest rates and the amount of deposits. It also means that 76.10% variability in public bank's profitability is explained by capital adequacy, size, amount of loans issued, liquidity, interest rates and the amount of deposits.

**Table 6.9: Summary for Breusch–Godfrey Serial Correlation LM Test**

| | For public banks | | | For private banks | | |
|---|---|---|---|---|---|---|
| | ROA | ROE | NIM | ROA | ROE | NIM |
| F-statistic | 0.446581 | N\|a | 0.312037 | 1.241153 | 0.643604 | 0.385825 |
| Obs*R-squared | 1.404946 | N\|a | 0.998577 | 3.549739 | 1.975796 | 1.223161 |
| **Prob. Chi-Square(2,15)** | 0.6480 | N\|a | 0.7366 | 0.3171 | 0.5393 | 0.6864 |

For Model A, Model B and Model C the probabilities of Chi-Square are 0.6480, 0.7366 for public banks and 0.3171, 0.5393 and 0.6864 for private banks respectively. This means that the null hypothesis of no serial correlation is accepted for all models of public banks and accepted for ROE and NIM models of private banks and the alternative hypothesis (there is serial correlation) is rejected. In other words the estimated coefficients of the variables reflect their relation correctly with the dependent variable and the estimation of the three models are efficiently correct and bias does not exists in the estimated coefficients.

**Table 6.10: Summary of Heteroscedasticity Test: Breusch-Pagan-Godfrey**

| | For public banks | | | For private banks | | |
|---|---|---|---|---|---|---|
| | ROA | ROE | NIM | ROA | ROE | NIM |
| F-statistic | 1.886753 | N\|a | 1.399814 | 0.612449 | 1.407385 | 0.371761 |
| Obs*R-squared | 10.93054 | N\|a | 9.141020 | 5.034899 | 9.172320 | 3.318904 |
| **Prob. Chi-Square(7,17)** | 0.1349 | N\|a | 0.2682 | 0.7383 | 0.2654 | 0.9063 |

Respectively from table 6.10 we can see that the ROA and NIM models of private banks suffer from heteroscedasticity and this includes the ROE model of private

banks. This means that the null hypothesis of no heteroscedasticity is accepted for only ROA and NIM models of private banks and the alternative hypothesis (heteroscedasticity) is rejected.

**Table 6.11: Expected relationship and actual results comparison**

| Variables | Significance level | Expected sign | Actual Sign |
|---|---|---|---|
| LOGCA | Significant at 1 % | (+/-) | (+) |
| LOGDEPO | Significant at 10 % | (+) | (+/-) |
| LOGSIZE | Significant at 10 % | (+) | (+) |
| LOGLQD | Significant at 1 % | (+/-) | (+) |
| LOGLOAN | Significant at 1 % | (+/-) | (+) |
| logIntr | Significant at 5 % | (+) | (-) |

As can be seen from Table 6.11, the actual results coincide with the expected results and this is in relation to capital adequacy ratio, assets size, liquidity ratio, assets quality. The actual results do however differ for interest rate, and ROA, ROE and NIM models. A positive relationship between deposit and ROA and ROE was obtained and this matches the expected results. This is however negative with NIM. Return on asset ratio is the most robust profitability proxy for a bank according to Rivard and Thomas (1997), as high equity multipliers and the evaluation of the return-generating capacity of the banks total assets does not affect this ratio.

The numerical analyses of the independent variables on profitability can be expressed in a mathematical form and is therefore given as follows:

$$ROA_{public} = -21.48 + 3.14 LogCA + 0.27 LogSize + 0.21 LogLoan + 0.69 LogLiquidity$$
$$- 0.74 LogInterest + 0.69 LogLiquidity + 0.69 LogDeposit - 1.7 Dummy$$
$$+ \varepsilon_t$$

$$ROA_{private} = -63.38 + 1.64 LogCA + 0.31 LogSize + 4.79 LogLoan + 2.19 LogLiquidity$$
$$- 0.41 LogInterest + 8.48 LogDeposit - 4.73 Dummy + \varepsilon_t$$

$$ROE_{private} = 571.99 + 11.35 LogCA + 09.09 LogSize + 54.39 LogLoan + 38.76 LogLiquidity$$
$$- 29.75 LogInterest + 68.07 LogDeposit - 113.91 Dummy + \varepsilon_t$$

$$NIM_{public} = 277.31 + 39.84 LogCA + 9.78 LogSize + 40.15 LogLoan + 62.67 LogLiquidity$$
$$- 202.88 LogInterest + 215.83 LogDeposit + 21.81 LogDummy + \varepsilon_t$$

$$NIM_{private} = 821.09 + 58.29 LogCA + 6.25 LogSize + 44.65 LogLoan + 69.06 LogLiquidity$$
$$- 136.49 LogInterest - 188.79 LogDeposit - 18.79 Dummy + \varepsilon_t$$

In ROA, ROE and NIM models liquidity can be seen to be having a significant and positive impact on both public sectors and private sector banks' profitability of 0.69% which is a high impact. This result is in line with the study done by Bourke, (1989) as he indicated a significant positive relationship between liquidity and profitability. This may be possibly due to the fact that the state-owned banks invest in various short term liquid assets. These results are in also in line with the study conducted by Alper et al, (2011). However, Molyneux and Thornton, (1992) reported a negative relationship among European banks. Conflicting findings in the relationship may be due to different elasticity's of demand for loans between different banks.

Another variable affecting the profitability of Turkish public-sector banks positively is the size of their total assets. The literature justified this positive relation in two different ways. Firstly, banks possessing large amounts of assets in their balance sheets are reflected as a larger share of domination of the market making them more reliable and trustworthy to customers. Therefore these banks raise less expensive capital and cause their profitability to increase as a consequence of the reliability with its customers. Our positive relation is consistent with (Alper et al, 2011).

Second explanation according to economies of scale, as the unit costs of large scale banks decreases the larger the banks becomes, so their profitability ratios are expected to be higher.( Hauner, 2005; Pasiouras and Kosmidou, 2007; Staikouras et. al., 2006).

The main activity of a bank as a major credit institution is to attract the funds of surplus units of the economy and lend them to deficit units. The costs of these activities are the earnings and returns of the bank. Thus the larger the loan given by banks to customers the higher bank profits in return. Along with previous studies done by Gul et al., Sufian and Suzuki, (2008) our study reported a positive relationship between loan ratio and profitability.

Regards the banks that have a higher capital adequacy ratio, this high ratio consequently decreases the cost of their capital so that it has a positive impact on bank profitability. This result was also in line with studies of Alp, A et al, (2010).

From the NIM models C1 and C2 it is observed that interest income is significant at 1% level. Logint is negative for both NIM models. Possible reasons suggest that the bank is offering high interest rates on deposits as incentives to attract more deposits. Thus causing interest expenses to rise and hence NIM. The other reason is that high interest rates dissuade people from taking loans so income from loans will fall and this will negatively affect NIM. This also indicates that more diversification in the public banks activity positively influence its returns. Our results are consistent with the results of Alp, A et al, (2010). Moreover, the ration of Interest income did not show any significance effect on the public banks profitability. This ratio was positively related with ROA as the theory expects. The more credit the banks offer the more its profitability will increase.

# CHAPTER SEVEN

## CONCLUSION AND RECOMMENDATIONS

### 7.1. Conclusion

Profitability is an important criterion to measure the performance of banks, especially in the changing environment of banking. This study examines the determinants of public and private banks profitability in Turkey. For this aim, multiple linear regression (OLS) is applied to data obtained from the banking association of Turkey for the period 1988 to 2013. A dummy variable is included to adjust for the 2000-2001 financial crises. We find that asset size has a positive and significant influence on profitability. It suggests that larger banks achieve a higher ROA which also provides evidence for the economies of scale theory. The ratios of loans/assets are found with positive and significant powers on ROA. Also, the study concluded that there is a positive relationship between the liquidity ratio and the dependent variable (return on assets) and that shows that Turkish banks are able to cover the short term debts from the good liquidity that it has and this also shows that the banking sector will be able to continue as a going concern in the future.

Consequently, in order to increase their profitability, Turkish banks should attempt to strengthen their capital structures by equity and less leverage funding. As these attempts will increase the reliability between the Turkish public-sector banks and their current or/and potential investors, banks will have opportunity to raise less expensive capital. Empirical findings also indicate that other ways to increase profitability are to attract more saving deposits and invest these funds in more diversified loan portfolios. The Turkish public banks Income/Expenditure mean that interest and non-interest structure, the diversification of these banks activities is favored as it increases the bank's profitability. However, these conclusions may be considered to be valid only through the empirical findings of this study. Thus more studies considering other variables are advised to be done on the banking sector of Turkey. In addition, the researcher found out that the Turkish banking sector is able to evaluate the assets to measure the credit risk that associated with it. It is understood and found that there is a significant positive relationship between the loans ratio and the dependent variable (return on asset) and the reason behind that is

the bank managers are interested in the quality of their loans because loans provide earnings for the bank.

## 7.2. Recommendations

Our study implemented multiple regression analysis and some stability tests to test the model like autocorrelation and Heteroscedasticity. However our findings revealed that the selected independent variables in our model can explain only 65% and 76.9% of change in the ROA and NIM respectively for public banks and 88.93%, 91.20% and 91.20% change in the ROA, ROE and NIM respectively for public banks

1.  We recommend using more advanced analysis techniques to reach a more efficient model and apply other econometric techniques and apply advanced analysis technique to confirm more accurate and precise results.
2.  In further work, researchers will try to increase the number of independent variables and the researcher will also try to increase the number of years to get more accurate results.
3.  Diversify the Turkish financial sector and expand its services to other institutions and not just banks.
4.  Increasing the liquidity ratio for the banks and take advantage of short term investment and not just long term investments.
5.  our study found there is positive relationship between the capital adequacy and the return on asset for that the researcher recommends that the Turkish banks should increase their reserve accounts to increase their capital adequacy ratio for the coming period to enhance the safety of their banking systems and also to affect the return on assets by increasing positively, because banks interested in high return for shareholders and they considered as profit making organizations. So, they will optimize their capital levels to earn a higher return on asset.

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# APPENDICES

## Appendix 1: List of Banks

## List of Public – Owned Deposit Banks

| No. | Bank Name |
|-----|-----------|
| 1 | Türkiye Cumhuriyeti Ziraat Bankası A.Ş. |
| 2 | Türkiye Halk Bankası A.Ş. |
| 3 | Türkiye Vakıflar Bankası T.A.O. |

## List of Privately – Owned Deposit Banks

| No. | Bank Name |
|-----|-----------|
| 1 | Yapı ve Kredi Bankası A.Ş. |
| 2 | Türkiye İş Bankası A.Ş. |
| 3 | Türkiye Garanti Bankası A.Ş. |
| 4 | Türk Ekonomi Bankası A.Ş. |
| 5 | Turkish Bank A.Ş. |
| 6 | Şekerbank T.A.Ş. |
| 7 | Fibabanka A.Ş. |
| 8 | Anadolubank A.Ş. |
| 9 | Akbank T.A.Ş. |
| 10 | Adabank A.Ş. |
| 11 | Alternatif Bank A.Ş |

## Appendix 2: Data

## Appendix 2.1: Public banks' data

| YEARS | ROA | ROE | NIM | CA | DEPOS | INT | LOAN | LQD | SIZE | DUM |
|-------|-----|------|------|------|-------|-------|-------|-------|----------|-----|
| 1988 | 2.4 | 46.40 | 81.8 | 7.62 | 43.44 | 127.1 | 44.08 | 34.76 | 29492.06 | 0 |
| 1989 | 1.7 | 28.02 | 97.2 | 8.24 | 47.12 | 113.6 | 43.79 | 34.57 | 49466.35 | 0 |
| 1990 | 2.2 | 33.37 | 57.7 | 8.18 | 48.51 | 135.5 | 47.61 | 29.88 | 75861.13 | 0 |
| 1991 | 0.7 | 11.94 | 27.9 | 7.05 | 46.26 | 145.5 | 44.81 | 30.43 | 125116.0 | 0 |
| 1992 | 2.1 | 49.82 | 33.4 | 6.31 | 49.70 | 143.2 | 41.11 | 34.49 | 238756.2 | 0 |
| 1993 | 3.1 | 57.91 | 15.0 | 8.77 | 43.55 | 167.4 | 39.89 | 37.58 | 386186.0 | 0 |
| 1994 | -0.1 | -1.228 | -11.3 | 5.89 | 43.81 | 150.5 | 37.61 | 36.92 | 800216.4 | 0 |
| 1995 | 0.2 | 3.966 | 41.8 | 5.08 | 43.28 | 140.3 | 44.23 | 32.49 | 1547219. | 0 |
| 1996 | 0.9 | 22.13 | 25.3 | 4.68 | 44.06 | 147.2 | 39.47 | 35.19 | 3428987. | 0 |
| 1997 | 0.8 | 17.94 | 3.4 | 5.96 | 39.87 | 144.5 | 45.60 | 28.11 | 6696989. | 0 |
| 1998 | 0.8 | 20.04 | 2.0 | 4.23 | 40.68 | 147.8 | 31.93 | 24.01 | 12865583 | 0 |
| 1999 | 1.5 | 48.17 | 21.3 | 4.10 | 39.79 | 129.5 | 24.32 | 23.19 | 25182230 | 0 |
| 2000 | -0.6 | -21.50 | 19.8 | 3.06 | 40.34 | 127.7 | 25.83 | 18.29 | 35706807 | 0 |
| 2001 | 0.0 | -0.800 | -47.9 | 8.45 | 32.36 | 145.2 | 16.35 | 21.63 | 53831379 | 1 |
| 2002 | 1.6 | 15.65 | 73.1 | 9.95 | 34.33 | 147.4 | 13.80 | 70.68 | 67831493 | 1 |
| 2003 | 2.2 | 18.70 | 114.0 | 11.52 | 37.54 | 147.9 | 15.31 | 73.61 | 83134383 | 1 |
| 2004 | 2.5 | 26.64 | 78.4 | 9.42 | 41.75 | 189.1 | 20.15 | 71.82 | 1.07E+08 | 1 |
| 2005 | 2.3 | 21.64 | 69.7 | 10.65 | 37.71 | 184.4 | 25.34 | 67.50 | 1.24E+08 | 1 |
| 2006 | 2.6 | 25.14 | 81.1 | 10.36 | 35.70 | 160.9 | 32.83 | 64.15 | 1.43E+08 | 1 |
| 2007 | 2.8 | 26.81 | 81.6 | 10.29 | 35.84 | 159.2 | 38.63 | 58.26 | 1.64E+08 | 1 |
| 2008 | 1.9 | 22.54 | 64.1 | 8.34 | 35.56 | 157.9 | 41.97 | 55.10 | 2.08E+08 | 1 |
| 2009 | 2.6 | 27.21 | 73.6 | 9.40 | 36.89 | 200.1 | 41.51 | 55.69 | 2.50E+08 | 1 |
| 2010 | 2.3 | 23.35 | 76.5 | 9.88 | 37.14 | 204.2 | 49.18 | 48.09 | 2.98E+08 | 1 |
| 2011 | 1.6 | 17.26 | 71.6 | 9.13 | 34.37 | 183.8 | 54.24 | 43.17 | 3.41E+08 | 1 |
| 2012 | 1.8 | 16.19 | 66.5 | 11.02 | 34.57 | 194.1 | 54.68 | 42.30 | 3.76E+08 | 1 |

**Appendix 2.2: Private Banks' data**

|      | ROA   | ROE   | NIM    | CA    | DEPO  | INT    | LOAN  | LQD   | SIZE     | DU |
|------|-------|-------|--------|-------|-------|--------|-------|-------|----------|----|
| 1988 | 3.09  | 54.8  | 76.63  | 9.84  | 52.70 | 123.27 | 60.13 | 40.36 | 40626    | 0  |
| 1989 | 2.16  | 35    | 95.51  | 10.12 | 49.91 | 109.72 | 59.49 | 37.47 | 63162    | 0  |
| 1990 | 2.77  | 41.9  | 57.99  | 10.64 | 49.10 | 126.72 | 60.83 | 32.82 | 71243    | 0  |
| 1991 | 2.41  | 47.2  | 30.83  | 9.34  | 51.71 | 132.62 | 59.43 | 35.54 | 144368   | 0  |
| 1992 | 2.76  | 40.6  | 48.24  | 8.71  | 48.56 | 127.69 | 60.89 | 38.39 | 267383   | 0  |
| 1993 | 3.51  | 56.5  | 35.28  | 8.92  | 54.86 | 145.06 | 61.23 | 41.44 | 528491   | 0  |
| 1994 | 2.15  | 52.9  | -3.993 | 6.54  | 54.27 | 129.86 | 48.82 | 39.32 | 900345   | 0  |
| 1995 | 3.42  | 76.8  | 57.11  | 6.32  | 54.00 | 111.29 | 52.41 | 36.91 | 178336   | 0  |
| 1996 | 3.89  | 80    | 36.18  | 5.68  | 53.39 | 121.51 | 54.65 | 36.41 | 538744   | 0  |
| 1997 | 3.42  | 69.6  | 45.46  | 7.2   | 56.71 | 113.10 | 46.04 | 33.47 | 643794   | 0  |
| 1998 | 2.70  | 70.8  | 33.78  | 6.84  | 52.35 | 114.04 | 44.98 | 31.43 | 143753   | 0  |
| 1999 | -0.56 | 65.2  | 67.64  | 4.7   | 46.38 | 109.77 | 38.24 | 28.85 | 374574   | 0  |
| 2000 | -3.60 | 9.6   | 29.30  | 3.59  | 43.52 | 114.02 | 26.65 | 27.15 | 489563   | 0  |
| 2001 | -3.80 | -69.5 | -62.26 | 7.81  | 60.98 | 140.72 | 25.12 | 25.29 | 694534   | 1  |
| 2002 | 1.35  | 15.9  | 75.13  | 10.43 | 58.47 | 131.42 | 40.34 | 56.64 | 874396   | 1  |
| 2003 | 2.24  | 13.9  | 95.64  | 11.32 | 57.26 | 141.18 | 65.44 | 57.33 | 1.04E+08 | 1  |
| 2004 | 2.10  | 10.3  | 71.91  | 10.27 | 55.02 | 161.39 | 73.82 | 54.39 | 1.07E+08 | 1  |
| 2005 | 1.43  | 4.7   | 92.54  | 10.64 | 57.44 | 150.34 | 73.02 | 51.94 | 1.35E+08 | 1  |
| 2006 | 2.26  | 16.9  | 76.59  | 11.01 | 52.32 | 152.73 | 73.67 | 53.00 | 1.57E+08 | 1  |
| 2007 | 2.55  | 19.9  | 82.18  | 10.92 | 49.72 | 146.60 | 73.93 | 54.67 | 1.77E+08 | 1  |
| 2008 | 1.80  | 15.8  | 58.20  | 9.63  | 51.14 | 144.65 | 71.44 | 43.73 | 2.19E+08 | 1  |
| 2009 | 2.43  | 18.5  | 56.30  | 8.43  | 50.21 | 180.79 | 72.56 | 48.02 | 2.65E+08 | 1  |
| 2010 | 2.22  | 17.6  | 76.80  | 9.72  | 50.11 | 184.48 | 70.78 | 43.00 | 2.96E+08 | 1  |
| 2011 | 1.64  | 14.4  | 64.80  | 9.24  | 52.29 | 173.11 | 74.45 | 39.04 | 3.56E+08 | 1  |
| 2012 | 1.74  | 13.3  | 63.00  | 11.67 | 51.94 | 190.43 | 75.01 | 40.69 | 4.28E+08 | 1  |

## Appendix 3: Eviews test results

## Appendix 3.1: ROA for public banks

Dependent Variable: ROA
Method: Least Squares
Date: 06/24/15   Time: 14:18
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGSIZ | 0.272327 | 0.208523 | 1.305982 | 0.2090 |
| LOGLIQ | 0.692686 | 0.750597 | 0.922847 | 0.3690 |
| LOGLON | 0.207826 | 0.471998 | 0.440312 | 0.6653 |
| LOGDEP | 3.699014 | 3.502989 | 1.055959 | 0.3058 |
| DUMMY | -1.699598 | 1.434415 | -1.184872 | 0.2524 |
| LOGCA | 3.138381 | 1.435359 | 2.186478 | 0.0431 |
| LOGINT | -0.744167 | 1.893128 | -0.393089 | 0.6991 |
| C | -21.48879 | 12.58534 | -1.707446 | 0.1059 |

| | | | | |
|---|---|---|---|---|
| R-squared | 0.650096 | Mean dependent var | | 1.596000 |
| Adjusted R-squared | 0.506018 | S.D. dependent var | | 1.001449 |
| S.E. of regression | 0.703857 | Akaike info criterion | | 2.389854 |
| Sum squared resid | 8.422043 | Schwarz criterion | | 2.779894 |
| Log likelihood | -21.87317 | Hannan-Quinn criter. | | 2.498034 |
| F-statistic | 4.512113 | Durbin-Watson stat | | 1.820532 |
| Prob(F-statistic) | 0.005257 | | | |

## Appendix 3.2: ROA for private banks

Dependent Variable: ROA
Method: Least Squares
Date: 06/24/15   Time: 19:02
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGCA | 1.649436 | 1.566500 | 1.052943 | 0.3071 |
| LOGDEP | 8.482660 | 2.584287 | 3.282398 | 0.0044 |
| LOGINT | -0.414073 | 1.956417 | -0.211649 | 0.8349 |
| LOGLIQ | 2.187286 | 1.281310 | 1.707070 | 0.1060 |
| LOGLON | 4.788688 | 1.184989 | 4.041123 | 0.0008 |
| LOGSIZ | 0.309192 | 0.166532 | 1.856650 | 0.0808 |
| DUMMY | -4.725262 | 1.405100 | -3.362937 | 0.0037 |
| C | -63.38490 | 14.28677 | -4.436615 | 0.0004 |

| | | | | |
|---|---|---|---|---|
| R-squared | 0.889331 | Mean dependent var | | 1.847868 |
| Adjusted R-squared | 0.843762 | S.D. dependent var | | 1.889691 |
| S.E. of regression | 0.746938 | Akaike info criterion | | 2.508669 |
| Sum squared resid | 9.484588 | Schwarz criterion | | 2.898710 |
| Log likelihood | -23.35837 | Hannan-Quinn criter. | | 2.616850 |
| F-statistic | 19.51590 | Durbin-Watson stat | | 1.395958 |
| Prob(F-statistic) | 0.000001 | | | |

## Appendix 3.3: ROE for private banks

Dependent Variable: ROE
Method: Least Squares
Date: 06/24/15   Time: 19:17
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGCA | 11.35607 | 23.66352 | 0.479898 | 0.6374 |
| LOGDEP | 68.07394 | 39.03819 | 1.743778 | 0.0993 |
| LOGINT | -29.75065 | 29.55359 | -1.006668 | 0.3282 |
| LOGLIQ | 38.76084 | 19.35544 | 2.002582 | 0.0614 |
| LOGLON | 54.39150 | 17.90042 | 3.038560 | 0.0074 |
| LOGSIZ | 9.093939 | 2.515630 | 3.614974 | 0.0021 |
| DUMMY | -113.9059 | 21.22540 | -5.366487 | 0.0001 |
| C | -571.9896 | 215.8156 | -2.650362 | 0.0168 |

| | | | | |
|---|---|---|---|---|
| R-squared | 0.911992 | Mean dependent var | | 31.70400 |
| Adjusted R-squared | 0.875754 | S.D. dependent var | | 32.01050 |
| S.E. of regression | 11.28323 | Akaike info criterion | | 7.938850 |
| Sum squared resid | 2164.293 | Schwarz criterion | | 8.328891 |
| Log likelihood | -91.23563 | Hannan-Quinn criter. | | 8.047031 |
| F-statistic | 25.16646 | Durbin-Watson stat | | 1.823559 |
| Prob(F-statistic) | 0.000000 | | | |

## Appendix 3.4: NIM for public banks

Dependent Variable: NIM
Method: Least Squares
Date: 06/24/15   Time: 14:58
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGSIZ | 9.788525 | 6.615480 | 1.479639 | 0.1573 |
| LOGLON | 40.15459 | 14.97434 | 2.681559 | 0.0158 |
| LOGLIQ | 62.66726 | 23.81301 | 2.631639 | 0.0175 |
| LOGINT | -202.8838 | 60.06029 | -3.378001 | 0.0036 |
| LOGCA | 39.83811 | 45.53737 | 0.874844 | 0.3939 |
| LOGDEP | 215.8289 | 111.1338 | 1.942063 | 0.0689 |
| DUMMY | 21.81332 | 45.50741 | 0.479336 | 0.6378 |
| C | -346.8011 | 399.2753 | -0.868576 | 0.3972 |

| | | | | |
|---|---|---|---|---|
| R-squared | 0.760967 | Mean dependent var | | 48.70400 |
| Adjusted R-squared | 0.662542 | S.D. dependent var | | 38.43985 |
| S.E. of regression | 22.33015 | Akaike info criterion | | 9.304090 |
| Sum squared resid | 8476.807 | Schwarz criterion | | 9.694131 |
| Log likelihood | -108.3011 | Hannan-Quinn criter. | | 9.412271 |
| F-statistic | 7.731416 | Durbin-Watson stat | | 1.530235 |
| Prob(F-statistic) | 0.000288 | | | |

## Appendix 3.5: NIM for private banks

Dependent Variable: NIM
Method: Least Squares
Date: 06/24/15   Time: 19:28
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGCA | 58.28769 | 39.99562 | 1.457352 | 0.1632 |
| LOGDEP | -188.7498 | 65.98158 | -2.860644 | 0.0108 |
| LOGINT | -136.4942 | 49.95091 | -2.732566 | 0.0142 |
| LOGLIQ | 69.05564 | 32.71418 | 2.110878 | 0.0499 |
| LOGLON | 44.64822 | 30.25494 | 1.475733 | 0.1583 |
| LOGSIZ | 6.247287 | 4.251869 | 1.469304 | 0.1600 |
| DUMMY | -18.78865 | 35.87477 | -0.523729 | 0.6072 |
| C | 821.0901 | 364.7674 | 2.250997 | 0.0379 |

| | | | | |
|---|---|---|---|---|
| R-squared | 0.776675 | Mean dependent var | | 54.43487 |
| Adjusted R-squared | 0.684718 | S.D. dependent var | | 33.96386 |
| S.E. of regression | 19.07070 | Akaike info criterion | | 8.988521 |
| Sum squared resid | 6182.758 | Schwarz criterion | | 9.378561 |
| Log likelihood | -104.3565 | Hannan-Quinn criter. | | 9.096702 |
| F-statistic | 8.446043 | Durbin-Watson stat | | 1.494924 |
| Prob(F-statistic) | 0.000169 | | | |

# Appendix 4: Heteroscedasticity Tests

## Appendix 4.1: ROA Heteroscedasticity Test- public banks

Heteroscedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 1.886753 | Prob. F(7,17) | 0.1349 |
| Obs*R-squared | 10.93054 | Prob. Chi-Square(7) | 0.1417 |
| Scaled explained SS | 4.826894 | Prob. Chi-Square(7) | 0.6811 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/15   Time: 18:31
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 12.17941 | 7.573412 | 1.608181 | 0.1262 |
| LOGSIZ | -0.164449 | 0.125482 | -1.310538 | 0.2074 |
| LOGLIQ | 0.697060 | 0.451683 | 1.543251 | 0.1412 |
| LOGDEP | -4.886602 | 2.107975 | -2.318151 | 0.0332 |
| LOGINT | 1.603940 | 1.139217 | 1.407931 | 0.1772 |
| LOGCA | -0.433406 | 0.863748 | -0.501774 | 0.6223 |
| LOGLON | -0.119257 | 0.284032 | -0.419871 | 0.6798 |
| DUMMY | -1.077348 | 0.863180 | -1.248116 | 0.2289 |

| | | | |
|---|---|---|---|
| R-squared | 0.437222 | Mean dependent var | 0.336882 |
| Adjusted R-squared | 0.205489 | S.D. dependent var | 0.475183 |
| S.E. of regression | 0.423556 | Akaike info criterion | 1.374076 |
| Sum squared resid | 3.049795 | Schwarz criterion | 1.764116 |
| Log likelihood | -9.175944 | Hannan-Quinn criter. | 1.482256 |
| F-statistic | 1.886753 | Durbin-Watson stat | 2.385691 |
| Prob(F-statistic) | 0.134915 | | |

## Appendix 4.2: ROA Heteroscedasticity Test- private banks

Heteroscedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 0.612449 | Prob. F(7,17) | 0.7383 |
| Obs*R-squared | 5.034899 | Prob. Chi-Square(7) | 0.6557 |
| Scaled explained SS | 2.255275 | Prob. Chi-Square(7) | 0.9444 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/15   Time: 19:09
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -7.921088 | 10.94585 | -0.723661 | 0.4791 |
| LOGCA | -1.048037 | 1.200179 | -0.873234 | 0.3947 |
| LOGDEP | 1.345209 | 1.979959 | 0.679412 | 0.5060 |
| LOGINT | 0.207863 | 1.498915 | 0.138676 | 0.8913 |

| | | | | |
|---|---|---|---|---|
| LOGLIQ | 0.925884 | 0.981679 | 0.943163 | 0.3588 |
| LOGLON | 0.211644 | 0.907883 | 0.233118 | 0.8185 |
| LOGSIZ | -0.012332 | 0.127589 | -0.096653 | 0.9241 |
| DUMMY | 0.251819 | 1.076521 | 0.233919 | 0.8178 |

| | | | |
|---|---|---|---|
| R-squared | 0.201396 | Mean dependent var | 0.379384 |
| Adjusted R-squared | -0.127441 | S.D. dependent var | 0.538956 |
| S.E. of regression | 0.572269 | Akaike info criterion | 1.975922 |
| Sum squared resid | 5.567361 | Schwarz criterion | 2.365963 |
| Log likelihood | -16.69903 | Hannan-Quinn criter. | 2.084103 |
| F-statistic | 0.612449 | Durbin-Watson stat | 2.511233 |
| Prob(F-statistic) | 0.738328 | | |

## Appendix 4.3: ROE Heteroscedasticity Test- private banks

Heteroscedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 1.407385 | Prob. F(7,17) | 0.2654 |
| Obs*R-squared | 9.172320 | Prob. Chi-Square(7) | 0.2405 |
| Scaled explained SS | 3.210436 | Prob. Chi-Square(7) | 0.8649 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/15   Time: 19:35
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 917.8091 | 1965.885 | 0.466868 | 0.6465 |
| LOGCA | -84.15413 | 215.5532 | -0.390410 | 0.7011 |
| LOGDEP | -289.3274 | 355.6025 | -0.813626 | 0.4271 |
| LOGINT | 34.03845 | 269.2065 | 0.126440 | 0.9009 |
| LOGLIQ | 434.1542 | 176.3105 | 2.462441 | 0.0248 |
| LOGLON | -280.5517 | 163.0566 | -1.720579 | 0.1035 |
| LOGSIZ | -10.26936 | 22.91511 | -0.448148 | 0.6597 |
| DUMMY | 47.47059 | 193.3442 | 0.245524 | 0.8090 |

| | | | |
|---|---|---|---|
| R-squared | 0.366893 | Mean dependent var | 86.57172 |
| Adjusted R-squared | 0.106202 | S.D. dependent var | 108.7149 |
| S.E. of regression | 102.7800 | Akaike info criterion | 12.35740 |
| Sum squared resid | 179583.5 | Schwarz criterion | 12.74744 |
| Log likelihood | -146.4675 | Hannan-Quinn criter. | 12.46558 |
| F-statistic | 1.407385 | Durbin-Watson stat | 2.439565 |
| Prob(F-statistic) | 0.265377 | | |

## Appendix 4.4: NIM Heteroscedasticity Test- public banks

Heteroscedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 1.399814 | Prob. F(7,17) | 0.2682 |
| Obs*R-squared | 9.141020 | Prob. Chi-Square(7) | 0.2427 |
| Scaled explained SS | 3.574470 | Prob. Chi-Square(7) | 0.8273 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/15   Time: 18:00
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 19634.07 | 7615.541 | 2.578158 | 0.0195 |
| LOGSIZ | -325.2942 | 126.1798 | -2.578021 | 0.0195 |
| LOGLON | 243.8991 | 285.6118 | 0.853953 | 0.4050 |
| LOGLIQ | 449.7608 | 454.1954 | 0.990236 | 0.3359 |
| LOGINT | 695.1916 | 1145.555 | 0.606860 | 0.5520 |
| LOGCA | -1823.107 | 868.5530 | -2.099017 | 0.0511 |
| LOGDEP | -4604.026 | 2119.701 | -2.172017 | 0.0443 |
| DUMMY | 1242.975 | 867.9816 | 1.432029 | 0.1703 |

| | | | | |
|---|---|---|---|---|
| R-squared | 0.365641 | Mean dependent var | | 339.0723 |
| Adjusted R-squared | 0.104434 | S.D. dependent var | | 450.0609 |
| S.E. of regression | 425.9122 | Akaike info criterion | | 15.20068 |
| Sum squared resid | 3083820. | Schwarz criterion | | 15.59072 |
| Log likelihood | -182.0085 | Hannan-Quinn criter. | | 15.30886 |
| F-statistic | 1.399814 | Durbin-Watson stat | | 2.690852 |
| Prob(F-statistic) | 0.268220 | | | |

## Appendix 4.5: NIM Heteroscedasticity Test- private banks

Heteroscedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 0.371761 | Prob. F(7,17) | 0.9063 |
| Obs*R-squared | 3.318904 | Prob. Chi-Square(7) | 0.8540 |
| Scaled explained SS | 0.765211 | Prob. Chi-Square(7) | 0.9978 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/15   Time: 19:31
Sample: 1988 2012
Included observations: 25

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 6382.523 | 5334.665 | 1.196424 | 0.2480 |
| LOGCA | -290.2767 | 584.9296 | -0.496259 | 0.6261 |
| LOGDEP | -681.8211 | 964.9701 | -0.706572 | 0.4894 |
| LOGINT | -719.7051 | 730.5241 | -0.985190 | 0.3383 |
| LOGLIQ | 41.50050 | 478.4397 | 0.086741 | 0.9319 |
| LOGLON | 262.3435 | 442.4737 | 0.592902 | 0.5611 |
| LOGSIZ | -44.81662 | 62.18291 | -0.720723 | 0.4809 |
| DUMMY | 518.4327 | 524.6627 | 0.988126 | 0.3369 |

| | | | | |
|---|---|---|---|---|
| R-squared | 0.132756 | Mean dependent var | | 247.3103 |
| Adjusted R-squared | -0.224344 | S.D. dependent var | | 252.0612 |
| S.E. of regression | 278.9060 | Akaike info criterion | | 14.35396 |
| Sum squared resid | 1322405. | Schwarz criterion | | 14.74400 |
| Log likelihood | -171.4245 | Hannan-Quinn criter. | | 14.46214 |
| F-statistic | 0.371761 | Durbin-Watson stat | | 2.200289 |
| Prob(F-statistic) | 0.906325 | | | |

# Appendix 5: Autocorrelation tests

## Appendix 5.1: ROA Autocorrelation Test- public banks

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.446581 | Prob. F(2,15) | 0.6480 |
| Obs*R-squared | 1.404946 | Prob. Chi-Square(2) | 0.4954 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/24/15   Time: 18:27
Sample: 1988 2012
Included observations: 25
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGSIZ | -0.070770 | 0.230496 | -0.307033 | 0.7630 |
| LOGLIQ | -0.359752 | 0.869232 | -0.413874 | 0.6848 |
| LOGDEP | 0.508401 | 3.662692 | 0.138805 | 0.8915 |
| LOGINT | -0.165843 | 2.005127 | -0.082710 | 0.9352 |
| LOGCA | -0.385565 | 1.560982 | -0.247002 | 0.8083 |
| LOGLON | 0.133352 | 0.511379 | 0.260770 | 0.7978 |
| DUMMY | 1.003934 | 1.830569 | 0.548427 | 0.5915 |
| C | 1.264750 | 13.14295 | 0.096230 | 0.9246 |
| RESID(-1) | -0.024074 | 0.268299 | -0.089729 | 0.9297 |
| RESID(-2) | -0.328689 | 0.347804 | -0.945040 | 0.3596 |

| | | | |
|---|---|---|---|
| R-squared | 0.056198 | Mean dependent var | -2.89E-16 |
| Adjusted R-squared | -0.510083 | S.D. dependent var | 0.592384 |
| S.E. of regression | 0.727953 | Akaike info criterion | 2.492015 |
| Sum squared resid | 7.948742 | Schwarz criterion | 2.979565 |
| Log likelihood | -21.15019 | Hannan-Quinn criter. | 2.627241 |
| F-statistic | 0.099240 | Durbin-Watson stat | 1.918891 |
| Prob(F-statistic) | 0.999289 | | |

## Appendix 5.2: ROA Autocorrelation Test- private banks

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.241153 | Prob. F(2,15) | 0.3171 |
| Obs*R-squared | 3.549739 | Prob. Chi-Square(2) | 0.1695 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/24/15   Time: 19:10
Sample: 1988 2012
Included observations: 25
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| LOGCA | -0.099337 | 1.561245 | -0.063627 | 0.9501 |
| LOGDEP | -0.605877 | 2.581754 | -0.234676 | 0.8176 |
| LOGINT | 0.519236 | 2.014672 | 0.257728 | 0.8001 |
| LOGLIQ | 0.012725 | 1.320429 | 0.009637 | 0.9924 |
| LOGLON | -0.252233 | 1.192548 | -0.211508 | 0.8353 |
| LOGSIZ | -0.030850 | 0.176234 | -0.175050 | 0.8634 |
| DUMMY | 0.127833 | 1.472797 | 0.086796 | 0.9320 |
| C | 1.466773 | 14.53848 | 0.100889 | 0.9210 |
| RESID(-1) | 0.395633 | 0.270001 | 1.465304 | 0.1635 |
| RESID(-2) | -0.245597 | 0.303734 | -0.808595 | 0.4314 |

| | | | |
|---|---|---|---|
| R-squared | 0.141990 | Mean dependent var | -1.11E-14 |
| Adjusted R-squared | -0.372817 | S.D. dependent var | 0.628642 |
| S.E. of regression | 0.736563 | Akaike info criterion | 2.515530 |
| Sum squared resid | 8.137875 | Schwarz criterion | 3.003081 |
| Log likelihood | -21.44413 | Hannan-Quinn criter. | 2.650756 |
| F-statistic | 0.275812 | Durbin-Watson stat | 2.158962 |
| Prob(F-statistic) | 0.971721 | | |

## Appendix 5.3: ROE Autocorrelation Test- private banks

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.643604 | Prob. F(2,15) | 0.5393 |
| Obs*R-squared | 1.975796 | Prob. Chi-Square(2) | 0.3724 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/24/15   Time: 19:22
Sample: 1988 2012
Included observations: 25
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGCA | 5.399176 | 24.63971 | 0.219125 | 0.8295 |
| LOGDEP | 9.342630 | 41.03243 | 0.227689 | 0.8230 |
| LOGINT | 10.20910 | 31.53168 | 0.323773 | 0.7506 |
| LOGLIQ | -13.04463 | 23.13784 | -0.563779 | 0.5812 |
| LOGLON | 0.698756 | 18.57314 | 0.037622 | 0.9705 |
| LOGSIZ | 0.337804 | 2.606730 | 0.129589 | 0.8986 |
| DUMMY | -3.257016 | 21.92564 | -0.148548 | 0.8839 |
| C | -57.44073 | 227.2615 | -0.252752 | 0.8039 |
| RESID(-1) | 0.100016 | 0.271737 | 0.368063 | 0.7180 |
| RESID(-2) | -0.365023 | 0.330060 | -1.105928 | 0.2862 |

| | | | |
|---|---|---|---|
| R-squared | 0.079032 | Mean dependent var | -9.09E-15 |
| Adjusted R-squared | -0.473549 | S.D. dependent var | 9.496256 |
| S.E. of regression | 11.52749 | Akaike info criterion | 8.016521 |
| Sum squared resid | 1993.245 | Schwarz criterion | 8.504071 |
| Log likelihood | -90.20651 | Hannan-Quinn criter. | 8.151746 |
| F-statistic | 0.143023 | Durbin-Watson stat | 2.129138 |
| Prob(F-statistic) | 0.997097 | | |

## Appendix 5.4: NIM Autocorrelation Test- public banks

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.312037 | Prob. F(2,15) | 0.7366 |
| Obs*R-squared | 0.998577 | Prob. Chi-Square(2) | 0.6070 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/25/15   Time: 00:23
Sample: 1988 2012
Included observations: 25
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGCA | -16.83878 | 52.14363 | -0.322931 | 0.7512 |
| LOGDEP | -61.87771 | 140.8161 | -0.439422 | 0.6666 |
| LOGINT | 22.12433 | 68.80984 | 0.321528 | 0.7522 |
| LOGLIQ | 18.68645 | 34.34675 | 0.544053 | 0.5944 |
| LOGLON | 0.127953 | 15.64412 | 0.008179 | 0.9936 |
| LOGSIZ | -1.452368 | 7.206943 | -0.201523 | 0.8430 |
| DUMMY | -12.28470 | 49.95729 | -0.245904 | 0.8091 |
| C | 110.9710 | 442.6452 | 0.250700 | 0.8054 |
| RESID(-1) | 0.269721 | 0.357935 | 0.753548 | 0.4628 |
| RESID(-2) | 0.120788 | 0.305610 | 0.395236 | 0.6982 |

| | | | |
|---|---|---|---|
| R-squared | 0.039943 | Mean dependent var | -8.11E-14 |
| Adjusted R-squared | -0.536091 | S.D. dependent var | 18.79362 |
| S.E. of regression | 23.29266 | Akaike info criterion | 9.423328 |
| Sum squared resid | 8138.218 | Schwarz criterion | 9.910878 |
| Log likelihood | -107.7916 | Hannan-Quinn criter. | 9.558553 |
| F-statistic | 0.069342 | Durbin-Watson stat | 1.768824 |
| Prob(F-statistic) | 0.999833 | | |

## Appendix 5.5: NIM Autocorrelation Test- private banks

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.385825 | Prob. F(2,15) | 0.6864 |
| Obs*R-squared | 1.223161 | Prob. Chi-Square(2) | 0.5425 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 06/24/15   Time: 19:29
Sample: 1988 2012
Included observations: 25
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOGCA | -5.313670 | 50.72460 | -0.104755 | 0.9180 |
| LOGDEP | 5.409315 | 69.35504 | 0.077995 | 0.9389 |

| | | | |
|---|---|---|---|
| LOGINT | -2.040358 | 53.37674 | -0.038226 | 0.9700 |
| LOGLIQ | 5.280288 | 36.48068 | 0.144742 | 0.8868 |
| LOGLON | 1.570595 | 32.35479 | 0.048543 | 0.9619 |
| LOGSIZ | -0.132142 | 4.568842 | -0.028922 | 0.9773 |
| DUMMY | 0.777186 | 37.68797 | 0.020622 | 0.9838 |
| C | -24.02146 | 390.9520 | -0.061443 | 0.9518 |
| RESID(-1) | 0.235956 | 0.269827 | 0.874473 | 0.3956 |
| RESID(-2) | -0.029967 | 0.354918 | -0.084433 | 0.9338 |

| | | | |
|---|---|---|---|
| R-squared | 0.048926 | Mean dependent var | -2.23E-13 |
| Adjusted R-squared | -0.521718 | S.D. dependent var | 16.05039 |
| S.E. of regression | 19.79942 | Akaike info criterion | 9.098357 |
| Sum squared resid | 5880.258 | Schwarz criterion | 9.585908 |
| Log likelihood | -103.7295 | Hannan-Quinn criter. | 9.233583 |
| F-statistic | 0.085739 | Durbin-Watson stat | 1.912932 |
| Prob(F-statistic) | 0.999603 | | |