BASEL CAPITAL REQUIREMENTS AND BANK BEHAVIOR: EVIDENCE FROM TURKISH BANKING SYSTEM

A Master's Thesis

by

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September 2014

To My Family

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Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

AHMET DERYOL

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I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science in Management.

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ABSTRACT

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Deryol, Ahmet

M.S. Department of Management

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September 2014

In this study I examine the effects of Basel capital requirements on the behavior of Turkish banks for the period between December 2002 and December 2013. Turkish banks are found to increase their lending rates by 17.33 basis points in case of a one-percent rise in equity to asset ratio. When the same analysis is applied to state, private and foreign banks, it is found that state banks behave differently and decrease their lending rates when they increase their equity to asset ratio. As a second analysis, I examine how banks react when they are exposed to regulatory pressure to increase their equity to asset ratio. I use simultaneous equations methodology to measure the effects of regulatory pressure. The findings indicate that private banks do not change their behavior, state banks increase their equity to asset ratio and foreign banks decrease their risk level when they are exposed to regulatory pressure.

Keywords: Basel capital requirements, Turkish banks

ÖZET

BASEL SERMAYE DÜZENLEMELERİ VE BANKA DAVRANIŞLARI: TÜRK BANKACILIK SİSTEMİ ÖRNEĞİ

Deryol, Ahmet

Yüksek Lisans, İşletme Bölümü

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Eylül 2014

Bu çalışmada Basel sermaye düzenlemelerinin Türkiye'de faaliyet gösteren bankaların davranışı üzerinde yarattığı etkiler analiz edilmektedir. Aralık 2002-Aralık 2013 döneminde aylık veriler kullanılarak Türkiye'de faaliyet gösteren bankalar, özkaynak/toplam varlık oranının yüzde bir arttığı durumlarda kredi faizlerini 17.33 baz puan artırmaktadır. Aynı analizler kamu bankaları, özel bankalar ve yabancı bankalar olarak ayrı ayrı uygulandığında, kamu bankalarının farklı davranarak özkaynak/toplam varlık oranını artırdığında kredi faizlerinde düşüş yaptığı gözlemlenmiştir. İkinci bir analiz olarak bankaların özkaynak/toplam varlık oranını artırması yönünde baskıya maruz kalması durumunda davranış biçimleri incelenmektedir. Bu amaçla analizde eşanlı denklem çözümleme yöntemi kullanılmıştır. Bulgularımıza göre böyle bir durumda özel bankalar davranışlarını değiştirmemekte, kamu bankaları sermaye/toplam aktif oranlarını artırmakta, yabancı bankalar ise risk seviyesini azaltmaktadır.

Anahtar Kelimeler: Basel sermaye düzenlemeleri, Türk bankaları

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CHAPTER 1

INTRODUCTION

Banks are the most dominant players in the financial sector. Their main function in the economy is financial intermediation and they use external sources while doing their business. They have a tendency to take risks due to their nature of business model. However, any problem in the banking sector creates contagion effect, is transmitted to the rest of the financial system and affects negatively the whole economy. All of these factors make the resiliency of banks very important. Several regulations have been issued to promote a more resilient banking sector, to reduce riskiness of banks and to improve banks' ability to absorb shocks arising from financial and economic stress. Basel Capital Accord was created in 1988 in order to strengthen the stability of banking system.

Basel capital requirements have been introduced to cover banks from unexpected stress conditions and minimize their default risk. As for all regulations, besides the contribution the resiliency, capital regulations were criticized that they prevent banks from performing their financial intermediation function. It is argued that heightening capital requirements increases the cost of funding for banks and bank reacts by increasing their lending rates under the assumption that marginal cost of equity is higher than marginal cost of deposits. How banks change their behavior after capital requirements is an empirical question.

The relationship between capital requirements and lending rates has been estimated for several economies. For example, Cosimano and Hakura (2011) predict the impact of one percent increase in equity to asset ratio on lending rate by using the bank data from advanced economies and observe that banks increase their lending rates but the size of the increase changes by country. Although BRSA (2012) estimates that a one percent increase in equity to asset ratio causes 19 basis points increase in lending rates of Turkish banks, their analysis is based on six Turkish banks and considered only current levels of variables.

The Basel capital requirements have two components: risk and capital. Capital adequacy is defined with total regulatory capital and risk adjusted assets. A bank can change its capital adequacy ratio by either increasing its capital level or decreasing its risk level or both. Any regulatory pressure for the banks to increase their capital level due to capital requirements may result in either raising capital or decreasing risk.

In this thesis, first, the effect of increase in equity to asset ratio on lending rates is estimated for Turkish banks using monthly data for the period between December 2002 and December 2013. My hypothesis is that higher equity to asset ratios is associated with higher lending rates because equity financing is considered to be more costly than debt financing to some extent due to tax benefits. I expect that heightened equity to asset ratios will result in higher lending rates. In order to test this hypothesis, I used a two stage model. In the first stage equity to asset ratio (E/A) is predicted. In the second stage, lending rates are estimated using predicted E/A ratio and controlling for deposit interest rates, non-interest expenses, non-performing loans and size. It is estimated that Turkish banks increase their lending rates by 17.33 basis points when equity to asset ratio increases by one percent. When the same model is applied to state, private and foreign banks separately, private and foreign banks are found to increase their lending rates

by 8.43 and 43.85 basis points respectively whereas state banks are found to decrease their lending rates by 125.41 basis points because of 1% increase in equity to asset ratio.

In the second part, I examine how Turkish banks react to regulatory pressure of increasing capital adequacy ratios. My hypothesis is that Turkish banks react regulatory pressures either increasing their capital or decreasing their risk level. Academic literature suggests that banks determine their capital and risk level simultaneously. In this regard, I estimate change in risk and change in capital simultaneously. My findings indicate that state banks increase their capital level and foreign banks decrease their risk level; whereas private banks neither increase their capital nor decrease their riskiness.

The remaining of the thesis is organized as follows: Chapter 2 presents the historical progress of Basel capital requirements both globally and in Turkish legislation. Chapter 3 focuses on the outlook for Turkish banking sector. Chapter 4 provides information about the previous discussion in literature on the effects of capital requirements on bank behavior. In this section I concentrated on empirical and theoretical studies on this issue. Chapter 5 introduces the data and elaborates the methodology used in the

analysis. Chapter 6 discusses the descriptive statistics and the results of the analysis. Chapter 7 presents conclusions.

CHAPTER 2

THE DEVELOPMENT OF BASEL CAPITAL REQUIREMENTS AND TURKISH LEGISLATION

Banking crises beginning in 1970s created a necessity to efficient regulation of the banking sector and international convergence of capital regulations. Basel Committee on Banking Supervision (BCBS) was established in 1974 which operates under Bank for International Settlements (BIS) to prepare international regulations for the banks. The studies of BCBS are evaluated under the heading of "Building Resilient Financial Institutions".

Capital requirements regulations are the main tool of the BCBS to create resilient financial institutions. The first capital requirements (Basel I) was provisioned in 1988. BCBS revised their requirements several times. It has made the last radical change in 2011 (Basel III) with the aim of increasing the quantity and quality of bank capital.

Basel I defines capital adequacy ratio for banks to make them have sufficient capital so that the stability of international banking system is strengthened. They created Basel II norms in 2004 in order to create international standards that regulators can use to ensure that banks have sufficient capital appropriate to hold the risk that they are exposed to.

The first standard Basel I on capital requirements was mainly concentrated on the definition of capital adequacy ratio which takes into account the riskiness of assets. According to this standard, banks are obliged to maintain at least minimum 8% capital adequacy ratio (BCBS, 1988).

$$Capital\ Adequacy\ Ratio = \frac{Regulatory\ Capital}{Risk\ Weighted\ Assets} \geq 8\%$$

Regulatory capital has two components: Tier 1 capital and Tier 2 capital. Tier 1 capital is core capital, mainly consists of equity (paid in capital and reserves). In addition to this, there are some components of the balance sheet of the banks which have similar behavior with the equity. Tier 2 capital is considered as supplementary capital, mainly composed of general provisions, subordinated debt and revaluation reserves. Tier 2 capital is limited up to 100% of the Tier 1 capital. Risk weighted assets are calculated by multiplying bank assets by corresponding risk weights. The assets are multiplied by four different risk weights, i.e. 0,20,50 and 100%, depending on

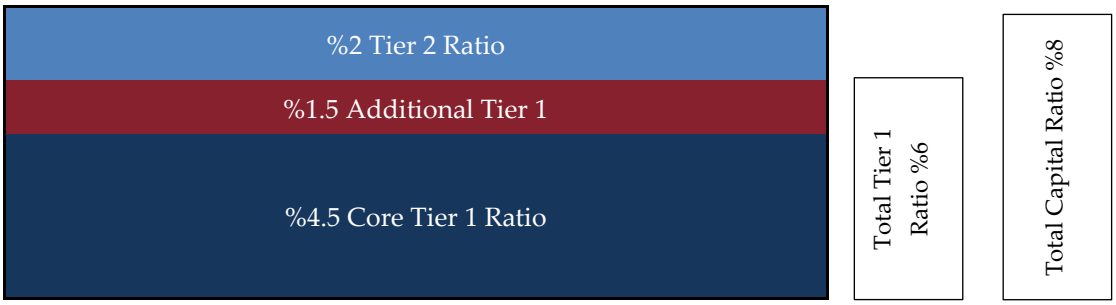
the default risk of assets. Off balance sheet exposures are evaluated by using conversion factors before they are multiplied with risk weights. In addition to credit risk, in 1996 market risk was also incorporated to the Basel capital requirements in order to cover risks arising from movements in market prices. Basel Committee allowed banks to use their internal models to calculate capital adequacy ratios but these internal models have to be approved by the regulatory authorities.

Although simplicity of the requirements leaded to increase the easiness of understanding the requirements, standards were criticized since risk sensitivity of requirements was considerably low and standards did not cover risks arising from counterparties. BCBS introduced new standards which increased the risk sensitivity of the model to cover weaknesses of Basel I and set the regulatory infrastructure on three pillars: Minimum capital standards, supervisory review process and market discipline. The new standards were introduced in 2004 and revised in 2006. By the introduction of Basel II, the definition of capital has changed and operational risk is considered in risk weighted assets calculation in addition to credit risk and market risk.

Basel capital framework was revised in 2009 and BCBS published a new document called 'Enhancements to the Basel II framework'. In addition to this, the regulations for market risk and trading book have developed after the global financial crisis. BCBS aimed to capitalize better the risks arising from the risky investments of banks. By the introduction of requirements securitization activities have been better capitalized and off balance sheet exposures are better addressed.

'Basel III: A global regulatory framework for more resilient banks and banking systems' was published in 2011. It introduces leverage and liquidity standards for banks in addition to capital requirements. In this framework, capital is defined in three ways: Common Equity Tier 1 capital (CET1), Tier 1 Capital and Total Capital. CET1 consists of mainly common shares, retained earnings and reserves, total Tier 1 capital is sum of CET1 and mainly preferred stocks, total capital is the sum of T1 Capital and T2 Capital which include mainly general provisions, subordinated debt and revaluation reserves addition to T1. Banks are obliged to maintain at least 4.5%, 6% and 8% capital levels of risk weighted assets as CET1, T1 capital and total capital respectively.

Table 1. Basel III Capital Adequacy Framework



In Turkey, the first capital requirements for banks was introduced in October 1989 following the publication of Basel I capital requirements. Additional legislations were introduced in 1995, 1998, 2001, 2002 and 2006, consistent with the revisions of the BCBS on capital requirements. The 2006 capital requirement legislation was modified in 2007 and 2008. The current legislation has been published in 2012 which follows Basel II capital requirements and modified in 2013 and 2014 as to involve most of the regulations of Basel III. According to the progress report on implementation of Basel regulatory framework, Turkey is one of the countries which fully implements Basel III capital requirements (BCBS, 2014).

CHAPTER 3

TURKISH BANKING SECTOR[1]

There are 49 banks currently operating in Turkey as of April 2014 with total assets of 1.8 trillion Turkish lira (approximately 860 billion USD). The ratio of total assets to GDP is 111% as of April 2014. This ratio is low compared to developed economies and indicates that there is the potential for growth. Global crisis was a kind of stress test for Turkish banks which shows robust structure against crisis. Turkish banking sector also sustained its positive outlook in the global crisis period and none of the banks liquidated in this period. High loan and asset growth rates have potential to erode capital ratios. Therefore, the supervision of capital adequacy in the high growth period has key role in order to reach sustainable growth.

[1] All data in this section is gathered from BRSA and CBRT databases.

3.1. Growth and Market Share

Turkish banking sector is dominated by deposit banks. As of April 2014, 90.5% of Turkish banking sector assets is held by deposit banks (Figure 1). On the other hand, the asset growth rates of participation and development and investment banks are higher than deposit banks. On April 2014 the annual growth rates of assets and loans are 24.5% and 27.8% (Figure 2). Turkish banking sector has experienced growth even in the crisis period. In addition to this, growth rates have cyclical behavior as expected.

Figure 1. The Market Share Distribution of Turkish Banks (%)

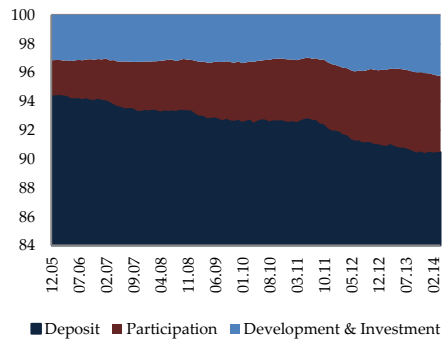
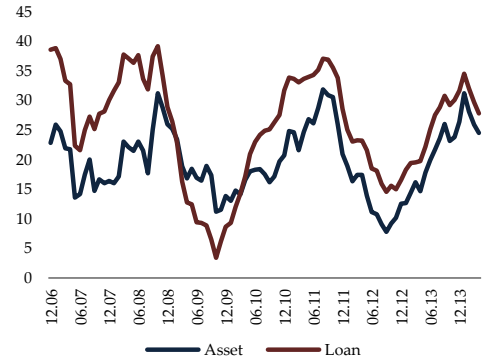


Figure 2. The Asset and Loan Growth (yoy %)



3.2. Asset Quality and Source of Financing

Turkish banks perform traditional banking activities considering high share of loan and deposit stocks in the balance sheet. The share of deposit and loans in the total liabilities and the total assets are 54.6 and 62.2 % respectively as of April 2014 (Figure 3,4). Financing of assets is heavily dependent on core funding sources since deposit and equity are the main funding sources.

Figure 3. The Asset Distribution of Turkish Banks (%), April 2014

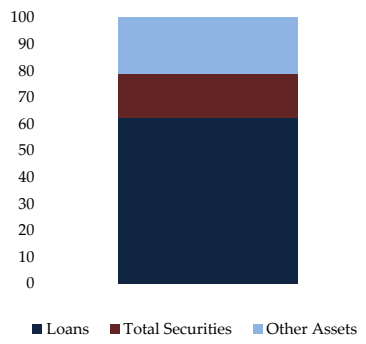
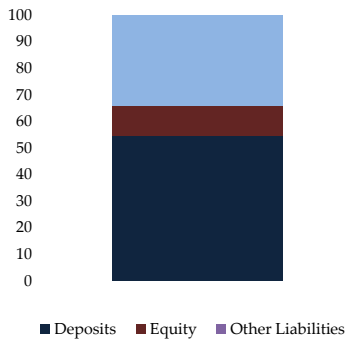
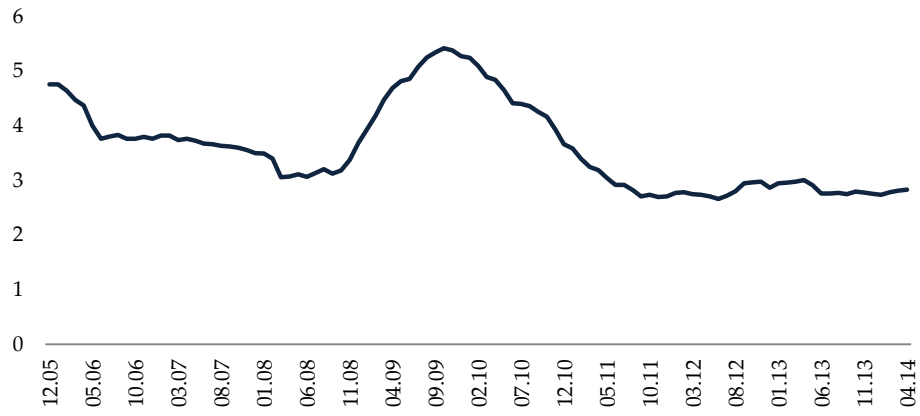


Figure 4. The Liability Distribution of Turkish Banks (%), April 2014



As of 2014, 2.75 % of total loans are non-performing loans. During the global crisis period, NPL ratio increased and reached its peak level on September 2009 since then, Turkish banks has been able to decrease it to better levels.

Figure 5. The Evaluation of Non-Performing Loans of Turkish Banks (%)



3.3. Profitability

The profitability ratios of Turkish banks have been decreasing gradually since the global crisis period (Table 2). The return on equity ratio

(ROE) of Turkish banks declined to 13% in 2013 from 22% in 2007. ROE is decomposed as the multiplication of return on assets (ROA) and equity multiplier (EM). Equity multiplier is the ratio of average assets to average equity. The decrease in ROE can be explained by the shrinkage of ROA by 1.15%. Although banks increased their leverage in some years, they are unable to sustain their past profitability performance.

ROA consists of two components: profit margin (PM) and asset utilization (AU). The diminishing trend of the either ratios causes ROA ratios of the banks to decrease. From this point of view, I may assert that Turkish banks experienced both cost control and revenue generation problems. In terms of cost control, the ratio of non-interest expense to total income ratio increases. The loan loss provisions to total income ratio has maintained its heavy increase trend. The decreasing tendency of interest income and non-interest income ratios of Turkish banks signs the deterioration of revenue generation performance. The main reason of the decrease in asset utilization ratio is the deteriorating performance of banks on both net interest income generation and non-interest income generation. The loan and deposit interest rate spreads have been diminished in recent years so it is reflected in net interest income. The figures for the non-interest income ratios, suggest that

Turkish banks have also experienced problems in generating non-interest income.

Table 2. The Profitability Analysis for Turkish Banks

	2006	2007	2008	2009	2010	2011	2012	2013
ROE= ROA*EM								
Net Income/ Average Equity (ROE)%	19.90%	21.95%	16.54%	20.46%	18.02%	14.22%	14.41%	13.13%
Net Income/ Average Assets (ROA)%	2.51%	2.75%	2.04%	2.58%	2.40%	1.78%	1.82%	1.59%
Average Assets/ Average Equity (EM)	7.9	8.0	8.1	7.9	7.5	8.0	7.9	8.3
ROA=PM*AU								
Net Income/Total Income (PM)%	32.16%	34.25%	27.57%	32.07%	35.18%	30.25%	29.10%	26.91%
Total Income/Average Assets (AU)%	7.79%	8.02%	7.41%	8.03%	6.83%	5.90%	6.24%	5.91%
PM=1-((NIE+LLP+Tax)/TI)								
Non-Interest Expense/Total Income (NIE/TI)%	53.06%	51.21%	54.63%	44.32%	48.04%	55.23%	53.00%	54.53%
Loan Loss Provisions/Total Income (LLP/TI)%	5.95%	6.82%	11.19%	15.71%	8.60%	6.29%	9.75%	11.49%
Tax/Net Interest Income %	8.84%	7.72%	6.61%	7.90%	8.18%	8.23%	8.15%	7.07%
AU= (Net Interest Income+Non Interest Income)/Average Assets (AA)								
Net Interest Income/Average Assets%	4.68%	4.82%	4.72%	5.34%	4.20%	3.54%	4.04%	3.70%
Non-Interest Income/Average Assets%	3.11%	3.21%	2.69%	2.70%	2.63%	2.36%	2.21%	2.21%

Source: Calculations

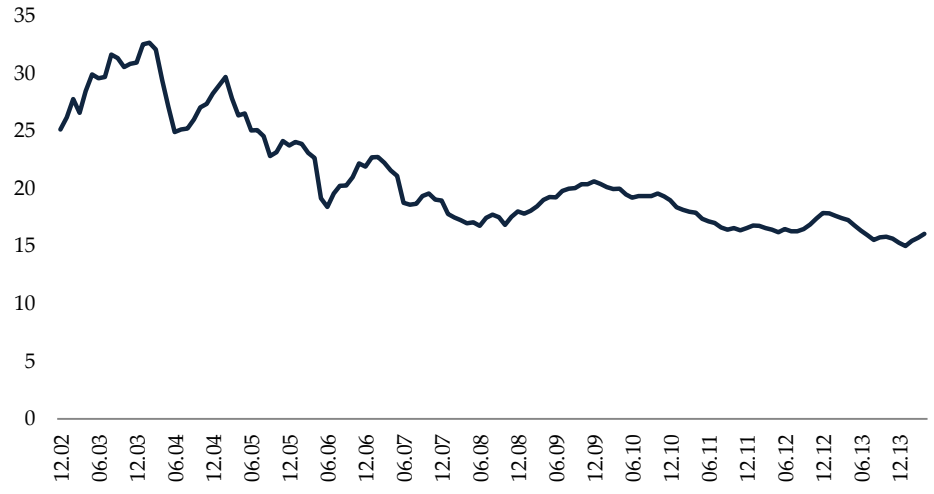
3.4. Capital Adequacy

Capital adequacy ratios of Turkish banks are in a downward trend since 2003. The main reason for this downward trend is rapid loan growth. There is inverse relationship between high loan growth and capital adequacy ratio in Turkish banking system. The average annual year on year growth of total loans is 25% for the period between 2007 and 2013. In this period,

profitability of Turkish banks which is one of the main sources of capital, did not increase enough to sustain loan growth.

On April 2014, the capital adequacy ratio of all Turkish banks was 16.07%. Figure 6 presents how capital adequacy ratio of all Turkish banks has changed from December 2002 to April 2014. It was more than 30% after the banking crisis in Turkey and it declined gradually. This ratio was stable around 18% after the global crisis. It reached its minimum level at the end of January 2014 (15.02%). The loan growth of sector was controlled by the beginning of 2014 and this was reflected as increase in capital adequacy ratios.

Figure 6. Capital Adequacy Ratios of all Turkish Banks , Dec. 2002-April 2014 (%).



Although the capital adequacy of Turkish banks has a downward trend, the banks hold more than the regulatory minimum CA ratio (8%) and

the target capital ratio (12%), set by the Banking Regulation and Supervision Authority (BRSA). On the other hand, capital buffers have great importance for banks to sustain their growth performance. However, in the future, low and downward trended capital adequacy ratios might distort the growth potential of Turkish banks.

CHAPTER 4

LITERATURE REVIEW

The optimal capital structure for corporations has been discussed since Modigliani and Miller (1958) and debt financing has generally accepted as less costly than equity financing considering tax benefit of debt. Additionally, being shareholder of a company is riskier than being lender so shareholders require more return than lenders. Borrowing for a bank is easier than raising equity since the procedures of increasing capital are more compelling than borrowing. Furthermore, financial institutions generally operate with high leverage due to their nature and business model. Nevertheless, capital requirements for the banks limit in choice of capital and debt financing choices of them.

In the literature, several studies examine how capital requirements affect banks' financing and risk taking decisions from theoretical point of view. There are also several empirical studies examining increasing capital requirements on lending rates and how regulatory pressure affect bank behavior in different countries. Bank behavior is measured in two ways: changing its equity to asset ratio or/and changing risk levels.

Chami and Cosimano (2010) analyze optimal bank capital by defining capital as a call option where the strike price is the difference between optimal loan level for the bank in the next period and the amount of loans funded by capital. If in the next period loan level exceeds the capital level then theoretical call option becomes exercisable. Increasing the capital level decreases the strike price so banks gain flexibility. Therefore, they conclude that banks hold more capital than required in order to better response loan demands in future. On the other hand, they assert that heightening capital requirements of banks has unclear effect on banks' optimal capital decision level. First, higher capital requirements lead the strike price to decline so the value of call option increases. However, the raise in regulatory capital also causes marginal payoff of the option decrease. Therefore, they conclude that heightening capital requirements has ambiguous impact on the capital level.

Thakor (1996) analyzes the effects of increasing risk weights of the loans of banks. He develops a theoretical approach to analyze the impact. In his model there are two instruments which banks allocate their money: government securities and lending. Also, there are several banks in the model and when a borrower needs lending, it is assumed that borrower applies for the loan to all banks in the model. Another assumption in the model is that government security investing does not need capital financing since risk weight applied to them is 0%. The loan applicants are classified as "good" or "lemons" based on their creditworthiness. If the credibility of applicant is "lemon" level, no banks provide lending to this customer. If the credibility is "good" then banks consider their cost of funding. If the lending rates are higher than their cost of funding then they provide lending. The preliminary assumption in this model is that equity financing is more costly than debt financing. In the model, he considers a scenario where risk weights for the loans increased. In such a condition, he concludes that the amount of lending decreases and cost of lending increases since the cost of loan funding increases for all banks in the model.

Ediz, Michael and Perraudin (1998) try to find whether regulatory pressure has an effect on UK bank behavior or not controlling for bank profitability and riskiness related variables and regulatory pressure. They

measure regulatory pressure in two ways. They first add a dummy which equals 1 when bank increases capital requirement ratio in three consecutive periods. As a second methodology, they define another dummy variable which equals unity when the bank specific capital adequacy ratio (CAR) is lower than the minimum legal CAR plus bank specific standard deviation of CAR. Considering the significance and positive signs of two dummies, they conclude that regulatory pressure has an effect on bank behavior which causes banks to increase their capital adequacy ratios. They also check whether banks increase their ratios by raising capital or replacing higher risky assets with lower risky assets. They run the same regression by changing dependent variable as 100 percent weighted assets (risky portion of total risk weighted assets) divided by total risk weighted assets. In the model regulatory pressure measure variables are not significant so it is concluded that regulatory pressure does not lead banks to replace risky assets with lower risky assets.

Rime (2001) tries to identify whether regulatory pressure on Swiss banks' capital has effect on their capital and riskiness level. In order to determine the effects of regulatory capital, he applies a simultaneous equations model using change in capital level and risk level as dependent variables. He defines regulatory pressure by using two different

methodologies. First, he uses probabilistic measure to measure regulatory pressure as it is used Ediz et al. (1998) which reflects the impact of capital ratio's volatility on the probability of a bank not having adequate capital. Then, he uses three stage least squares methodology to estimate the simultaneous equations model. Based on the significance levels of regulatory pressure measure on both equations, he concludes that while regulatory pressure has significant and positive effect on bank capital, it has no significant effect on the level of risk.

Heid, Porath and Stolz (2004) focus on capital buffer theory which predicts that under capital requirements, banks' behavior depend on the size of their capital buffer. Capital buffer is defined as the excessive portion of bank specific CAR above regulatory minimum. According to capital buffer theory banks with high CAR try to maintain their capital buffer and banks with low capital buffer try to rebuild their capital level. They provide empirical evidence for 570 German savings banks over the 1993-2000 period. In the model, they use simultaneous equations model considering the rigidities and adjustment cost that prevent banks from making discretionary adjustments as assumed in capital buffer theory. To analyze the variables affecting the levels of capital and risk, they use size, bank's return on assets, current loan assets, a merger dummy variable and local insolvencies as

explanatory variables. Moreover, in order to distinguish banks according to their size of capital buffer, they define a regulatory dummy. Then, they test the effects of size of capital buffer in terms of three different specifications which are the magnitude of capital and risk adjustment, speeds of the adjustment and the relationship between the adjustment in capital and risk. The results suggest that capital and risk adjustments depend on the level of current capital level for banks. Banks with low capital buffers try to rebuild an appropriate capital buffer by increasing capital while decreasing risk. In contrast, banks with high capital buffers increase risk when capital increases by maintaining their capital buffer. Moreover, banks do not adjust capital when risk changes. In addition, there is no evidence that banks with low capital buffers adjust capital and risk faster than banks with high capital buffers. Ultimately, all these findings are consistent with the results of the capital buffer theory.

Abdel-Baki (2012) analyzes the effects of Basel III regulations about capital adequacy, leverage and liquidity standards on the loan growth, recapitalization and liquidity enhancement. Data is gathered from Bankscope database. 1546 banks from 47 emerging economies in 2001-2006 period are used in the analysis in order to both avoid external shocks arising from global crisis. She defines a z-score for individual banks indicating that the needed

number of loan growth standard deviations under mean loan growth to comply with Basel III requirements for banks by summing average loan growth/GDP, recapitalization/GDP and liquidity enhancement/GDP and dividing the sum by standard deviation of loan growth/GDP. In the analysis, z-scores of individual banks are used as dependent variable in an ordinary OLS estimation. The controls for country and bank characteristics are divided into three categories which include compliance of Basel III requirements, country characteristics like inflation, GDP growth etc. and bank characteristics such as size, loan loss provision, ROE etc. They determine the compliance with Basel III requirements by defining an index which gets 4 when banks perfectly compliant and 0 when banks non- compliant. It is realized that capital adequacy compliance has negatively and statistically significant effect on z- scores of banks. Abdel-Baki concludes that compliance with the Basel III capital requirements has negative effect on average loan growth, recapitalization and liquidity enhancements of emerging economies' banks.

Kashyap, Stein and Hanson (2010) analyze the effects of increasing capital requirements on lending rate of US banks. They estimate that US banks increase lending rates by 2.5-4.5 basis points with respect to 1 percent increase in equity to total assets ratio. They base the analysis on tax benefit of debt financing and they assume the banks' cost of capital increase directly

reflected in lending rates. In the first scenario, they assume that instead of raising equity, banks decrease their long term debt level. Assuming that the cost of long term debt is 7 percent and corporate tax rate 35 percent in US, they assert that 1 percent increase in equity to assets ratio reflects in lending rates 0.07*0.35 = 2.45 basis points. In the second scenario, they assume that equity crowds out short term debt which has 1 percent money premium in addition to tax benefit. Therefore, in the second scenario the total effect of heightening equity to assets ratio is 3.5 basis points. In the last scenario they assume the money premium increases to 2 percent so the net effect is 4.5 basis points. In conclusion, basing the analysis on tax benefit, Kashyap, Stein and Hanson find the effect of increasing capital requirements on lending rate between 2.5 and 4.5 basis points.

Elliott (2009) analyzes the outcomes of heightening capital requirements of banks by identifying lending rates of banks as the function of funding side components of bank balance sheet. He assumes lending rate of banks is affected only by the share of equity funding, cost of equity, cost of debt, the credit spread, administrative expenses and other benefits to the bank arising from loan. As the base scenario he assumes banks operate minimum capital requirements which is 6% for Tier 1 and determines cost of equity, cost of debt, credit spread, administrative costs and other benefits of loans as 15, 2,

1, 1.5, and 0.5 percent respectively based on past experiences in the US banking system (tax rate 30%). He calculates lending rate for a bank as 5.17 percent using the above assumptions for the variables are valid. He widens the analysis by increasing the share of capital funding to 8% and 10% holding other variables constant. Then he assumes variables other than equity funding changed in alternative scenarios. For the scenarios he considered and assumptions of 8 percent capital funding and 10 percent capital funding, he calculates the lending rates increase up to 5.94 percent.

Macroeconomic Assessment Group (MAG, 2010 a and b) of the Financial Stability Board (FSB) and Basel Committee on Banking Supervision (BCBS) examine impacts of increased capital requirements on lending spreads of banks. They apply the analysis on 17 developed and emerging countries and Euro area. They use change in the deposit-lending spreads as dependent variable and selected macroeconomic variables including aggregated capital ratios as independent variables. However, although dependent variable is the same for all countries, independent variables change considering the characteristics of individual countries. For example, they use capital adequacy ratios of banks, previous period lending spreads, mortgage lending and net personal wealth to personal income as explanatory variables for United Kingdom's analysis. In their first report (2010a), they analyze the effects of

capital ratios on the next 32 quarter deposit-lending spreads. They conclude that one percent increase in capital requirements causes lending spreads to increase 17.3 basis points as median value of countries at the next 18th quarter (highest effect) and 15.3 basis points at the next 32nd quarter as median compared to base period. In their second report (2010 b) they expand their analysis to 48 quarter. Based on the unweighted median results of countries, they find that one percentage increase in capital requirements results banks to increase their lending spreads 15.5 basis points at the 35th quarter (highest effect) and 12.2 basis points at 48th quarter.

Sutorova and Teply (2013) also focus on the impacts of Basel III capital requirements on lending rates. They focus on 594 EU banks during the period between 2006 and 2011. They use Chami and Cosimano's (2001, 2010) model to analyze the effect of the capital requirements on the loan volumes and loan interest rates of EU banks. In the model they refer the capital as a call option. They examine the impacts of Basel III on the capital choice, loan rate and loans level. In order to estimate the choice of capital and loan rate, they use 2-stage least square methodology and to describe the amount of loans provided, they employ heteroskedasticity – adjusted OLS model. According to results of the model, there is a positive and significant relationship between common equity ratio and the loan rate, i.e., a one percentage point increase in the

common equity ratio leads to 18.8 basis points increase in the loan rate. Moreover, there is a negative relationship between the interest rate of loans and loans provided as expected, i.e., a 1% increase in interest rate of loans leads to 0,156% decrease in loans provided which shows the negative elasticity of demand for loans. As a result, with the capital requirement, there is a modest drop in loans provided due to low elasticity of demand for loans in Europe. Therefore, critics about the negative effects of capital requirements on economic output through the increased interest rates and a reduced volume of loans provided are not justified by the econometric model developed by Sutorova and Teply.

Cosimano and Hakura (2011) examine how heightening capital requirements affect lending rates in twelve developed countries using data from 100 largest banks worldwide. They gather data from Bankscope for the banks operating in 12 different countries for the period of 2001-2009. In their analysis they first estimate the equity to asset ratio using the banks' initial level of equity to asset, interest expense ratio, non-interest expense ratio, non-performing loan (NPL) ratio and total assets. Using the estimated capital adequacy ratio, in the second stage, besides interest expense ratio, non-interest expense ratio, NPL ratios, total assets and year dummies, they estimate the effect on the lending rates. They conclude that one percent

increase in equity to asset ratio leads 12.2 basis points increase in lending rates. In addition to this, they analyze the capital needs of 100 largest banks to comply with capital requirements and they conclude that banks need to heighten their capital by 1.3 percent. Combining the findings of two analyses, they conclude that Basel capital requirements would lead 100 largest banks worldwide to increase their lending rates by 16 basis points (1.3*12.2=16). They also run the same analysis for 12 individual countries. They find significant results except for Canada and Korea. The effects of increasing equity to asset ratio by one percent on lending rates are represented table below.

Table 3. The Effect of Increasing Capital Requirements on Lending Rates in Selected Countries

Countries	**Lending Rates (basis points)**
Canada	0.3
Czech Republic	10.5
Denmark	19.1
Germany	11.6
Greece	8
Ireland	21.6
Japan	26.1
Korea	5.5
Sweden	2
Switzerland	0.9
UK	6.4
US	13.1

The effects of heightening capital requirements in Turkey is estimated in BRSA (2012) using the methodology by Elliot (2009). According to their

model, the interest rate on loans should cover the sum of all the cost of providing credit, including cost of capital and other funding sources, any expected credit loans and administrative expenses. Based on their analysis with Basel III of only commercial banks, they conclude that the marginal effect of increasing capital requirements on lending rates is 19 basis points at the aggregate level.

CHAPTER 5

DATA AND METHODOLOGY

In this thesis, I have two main hypotheses. I examine how increase in capital requirements affect banks' behavior in terms of their lending rate, capital and risk. The first hypothesis is that an increase in equity to asset ratio increases lending rates for Turkish banks. The second hypothesis is related with the reaction of Turkish banks to regulatory pressures increasing their capital or decreasing risk level or both. I expect that Turkish banks increase their capital or reduce risk level or both when they face with regulatory pressures to increase their capital adequacy ratio.

5.1. Data

The data used in the analysis obtained from the database of The Central Bank of Turkey (CBRT). Banks operating in Turkey report to BRSA and CBRT simultaneously their balance sheets, income statements, lending and deposit rates on a regular basis. The dataset is in the panel data format and consists of the monthly data of 29 commercial banks beginning from December 2002 ending in December 2013. I have an unbalanced panel. Only 23 banks have data in the full period of December 2002-2013. During the sample period, the dataset covers both viable and non-viable banks and some new banks started to operate, some merged with others or acquired by other banks.

Only commercial banks are analyzed in the study since main function of them is to collect deposit and supply loans. I do not include the participation banks because their deposit rates are determined based on the performance of their asset pool and they are not pre-determined. I exclude foreign banks operating in Turkey through their branches from my sample.

The commercial banks used in the analysis are divided into three as state banks, private banks and foreign banks based on their ownership structure. The categorization of the Banks Association of Turkey is used in this classification. During the sample period, some banks changed their ownership type. For example, some private banks were acquired by foreign banks.

5.2. Methodology

My first research question examines the relationship between equity to asset ratio and lending rate. The second question analyzes how banks respond to regulatory pressures.

5.2.1. Relationship between Equity to Asset Ratio and Lending Rate Model

A model developed by Casimano and Hakura (2011) is used in order to capture the effects of heightening capital adequacy ratio on lending rate. It is a two stage model. In the first stage, the equity to asset ratio for each bank is estimated. In the second stage, the effect of equity to asset ratio on lending rate is estimated.

$$CAP_{j,t} = a_0 + a_1 + a_2 . CAP_{j,t-1} . \Delta CAP_{j,t-1} + a_3 + a_4 . CAP_{j,t-1} . DEP_{j,t} + a_5 + a_6 . CAP_{j,t-1} . NIE_{j,t} + NPL_{j,t} + a_7 . LN\ SIZE_{j,t} + a_8 . RGL_{2007} + a_9 . RGL_{2012} + a_{10} . d_{2004} + \ldots\ldots\ldots\ldots + a_{19} . d_{2013} + \varepsilon_{j,t} \quad (1)$$

$$LOANR_{j,t} = a_0 + a_1 \,.\, CAP'_{j,t} + a_2 \,.DEP_{j,t} + a_3 \,.\, NIE_{j,t} + a_4\, NPL_{j,t} + a_5 \,.LN\ SIZE_{j,t} + a_6 \,.RGL_{2007} +$$

$$a_7 \,.\, RGL_{2012} + a_8 \,.\, d_{2004} + \ldots\ldots\ldots + a_{17} \,.\, d_{2013} + \gamma_{j,t} \qquad (2)$$

$CAP_{j,t}$ is the equity to assets ratio of bank j in month,

$LOANR_{j,t}$ is the weighted average lending rates of individual banks,

$DEP_{j,t}$ is the weighted average deposit rates,

$NIE_{j,t}$ is the non-interest expense to total assets ratio,

$NPL_{j,t}$ is the non-performing loan to total assets ratio,

LN ($SIZE_{j,t}$) is the natural logarithm of total assets of bank j in month t.

RGL_{2007} and RGL_{2012} are two dummy variables indicating the regulatory changes regarding to capital adequacy ratio in Turkey,

d_{2004}, d_{2005},…, d_{2013} are year dummy variables,

$\varepsilon_{j,t}$ and $\gamma_{j,t}$ are error terms.

A two stage model is employed in order to eliminate the endogeneity problem. I realized the existence of endogeneity due to the high causality relationship between equity to asset ratio and lending rate (Appendix B). At the first stage, I run a model which uses equity to asset ratio as dependent variable and the fitted values are used as input in the second stage model to estimate lending rate. In this regard, I eliminated the endogeneity problem arising from equity to asset ratio.

Heteroscedasticity and autocorrelation were the other econometrical problems (Appendix A). To get heteroscedasticity and autocorrelation adjusted estimates (HAC)[2] with fixed effects, I use Driscoll-Kraay (2000) adjustment.

5.2.1.1. Variables

5.2.1.1.1. Lending Rate

LOANR is the weighted average lending rates by maturity for Turkish lira denominated loans. It does not cover the interest rates of foreign exchange denominated loans.

5.2.1.1.2. Capital

Capital (CAP) is measured by the ratio of total equity to total assets. It is one of the main determinants of cost of funding for banks. Therefore, it is expected that capital has positive effect on lending rates. Similarly, capital in the previous period and any change in capital are expected to increase capital ratios.

[2] Stata code, xtscc

5.2.1.1.3. Deposit Interest Rate

Deposit interest rate (DEP) is measured as the weighted average deposit interest rates by currency and maturity. The weights are determined by the share of deposits in different maturities. Deposit rates have also direct effect on the cost of funding. Therefore, my preliminary expectation for deposit rate is that it should have positive effect on lending rates. Deposit rate may have twofold effect on equity to asset ratio. Since increases in deposit rate is reflected in income statement, the increase in deposit rates may cause the equity to asset ratio to decrease. On the other hand, deposit funding and equity funding are substitute of each other. Therefore, if the interest rate of deposits increases, banks may change their behavior and increase the share of capital in their balance sheet.

5.2.1.1.4. Non-Interest Expense

Non-interest expense (NIE) is the ratio of non-interest expense to total assets. Since it is hard to calculate non-interest expenses for collecting deposit, I approximated it by dividing total non-interest expenses to total assets. Since non-interest expense is directly reflected in cost of funding, my expectation is that it should have positive effect of lending rates. My expectation for the coefficient of non-interest expense on the equity to asset is the same as deposit

rates. I expect that non-interest expense may affect the equity to asset ratio in either way regarding the twofold effect on it.

5.2.1.1.5. Non-Performing Loans

Non-performing loan (NPL) is measured as the ratio of non-performing loan to total assets. Since non-performing loans are additional cost item for new lending, I expect that increase in NPL is also reflected in lending rates. Since it has direct effect on profitability, my expectation is that its coefficient in the model for equity to asset ratio is negative.

5.2.1.1.6. Size

Size is measured with the total assets of the banks. I took the logarithm of total assets. Also, in the real value analysis, all the total asset data is expressed as of January 2003 CPI.

I expect that size has positive effect on lending rates since big banks may have better power to control lending and deposit interest rates. In addition to this, it is hard to determine the direction of the effect of the size on equity to asset ratio.

The model to analyze the relationship between equity to asset ratio and lending rate is estimated for nominal and real interest rates. In the estimation of real lending rate, all monetary values, i.e., size is expressed in terms of January 2003 values, calculated using CPI.

5.2.1.1.7. Regulation and Year Dummies

Turkish legislation on the capital adequacy ratios is modified several times between 2002 and 2013. Among those changes November 2006 (put into force in June 2007) legislation and June 2012 legislation which is still in force have significantly affected capital adequacy ratios of banks. Therefore, I added regulation dummies (RGL) to control its effects. In addition to this year dummy variables for year effects are added in the model, taking 2003 as a base year.

Lending rates have decreased gradually in Turkey since 2003 because of decline in inflation rate. Therefore, I expect that the coefficients of year dummies to have negative signs in lending rate model. Additionally, regulations have tightened the capital adequacy obligations of Turkish banks. RGL variables are expected to have positive effect on lending rates and equity to asset ratio.

5.2.2. Bank Response to Regulatory Pressure Model

Capital adequacy ratio which is defined by the Basel Committee has two main components: capital and risk. Banks can change their capital adequacy ratio both by increasing their capital level or decreasing the share of risky assets. Hence, the regulatory pressure on capital adequacy ratio will simultaneously affect both capital and risk levels of banks.

In analyzing the bank's response to regulatory pressure, a simultaneous equations model developed by Shrieves and Dahl (1992) and Rime (2001) is employed. Their model recognizes that change in both capital and risk has exogenous and endogenous components and focuses on the determination of endogenous changes in capital (risk) that are induced by both exogenous and endogenous change in risk (capital).

The following simultaneous equations model is estimated:

$$\Delta CAP_{j,t} = a_0 + a_1 . REG_{j,t-1} + a_2 . ROA_{j,t} + a_3 . SIZE_{j,t} + a_4 . \Delta RISK_{j,t} - a_5 . CAP_{j,t-1}$$

$$+a_6 . RGL_{2007} + a_7 . RGL_{2012} + a_8 . d_{2004} + \ldots\ldots\ldots\ldots + a_{17} . d_{2013} + \varepsilon_{j,t} \quad (3)$$

$$\Delta RISK_{j,t} = a_0 + a_1 . REG_{j,t-1} + a_2 . LLOSS_{j,t} + a_3 . SIZE_{j,t} + a_4 . \Delta CAP_{j,t} - a_5 . RISK_{j,t-1}$$

$$+a_6 . RGL_{2007} + a_7 . RGL_{2012} + a_8 . d_{2004} + \ldots\ldots\ldots\ldots + a_{17} . d_{2013} + \gamma_{j,t} \quad (4)$$

$\Delta CAP_{j,t}$ and $\Delta RISK_{j,t}$ are the change in equity to assets ratio and change in risk weighted assets to total assets ratio of bank j from month t-1 to t, respectively.

$REG_{j,t}$ is the dummy variable for regulatory pressure,

$ROA_{j,t}$ is the ratio of net income to total assets,

$SIZE_{j,t}$is measured within the natural logarithm of total assets,

$LLOSS_{j,t}$ represents the ratio of loan loss provisions to total assets,

RGL_{2007}: is dummy variable for the 2007 capital adequacy ratio regulatory change,

RGL_{2012} is dummy variable for the 2012 capital adequacy ratio regulatory change,

d_{2004}, d_{2005},…, d_{2013} are year dummies,

$\varepsilon_{j,t}$ and $\gamma_{j,t}$ are error terms.

5.2.2.1. Variables

5.2.2.1.1. Risk

Risk is measured with the ratio of risk weighted assets (RWA) to total assets. If the bank holds less risky assets, the ratio will approach to 0, in other words risky banks have higher RISK coefficient. An increase in RWA to total assets ratio indicates an increase in the riskiness of a bank. ΔRISK is the change in the RWA to total assets ratio from month t-1 to t.

5.2.2.1.2. Regulatory Pressure

In the literature regulatory pressure is defined in several ways as explained in the literature review chapter. For example, Ediz et al. (1998) defines a dummy which takes 1, if capital level decreases for three consecutive periods. As an alternative measure, they define a target capital as a summation of the regulatory minimum capital and one standard deviation of actual capital hold by an individual bank. If the actual capital level is below this target capital, bank will face a regulatory pressure.

In the analysis, the second approach is followed to define regulatory pressure in Turkish banking system. During the sample period December 2002-2013, banks in Turkey mostly satisfied the minimum capital requirements both at the aggregate level and individually. Therefore, I evaluated that banks are exposed to regulatory pressure if they have lower capital than the regulatory minimum plus bank specific standard deviation of capital ratio. A dummy variable is created that takes a value of 1 if the capital ratio is less than target ratio and 0 if it is higher than the target. Based on this definition, Turkish banks are exposed to regulatory pressure 1151 times during the period December 2002-2013. Total observation is 2966.

I expect that regulatory pressure has positive effect on change in capital and negative effect on change in risk. In the model, profitability, size, loan loss provisions, regulatory changes and year effects are controlled.

5.2.2.1.3. Return on Asset

Profitability is measured with return on asset which is one of determinants of change in capital since shifts in profitability are reflected directly in capital. Based on this assertion, ROA is expected to have positive effect on the change in capital.

5.2.2.1.4. Size

Size is specified as the natural logarithm of total assets. Although the coefficient of size in the capital model is ambiguous since big banks may have potential to better manage their risks, it is expected to be negative in the change in risk model.

5.2.2.1.5. Loan Loss Provisions

Loan loss provision (LLOSS) is calculated by dividing loan loss provision by the total assets. If bank holds more risky assets in their portfolio, their risk is higher. So, the coefficient of LLOSS is expected to be positive in the risk model.

5.2.2.1.6. Regulation and Year Dummies

Regulation dummy variables that are defined in part 5.2.1.1.7 are also used in this model. I also added year dummies in order to capture the year effects on change in capital and change in risk.

The models are estimated for all banks as well as the three types of banks by ownership , i.e., state, private and foreign separately.

CHAPTER 6

EMPIRICAL RESULTS

6.1. Descriptive Statistics

6.1.1. Relationship between Equity to Asset Ratio and Lending Rate Model

The descriptive statistics of the variables used in the analysis are represented in Table 4. There are 29 commercial banks operating in Turkey during the time period between December 2002 and December 2013. There are 3259 observations between 2002 and 2013.

The mean value of the equity to asset ratio (CAP) is 0.1643. Although on average Turkish banks did not experience capital adequacy related

problems in the sample period, there are some banks that have lower equity to asset ratio than regulatory minimum. The minimum and maximum values for the equity to asset ratio are 0.033 and 0.916 respectively between 2002 and 2013.

The average value of the lending rate (LOANR) is 25.05%. The minimum rate for the lending is 6.11% whereas the maximum is 102.84%. At the beginning of the sample period, inflation and interest rates were high. The standard deviation, 14.33%, indicates big variation in lending rates over the sample period.

The mean value for the deposit rate (DEP) is 14.25%. The minimum and maximum values for the deposit rates are 2.49 and 56.47% respectively. The standard deviation is also high for deposit rate which is 8.14%.

The mean value for the non-interest expense (NIE) to total assets ratio is 0.466. The minimum value for non-interest expense to total asset ratio is -3.75 whereas the maximum is 20.13. The non-interest expense is found by summing total non-interest expenses and total other non-interest expense (income) items in income statement. Since it is possible for total other non-

interest expense (income) item to have negative balance, the non-interest expense to total assets ratio gets negative values for some observations.

The average value of the non-performing loan (NPL) to total asset ratio is 3.58 during the sample period between 2002 and 2013. The minimum value for the NPL to total assets is 0 which means that there were some banks which experienced periods with no NPL. The maximum value, 78.33, is recorded by a bank that is in a liquidation process.

Table 4. Descriptive Statistics for the Variables Used in the Lending Rate Model

Variable	Mean	Std. Dev.	Min	Max	# of Obs.
$CAP_{j,t}$	0.16	0.15	0.03	0.92	3259
$LOANR_{j,t}$	25.05	14.33	6.11	102.84	3149
$\Delta CAP_{j,t-1}$	0.00	0.02	-0.40	0.45	3201
$DEP_{j,t}$	14.27	8.13	2.49	56.47	3254
$NIE_{j,t}$	0.47	0.66	-3.75	20.13	3230
$NPL_{j,t}$	3.58	8.78	0.00	78.33	3259
$LN\ (SIZE_{j,t})$	15.73	2.02	10.11	19.15	3259
$SIZE_{nominal\ (000)}$	27,421,234	722,022	24,661	207,529,954	3259
$SIZE_{real\ (000)}$	15,536,432	364,350	20,644	86,410,357	3231

Table 5 reports the descriptive statistics for each year. Lending rates and deposit rates have decreased gradually, consistent with the decline in inflation rate. The equity to asset ratios is high in highly profitable years

which is parallel with my expectations (see Chapter 2). NPL to total asset ratio has experienced increase after 2003 and this increase lasts 2011 which can be evaluated as the end of global financial crisis period. There was no jump in 2009 even if loan loss provisions increased during the global crisis years (see Table 2). There might be two explanations. First, the total assets increased in the same period very rapidly and NPL increased slower proportionally and NPL to total assets ratio decreased. Second, non-performing loans may be excluded from the balance sheet by a loss in income statement. It is observed that the non-interest expenses have decreased over time.

Table 5. Descriptive Statistics for the Selected Variables in Lending Rate Model on a Yearly Basis

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
$LOANR_{j,t}$ (%)												
Mean	57.74	52.35	36.03	28.24	23.92	24.29	23.38	21.30	15.00	13.77	15.21	12.38
Std. Dev.	13.79	14.42	13.65	10.77	6.57	5.05	5.05	5.06	3.12	2.09	2.41	2.20
Min	34.55	23.17	17.68	14.72	13.30	15.20	15.42	8.82	8.87	8.04	7.15	6.11
Max	89.16	102.84	101.79	73.02	49.61	45.43	46.56	48.81	27.64	18.57	19.94	18.93
# of Obs.	27	318	311	296	285	276	276	276	276	265	267	276
$CAP_{j,t}$												
Mean	0.17	0.18	0.18	0.17	0.15	0.15	0.16	0.17	0.18	0.15	0.16	0.15
Std. Dev.	0.17	0.13	0.13	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Min	0.03	0.03	0.07	0.06	0.05	0.06	0.06	0.07	0.08	0.07	0.07	0.04
Max	0.85	0.92	0.73	0.82	0.84	0.85	0.85	0.85	0.85	0.85	0.85	0.85
# of Obs.	28	318	312	308	297	288	288	288	288	277	279	288
$DEP_{j,t}$ (%)												
Mean	37.24	32.18	19.55	14.75	14.45	15.53	15.48	10.03	7.43	7.57	8.48	6.57
Std. Dev.	7.27	7.72	2.42	1.87	2.37	1.92	2.46	2.46	1.05	1.59	1.95	1.54
Min	25.12	9.42	9.78	9.62	6.58	9.74	7.85	4.37	4.06	3.03	3.04	2.49
Max	52.88	56.47	26.19	21.00	19.47	19.63	21.41	17.25	9.54	11.52	12.26	9.65
# of Obs.	27	317	312	306	297	288	288	288	287	277	279	288
$NIE_{j,t}$ (%)												
Mean	-	0.57	0.66	0.60	0.50	0.44	0.46	0.40	0.41	0.36	0.36	0.34
Std. Dev.	-	0.96	0.74	1.40	0.70	0.36	0.46	0.21	0.22	0.17	0.22	0.20
Min	-	-2.75	-3.19	-0.54	-3.75	-0.18	-1.09	-0.09	-0.02	-0.04	0.04	-0.05
Max	-	5.71	5.51	20.13	4.96	5.62	7.07	1.14	1.61	1.1	1.67	2.22
# of Obs.	-	318	312	308	297	288	288	288	288	277	278	288
$NPL_{j,t}$ (%)												
Mean	2.71	2.85	3.25	4.35	4.87	4.66	4.32	3.65	3.78	2.66	2.53	2.45
Std. Dev.	2.39	2.55	6.72	12.16	15.04	14.65	12.92	3.38	3.02	2.43	2.45	2.40
Min	0.01	0.00	0.00	0.00	0.00	0.01	0.08	0.61	0.52	0.20	0.00	0.00
Max	7.32	20.05	51.06	78.30	78.33	76.14	75.86	18.19	18.44	12.82	12.97	12.91
# of Obs.	28	318	312	308	297	288	288	288	288	277	279	288
LN ($SIZE_{j,t}$)												
Mean	14.48	14.64	14.90	15.14	15.49	15.67	15.90	16.00	16.11	16.40	16.53	16.69
Std. Dev.	1.91	1.80	1.81	1.87	1.87	1.91	1.90	1.93	1.98	2.01	2.00	1.99
Min	10.11	10.64	11.14	10.72	10.72	10.75	10.75	10.82	10.82	10.84	10.82	10.82
Max	17.44	17.66	17.86	17.99	18.14	18.21	18.46	18.64	18.83	18.95	18.99	19.15
# of Obs.	28	318	312	308	297	288	288	288	288	277	279	288

Table 6 reports the descriptive statistics of the variables used in the analysis based on the bank type. At first glance, I realized that state banks operate with lower capital adequacy ratios and higher leverage ratios than private and foreign banks. In addition, state banks have lower loan-deposit spreads compared to foreign and private peers. Private banks have highest non-performing loan ratio although their average lending rates are not the highest. Foreign banks have a good mixture of loans since they lend with the highest rate and they have lowest non-performing loans ratio.

Table 6. Descriptive Statistics for Variables in Lending Rate Model Based on Bank Type

Variable	Mean	Std. Dev.	Min	Max
$CAP_{j,t}$				
State	0.10	0.00	0.10	0.10
Private	0.14	0.00	0.13	0.14
Foreign	0.16	0.00	0.15	0.16
$LOANR_{j,t}$				
State	21.43	0.55	20.34	22.51
Private	24.34	0.33	23.70	24.98
Foreign	25.75	0.45	24.86	26.64
$DEP_{j,t}$				
State	13.55	0.38	12.81	14.29
Private	14.79	0.20	14.40	15.18
Foreign	13.38	0.21	12.98	13.79
$NIE_{j,t}$				
State	0.23	0.01	0.22	0.24
Private	0.45	0.02	0.42	0.48
Foreign	0.50	0.01	0.47	0.53
$NPL_{j,t}$				
State	2.60	0.09	2.43	2.77
Private	2.35	0.08	2.19	2.50
Foreign	2.25	0.05	2.16	2.34
LN ($SIZE_{j,t}$)				
State	17.88	0.03	17.82	17.95
Private	15.93	0.05	15.84	16.03
Foreign	15.27	0.05	15.18	15.36

Pairwise correlations of the variables are represented in Table 7. The correlations have high variability for the regression ranging between 0.4484 (NPL and fitted E/A) and -0.9422 (logarithm of assets and fitted E/A). Since the correlation between logarithm of assets and fitted E/A are very high, I also conducted my analysis by excluding logarithm of assets from the model. However, the results did not change significantly. Logarithm of assets is negatively correlated with other independent variables. The correlation of all variables with each other is less than 0.5 and greater than -0.5 except for logarithm of assets and fitted E/A.

Table 7. Pairwise Correlations of Variables Used in the Lending Rate Model

	Equity to asset ratio	Fitted E/A	Lending Rate	Change in E/A ratio (lagged)	Deposit Rate	NIE to Asset	NPL to Asset ratio	Logarithm of Assets
Equity to asset ratio	1							
Fitted E/A	0.7269	1						
Lending Rate	0.2066	0.0114	1					
Change in equity to asset ratio (lagged)	0.0553	0.0225	0.0389	1				
Deposit Rate	-0.0593	-0.0249	0.7651	0.0481	1			
Non-Interest Expense to Asset	0.2728	0.2458	0.1705	-0.0092	0.0782	1		
Non-Performing Loans to Asset	0.6846	0.4484	0.1627	0.0259	-0.0717	0.2215	1	
Logarithm of assets	-0.6176	-0.9422	-0.256	-0.0093	-0.2385	-0.2544	-0.3539	1

6.1.2. Bank Response to Regulatory Pressure Model

The descriptive statistics for the variables used in the bank response to regulatory pressure model is represented in Table 8. The statistics are calculated by using monthly data of individual banks between December 2002 and December 2013.

The mean change in E/A ratio is -0.0001, almost zero. The risk weighted assets to total assets ratio (change in risk) increased 29.5% on average. Two different explanation can be derived for the positive value of change in risk variable. First, the banks operating in Turkey moved their investments to riskier projects. As a second explanation, the regulations enacted in Turkey increased the risk weights of the current composition of assets. From my point of view both of the explanations are valid for the Turkish banking system.

The regulatory pressure dummy variable indicates that Turkish banks exposed to regulatory pressure in 38.81% of the bank-month combinations. Given the observation that Turkish banks hold higher capital than the regulatory minimum, the regulatory dummy variable seems to overestimate the pressure level. On the other hand, since the standard deviation of the bank

specific standard deviations for capital is so high, the number of pressure periods increased.

The average monthly ROA and loan loss provisions to total asset are 0.116% and 0.073% respectively. Turkish banks are profitable on average during the sample period between December 2002 and December 2013. Turkish banks allocate 0.073 percent of their assets as provision on a monthly basis on average.

The mean of the risk weighted assets to total assets (risk level) is 71.08 percent. Since the standard deviation of risk level is considerably high (22%), there is high variation in the riskiness behavior of Turkish banks.

Table 8. Descriptive Statistics for Regulatory Pressure Model

Variable	Mean	Std. Dev.	Min	Max	# of Obs.
Change in Equity to Asset Ratio	0.00	0.02	-0.12	0.17	2966
Change in Risk	0.30	4.33	-35.15	23.61	2964
Regulatory Pressure	0.39	0.49	0	1	2966
Return on Asset	0.12	0.61	-19.10	5.46	2966
Ln Size	15.94	1.97	11.00	19.00	2993
Initial Equity to Asset	0.16	0.15	0.03	0.85	2965
Loan Loss Provisions to Assets	0.07	0.26	-0.42	7.98	2966
Initial Risk Level	71.09	21.93	9.13	124.45	2965

Table 9. Descriptive Statistics for Regulatory Pressure Model on a Yearly Basis

$\Delta CAP_{j,t}$	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Mean	0.0035	0.0004	0.0000	-0.0010	0.0012	-0.0001	0.0014	-0.0006	-0.0009	-0.0014	-0.0013
Std. Dev.	0.02	0.01	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.03	0.01
Min	-0.05	-0.07	-0.12	-0.08	-0.09	-0.10	-0.07	-0.08	-0.05	-0.40	-0.04
Max	0.17	0.07	0.12	0.08	0.08	0.08	0.08	0.08	0.08	0.06	0.04
# of Obs.	294	288	284	273	264	264	264	264	253	254	264
$\Delta RISK_{j,t}$											
Mean	0.38	0.59	0.08	0.26	1.09	-0.18	0.19	0.24	0.12	0.02	0.42
Std. Dev.	4.46	4.17	4.08	4.26	4.50	5.23	4.66	4.15	3.49	4.13	4.27
Min	-35.15	-15.10	-15.59	-17.66	-20.33	-15.47	-27.64	-15.27	-12.63	-18.91	-19.81
Max	19.18	20.18	21.16	20.05	17.91	23.22	21.99	18.95	14.49	23.61	16.59
# of Obs.	293	288	284	273	264	264	264	264	253	254	263
$REG_{j,t}$											
Mean	0.80	0.78	0.73	0.65	0.55	0.41	0.14	0.05	0.01	0.00	0.01
Std. Dev.	0.40	0.41	0.45	0.48	0.50	0.49	0.35	0.21	0.11	0.00	0.11
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
# of Obs.	294	288	284	273	264	264	264	264	253	254	264
$ROA_{j,t}$ (%)											
Mean	0.15	0.02	0.05	0.17	0.18	0.15	0.16	0.14	0.09	0.10	0.07
Std. Dev.	0.54	1.17	1.35	0.32	0.34	0.21	0.16	0.25	0.13	0.16	0.16
Min	-3.81	-11.28	-19.10	-1.09	-4.43	-0.58	-0.95	-0.42	-0.50	-1.09	-0.48
Max	3.04	5.46	1.41	3.42	1.46	1.36	0.67	3.11	1.24	0.84	1.10
# of Obs.	294	288	284	273	264	264	264	264	253	254	264
$SIZE_{j,t}$											
Mean	14.92	15.12	15.36	15.68	15.83	16.11	16.17	16.30	16.58	16.75	16.91
Std. Dev.	1.68	1.74	1.82	1.82	1.83	1.82	1.87	1.96	2.03	2.01	2.02
Min	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Max	18.00	18.00	18.00	18.00	18.00	18.00	19.00	19.00	19.00	19.00	19.00
# of Obs.	294	288	284	273	264	264	264	264	253	255	264
$CAP_{j,t-1}$											
Mean	0.16	0.17	0.17	0.15	0.15	0.16	0.17	0.17	0.16	0.16	0.15
Std. Dev.	0.10	0.13	0.14	0.15	0.15	0.16	0.15	0.15	0.16	0.16	0.15
Min	0.03	0.07	0.06	0.06	0.06	0.06	0.07	0.08	0.07	0.07	0.04
Max	0.68	0.73	0.81	0.84	0.85	0.85	0.85	0.85	0.85	0.85	0.85
# of Obs.	294	288	284	273	264	264	264	264	253	254	263
$LLOSS_{j,t}$											
Mean	0.07	0.14	0.06	0.04	0.05	0.08	0.13	0.06	0.03	0.06	0.06
Std. Dev.	0.30	0.73	0.11	0.07	0.09	0.11	0.12	0.08	0.04	0.07	0.06
Min	-0.42	-0.08	-0.13	-0.10	-0.35	-0.25	-0.17	-0.26	-0.10	-0.14	-0.14
Max	3.38	7.98	0.83	0.54	0.90	0.75	0.64	0.55	0.26	0.46	0.39
# of Obs.	294	288	284	273	264	264	264	264	253	254	264
$RISK_{j,t-1}$											
Mean	51.48	57.43	60.42	63.06	70.61	82.04	77.39	80.63	79.76	82.24	82.29
Std. Dev.	21.62	21.76	22.03	22.06	22.01	20.23	16.41	17.67	13.21	12.44	13.14
Min	9.13	10.73	14.78	11.62	19.63	35.19	34.50	36.20	46.00	51.97	42.34
Max	121.14	108.82	115.81	109.43	117.42	124.45	107.44	109.19	103.10	105.31	99.66
# of Obs.	294	288	284	273	264	264	264	264	253	254	263

Pairwise correlations of the variables are represented in Table 10. The correlations of the independent variables vary between -0.61 and 0.187. Most of the independent variables have negative correlations meaning that they behave in opposite directions. In addition to this, the measure of the movements is not so high considering that most of the correlation values are close to 0.

Table 10. Pairwise Correlations of Variables Used in the Regulatory Pressure Model

	Change in E/A Ratio	Change in Risk	Regulatory Pressure	Return on Asset	Size	Initial Equity to Asset	Loan Loss Provisions to Assets	Initial Risk Level
Change in E/A Ratio	1							
Change in Risk	0.4278	1						
Regulatory Pressure	0.024	0.0362	1					
Return on Asset	0.1073	0.0277	0.05	1				
Size	-0.0524	-0.0173	-0.0918	0.1392	1			
Initial Equity to Asset	-0.0268	-0.0374	-0.2281	-0.1807	-0.61	1		
Loan Loss Provisions to Assets	0.0332	-0.0376	-0.043	-0.4768	-0.07	0.1169	1	
Initial Risk Level	-0.0795	-0.1199	-0.2381	0.0726	0.187	-0.2458	-0.0337	1

6.2. Result of the Regression Model

6.2.1. Relationship between Equity to Asset Ratio and Lending Rate

Two models are estimated to examine the relationship between equity to asset ratio and lending rate. Model I controls for equity to asset ratio,

deposit rate, non-interest expense, non-performing loans and total assets. Total assets are not controlled in Model II because of high correlation between predicted equity to asset ratio and total assets which is -0.942. It is found that, heightening equity to asset ratio by 1 percent increase lending rates by 17.33 basis points (Table 11). When the size of the bank is controlled, a one percent increase in CAR is expected to 32.6 basis points increase in lending rates. The expected rate is similar to what was estimated using Elliot (2009) model. On overall, the sign of equity to asset coefficient is positive as expected. The effect increases to 18.68 basis points when I run analysis by using inflation adjusted real values. I reached interesting results when I run the same model to state banks, private banks and foreign banks individually. Increasing equity to assets ratio by 1 percent leads to -125.41, 8.43 and 43.85 basis points change on lending rates of state, private and foreign banks respectively. Subgroups respond to equity to asset changes differently. State banks decrease their lending rates when they increase their capital adequacy level.

Deposit rates have significant and positive impact on lending rates. This statement is also valid for the subgroups.

The coefficients of non-interest expense to total assets variable get negative values in all analyses except for private banks. On the other hand, none of the coefficients are significant. This insignificant effect of non-interest expense can be explained with the proxy used, since it includes all expenses not specifically for collecting deposits.

Non-performing loan to total asset variable has negative sign in estimating nominal, real lending rate and foreign bank lending rates. It is positive for state and private banks. The coefficients for state banks, private banks and foreign banks are found to be significant at 5, 10 and 1 percent level respectively. My preliminary expectation was NPL to asset ratio has significant and positive impact on lending rates. However, the reflection of higher NPL to asset ratio has no significant effect on overall analysis and negative impact on foreign bank lending rates.

The regulation dummy variables that are used to control the effects of regulatory changes are not found to have significant impact on lending rates except for RGL_{2012} variable in foreign bank analysis. The insignificant coefficients can be explained by the fact that Turkish banks are well

capitalized. Therefore, the changes in capital adequacy requirements have not reflected significantly on lending rate choices of banks.

Both nominal and real lending rates in all years are significantly lower than those in 2003. The coefficient of year dummy variables are negative and significant impact on lending rates. In the analysis, I take 2003 as the base year and the coefficients compare the related year's effect with 2003. The coefficients in nominal analysis decrease gradually almost all years. I deduce that lending rates decreased gradually almost all years after 2003 and this is parallel to my expectation.

Table 11. Second Stage Regression Results for the Lending Rate Model

Dependent Variable: Lending Rate	Nominal Rates		Real Rates		State		Private		Foreign	
	I	II	I	II	I	II	I	II	I	II
Constant	-7.8478	32.4838***	-2.9101	28.5964***	155.1783*	26.1995**	23.8572	28.4530***	-10.4784	40.6669***
	(19.8469)	(2.7425)	(8.6790)	(2.3877)	(37.1276)	(4.0533)	(19.2365)	(2.3804)	(28.2736)	(4.3951)
Equity to asset ratio	32.6048***	17.3265***	36.5839***	18.6759***	-92.7566*	-125.4085*	10.0125	8.4309**	64.2526***	43.8515***
	(6.6405)	(3.9859)	(5.5243)	(3.5800)	(27.3423)	(29.8807)	(6.9753)	(3.1114)	(11.8349)	(12.3361)
Deposit Rate	0.5829***	0.5450***	0.6974***	0.6394***	0.6007*	0.6170*	0.6353***	0.6302***	0.3611**	0.3409**
	(0.0745)	(0.0702)	(0.0722)	(0.0672)	(0.1716)	(0.1786)	(0.0520)	(0.0557)	(0.1344)	(0.1337)
Non-Interest Expense	-0.0210	-0.0706	-0.0271	-0.0546	-0.4748	-0.9075	0.2303	0.2236	-0.5211	-0.5367
	(0.2924)	(0.2807)	(0.2907)	(0.2777)	(1.7265)	(1.7524)	(0.1872)	(0.1841)	(0.5248)	(0.5270)
Non-Performing Loans to Asset	-0.0683	-0.0952	-4.9506	-6.8385	1.9787*	2.7093**	0.2206*	0.2176*	-1.4399***	-1.5683***
	(0.0809)	(0.0789)	(7.3368)	(7.4658)	(0.6414)	(0.5171)	(0.1179)	(0.1184)	(0.3414)	(0.2950)
Logarithm of assets	2.4752*		1.8122***		-7.5382*		0.2833		3.2894	
	(1.2269)		(0.4724)		(2.2059)		(1.2287)		(1.8107)	
Reg 2007	-0.3898	-0.0962	-0.1057	0.0808	0.0545	-0.3408	-0.2060	-0.1636	-0.1259	0.2267
	(0.2501)	(0.2022)	(0.3791)	(0.3712)	(0.2417)	(0.2130)	(0.3116)	(0.2356)	(0.3602)	(0.3143)
Reg 2012	-0.7818**	-0.3417	-0.3199	-0.1873	1.2618	0.7260	0.2165	0.2758	-1.9053***	-1.3724**
	(0.3516)	(0.2825)	(0.4481)	(0.4477)	(0.6102)	(0.5028)	(0.4363)	(0.3158)	(0.5464)	(0.4762)
d2004	-9.4254***	-9.3219***	-7.6978***	-8.0839***	-7.1677*	-7.2610*	-7.7562***	-7.7503***	-12.2745***	-11.9259***
	(1.6852)	(1.6342)	(1.5040)	(1.4641)	(2.2838)	(2.2078)	(1.4259)	(1.4112)	(2.3321)	(2.2786)
d2005	-14.7489***	-14.3195***	-12.0429***	-12.5491***	-3.6235	-4.4166	-12.1930***	-12.1548***	-20.0888***	-19.1364***
	(2.0052)	(1.9566)	(1.9003)	(1.8307)	(2.7576)	(2.5963)	(1.7833)	(1.7598)	(2.6869)	(2.6336)
d2006	-19.4654***	-18.5699***	-16.3534***	-16.8149***	-3.5697	-5.3120	-16.3005***	-16.1954***	-25.3600***	-23.9918***
	(1.7946)	(1.6386)	(1.5519)	(1.4687)	(2.9486)	(2.6356)	(1.6816)	(1.4751)	(2.3836)	(2.2683)
d2007	-20.2738***	-18.9023***	-17.1396***	-17.3112***	-3.0677	-5.4479	-16.3630***	-16.1951***	-26.71844***	-24.7775***
	(1.8074)	(1.5652)	(1.4624)	(1.392)	(2.8619)	(2.4820)	(1.7703)	(1.4233)	(2.3156)	(2.1430)

d2008	-21.7990***	-19.8405***	-18.4658***	-18.4009***	-4.9049	-8.7625*	-17.5519***	-17.3285***	-28.2358***	-25.1736***
	(1.9520)	(1.5807)	(1.5260)	(1.4694)	(2.9881)	(2.3750)	(1.9189)	(1.4213)	(2.5552)	(2.2270)
d2009	-21.3321***	-19.0570***	-17.1666***	-17.0101***	-2.4118	-7.9708	-16.6975***	-16.4385***	-26.8621***	-23.1627***
	(2.4045)	(2.0229)	(1.9186)	(1.8610)	(4.0897)	(2.9921)	(2.2986)	(1.7598)	(3.3441)	(2.7020)
d2010	-26.4332***	-23.9383***	-21.7956***	-21.6390***	-2.9183	-9.5341	-21.5009***	-21.2180***	-32.1328***	-28.1485***
	(2.5704)	(2.1241)	(2.0159)	(1.9520)	(4.7801)	(3.444)	(2.4866)	(1.8459)	(3.6792)	(2.9265)
d2011	-27.9593***	-25.0241***	-23.1791***	-22.8273***	-2.4755	-10.4496*	-22.1285***	-21.7788***	-34.6297***	-30.4182***
	(2.6616)	(2.0846)	(2.0088)	(1.9225)	(4.9858)	(3.3691)	(2.7128)	(1.8693)	(3.7694)	(2.9234)
d2012	-27.3398***	-24.0212***	-22.3167***	-21.7698***	-1.0272	-9.3506	-21.1013***	-20.7040***	-34.3064***	-29.6685***
	(2.6859)	(1.9454)	(1.8592)	(1.7777)	(4.9676)	(3.2826)	(2.7677)	(1.7292)	(3.7317)	(2.7237)
d2013	-28.9687***	-25.4467***	-23.4848***	-23.0318***	-1.6045	-11.3484*	-22.7293***	-22.3123***	-36.0519***	-31.0983***
	(2.8703)	(2.0460)	(1.9568)	(1.8619)	(5.4152)	(3.4025)	(2.9324)	(1.8243)	(4.0642)	(2.9077)
within R-squared	0.7829	0.7824	0.7792	0.7783	0.9317	0.9281	0.8274	0.8274	0.7503	0.7489
F Value	786.57	921.78	485.1	523.11	1350.24	1067.8	1018.93	1074.8	1283.72	805.9
P Value	0.0000	0.0000	0.0000	0.0000	0.0007	0.0009	0.0000	0.0000	0.0000	0.0000

Heteroscedasticity and autocorrelation adjusted standard errors are represented in parentheses. (***), (**) and (*) indicate significance of 1, 5, and 10% levels separately.

Table 12 presents the estimated coefficients of the first stage model predicting equity to asset ratio. All of the variables in the model except for 2004 and 2005 year dummy variables are found to be significant. The change in equity to asset ratio has positive and significant impact on equity to asset ratio. On the other hand, when I consider initial period equity to asset ratio, the impact of the previous period change in equity to asset ratio changes its sign but maintains its significance. In other words, higher equity to asset ratio in previous period decreases the impact of change in equity to asset ratio on current level equity to asset ratio. Deposit rate, non-interest expense to total asset and non-performing loan to total asset ratios have negative and significant impact on equity to asset ratio. The interaction effects of these variables with initial equity to asset ratio are found to be positive and significant. Size of banks is found to have negative impact on equity to asset ratio which is consistent with the preliminary expectations. Regulation changes in 2007 have significant effect only on private banks' equity to asset choices. On the other hand, regulations in 2012 have significantly affected the capital choices of state, private and foreign banks.

Table 12. First Stage Regression Results of Equity to Asset Ratio					
Dependent Variable: Equity to Asset	**Nominal**	**Real**	**State**	**Private**	**Foreign**
Constant	1.6363***	1.0649***	0.0825	1.7765***	0.9735***
	(0.1112)	(0.1076)	(0.0970)	(0.1321)	(0.0673)
Change in equity to asset ratio (lagged)	0.2117***	0.1401**	0.5643	0.3099**	-0.3520***
	(0.0595)	(0.0661)	(0.3202)	(0.1329)	(0.1046)
Change in equity to asset ratio (lagged)*initial equity to asset ratio	-0.4836***	-0.4613**	-5.1332	-0.6350***	1.6418***
	(0.1494)	(0.1714)	(3.4696)	(0.1671)	(0.3834)
Deposit Rate	-0.0045***	-0.0052***	-0.0020*	-0.0051***	-0.0048***
	(0.0006)	(0.0008)	(0.0006)	(0.0011)	(0.0005)
Deposit Rate*initial equity to asset ratio	0.0176***	0.0180***	0.0196*	0.0174***	0.0272***
	(0.0010)	(0.0012)	(0.0052)	(0.0012)	(0.0024)
Non-Interest Expense to Asset	-0.0110***	-0.0120***	-0.0359*	-0.0136***	-0.0113**
	(0.0018)	(0.0027)	(0.0085)	(0.0029)	(0.0043)
Non-Interest Expense to Asset*initial equity to asset ratio	0.01560***	0.0210**	0.2911*	0.0190***	0.0424
	(0.0046)	(0.0080)	(0.0794)	(0.0055)	(0.0249)
NPL to Asset	-0.0029**	-0.2630**	-0.0056	-0.0042**	-0.0070**
	(0.0011)	(0.1086)	(0.0024)	(0.0017)	(0.0027)
NPL to Asset*initial equity to asset ratio	0.0042***	0.3501***	0.0887*	0.0057***	0.0096
	(0.0011)	(0.1177)	(0.0229)	(0.0019)	(0.0135)
Logarithm of assets	-0.0957***	-0.0557***	0.0001	-0.1040***	-0.0554***
	(0.0070)	(0.0066)	(0.0055)	(0.0078)	(0.0045)
Reg 2007	0.0109***	0.0057***	0.0013	0.0149***	0.0043
	(0.0029)	(0.0017)	(0.0017)	(0.0036)	(0.0034)
Reg 2012	0.0165***	0.0035	0.0069*	0.0203***	0.0087**
	(0.0034)	(0.0028)	(0.0020)	(0.0044)	(0.0036)
d2004	0.0008	-0.0180	0.0026	-0.0044	0.0085**
	(0.0080)	(0.0113)	(0.0019)	(0.0154)	(0.0033)
d2005	0.0118	-0.0245*	0.0083*	0.0048	0.0193***
	(0.010)	(0.0136)	(0.0024)	(0.0192)	(0.0036)
d2006	0.0264**	-0.0275**	0.0104*	0.0250	0.0187***
	(0.0100)	(0.0132)	(0.0029)	(0.0184)	(0.0046)
d2007	0.0460***	-0.0168	0.0114*	0.0479***	0.0336***
	(0.0091)	(0.0121)	(0.0036)	(0.0161)	(0.0044)
d2008	0.0704***	-0.0076	0.0060	0.0690***	0.0585***
	(0.0108)	(0.0125)	(0.0045)	(0.0165)	(0.0080)
d2009	0.0838***	-0.0042	0.0048	0.0839***	0.0789***
	(0.0126)	(0.0158)	(0.0051)	(0.0211)	(0.0081)
d2010	0.0918***	-0.0053	0.0090	0.0918***	0.0845***
	(0.0138)	(0.0175)	(0.0059)	(0.0234)	(0.0082)
d2011	0.1012***	-0.0085	0.0060	0.1098***	0.0669***
	(0.0145)	(0.0171)	(0.0068)	(0.0229)	(0.0082)
d2012	0.1171***	0.0001	0.0104	0.1284***	0.0750***
	(0.0142)	(0.0156)	(0.0071)	(0.0213)	(0.0082)
d2013	0.1218***	-0.0064	0.0063	0.1328***	0.0725***
	(0.0151)	(0.0164)	(0.0082)	(0.0221)	(0.0087)
R-squared	0.6779	0.5243	0.8558	0.7487	0.7157
F Value	167.56	88.68	144.34	181.84	182.88
P Value	0.0000	0.000	0.0069	0.000	0.000

Heteroscedasticity and autocorrelation adjusted standard errors are represented in parentheses. (***), (**) and (*) indicate significance of 1, 5, and 10% levels separately.

When I compared my study's results with the Cosimano and Hakura (2011), I noticed that the findings almost overlap. In the first stage, the signs of all variables and significances in my study are parallel to the findings of them except for change in equity to asset (lagged) and change in equity to asset (lagged)*initial E/A. The sign of change in E/A is positive and the sign of change in E/A* initial E/A is negative and they are both significant at 1% level in my study. The signs of those variables are negative and they are not significant in Cosimano and Hakura (2011) study. For the second stage, the only difference arose from the significance of non-interest expense ratio. In my study I could not reach significant results for NIE to total assets.

The R-squares of the first stage estimations vary between 52.43 and 85.58%. In this regard, the independent variables that are used in the first stage have ability to explain most of the variability in the equity to asset ratio. The range of R-squares of the second stage estimation models is 0.7489-0.9317. The first and second stage R-squares are close to findings of Cosimano and Hakura (2011).

6.2.2. Bank Response to Regulatory Pressure Model

The findings of the model examining the effect of regulatory pressure on banks behavior to change their capital and risk are represented in Table 13. For a sample of all types of banks, no significant effect of regulatory pressure on change in capital and change in risk is found. This result is somewhat surprising since banks that are exposed to regulatory pressure are expected to either increase their capital level or decrease their risk level or both. This insignificant effect might be explained by the E/A ratio of Turkish banks since they hold more than required minimum level of capital during sample period even though there is a downward trend. Hence, regulatory pressure measure based on as defined by Ediz et al. (1998) and Rime (2001) may not fit for the Turkish banks.

The impact of regulatory pressure is different when the analysis is run for different types of banks. It is found that although private banks do not change their capital level or their riskiness with regulatory pressure, state banks significantly increase their capital level but do not change their riskiness whereas foreign banks significantly decrease their riskiness but do not change their capital when they are exposed to regulatory pressure.

The results indicate that return on asset (ROA), size, change in risk and initial E/A ratio have significant impact on the change in E/A ratio. It is found that when profitability and riskiness of a bank increase, banks increase their capital ratio. However, if they have high E/A ratio at the beginning, they reduce their capital ratio. The bigger banks are found to reduce their equity to asset ratio. The results are as expected similar to findings of Rime (2001). The way of the impacts of independent variables seems meaningful. Banks are found to increase their capital holdings protect themselves from the adverse effects of higher risks. Large banks and banks that have high capital at the initial level, are found to reduce their capital significantly in next period.

The findings of second equation demonstrate that change in E/A ratio, initial period risk level and size have significant impact on the risks banks take but loan loss provision variable has not significant impact on change in risk. The signs of size and initial risk level variables are negative and the sign of change in E/A ratio is negative which is again consistent with the findings of Rime (2001). The negative sign of size variable in change in risk model contradicts that too big to fail theory since bigger banks in Turkey are more prone to taking lower risks.

The findings of the model for state, private and foreign banks are almost identical. They all increase their capital when their profitability increased. Initial level equity to asset ratio has negative impact on the changes in equity to asset ratio in the next period for all banks. Size has negative impact on their riskiness.

Table 13. Simultaneous Equations Results for Change in Capital and Change in Risk								
Dependent	**Aggregate**		**State**		**Private**		**Foreign**	
Variable	**ΔCAP**	**ΔRISK**	**ΔCAP**	**ΔRISK**	**ΔCAP**	**ΔRISK**	**ΔCAP**	**ΔRISK**
Constant	0.1004***	21.1072***	-0.0085	16.4074***	0.0281*	9.9301***	0.2512***	55.5542***
	(0.0162)	(3.2617)	(0.0199)	(6.1119)	(0.0149)	(3.5889)	(0.0366)	(6.9923)
Regulatory Pressure	-0.0006	-0.2127	0.0028***	-0.2320	-0.0014	0.3755	0.0007	-1.0291*
	(0.0009)	(0.2633)	(0.0009)	(0.4389)	(0.0011)	(0.3439)	(0.0021)	(0.5724)
Return on Asset	0.0036***		0.0045**		0.0028***		0.0126***	
	(0.0004)		(0.0019)		(0.0004)		(0.0021)	
Change in Risk	0.0010***		0.0009		0.0008**		-0.0001	
	(0.0003)		(0.0006)		(0.0004)		(0.0004)	
Initial Equity to Asset	-0.1392***		-0.0575***		-0.0684***		-0.3852***	
	(0.0078)		(0.0178)		(0.0079)		(0.0207)	
LLP to Assets		-0.3162		0.2544		-0.3348		-1.1161
		(0.2796)		(0.7531)		(0.2642)		(1.7359)
Size	-0.0051***	-1.1055***	0.0007	-0.8950***	-0.0013	-0.3796*	-0.012***	-2.9062***
	(0.0009)	(0.1829)	(0.0012)	(0.3475)	(0.0009)	(0.2220)	(0.0023)	(0.4587)
Change in Equity to Asset Ratio		83.2305***		105.3756		72.3337***		54.8946***
		(11.4064)		(82.7297)		(22.4512)		(11.9725)
Initial Risk Level		-0.0920***		-0.0706***		-0.0802***		-0.1577***
		(0.008)		(0.0162)		(0.0110)		(0.0165)
Reg 2007	-0.0005	1.9101***	0.0016	2.5798***	0.0010	1.7315***	-0.0018	1.9570*
	(0.0017)	(0.479)	(0.0022)	(0.7219)	(0.0020)	(0.6066)	(0.0037)	(1.0090)
Reg 2012	-0.0012	1.7621***	0.0030	2.2424**	0.0025	1.6769**	-0.0044	1.4132
	(0.0024)	(0.6785)	(0.0026)	(0.9608)	(0.0027)	(0.8498)	(0.0053)	(1.4635)
d2004	0.0007	1.2589***	-0.0034***	1.2332**	0.0006	1.1234***	-0.0045*	2.4356***
	(0.0011)	(0.3217)	(0.0013)	(0.4973)	(0.0013)	(0.3955)	(0.0027)	(0.7275)
d2005	0.0020*	1.2375***	-0.0008	0.8443***	0.0005	0.3922	-0.0040	4.6770***
	(0.0012)	(0.3327)	(0.0013)	(0.4606)	(0.0013)	(0.4037)	(0.0031)	(0.8160)
d2006	-0.0003	1.9835***	-0.0026*	1.9605***	-0.0015	1.3101***	-0.013***	4.9411***
	(0.0012)	(0.356)	(0.0014)	(0.5019)	(0.0014)	(0.4319)	(0.0031)	(0.8555)
d2007	0.0025	2.3440***	-0.0031*	1.7372***	-0.0009	1.5085***	-0.0044	5.9082***
	(0.0016)	(0.4641)	(0.0016)	(0.6526)	(0.0019)	(0.5728)	(0.0039)	(1.0564)
d2008	0.0049**	1.7231***	-0.0047*	1.1565	-0.0012	0.8282	0.0051	6.2123***
	(0.0021)	(0.6291)	(0.0024)	(0.9667)	(0.0024)	(0.7763)	(0.0051)	(1.4291)
d2009	0.0076***	1.5629**	-0.0020	0.6641	0.0011	0.8936	0.0089*	5.7775***
	(0.0022)	(0.6329)	(0.0025)	(0.9189)	(0.0025)	(0.7834)	(0.0052)	(1.4302)
d2010	0.0069***	2.1885***	-0.0022	1.6167*	-0.0006	1.5243*	0.0083	6.1643***
	(0.0022)	(0.6501)	(0.0025)	(0.9496)	(0.0026)	(0.8071)	(0.0053)	(1.4540)
d2011	0.0060***	2.4050***	-0.0034	2.1817**	-0.0018	1.5016*	0.0051	6.5970***
	(0.0023)	(0.67)	(0.0025)	(1.0047)	(0.0026)	(0.8306)	(0.0057)	(1.5315)
d2012	0.0078***	2.8435***	-0.0011	2.1838**	0.0000	1.6989*	0.0072	7.7594***
	(0.0025)	(0.7253)	(0.0026)	(1.0958)	(0.0028)	(0.8894)	(0.0063)	(1.6632)
d2013	0.0098***	3.4128***	-0.0052	3.9385***	-0.0030	2.2557**	0.0121*	8.2164***
	(0.0029)	(0.8449)	(0.0033)	(1.3031)	(0.0033)	(1.0354)	(0.0072)	(1.9329)
R-squared	0.3394	0.2343	0.1703	0.1665	0.2531	0.1581	0.3817	0.2796
Chi-squared	966.17	336.57	65.97	61.49	352.55	128.8	689.2	210.81
P value	0	0	0	0	0	0	0	0

Heteroscedasticity and autocorrelation adjusted standard errors are represented in parentheses. (***), (**) and (*) indicate significance of 1, 5, and 10% levels separately.

CHAPTER 7

SUMMARY AND CONCLUSIONS

In this thesis, the effect of capital requirements on the behavior of Turkish banks is examined for the period between December 2002 and December 2013. First, it is found that Turkish banks are found to increase their lending rates when their capital ratio increases. It is estimated that a one percent increase in capital asset ratio increases the lending rate by 17.33 basis points. The effect is found to be different when the analysis is conducted for banks with different ownership. State banks decrease their lending rates by 125.41 basis points whereas private and foreign banks increase their lending rates by 8.43 and 43.85 basis points respectively, when equity to asset ratio increases by 1%.

Second, how banks change their capital and risk levels when they are exposed to regulatory pressure to increase their capital adequacy ratio is examined. It is found that Turkish banks do not react significantly to regulatory pressure. The insignificant reaction of Turkish banks can be explained by high level of buffers held by Turkish banks during the sample period. Between December 2002 and December 2013, Turkish banks have 16.40% E/A ratio which is higher than the regulatory minimum. Since they are holding more than required, Turkish banks do not need to change their behavior when they are exposed to regulatory pressure. When the analysis is employed for banks with different ownership type, private, state and foreign banks are found to react differently to regulatory pressure. It is found that private banks do not change their capital and risk level significantly, state banks increase their capital and foreign banks decrease their risk level significantly in order to comply with capital requirements when they are exposed to regulatory pressure.

There are some limitations of this study. The insignificant coefficient on the regulatory pressure on the changes in capital can be explained by usage of monthly data in the analysis. Banks may not change their equity to asset ratio on a monthly basis. This time frequency may not be enough to recognize the changes in the capital adequacy ratio of Turkish banks. Another limitation is

the definition of regulatory pressure. I use the regulatory pressure variable which is defined by Ediz et al. (1998), but it may not measure regulatory pressure on Turkish banks. Moreover, the scarcity of data limits the comprehensiveness of the study. Basel capital requirements are based on capital adequacy ratio but I use equity to asset ratio as its proxy in the analyses.

There are some further research opportunities in this area. As the next step, the detailed analysis for the state banks' response for the equity to asset ratio changes may be conducted to understand the underlying reasons.

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APPENDICES

APPENDIX A: ECONOMETRICAL TESTS

Test for Serial Correlation

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 26) = 17.764
Prob > F = 0.0003

Test for Heteroscedasticity

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (29) = 49523.78
Prob>chi2 = 0.0000

Test for Endogeneity[3]

Dependent Variable: Lending Rate	
Constant	27.3649
	(18.1138)
Equity to asset ratio	21.4617***
	(5.7954)
Deposit Rate	0.5369***
	(0.0707)
Non-Interest Expense	-0.1709
	(0.2827)
Non-Performing Loans to Asset	-0.1566*
	(0.0866)
Logarithm of assets	0.3297
	(1.1571)
Residuals	21.8746***
	(5.2207)
Reg 2007	-0.1538
	(0.2604)
Reg 2012	-0.4554
	(0.3667)
d2004	-9.4554***
	(1.6044)
d2005	-14.5120***
	(1.9525)
d2006	-18.7843***
	(1.7770)
d2007	-19.1964***
	(1.8289)
d2008	-20.2286***
	(2.0121)
d2009	-19.4616***
	(2.5037)
d2010	-24.3782***
	(2.6432)
d2011	-25.5366***
	(2.7548)
d2012	-24.5827***
	(2.7885)
d2013	-26.0421***
	(2.9735)
within R-squared	0.7846
F Value	689.11
P Value	0.0000

Heteroscedasticity and autocorrelation adjusted standard errors are represented in parentheses and significances of 1 (***), 5 (**) and 10 (*) are indicated.

[3] I used the residuals of equity to asset regression in the first stage as the independent variable lending rate model. Since the residual coefficient is significant I concluded that equity to asset variable is the endogen variable.

Hausman Test for Random vs. Fixed[4]

Test: Ho: difference in coefficients not systematic

chi2(17) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 30.59
Prob>chi2 = 0.0224
(V_b-V_B is not positive definite)

[4] I run the models both with fixed and random effects. Then I applied Hausman test for the predicted results and concluded that fixed effect is a better choice.

APPENDIX B: ROBUSTNESS CHECK

Table. Results of the Fixed Effect Model

Dependent Variable: Lending Rate		Nominal	Real	State	Private	Foreign
Constant		28.4815***	27.7445***	150.9165***	32.1629***	17.9817
		(8.0278)	(4.9210)	(28.9353)	(9.1118)	(16.6189)
Equity to asset ratio		22.4132***	22.8074***	-89.1142***	11.8969***	42.2030***
		(3.0453)	(2.7214)	(12.9220)	(3.2177)	(7.4100)
Deposit Rate		0.5284***	0.5996***	0.5235***	0.6060***	0.3581***
		(0.0393)	(0.0379)	(0.0607)	(0.04723)	(0.0791)
Non-Interest Expense		-0.1808	-0.2450	-0.1186	0.0883	-0.4413
		(0.2120)	(0.2113)	(1.1945)	(0.2273)	(0.4233)
Non-Performing Loans to Asset		-0.1653***	-16.9024***	2.1451***	0.1570**	-1.4767***
		(0.0618)	(6.1517)	(0.3154)	(0.0617)	(0.2038)
Logarithm of assets		0.2730	0.1236	-7.2369***	-0.2202	1.5975
		(0.5090)	(0.3032)	(1.6816)	(0.5784)	(1.0833)
Reg 2007		-0.1571	0.0406	-0.0040	-0.1884	0.0775
		(0.7109)	(0.7076)	(1.0046)	(0.8672)	(1.3695)
Reg 2012		-0.4997	-0.3459	1.0403	0.1980	-1.6420
		(1.0117)	(1.0067)	(1.4165)	(1.2230)	(1.9801)
d2004		-9.6730***	-8.5532***	-7.7820***	-7.9950***	-12.5382***
		(0.6777)	(0.6501)	(1.1325)	(0.8220)	(1.2942)
d2005		-14.7593***	-13.1469***	-4.3366***	-12.4192***	-20.0527***
		(0.8404)	(0.7848)	(1.3856)	(1.0297)	(1.5991)
d2006		-19.0030***	-17.3762***	-4.3030***	-16.3167***	-25.4167***
		(0.8931)	(0.8100)	(1.5314)	(1.0891)	(1.7142)
d2007		-19.3998***	-17.8764***	-3.6391**	-16.2532***	-26.3369***
		(0.9789)	(0.8784)	(1.6662)	(1.2032)	(1.8731)
d2008		-20.4230***	-18.9878***	-5.4753***	-17.3469***	-27.1075***
		(1.1738)	(1.0519)	(1.9820)	(1.4184)	(2.3068)
d2009		-19.6997***	-17.7097***	-3.5490	-16.5422***	-25.3304***
		(1.3257)	(1.1730)	(2.2719)	(1.5960)	(2.6322)
d2010		-24.6321***	-22.4085***	-4.3274*	-21.3603***	-30.4746***
		(1.4162)	(1.2429)	(2.4967)	(1.7103)	(2.8004)
d2011		-25.7561***	-23.6407***	-3.8740	-21.8564***	-33.2619***
		(1.4763)	(1.2671)	(2.7273)	(1.7839)	(2.8777)
d2012		-24.7806***	-22.5187***	-2.3658	-20.7107***	-32.7215***
		(1.5140)	(1.2615)	(2.8223)	(1.8223)	(2.9605)
d2013		-26.1985***	-23.7620***	-3.0816	-22.3008***	-34.2632***
		(1.6956)	(1.4323)	(3.1676)	(2.0321)	(3.3363)
	within	0.7921	0.7880	0.9323	0.8332	0.7587
R-squared	**between**	0.7266	0.7069	0.9836	0.845	0.149
	overall	0.6678	0.657	0.9029	0.7505	0.5726
F Value		688.47	671.57	304.75	447.27	210.66
P Value		0	0	0	0	0

Heteroscedasticity and autocorrelation adjusted standard errors are represented in parentheses and significances of 1 (***), 5 (**) and 10 (*) are indicated.