A PERFORMANCE ANALYSIS OF COMMERCIAL BANKS IN TURKEY

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BOĞAZİÇİ UNIVERSITY

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A PERFORMANCE ANALYSIS OF COMMERCIAL BANKS IN TURKEY

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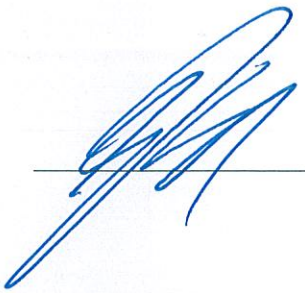

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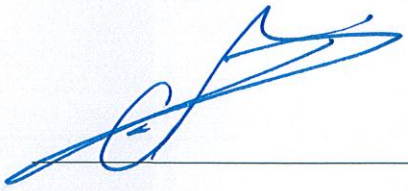

July 2018

DECLARATION OF ORIGINALITY

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- this thesis contains no material that has been submitted or accepted for a degree or diploma in any other educational institution;
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ABSTRACT

A Performance Analysis of Commercial Banks in Turkey

In this study, I analyze the performance of the commercial banks in Turkey using the CAMEL approach and investigate the relationship between loan growth and soundness indicators such as asset quality, profitability and capital ratios of the banks by using econometric methods. I describe and document efficiency measures for the banking sector and find a more negative position in recent years. I observe an increasing behavior in loans to deposits ratio and explain the relation between the rising trend of the ratio and the efficiency measures. My findings are robust and significant which suggest that there is a relation between loan growth and efficiency of the sector.

ÖZET

Türkiye'deki Mevduat Bankalarının Performans Analizi

Bu çalışmada CAMEL yöntemi kullanarak Türkiye'deki mevduat bankalarının performanslarını analiz ettim ve kredilerdeki büyüme ile bankaların varlık kaliteleri, karlılıkları ve sermaye rasyoları gibi risklilik göstergeleri arasındaki ilişkiyi ekonometrik metotlar kullanarak araştırdım. Etkinlik göstergeleri tanımlayıp zaman içindeki hareketlerini açıkladım ve son yıllardaki performansın önceki yıllara kıyasla daha aşağıda seyrettiğini gösterdim. Kredilerin mevduatlara olan oranında sürekli bir artış gözlemledim ve bu yükseliş trendi ile bankaların etkinlik göstergeleri arasındaki ilişkiyi açıkladım. Bulgularım, kredi büyümesi ve bankaların verimliliği arasında bir ilişki olduğunu gösterdi.

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CHAPTER 1

INTRODUCTION

The global financial crisis of 2008 had a great impact on the strength of economies all around the world. This showed the interconnectedness of the financial systems and the influential power of the crises. The soundness of the financial institutions attracted the special attention of regulators and supervisors and this led to an increase in the number of research related to the financial crises.

In addition to the recent one, the world has witnessed many severe financial crises in the last several decades. The United States had a major savings and loan crisis in the 1980s. Nordic countries such as Finland, Norway and Sweden experienced banking crises between 1987 and 1994. In the early 1990s, financial crises caused serious problems in the economies of Latin American countries such as Mexico, Peru and Venezuela.

The Asian financial crisis of 1997 brought political and economic distress as well as bank and corporate fragility. On the other hand, the crisis was substantially contagious. Anything that affected one market negatively also put pressure on the other markets (Baign & Goldfajn, 1999). The currency crisis of Russia in 1998 caused devaluation of the ruble and increased public and private debt. The crisis had an impact on the vulnerable economies related to Russia (Chiodo & Owyang, 2002). Those and other important crises affected the financial system and real economy of many countries and Turkey was also one of them.

Turkey had two major crises in the last three decades. One of them was the 1994 currency crisis. High levels of public sector borrowing and crucial mistakes in deficit financing induced a significant depreciation of the currency and half of the Central Bank reserves have been lost. A continuous deterioration of macroeconomic conditions occurred in the post-crisis period (Celasun, 1998; Ozatay, 2007).

The other crisis in Turkey was in 2000 and 2001. There was a stabilization program and the crisis started in November 2000. The interest rates rose substantially and again there was a great depreciation in Turkish Lira. In the second month of 2001, with the announcement of a political crisis, interest rates jumped once again. The exchange rate system of the stabilization program collapsed and floating exchange rate regime was implemented (Ozatay & Sak, 2002).

After the 2000-2001 financial crisis, the Turkish banking system underwent a major transformation. The programs that were implied aimed to strengthen the capital structure of the banks, decrease borrowing in foreign currency, create incentives for mergers and acquisitions, solve the problem of bad debt. Strict regulations are applied in order to achieve these goals.

In this study, I examine the performance of the commercial banks in Turkey after the crisis. I investigate the change in capital adequacy, asset and management quality, liquidity and earnings of these institutions by using the CAMEL approach. I observe that performance of the deposit banks has been following a decreasing trend in recent years. I find that capital adequacy, liquidity and earnings indicators are the ones which display an unsuccessful performance recently. That decreases the overall efficiency of the banks based on the CAMEL approach starting from 2014.

Another thing that I observe is an increasing trend in loans. Total loans to total assets and total loans to total deposits ratios have been rising with a short discontinuation in the global crisis of 2008-2009. The literature that examines the relationship between high growth rate of loans and riskiness, profitability and capital structure of the banks is especially for developed countries. I study this relation for the banks in Turkey.

The crises in the past showed that strength of the banking sector and the financial system is crucial for the health of an economy and the others which have connections. That is the reason why it is important to investigate the efficiency of the sector and the factors that may cause deterioration. This study analyzes the performance of commercial banking and finds a link between loan growth trend and soundness of the system. Especially, increase in loans is negatively related to the improvements in interest income and capital ratios. The study contributes to the literature by examining the effects of high growth rates of loans on profitability, solvency, and riskiness for the banks in Turkey. It uses random effects and fixed effects models and the findings verify significance and robustness.

The organization of the thesis is as follows: Chapter 2 gives the literature review. Chapter 3 presents the data and describes the indicators and variables. Chapter 4 consists of the performance analysis by using the CAMEL approach. Chapter 5 examines the relationship between loan growth and bank performance and gives the results of the empirical analysis. Chapter 7 concludes.

CHAPTER 2

LITERATURE REVIEW

CAMEL approach is a widely used method in analyses of the banking sector. Earlier studies analyze the performance of banks using this method and explain the relationship between financial soundness and CAMEL components. Another group of studies investigates the predictive ability of the method in failures of banks.

The research that relates efficiency to CAMEL variables is available for different regions (Barr, Killgo, Siems & Zimmel, 2002; Rostami, 2015; Meena, 2016). In particular, Barr et al. (2002) study the US banks and show that commercial banks with high efficiency also have greater CAMELS[1] ratings whereas Rostami (2015) conducts an analysis for the banking industry in Iran by choosing five indicators for each component and comparing these ratios with average values of the sector. The author uses the CAMEL approach as a tool of comparison of an institution with the others in internal and external sectors. The study by Meena (2016) differs in the methodology that is used. The author conducts regression analysis in which the dependent variable is the return on assets and the independent variables are other CAMEL components. The results show that ratios such as debt to equity and NPL to total loans are correlated with the financial performance of the banks. The common point of these studies is that they find a significant linkage between the efficiency of a bank and its CAMEL ratings.

[1] A version of CAMEL rating system that includes sensitivity to market risk component

Similar analyses accompanied with the investigation of the difference in mode of ownership are commonly seen in the literature (Aftab, Samad & Husain, 2015; Shukla, 2015). The former study has regression analysis with the dependent variable of return on equity and return on assets and dummy variables of ownership and political regime. The authors conclude that privately-owned banks' profitability is positively related to their asset and management quality and negatively linked to their capital adequacy and liquidity in Pakistan. For state-owned banks, only capital adequacy and quality of management have an impact on profitability and these banks are better in terms of absorbing the losses. On the other hand, Shukla (2015) creates an overall performance ranking by using CAMEL variables. The author finds that private banks perform better and grow faster than public banks in India.

There is a wide range of studies that associate the probability of bank failure to CAMEL variables by using multivariate logit models (Thomson, 1991; Nurazi & Evans, 2005; Arena, 2008). Thomson (1991) examines the US banks and finds a significant relationship between the variables and the probability, four years before a bank fails. Nurazi and Evans (2005) investigate the prediction power of CAMEL ratios in bank failures by conducting logistic regression analysis and find that capital adequacy ratio, asset quality, management quality, earnings, liquidity and size of the banks are important factors in explaining bank failures. Lastly, Arena (2008) studies the cases of East Asia and Latin America. The author shows that CAMEL indicators are significantly related to the collapses of the banks in two regions.

There are other studies that examine the same linkage by using different methodologies (Gasbarro, Sadguna & Zumwalt, 2002; Mannasoo & Mayes, 2009). The former paper's motivation is the quick and unforeseen failure of banks during the Southeast Asian financial crisis. The authors conduct panel data analysis by using CAMEL ratings. They use ordinary least squares, random effects and fixed effects models. The dependent variable is CAMEL rating percentiles provided by Bank Indonesia and the independent variables are the five ratios that they choose as CAMEL components. They show that in non-crisis periods CAMEL variables provide evidence of bank soundness whereas during the crisis period this relationship is broken. In addition to this, they underline the importance of systemic risk. The study by Mannasoo and Mayes (2009) uses survival analysis and examines the banking problems in Eastern European countries. It concludes that CAMEL variables have an important role in explaining bank distress.

The Turkish banking system had major problems in the past and most of them were substantially related to deterioration of CAMEL components. That is the reason why this approach is a useful tool to analyze the performance of the banks in Turkey.

Studies related to the Turkish banking sector utilize CAMEL approach both as a performance evaluator and as a probability of failure indicator (Kaya, 2001; Mercan, Reisman, Yolalan & Emel, 2003). Mercan et al. (2003) present the effect of scale and type of ownership on the sector's performance by applying data envelopment analysis to CAMEL ratios. They find that foreign and private commercial banks performed better than state-owned banks between 1989 and 1999. They also show the worsening in the financial performance of publicly owned banks for three years starting from 1997.

The research conducted by Kaya (2001) analyzes the relationship between the CAMELS rating of a bank in 1997 and the probability of being taken over by Savings Deposit Insurance Fund of Turkey (TMSF) by using binary probit model. The study suggests a significant and strong relation and shows a decreasing trend in ratings from 1997 to 2000. The findings imply that CAMELS rating system can work as an early warning system.

This study presents the situation of capital adequacy, asset and management quality, earnings and liquidity ratios of the commercial banks in Turkey for the last fifteen years. It also calls attention to the increasing trend in loans in the system. It investigates the relationship between loan growth and soundness indicators.

The literature about the linkage between loan growth and bank efficiency is various. There are studies which investigate the impact of loan growth on asset quality (Clair, 1992; Keeton, 1999). The former study conducts regression analysis with the data of Texas banks and finds a significant relationship between loan growth and decreasing loan quality after a lag. Keeton (1999) answers the question of whether faster loan growth causes more loan losses and provides supportive results when there is a positive shift in the supply of bank credits.

A study by Foos, Norden and Weber (2010) addresses the issue in a broader way. They answer the questions regarding the influence of loan growth on bank solvency, asset risk, and profitability. They test their hypotheses by using ordinary least squares, fixed effects and modified VAR models and conduct research for sixteen developed countries. They find a positive and significant impact of loan growth on loan loss provisions in the future. The results also show the negative effects of loan growth on profitability and solvency.

Another approach to the relationship has been chosen by Curry, Fissel and Ramirez (2008). The authors utilize CAMEL variables in their analysis and explain the impact of bank supervision on loan growth in the US. For the 1985-1993 period, they find that commercial and industrial loans are more responsive to the changes in CAMEL ratings. For the period after that, they do not mention a significant influence of CAMEL ratings on loan growth.

In this study, I examine the effects of loan growth by using a similar approach to the related literature. I also answer the linkage between loan growth and deteriorating CAMEL ratings.

CHAPTER 3

DATA AND DESCRIPTIVE STATISTICS

3.1 Data

I use time-series and panel data from the Banks Association of Turkey (TBB) covering the period from the last quarter of 2002 to the last quarter of 2017. The data are quarterly and available for individual commercial banks as well as all commercial banks as a group. Other data sources that I utilize are required reserve ratios and required reserve data set from The Central Bank of the Republic of Turkey (TCMB) and consumer price index from the Turkish Statistical Institute (TUIK).

I conduct CAMEL analysis by using the capital adequacy ratio, gross non-performing loans to total loans ratio, return on average assets and ratio of liquid assets to total assets data for the group of all commercial banks. I create a variable as management quality indicator by utilizing total loans to total deposits and required reserve ratios.

For panel data analysis, I examine the data for each bank. The data is available for 33 commercial banks and 27 of them exist during the period of 2002-2017. Table A1 (Appendix A) and Table A2 (Appendix A) give the list of bank names and merger and acquisition activities, respectively.

I use difference in equity to assets ratio, difference in relative interest income and relative loan loss provisions as dependent variables whereas abnormal loan growth, total loans and equity to assets ratio as independent variables in various regressions.

3.2 Descriptive statistics

Table 1 shows the summary statistics of variables that I use in CAMEL analysis after subtracting the outliers. The data for capital adequacy, asset and management quality indicators are incompatible with the rest of the values during the four years following the financial crises of 2000 and 2001. Quarters after the third quarter of 2016 are also omitted for the reasons that I explain in Chapter 4. These are the reasons why Table 1 displays the data from the third quarter of 2005 to the third quarter of 2016 with 45 observations for each variable.

Table 1. Summary Statistics of CAMEL Variables

Variable (in %)	Mean	Median	Std. Dev.	Min.	Max.
Capital Adequacy	16.78	16.13	1.86	14.08	21.61
Asset Quality	3.58	3.23	0.87	2.71	5.62
Management Quality	16.79	17.59	8.26	0.58	36.20
Earnings	1.89	1.82	0.48	1.16	2.77
Liquidity	31.62	31.36	3.68	26.17	39.96

I choose capital adequacy ratio which is the ratio of the sum of tier 1 capital and tier 2 capital to risk-weighted assets as the indicator of capital adequacy. As an asset quality variable, I use gross non-performing loans to total loans ratio. Return on average assets is a widely used earnings and profitability measure. Dividing net income of a particular period by the average of assets at the beginning and at the end of that period gives this ratio. For the liquidity component of the analysis, I examine the liquid assets to total assets ratio.

I compose a variable for the management quality component. I calculate the average required reserve ratio for each quarter and subtract these ratios from 1. This subtraction gives the expected loans to deposits ratio for that quarter. I compute the deviation of the actual loans to deposits ratio from the expected one for each period. The absolute value of this calculation is the indicator of management quality under the assumption that the main role of a commercial bank is collecting deposits and giving credits.

Table 2 displays the descriptive statistics of the main variables used for empirical analyses. Again, the period before the third quarter of 2005 is excluded due to extremely high or low values. Equity to total assets and capital adequacy ratios are directly taken from the data set of the Banks Association of Turkey (TBB). Higher values for these variables generally belong to the foreign banks in Turkey.

Relative interest income is obtained by dividing gross interest income by total loans. Since borrowers do not start paying interests immediately, previous year's total loans are used in the denominator. Similarly, borrowers usually do not default in the first year of a new loan. That is the reason why relative loan losses variable is the ratio of loan loss provisions to previous year's total loans as used in the literature (Laeven & Majnoni, 2003; Foos et al., 2010).

Abnormal loan growth is the difference between the individual loan growth and aggregate loan growth of all commercial banks. The growth is measured yearly by using the change in four quarters for each quarter.

Total loans are total loans and receivables in banks' balance sheets. Since Turkey has relatively high inflation rates, I create an inflation-adjusted version of the series with the base year of 2003. For all other variables that I use in panel data analysis, I take inflation into account.

Table 2. Summary Statistics of Panel Data Variables

Variable (in %)	Mean	Median	Std. Dev.	Min.	Max.
Equity to Total Assets	13.79	11.98	7.34	3.76	55.85
Capital Adequacy Ratio	20.08	16.69	9.58	9.25	60.98
Relative Interest Income	19.98	16.30	10.52	5.34	67.94
Relative Loan Losses	3.19	2.59	2.67	0	15.50
Abnormal Loan Growth	1.46	-1.28	25.74	-63.87	151.69
Total Loans (in mill. TRY)	11170.29	2731.46	15920.31	0.65	64260.37

CHAPTER 4

CAMEL ANALYSIS

The first part of the study consists of the description and evaluation of CAMEL variables. There are earlier studies that use more than one indicator for each component. In order to decrease measurement error, I only use the most appropriate variable for each component.

Capital adequacy, equity to total assets, debt to equity, total advances to total assets ratios are the most commonly used indicators for the capital adequacy component. Capital adequacy ratio is calculated by dividing the sum of tier 1 capital and tier 2 capital by risk-weighted assets. I choose this ratio as the indicator since it is the most appropriate sign of financial soundness in absorbing losses.

Gross and net non-performing loans to total loans, non-performing assets to total assets, fixed assets to total assets ratios are used as asset quality indicators and return on assets, return on equity, operating profit to total assets, total income to total expenses ratios are chosen for earnings component in various studies. Liquid assets to total assets, liquid assets to short-term liabilities and total loans to total deposits ratios are commonly seen in the literature as liquidity variables.

In this study, gross NPL ratio, return on average assets, short-term liabilities are the pointers of asset quality, earnings, and liquidity, respectively. Most of the ratios that I mention are strongly correlated in many cases. This is one reason that I prefer to analyze one ratio for each component. For the situations other than that, choosing the most appropriate ratio reduces the measurement error. I aim to investigate the most relevant variables with least measurement error.

There is a variety of ratios that are selected for management quality. Most of them are same as the ones for asset quality, earnings and liquidity components. Earlier studies used variables such as NPL ratio, total loans to total deposit ratio and net profit margin (Kaya, 2001; Shukla, 2015; Meena, 2016). Total loans to total deposits ratio is a commonly accepted measure but an increase in this ratio does not always mean an improvement in management quality since the high growth of loans may imply riskiness. That is the reason why I compose another measure for management quality. The main function of a commercial bank is collecting deposits and giving credits. It needs to comply with the reserve requirement before giving loans. I calculate the reserve requirement ratio for each quarter. I use the composition of local and foreign currency of deposits to determine the average reserve requirement ratio. To fulfill the main mission, commercial banks are expected to give the remaining part as loans. Expected loans to deposits ratio is calculated by subtracting the average reserve requirement ratio from 1. The periods that have total loans to total deposits ratio that is lower than the expected one are considered less efficient whereas the ones that are higher are regarded as riskier. The absolute value of the difference between the actual ratio and expected loans to deposits ratio is the sign of management quality.

The Banks Association of Turkey annually issues a publication on banks in Turkey. In this part of the study, I utilize its reports along with the data from Banking Regulation and Supervision Agency (BDDK) and Credit Guarantee Fund (KGF).

Credit Guarantee Fund (KGF) started to play a significant role after November 2016. Guarantees used were 7,189 million between 1994-2005, 5,128 million in 2016 and 187,499 million Turkish Lira in 2017 as shown in Figure 1.

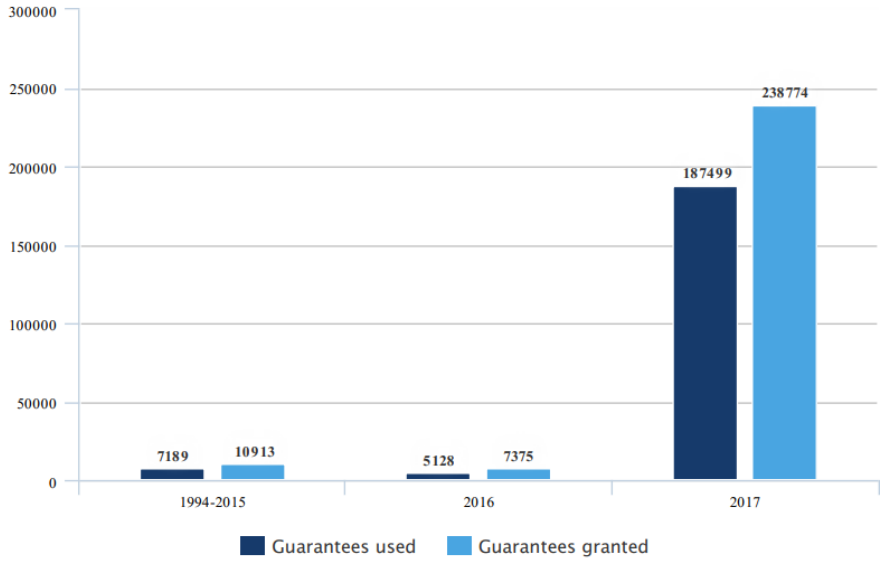
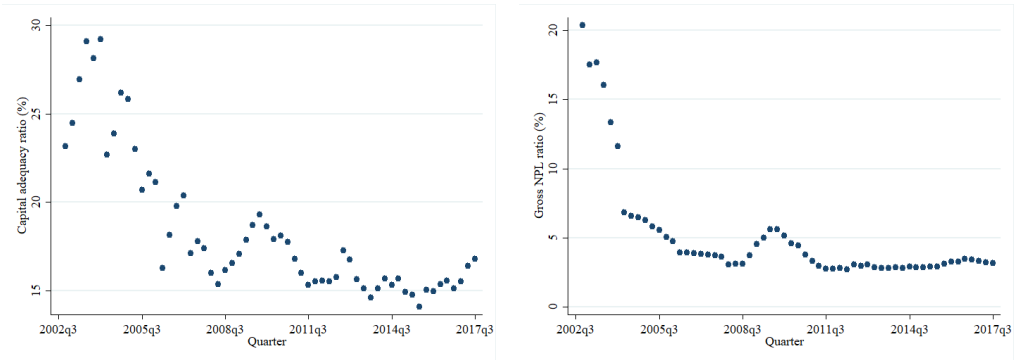


Figure 1. Guarantees granted and used

Figure 2 displays the data for capital adequacy ratio and gross NPL to total assets ratio from 2002 to 2017. During the four years after the crises, particularly these variables of interest contain outliers. Due to the rising role of Credit Guarantee Fund (KGF) as illustrated in Figure 1, the data for Gross NPL to total assets ratio after November 2016 do not reveal the actual performance of the banks. I extract these periods from the analysis.



(a) Capital adequacy ratio (b) Gross NPL to total loans ratio

Figure 2. Indicators for capital adequacy and asset quality

Figure 3 plots capital adequacy ratio between 2005 and 2016. In 2006, there was an increase in paid-in capital and retained earnings of commercial banks. This movement reflects itself in higher capital adequacy ratios. In 2007, the growth of loans was superior to the growth of capital. In addition to that, in June 2007, operational risk was included in the calculation of capital adequacy ratio. These are the main reasons for the decrease in the ratio during the year. During the global financial crisis, the slowdown of the economy affected the ratio negatively. Again, growth in capital was lower than the growth in loans and non-performing loans were increasing. Reduction in growth of loans in 2009 is associated with the rising capital adequacy ratio. In 2010 and 2011, the proportion of riskier assets increased and growing trend of loans continued. In July 2012, Basel II regulations started to be implemented and new risk weights are defined. This lowered the riskiness of assets and increased capital adequacy ratio. High loan growth, depreciation of the local currency and changing composition of risk-weighted assets explain the fluctuations in 2013 and afterward.

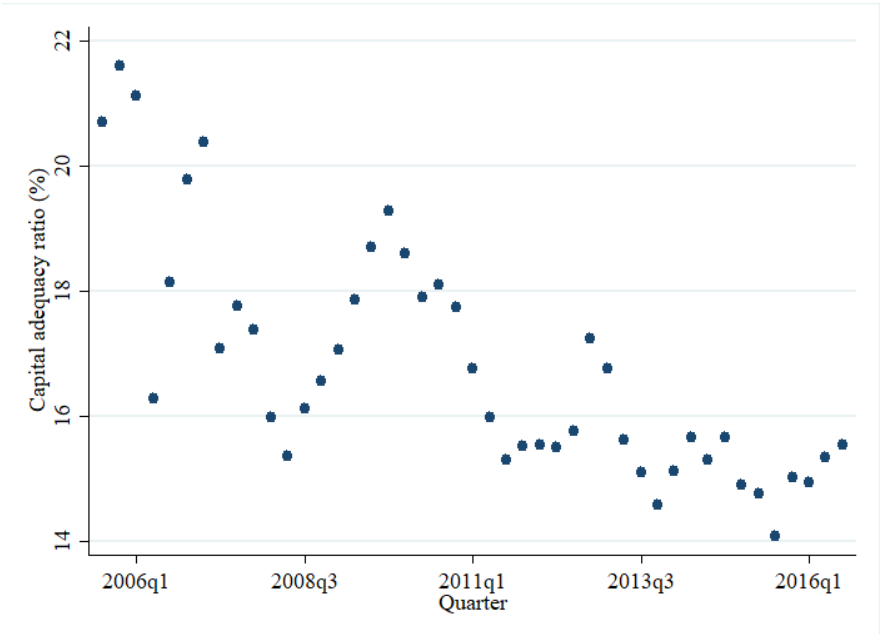


Figure 3. Capital adequacy ratio

Figure 4 shows gross non-performing loans to total loans ratio for the same period. In 2006, the ratio was approximately 4%. Since the growth of non-performing loans was lower than the growth of total loans in 2007, the ratio displays a declining behavior. The influence of the global financial crisis of 2008 on the real economy caused a significant increase in non-performing loans. According to the data from Banking Regulation and Supervision Agency (BDDK), the growth of non-performing loans was the highest for consumer credits in 2009. After 2010, the ratio started to decrease and followed a stable trend until the last quarter of 2015. In March 2016, consumer loans and credit cards had the largest proportion of non-performing loans followed by the loans to small and medium-sized enterprises. Starting from the last quarter of 2016, Credit Guarantee Fund (KGF) played a significant role in declining NPL ratios.

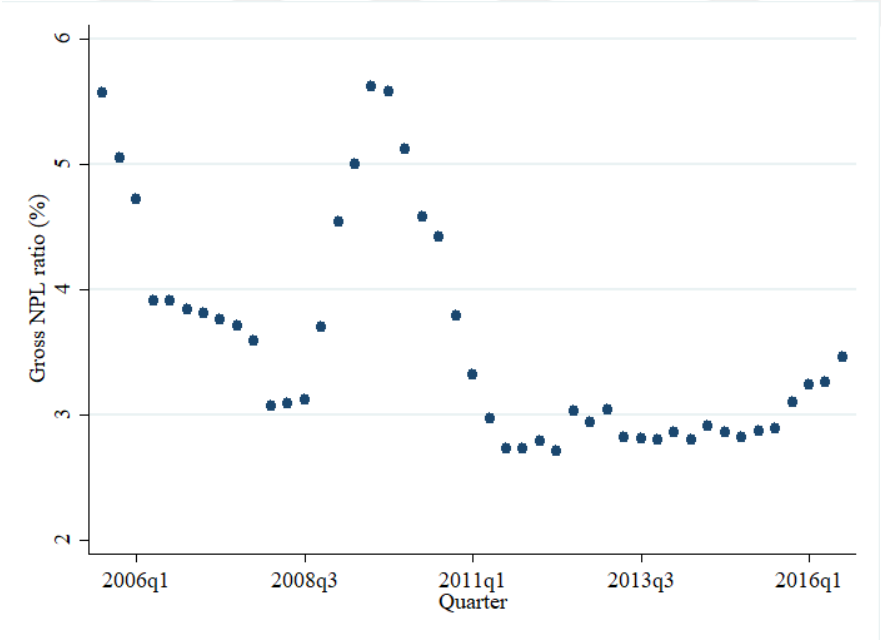
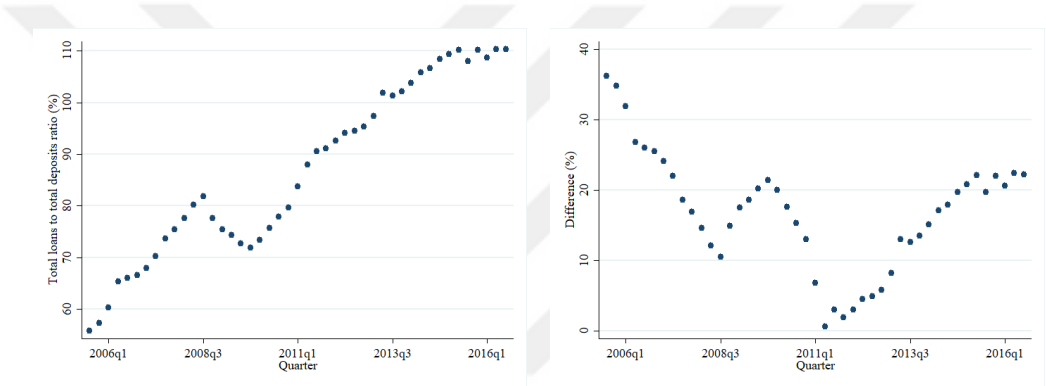


Figure 4. Gross non-performing loans to total loans ratio

Total loans to total deposits ratio and deviation from the expected ratio are illustrated in Figure 5. There is an increasing trend in loans to deposits ratio with a short discontinuation during the global financial crisis. Under the assumption that the main mission of a commercial bank is to collect deposits and give credits, 2011 is the year that the ratio is the closest to the expected one. Before 2007, actual ratios were below the expected values and deviations were the highest. Starting from the beginning of 2014, absolute values of differences have been approaching the ratios of that period.



(a) Total loans to total deposits ratio (b) Deviation from the expected ratio

Figure 5. Management quality indicators

Figure 6 plots return on average assets for commercial banks. Due to declining loan loss provisions and rising income from fees and commissions, profit and return on average assets increased in 2006 and 2007. With the financial global crisis that influenced the whole economy, non-performing loans and provisions ascended and negatively affected the profit. In 2009, interest rates fell and caused an improvement in return on average assets by lessening the cost of debt.

As illustrated in Figure 4, recovery in asset quality along with the reduction of adverse effects of the crisis contributed to higher levels of return on average assets after 2010. Depreciation of the local currency and increase in provisions unfavorably affected return on assets in 2013. The Central Bank of the Republic of Turkey (TCMB) raised interest rates after the second quarter of the same year. Data from Banking Regulation and Supervision Agency (BDDK) shows that net interest income did not change during 2014 and 2015 whereas net non-interest income has declined in this period. Negative trend of income from fees and commissions reversed in 2014. Decreasing operating expenses to operating income ratio was a contributor in the improvement of return on average assets in 2016.

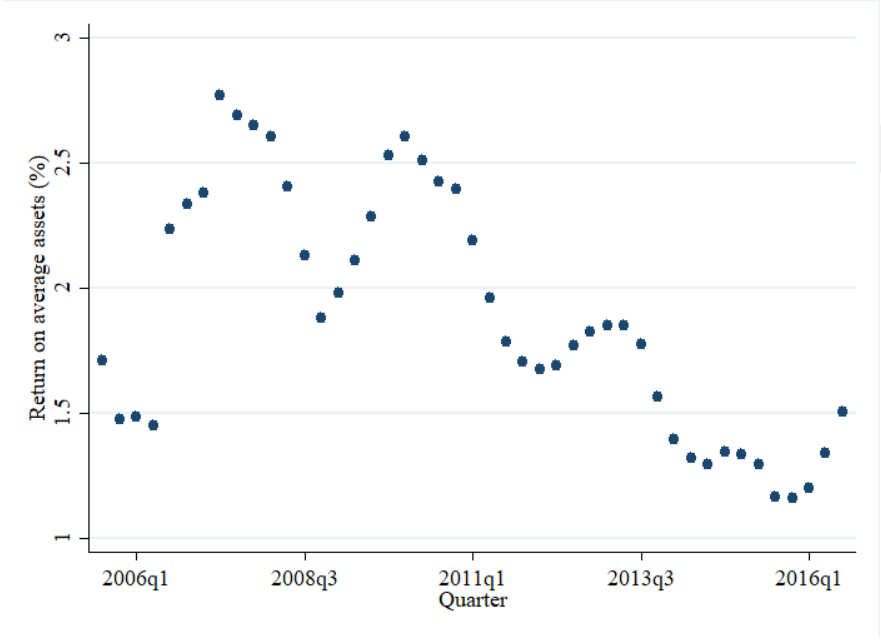


Figure 6. Return on average assets

The last CAMEL component, liquid assets to total assets ratio is illustrated in Figure 7. Worsening of the economic conditions in 2008 caused a reduction in deposits and increased the cost of debt. Banks' attitude towards risk changed and this resulted in an improvement in liquid assets to total assets ratio. When the adverse effects of the global crisis reduced, the opportunity of borrowing from the international financial markets and well-performing economic conditions decreased the risk perception of banks, thus liquidity. The Central Bank of the Republic of Turkey (TCMB) increased the required reserves in the first two quarters of 2011 and this caused a rise in the ratio. The high growth rate of loans is associated with the reduction in the liquidity indicator. It is important to note that public sector debt securities are included in liquid assets. With the improvements in fiscal discipline, the proportion of these securities in banks' assets declined and created a shift towards loans.

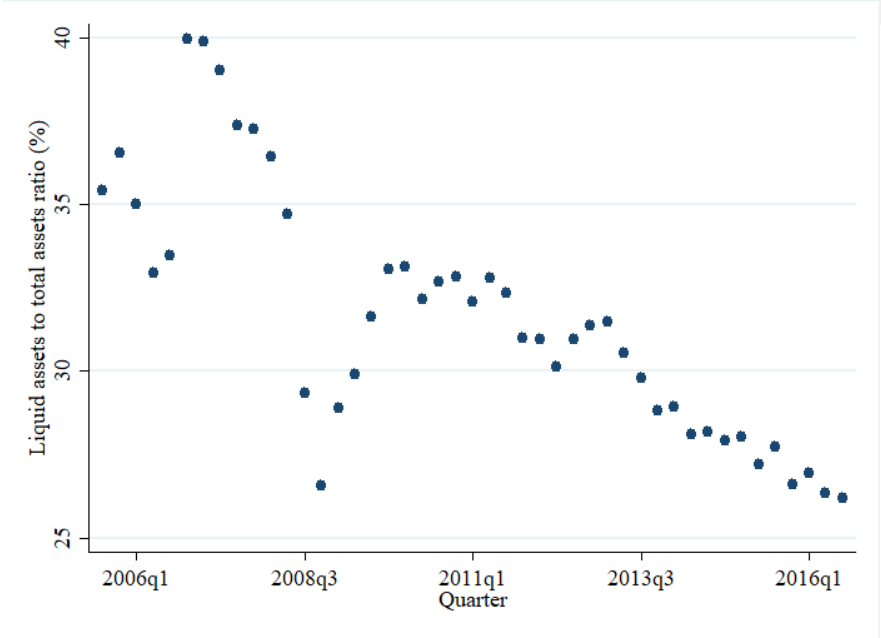


Figure 7. Liquid assets to total assets ratio

After evaluating each component, I compose a measure to refer to overall performance. I compare the relative efficiencies by using the CAMEL ratings. Each variable has a different mean, standard deviation, minimum and maximum value. In order to bring them together in an appropriate way, I cluster each variable separately and rate the periods based on the CAMEL approach. For capital adequacy, liquid assets to total assets ratios and return on average assets, having higher values whereas for non-performing loans and deviation from the expected loans to deposits ratio, having lower values are signs of a better performance.

Table 3 presents the CAMEL ratings and their interpretations as defined by Federal Deposit Insurance Corporation (FDIC). Rating of 1 is the highest value that can be obtained and indicates the most desirable performance. Rating of 5 is the lowest value and requires special notice. Each period is given CAMEL ratings based on the values of its components.

Table 3. CAMEL Ratings and Interpretations

Rating	Interpretation
1	Sound in every aspect
2	No material supervisory concerns
3	Some degree of supervisory concerns
4	Close supervisory attention is required
5	Ongoing supervisory attention is required

Figure 8 displays the average of these ratings and indicates a significant worsening in the performance of commercial banks starting from 2014. CAMEL ratings exhibit greater values during the global financial crisis and in recent years.

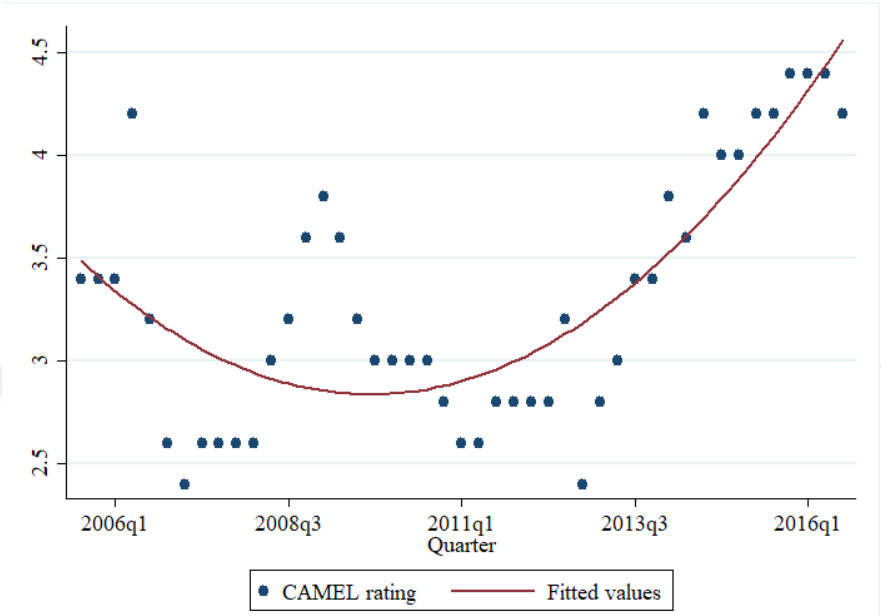


Figure 8. CAMEL ratings

Another important trend in the commercial banking is the increase in loans. Total loans to total assets and total loans to total deposits ratios have been rising with a short discontinuance in 2008 and 2009. Ascending loans is one factor that is already associated with two of the CAMEL components. Deviation from expected loans to deposits ratio and liquid assets to total assets ratio are directly related to loans. In Chapter 5, I investigate the relationship between loan growth and the remaining efficiency indicators.

CHAPTER 5

ECONOMETRIC MODEL, ANALYSIS AND RESULTS

The previous chapter analyzes the performance of the banks in Turkey and addresses a link between the worsening in efficiency and loan growth. In this part of the study, I investigate the relationship between great values of loans and financial soundness. In particular, I use mainly three econometric models by Foos et al. (2010) to observe the impact on solvency, profitability and loan losses.

The first model is about bank solvency which is associated with the capital adequacy component of the CAMEL approach. I investigate this relationship since the solvency is one of the substantial requirements of an institution and the factors that may affect it are worth analyzing. A bank can increase its loans by debt financing or equity financing. If it cannot raise its capital as much as it increases its loans, a negative relation is expected to be observed. The model uses the change in equity to total assets as the dependent variable, abnormal loan growth and natural logarithm of total loans as independent variables.

$$\Delta ETA_{i,t} = \alpha + \beta_1 ALG_{i,t} + \beta_2 LOANS_{i,t} + \gamma D_i + \delta D_t + \varepsilon_{i,t}$$

Since there is a strong correlation between equity to total assets ratio and its previous values, the dependent variable is the change in equity to total assets ratio. Natural logarithm of total loans is added to control for bank size. In addition to that, bank fixed effects and time fixed effects are used. A regression for change in capital adequacy ratio is run and gives analogous results (see Appendix B, Table B1).

The second model is to test for the relation between bank profitability and loan growth. This is linked to the earnings component of the CAMEL method. Relative interest income is the ratio of gross interest income to total loans. Since borrowers do not start paying interests immediately, previous year's total loans are used in the denominator. In the model, change in relative interest income is the dependent variable and abnormal loan growth, natural logarithm of total loans and equity to total assets ratio are independent variables. Again, bank fixed effects and time fixed effects are used. I also control for the mode of ownership in another regression. The main model is as follows:

$$\Delta RII_{i,t} = \alpha + \beta_1 ALG_{i,t} + \beta_2 LOANS_{i,t} + \beta_3 ETA_{i,t} + \gamma D_i + \delta D_t + \varepsilon_{i,t}$$

Relative interest income of a period is highly correlated with the ratio of the previous periods. That is the reason why the change in relative interest income is used as the dependent variable. It is important to note that the change in the ratio contains the gross income from all loans since the data of income from new loans is not available.

Lastly, I investigate the link between loan growth and asset quality. It is a noteworthy relation since asset quality is one of the most important components of bank riskiness and soundness. Abnormal loan growth of previous periods may cause risk for repayment of credits. The following model is used to understand whether the abnormal growth of loans influences asset quality:

$$RLL_{i,t} = \alpha + \beta_1 RLL_{i,t-4} + \sum_{k=1}^{4} (\beta_{k+1} ALG_{i,t-4k}) + \beta_6 SIZE_{i,t} + \beta_3 ETA_{i,t} + \gamma D_i + \varepsilon_{i,t}$$

Relative loan losses variable is obtained by dividing loan loss provisions to previous year's total loans. There are two problems regarding this ratio. The first one is the possibility of the cancellation of loan loss provisions. If the borrowers make the repayment, there will be a netting effect. The data is not available for controlling this effect. Underestimation of loan losses creates a bias in the analysis. Secondly, loan loss provisions decrease the amount of total loans but since the fraction is small, it does not constitute a major problem.

Since loan loss provisions are associated with many credit risk factors, they are significantly related to their past values. That is the reason why natural logarithm of relative loan losses is the dependent variable and the four quarter lagged value of it is one of the independent variables in the model. The econometric problem that may arise here is Nickell bias that stems from the correlation between regressor and error. The error term enters all values of the dependent variable and it is not independent of the lagged value of relative loan losses. The cross-sectional components of the dataset that I use are less than the time-series components. The possibility of the problem is negligible (Baum, 2013).

As Foos et al. (2010) suggest, loan losses do not occur before the second year of a new loan. Abnormal loan growths of the last four years are added to the model in order to observe the impact of past high loan growth on provisions. The past values of abnormal loan growth may be serially correlated. This may bring multicollinearity problem. In order to solve this, generalized method of moments with instruments such as the lagged values of relative loan losses and abnormal loan growth can be used.[2]

[2]I conduct an analysis by using GMM. The results are similar but less significant.

The other independent variables of the model are natural logarithm of total loans and equity to total assets ratio in order to control for the size and capitalization level of the banks. I run the regressions both with relative loan losses and relative non-performing loans as dependent variables (see Appendix B, Table B2).

Foos et al. (2010) use similar models to test their hypotheses on the effects of loan growth on bank riskiness, profitability, and solvency. They use the data for approximately 10000 banks in developed countries and find a positive and significant relationship between past abnormal loan growth and loan loss provisions. They also conduct a modified vector autoregression to address the multicollinearity problem of the linear regression model and to see the two-way relations between these variables.[3] They find supportive evidence. On the other hand, they detect a negative influence of abnormal loan growth on the change in relative interest income and equity to total assets ratio.

I continue with presenting the results of the panel data analyses and comment on the findings. I run similar regressions with different dependent variables in order to observe the relationship between loan growth and CAMEL components more clearly. Other regression results and robustness checks are given in Appendix B and Appendix C, respectively. Table C1 (Appendix C) presents robustness checks for the regression with change in equity to total assets ratio whereas Table C2 (Appendix C) shows the outcomes for the change in capital adequacy ratio variable. Table C3 (Appendix C) displays the regression results for change in relative interest income with robust standard errors and lastly, Table C4 (Appendix C) does the same for asset quality indicators.

[3] I use VAR model to analyze the same linkage. The results derived do not show a significant effect on the estimations.

Random effects and fixed effects model are two commonly used techniques in panel data analysis and Hausman test gives the appropriate model to use (Greene, 2008). For this analysis, I use the quarterly panel data from the Banks Association of Turkey (TBB). Data are available for 33 commercial banks but only 27 of them exist during the period of interest. For consistency, the tables in this chapter display the results for the period between 2006 and 2017. Analyses for the period starting from 2002 give very similar results.

The first econometric specification analyzes the linkage between loan growth and bank solvency. Table 4 summarizes the regression results in which difference in equity to total assets ratio is the dependent variable. Random effects model (1), fixed effects model with bank fixed effects (2), time fixed effects (3) and both (4) give similar results. It is more appropriate to use fixed effects model according to Hausman test. I detect a negative relation between abnormal loan growth and change in equity to total assets ratio and it is statistically significant at 1% level. The magnitude of the coefficient is approximately -0.04 which means that one standard deviation (25.7%) increase in abnormal loan growth is associated with 0.01% decrease in equity to total assets ratio. Although the magnitude is small, the negative linkage is economically and statistically significant.

Table 4. Results for Difference in Equity to Total Assets Ratio

Independent variables	(1)	(2)	(3)	(4)
Abnormal loan growth	-0.0314***	-0.0352***	-0.0335***	-0.0433***
	(0.005)	(0.005)	(0.005)	(0.005)
Total loans	0.478***	1.164***	0.431***	1.612***
	(0.066)	(0.173)	(0.049)	(0.191)
Bank fixed effects		Yes		Yes
Time fixed effects			Yes	Yes
Constant	-4.322***	-9.535***	-3.956***	-17.09***
	(0.528)	(1.322)	(0.394)	(2.090)
Observations	1,192	1,192	1,192	1,192
R-squared		0.066	0.173	0.234

Numbers in parentheses are standard errors.
* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

Table 5 presents the results for the regression with the dependent variable of difference in relative interest income. Random effects model (1) and another version of it that controls for the mode of ownership (2), fixed effects model with bank fixed effects (3), with bank and time fixed effects (4) only differ in the magnitude of coefficients but not in sign and significance. Again, fixed effects model is more appropriate to be used. In all models, I detect a very significant and negative linkage between abnormal loan growth and change in relative interest income. One standard deviation (25.7%) increase in abnormal loan growth is associated with 0.03% decline in relative interest income. Again, the magnitude is small but the negative relation is statistically significant.

Risk-based pricing is offering different interest rates to different borrowers based on their riskiness. If abnormal loan growth is regarded as risky, new loans granted should have higher interest rates. On the other hand, competition may cause banks to decrease the rates (Ogura, 2006). Table 5 shows that larger banks with higher total loans and less capitalized ones increase their rates and their relative interest income accordingly.

Table 5. Results for Difference in Relative Interest Income

Independent variables	(1)	(2)	(3)	(4)
Abnormal loan growth	-0.0614***	-0.0578***	-0.0919***	-0.124***
	(0.017)	(0.017)	(0.017)	(0.018)
Total loans	2.162***	2.386***	5.171***	7.445***
	(0.379)	(0.377)	(0.586)	(0.829)
Equity to assets ratio	-0.291***	-0.266***	-0.376***	-0.454***
	(0.101)	(0.099)	(0.110)	(0.115)
State-owned		-9.851***		
		(2.678)		
Privately-owned		-1.229		
		(1.209)		
Bank fixed effects			Yes	Yes
Time fixed effects				Yes
Constant	-16.89***	-17.37***	-40.37***	-74.25***
	(3.925)	(3.750)	(5.425)	(9.442)
Observations	1,065	1,065	1,065	1,065
R-squared			0.113	0.337

Numbers in parentheses are standard errors.
* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

Table 6 displays the regression results for relative loan losses. In order to claim that abnormal loan growth induces a deterioration in asset quality, I expect to see a positive relation between high loan growth of previous periods and relative loan losses. Random effects (1) and fixed effects (2) models again give similar results with different magnitudes of coefficients. A year lagged value of relative loan losses are highly correlated with the dependent variable as I mention above. Previous year's abnormal loan growth is negatively related to relative loan losses because of the technical effect. They both have total loans of the previous years as a component, one in the numerator and the other one in the denominator (Foos et al., 2010). A positive and significant linkage is observed for abnormal loan growth of eight quarters ago. Another positive relation exists for three years lagged variable but it is not statistically significant. The results indicate that one standard deviation (25.7%) increase in abnormal loan growth of two years ago causes 0.06% rise in relative loan losses.

Table 6. Results for Relative Loan Losses

Independent variables	(1)	p-values	(2)	p-values
Relative loan losses $_{t-4}$	0.6769***	0.000	0.5325***	0.000
Abnormal loan growth $_{t-4}$	-0.0050***	0.000	-0.0045***	0.000
Abnormal loan growth $_{t-8}$	0.0023***	0.000	0.0021***	0.000
Abnormal loan growth $_{t-12}$	0.0004	0.451	0.0008	0.134
Abnormal loan growth $_{t-16}$	-0.0010*	0.058	-0.0007	0.151
Total loans	0.0072	0.568	-0.1487***	0.000
Equity to total assets ratio	0.0116***	0.000	0.0197***	0.000
Bank fixed effects			Yes	
Constant	0.1175	0.387	1.4944***	0.000
Observations	732		732	
R-squared			0.500	

* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

CHAPTER 6

CONCLUSION

This study analyzes the performance of the commercial banks in Turkey by using CAMEL approach. It detects a decrease in efficiency in recent years. It associates the efficiency measures with an apparent trend in the banking sector. Impact of loan growth on the soundness of the banks is displayed.

In the first part of the analysis, I choose the most appropriate variables for CAMEL components and explain the fluctuations in them. I continue with clustering them separately and rating them based on a CAMEL rating system. I compare the relative efficiencies of the quarters and demonstrate that the performance based on CAMEL approach has been declining in recent years.

The crises in the past showed that it is crucial to investigate the efficiency of the sector and the factors that may cause deterioration. In further analysis, I investigate the relation between abnormal loan growth and bank solvency, profitability and asset quality by using a panel data for the banks in Turkey. For all econometric specifications, the magnitudes of the coefficients are low but the signs and significance levels are as expected. They reveal negative linkages between high loan growth and soundness of the banks. The study contributes to the literature by examining the effects of high growth rates of loans on the financial soundness of the banks in Turkey.

There are some implications of the results obtained from this study. First of all, worsening in the CAMEL components and other important indicators should be taken into account. Policymakers can take actions to create higher capital ratios and increase liquidity of the banks.

On the other hand, banks need to control for the additional return they generate from new loans and this return should compensate for the additional risk they take. Bank regulators and supervisors such as the Central Bank of the Republic of Turkey and Banking Regulation and Supervision Agency took some major actions to decrease loan growth in the past. Macroprudential policies have been implemented in order to control for the increase in credits. Continuation and strengthening of these policies may contribute to the soundness of the financial system.

Recently, there has been a discussion about overheating of the Turkish economy and it is told that economy's productive capacity cannot meet the increasing demand. Credit growth is one of the factors that contribute to the growth of overall economy and may trigger the problem of overheating. Policies that aim to prevent the abnormal growth of loans can also have a positive impact on the solution of the problem.

Combining the findings from both analyses, I conclude that increasing trend in loans may be a factor in the deteriorating performance of the commercial banks in Turkey. It may be beneficial for regulators and supervisors to attach special attention to the loan growth for the sake of financial strength and stability.

APPENDIX A

BANKS IN TURKEY AND M&A ACTIVITIES

The data for 33 commercial banks are available in the dataset of the Banks Association of Turkey (TBB). Table A1 gives the names of these commercial banks and the ones that are marked are excluded from the analysis since they do not exist during the whole period of interest.

Table A1. Commercial Banks in Turkey

Adabank A.Ş.*	JPMorgan Chase Bank N.A.*
Akbank T.A.Ş.	MUFG Bank Turkey A.Ş.*
Alternatifbank A.Ş.	Odea Bank A.Ş.*
Anadolubank A.Ş.	QNB Finansbank A.Ş.
Arap Türk Bankası A.Ş.	Rabobank A.Ş.*
Bank Mellat	Sociéte Générale (SA)
Birleşik Fon Bankası A.Ş.	Şekerbank T.A.Ş.
Burgan Bank A.Ş.	Turkish Bank A.Ş.
Citibank A.Ş.	Turkland Bank A.Ş.
Denizbank A.Ş.	Türk Ekonomi Bankası A.Ş.
Deutsche Bank A.Ş.	Türkiye Cumhuriyeti Ziraat Bankası A.Ş.
Fibabanka A.Ş.	Türkiye Garanti Bankası A.Ş.
Habib Bank Limited	Türkiye Halk Bankası A.Ş.
HSBC Bank A.Ş.	Türkiye İş Bankası A.Ş.
ICBC Turkey Bank A.Ş.	Türkiye Vakıflar Bankası T.A.O.
ING Bank A.Ş.	Yapı ve Kredi Bankası A.Ş.
Intesa Sanpaolo S.p.A.*	

Note: * indicates that the bank is not used in panel data analyses.

Mergers and acquisitions are types of activities that may have an impact on bank performance. Turkish banking system has experienced M&A activities especially after the 2000-2001 crisis. Table A2 represents some of the major transactions.

Table A2. Merger and Acquisition Activities

Bank Name	Year	Acquirer
Finans Bank A.Ş.	2006	National Bank of Greece S.A.
Denizbank A.Ş.	2006	Dexia Participation Belgique S.A.
MNG Bank A.Ş.	2007	Arap Bank Plc. and BankMed
Tekfenbank A.Ş.	2007	EFG Eurobank S.A.
Oyak Bank A.Ş.	2007	ING Bank N.V.
Denizbank A.Ş.	2012	Sberbank
Eurobank Tekfen A.Ş.	2013	Burgan Bank
Tekstil Bankası A.Ş.	2015	Industrial and Commercial Bank of China
Finans Bank A.Ş.	2016	Qatar National Bank S.A.Q

Note: These are some of the major changes. There are other and relatively smaller transactions during the period of interest. Current names of MNG Bank A.Ş., Tekfenbank A.Ş., Oyak Bank A.Ş., Tekstil Bankası A.Ş. and Finansbank A.Ş. are Turkland Bank A.Ş., Burgan Bank A.Ş., ING Bank A.Ş., ICBC Turkey Bank A.Ş. and QNB Finansbank A.Ş., respectively.

APPENDIX B

FURTHER ANALYSIS WITH DIFFERENT VARIABLES

Capital adequacy ratio and equity to total assets ratio are both indicators for capital adequacy of a bank. As mentioned in the first part of the analysis, capital adequacy ratio is a more appropriate measure since it is a better sign of financial soundness in absorbing loans. In the denominator of the ratio, there are risk-weighted assets. This is the reason why it is more related to the growth in loans. Table B1 presents the regression results where the dependent variable is the change in capital adequacy ratio. A negative correlation is displayed and it is statistically significant. The magnitude of the coefficients of abnormal loan growth is greater.

Table B1. Results for Difference in Capital Adequacy Ratio

Independent variables	(1)	(2)	(3)	(4)
Abnormal loan growth	-0.0501***	-0.0530***	-0.0391***	-0.0457***
	(0.009)	(0.009)	(0.008)	(0.008)
Total loans	0.876***	0.959***	0.767***	0.885***
	(0.171)	(0.318)	(0.092)	(0.096)
Privately-owned				4.239***
				(0.686)
Foreign bank				4.798***
				(0.690)
Bank fixed effects		Yes		
Time fixed effects			Yes	Yes
Constant	-8.384***	-8.925***	-7.449***	-12.27***
	(1.391)	(2.434)	(0.735)	(1.002)
Observations	1,196	1,196	1,196	1,196
R-squared		0.033	0.150	0.186

Numbers in parentheses are robust standard errors.
* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

Relative non-performing loans variable is another indicator of asset quality. Table B2 shows the regression results for this variable. The regression gives similar outcomes and denotes that past abnormal loan growth leads to an increase in non-performing loans, meaning that rising loans may cause riskiness for banks. Again, the magnitudes are small and loan growth of earlier than two years is insignificant. Larger banks and relatively less capitalized ones seem to perform better in terms of asset quality.

Table B2. Results for Relative Non-Performing Loans

Independent variables	(1)	p-values	(2)	p-values
Relative non-performing loans $_{t-4}$	0.650***	0.000	0.541***	0.000
Abnormal loan growth $_{t-4}$	-0.004***	0.000	-0.004***	0.000
Abnormal loan growth $_{t-8}$	0.003***	0.000	0.003***	0.000
Abnormal loan growth $_{t-12}$	-0.0002	0.701	0.000	0.937
Abnormal loan growth $_{t-16}$	-0.001	0.201	-0.001	0.210
Total loans	-0.016	0.216	-0.140***	0.000
Equity to total assets ratio	0.007**	0.20	0.014***	0.000
Bank fixed effects			Yes	
Constant	0.533***	0.000	1.648***	0.000
Observations	732		732	
R-squared			0.500	

* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

APPENDIX C

ROBUSTNESS CHECKS FOR PANEL DATA ANALYSIS

In this section, I present the regression results with robust standard errors. If there is a possibility of heteroskedasticity or within-panel serial correlation, robustness check gives more accurate results.

Table C1 shows the regression results with the dependent variable of change in equity to total assets ratio. The standard errors are higher than the ones displayed in Table 4 but the significance at the 1% level is kept for the fixed effects model.

Table C1. Robustness Check for Difference in Equity to Total Assets Ratio

Independent variables	(1)	(2)	(3)	(4)
Abnormal loan growth	-0.0314**	-0.0352**	-0.0335***	-0.0433***
	(0.013)	(0.014)	(0.009)	(0.011)
Total loans	0.478***	1.164***	0.431***	1.612***
	(0.126)	(0.392)	(0.102)	(0.422)
Bank fixed effects		Yes		Yes
Time fixed effects			Yes	Yes
Constant	-4.322***	-9.535***	-3.956***	-17.09***
	(1.047)	(2.992)	(0.875)	(4.447)
Observations	1,192	1,192	1,192	1,192
R-squared		0.066	0.173	0.234

Numbers in parentheses are standard errors.
* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

Table C2 presents the results for the change in capital adequacy ratio with robust standard errors. Again, the standard errors are higher but the significance levels are the same. The outcomes of both analyses verify robustness and strengthen my findings regarding the linkage between abnormal loan growth and bank solvency.

Table C2. Robustness Check for Difference in Capital Adequacy Ratio

Independent variables	(1)	(2)	(3)	(4)
Abnormal loan growth	-0.0501***	-0.0530***	-0.0391***	-0.0457***
	(0.0175)	(0.0178)	(0.0126)	(0.0119)
Total loans	0.876***	0.959	0.767***	0.885***
	(0.170)	(0.653)	(0.143)	(0.163)
Privately-owned				4.239***
				(0.998)
Foreign bank				4.798***
				(1.197)
Bank fixed effects		Yes		
Time fixed effects			Yes	Yes
Constant	-8.384***	-8.925*	-7.449***	-12.27***
	(1.625)	(4.981)	(1.273)	(2.185)
Observations	1,196	1,196	1,196	1,196
R-squared		0.033	0.150	0.186

Numbers in parentheses are robust standard errors.
* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

Regression results with the dependent variable of the change in relative interest income are displayed in Table C3. The outcomes for random effects models are no longer significant but the relation between abnormal loan growth and profitability is still highly significant for fixed effects models.

Table C3. Robustness Check for Difference in Relative Interest Income

Independent variables	(1)	(2)	(3)	(4)
Abnormal loan growth	-0.0614	-0.0578	-0.0919**	-0.124***
	(0.044)	(0.043)	(0.042)	(0.040)
Total assets	2.162**	2.386**	5.171**	7.445***
	(0.975)	(0.965)	(2.086)	(2.826)
Equity to assets ratio	-0.291	-0.266	-0.376	-0.454
	(0.336)	(0.316)	(0.429)	(0.306)
State-owned		-9.851***		
		(2.605)		
Privately-owned		-1.229		
		(1.132)		
Bank fixed effects			Yes	Yes
Time fixed effects				Yes
Constant	-16.89*	-17.37*	-40.37*	-74.25**
	(9.825)	(8.933)	(20.22)	(30.93)
Observations	1,065	1,065	1,065	1,065
R-squared			0.113	0.337

Numbers in parentheses are robust standard errors.
* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

Asset quality is another important indicator of financial soundness. Lastly, Table C4 gives the regression outcomes with the dependent variable of both relative loan losses and relative non-performing loans. In both models, abnormal loan growth before two years is slightly less significant.

Evaluating all the outcomes from the analyses, the results verify significance and robustness for the linkage between abnormal loan growth and financial soundness.

Table C4. Robustness Check for Asset Quality Indicators

	(1)	(2)	(3)	(4)
Variables	RLL	RLL	RNPL	RNPL
Relative loan losses $_{t-4}$	0.677***	0.533***		
	(0.041)	(0.055)		
Relative non-performing loans $_{t-4}$			0.650***	0.541***
			(0.042)	(0.052)
Abnormal loan growth $_{t-4}$	-0.005***	-0.004***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Abnormal loan growth $_{t-8}$	0.002**	0.002	0.003***	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Abnormal loan growth $_{t-12}$	0.000	0.001	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Abnormal loan growth $_{t-16}$	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Total loans	0.007	-0.149*	-0.016	-0.140*
	(0.025)	(0.074)	(0.028)	(0.071)
Equity to total assets ratio	0.012**	0.020***	0.007*	0.014***
	(0.005)	(0.005)	(0.004)	(0.005)
Bank fixed effects		Yes		Yes
Constant	0.118	1.494**	0.533*	1.648**
	(0.277)	(0.710)	(0.313)	(0.684)
Observations	732	732	732	732
R-squared		0.500		0.500

Numbers in parentheses are robust standard errors.
* for significance at the 10% level, ** for significance at the 5% level, *** for significance at the 1% level

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