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PH. D. DISSERTATION

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APPROVAL OF THE THESIS

The thesis, prepared by Mehmet Sercan ARSLAN and titled “Factors Explaining The Real Sector Credit Growth in Turkish Economy and The Effects of Credit Boom-Bust Cycles” is accepted as a doctoral thesis at Ankara Yıldırım Beyazıt University, Institute of Social Sciences, Department of Economics by unanimous vote.

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Director of the Institute of Social Sciences Assoc. Prof. Dr. Seyfullah YILDIRIM

PLAGIARISM PAGE

I hereby declare that all information in this thesis has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all materials and results that are not original to this work; otherwise I accept all legal responsibility. 04.08.2021

Mehmet Sercan ARSLAN

To my dear wife Menşure İlke, and great sons Ahmet and Ali

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ABSTRACT

Factors Explaining the Real Sector Credit Growth in Turkish Economy and the Effects of Credit Boom-Bust Cycles

This study constitutes an aggregate analysis for Turkish Economy in terms of presenting an outlook on the credit cycles, credit growth rates and its firm-level determinants. In this thesis, my aim is to find out which firm-level dynamics are important in explaining the real sector credit growth rates in Turkish economy and how this effect changes in periods of extensive credit growth and crunch periods. In first section I identified the extreme credit episodes in Turkey between 2006 and 2016 and explored the credit boom (expansion) and bust (crunch) periods by using Hodrick-Prescott filtering methodology.

In the second part I estimated the firm-level determinants of company credit growth rates. To do so, I investigated the balance sheet data of nearly 14 000 firms surveyed in Company Accounts Database of Central Bank of Turkey spanning from 2007 till 2016. I used certain balance sheet ratios as explanatory variables for a fixed-effect regression model and find out which firm dynamics are critical in terms of explaining credit growth rates of companies. I found that any increase in *Firm Size*, *Financial Expenses/Assets* and *Accounts Receivable/Sales*, decreases the credit growth rates of companies. On contrary, any rise in *Cash/Assets*, *Net Income/Assets* and *Debt/Assets* increases the credit growth rates.

In the last part, I tried to incorporate the effects of extreme credit cycle periods into the credit growth patterns of the firms. I launched interaction variables to combine the explanatory variables with credit cycle episodes. Results showed that the effect of some explanatory variables on credit growth rate differs during credit boom and bust periods.

Keywords: Credit cycle, credit growth, panel data, balance sheet, ratio analysis

ÖZET

Türkiye'de Reel Sektör Kredi Büyümesini Etkileyen Faktörler ve Kredi Daralma/Genişleme Döngülerinin Etkileri

Bu tez çalışmasında Türkiye ekonomisi için kredi döngüleri, kredi büyümesi ve kredi büyümesinin firma bazlı belirleyicileri hakkında genel bir tablo ortaya koymak üzere bir toplam (agrega) analiz yapılmıştır. Bu tezdeki ana amaç Türkiye'de reel sektör kredi büyüme oranlarını açıklayan firma temelli değişkenlerin neler olduğunu belirlemek ve bu değişkenlerden kaynaklı etkinin aşırı kredi daralma ve genişleme dönemlerinde ne yönde gerçekleştiğini tespit etmektir. Tezin ilk kısmında, Hodrick-Prescott filtreleme yöntemiyle Türkiye'de 2006-2016 yılları arasında meydana gelen kredi genişleme ve kredi daralma dönemleri ortaya çıkarılmıştır.

Tezin ikinci kısmında kredi büyüme oranlarını etkileyen firma temelli değişkenler belirlenmiştir. Bu analiz için Türkiye Cumhuriyet Merkez Bankası tarafından derlenen Şirket Hesapları Veritabanında bulunan yaklaşık 14 000 firmaya ait 2007-2016 yılları arasındaki bilanço verisi analiz edilmiştir. Sabit Etkili Regresyon Modeli için belirli bilanço oranları bağımsız değişken olarak kullanılmış ve böylece firmaların kredi büyümelerine etki eden firma bazlı değişkenler tespit edilmiştir. Bu kapsamda, *Firma Büyüklüğü*, *Finansal Masraflar/Varlıklar* ve *Vadeli Alacaklar/Satışlar* oranlarındaki herhangi bir artışın firma kredi büyüme oranlarını azalttığı görülmüştür. Diğer taraftan, *Nakit/Varlıklar*, *Net Kar/Varlıklar* ve *Toplam Borç/Varlıklar* oranlarındaki artışın, kredi büyüme oranlarını artırdığı ortaya çıkmıştır.

Tezin son kısmında, aşırı kredi hareketlerinden kaynaklı etkiler firma kredi büyüme davranışları üzerine yansıtılmıştır. Bu kapsamda modele kredi döngü dönemleri ile bağımsız değişkenlerin etkilerini birleştirmek üzere yapay değişkenler eklenmiştir. Sonuçlara göre, bazı değişkenlerin kredi büyüme oranına etkilerinin kredi daralma ve genişleme dönemlerinde farklılık gösterdiği tespit edilmiştir.

Anahtar Kelimeler: Kredi Döngüsü, Kredi Büyümesi, panel veri, bilanço, oran analizi

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LIST OF ABBREVIATIONS

AR	: Accounts Receivable
BAT	: Banks Association of Turkey
BIS	: Bank for International Settlements
BIST	: Borsa Istanbul
BCBS	: Basel Committee on Banking Supervision
BCPS	: Bank Credit to Private Sector
BOE	: Bank of England
BOJ	: Bank of Japan
BRSA	: Banking Regulation and Supervision Agency
CBRT	: Central Bank of Republic of Turkey
CPI	: Consumer Price Index
EBIT	: Earnings before Interest and Tax
ECB	: European Central Bank
EU	: European Union
FED	: Federal Reserve
FSVAT	: Firm and Sector Analysis Data Base
FX	: Foreign Exchange
GDP	: Gross Domestic Product
GNP	: Gross National Product
GLS	: Generalized Least Squares
HP	: Hodrick-Prescott
IMF	: International Monetary Fund
MM	: Money Market
MSE	: Mean Square Error
OLS	: Ordinary Least Squares
OECD	: Organization for Economic Cooperation and Development
ROA	: Return on Assets
ROE	: Return on Equity

ROTA	: Return on Total Assets
SME	: Small and Medium Sized Enterprises
TSI	: Turkish Statistical Institute
VAT	: Value Added Taxes

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1. INTRODUCTION

Economic system consists of two main parts as real sector and financial sector. Real sector conducts investment and production activities. As for financial sector, it deals with the funding of the activities carried out in real sector. Funds are transferred to the real sector through various instruments. Thanks to this fund transfer, savings turn into investments in real sector and increase the capital stock and the production capacity in the country. That the financial sector is able to manage this fund transfer is quite important for the development of economic system in a healthy way.

Banks provide most of the fund transfer between financial sector and real sector in Turkey by means of deposits and credits they grant. Hence, total credit level and its fluctuations are of critical importance to the economy. This mostly influences the companies which can only expand their business depending on external credits due to internal financing shortages. Policy makers expects that all companies would make additional investments with credit usage and contribute to employment. Therefore, the growth dynamics of firms play a big role in the growth of national economy. As for credits, they have critical effects on firm performances.

The overall credit level of a country and the variations in credits influence the growth of firms through balance sheets. In recent years Turkey has experienced various credit crunch and boom periods and these fluctuations observed in credit channels has led to different consequences. Although the effects of the credit fluctuations on companies' balance sheets are important, the current study focuses on addressing different but related research questions.

Our study, in particular, focuses on the hypothesis that *the companies' own performances have a significant effect on the overall growth rates of commercial credits in the country and these effects might change during periods of credit boom and bust.* In short, the study aims at analyzing the marginal effects of companies' balance sheet performance indicators on the credit atmosphere in the country. By doing so, we would like to identify the specific characteristics of firms that stimulate

or retard credit growth rates. Thus, we would like to provide policy makers with some indicators to focus on while designing their policies on increasing credit usage or, in time of excessive credit boom, ways to cool down the credit consumption.

Credit usage may depend on several factors that may somewhat link with macroeconomic outlook as well as firm and sector specific conditions. When economy is in downturn, the dynamics in credit markets may be quite different from when economy performs relatively well. The amount of available credit by financial institutions in these two circumstances may display quite heterogeneity. Moreover, in different state of the worlds in the economy, the behaviors of banks in making loans as well as firms in terms of using external financial resources display different characteristics that may have different governing mechanisms. Therefore, the current study aims at exploring these different set of dynamics and behaviors (by banks and firms) in three distinct analysis.

Firms are the critical actors of the economy. So, we argue that the balance sheet performance of the firms can have negative or positive effects on the credit usage depending on several factors. The individual performances of economic agents not only influence themselves or their sector but also the total credit developments of the country due to the collateral impact they cause. According to our standpoint, total commercial credits are supposed to be upwards or downwards depending on the performances of businesses. Additionally, influence of companies on credit movements might differ during periods of crisis and expansion.

With these arguments, this study stands as a unique work conducted in Turkish case. Since we benefited from a nonpublic dataset, we did not came across with any similar studies in Turkey.

This study first identifies the periods of credit expansion (boom) and credit crunch (bust) which took place in Turkey between 2006 and 2016. Many significant fluctuations occurred due to structural crises in Turkish economy and global developments. In order to create an input for the following parts, these credit expansion and crunch periods have been identified with proper methods commonly used in the related literature, namely Hodrick-Prescott filtering.

Later in the thesis, we analyzed the balance sheet data of nearly 14 000 firms operating in Turkey. We conducted our study by using the Company Accounts database of Central Bank of Turkey, which is one the biggest datasets in the country. Before all, being able to analyze this *confidential* huge dataset has contributed valuable input for the literature in terms of presenting a complete outlook of the economic ecosystem in Turkey. Results of this detailed analysis showed that company performance indicators such as Firm Size, Debt ratio, Profitability ratio, etc. have statistically significant effects on credit growth rates of companies. While in related literature mostly the effect of credits on firm performances has been studied, this thesis analyzes quite the opposite, which is, the impact of company performance on credit growth. In this sense, this study fills an important gap by focusing on a subject which has not been touched upon in Turkey. We found out that firms play a notable role in credit developments in the country.

How this relation changes at times of local and global crises has also been analyzed in later parts of the thesis. To see this effect we incorporated the credit boom-bust episodes, which we found in Section 2, into our model that we construct in Section 3. The findings indicate that firm performances can mitigate the negative effects of a credit crunch while some other firm-level factors could worsen the situation. As for credit boom episodes, similar analyses show that some balance sheet indicators have a calming effect on credit boom in the country. This analysis is also important to present that companies play a role in terms of deepening the crunches or boosting the expansions.

This thesis is an aggregate analysis with over 14 000 companies and 1.2 million observations. We aimed at presenting the researchers a complete outlook of the Turkish businesses, their balance sheets and credit performances without considering external macroeconomic interventions or policy changes. These kinds of enhancements to our research could be topics of other studies. We are aware that the systemic interventions of government might weaken our proposal and there could be numerous factors that might lead to endogeneity. However, in related literature we did not come across with any principle that invalidates our aggregate standpoint. We did not include any macroeconomic variable to our model, nor any dummy variable

to incorporate the effect of government intervention periods. Thus, the company credit growth rates are examined only through the company balance sheet indicators.

The thesis consists of three parts. The first part is about identifying the credit boom and credit bust periods occurred in Turkey between 2006 and 2016. The second part deals with the analysis of balance sheets of nearly 14 000 firms operating in Turkey and the effect of balance sheet performance indicators on credit growth rates. And the third part shows how the effect of these indicators, changed at times of credit crunch and boom periods, found in first part.

2. CREDIT CYCLES IN TURKEY

2.1. Importance of Credit Cycles

The relationship between credits and other macroeconomic variables has long been a matter of debate in economics literature. Considering the financial and economic stability perspective, credit growth has an important part in the macroeconomic scene of developing countries. In times of significant credit crunch, consumption is cut down, investment diminishes, economic activities get slower and unemployment increases. On the other hand, while credits contribute to aggregate demand and overall growth in the economy, extreme credit growth (boom) may lead to volatilities in financial system.

Companies and households utilize credit from banking sector in order to finance their investment and consumption expenditures. In economies, which went through the financial deepening process and had fully integrated financial sector, the level of credit growth is one of the main determinants of economic activity. This, in turn, has an impact on unemployment rate and wealth of residents in the economy. Since credit constitutes a significant part in macroeconomic setting of a country, its growth over time is one of the main indicators monitored by decision makers. That's why policy makers take necessary steps in order to prevent credit booms, especially in times of abundance of liquidity in the economy.

There is a huge literature on the relationship between credit instabilities and crises in banking sector. The studies related to financial crisis show that high credit expansion statistically opens the way to financial crises (Jakubik and Morinescu, 2015).

After the high growth performance in 2000, Turkish economy witnessed two financial crises and economic recessions which had serious consequences and it took a long time for the country to recover. After carefully designed reconstructing efforts at the beginning of the millennium, Turkey achieved a decent progress in its financial transmission mechanism which ultimately led the country out of those crises. As cited above, the extreme credit expansion has brought serious financial fragilities, so it has become a necessity for policy makers to monitor the situation elaborately. In this

frame, it is very significant in terms of financial stability to identify sudden credit expansions and to foresee its determinants.

It is claimed that the extreme credit expansion is related to the structure of financial system as well. For example, Tornell and Westermann (2002) state that extreme credit expansion took place following the financial market liberalization in many middle income countries. Also, it is argued that external factors have a significant effect on the credit expansion. It was found in the studies like Gourinchas et al (2001) that the sudden fluctuations in foreign investment inflow triggered extreme credit expansion. The rise of foreign capital increase the amount of loanable funds and therefore, banks soften their credit standards in order to give away the funds and help households and firms gain access to the credit market more easily. That is, the sudden fluctuations in foreign investment, to some extent, might have effects in financial imbalances and the balance of payments crises.

Due to the factors mentioned above, economists and policy makers gave importance to determining differences from historic trends and making necessary interventions. Different methods have been used to determine the periods of credit crunch/expansion in literature. One of the most popular one could be the filtration methods based on separating the credit indicators from long-term trends to obtain credit gap series (Hilbers et al., 2005; Drehman et al., 2010; Elekdağ and Wu, 2011). In this section, the goal is the determination of excessive credit slowdown and growth periods in Turkey by using a time series filter, namely Hodrick-Prescott (HP) filter, a method to identify the periods of credit growth by using credit gap indicators, for the period from 2006 to 2016. We try to produce measures for determining the periods of excessive growth or crunch for total loans by using econometric models.

2.2. Extraction of Credit Cycles and Determination of Boom-Bust Periods

2.2.1. Literature Review

Because of its importance as an input to assess the financial stability and to shape policies, identifying different phases of financial cycle has gained attention in the literature. This literature has been evolved in different ways, mainly based on the choice of credit indicators as well as methodological approaches.

The Basel Committee on Banking Supervision (BCBS) suggests countercyclical capital buffer as a macroprudential policy tool for banking sector (BCBS, 2010). The goal of this regulation is to protect banking system from excessive credit movements that lead to acceleration of systemic risk. In this context, the committee introduces a statistical approach to define excessive credit growth. Following the proposition exhibited by Basel III regarding the capital buffers, there arises plenty of studies to examine capital buffer as macroprudential policy framework. Drehman et al. (2010) propose some preliminary suggestions concerning countercyclical capital requirement process. Dell'Ariccia et al. (2012) discuss the excessive credit movements can be diminished by taking some macroprudential policy measures depending on the type of credit boom.

There are various implementations in the literature about the credit measure to be used in the calculation of credit cycle series. Some studies (Elekdağ and Wu, 2011) take real credit growth while some others like Guo et al. (2011) use nominal rate of credit growth as an indicator for credit cycle analysis. IMF (2004)[1] and Calza et al. (2006) considers the level of real credit as a credit measure. In fact, using the growth rate of credit level might have some disadvantages depending on the size of the sample (Çolak et al., 2019; Cottarelli, et al., 2005; Gourinchas et al., 2001). It disregards the level of financial development in the economy. The optimal growth rate of credits might differ depending on the size and maturity of the economy. While a minor growth rate might imply a risk for a low-income economy, the same rate might be inefficient for high-income country (Çolak et al., 2019). Preventing the disadvantages

[1] World Economic Outlook, 2004

emerged from the use of growth rates, we could take a ratio of credit level. Most of the studies in the literature use *Credit Level/GDP* (Eichengreen and Erteta, 2002, Barajas et. al. 2007, Dell'Ariccia et. al., 2016). Moreover, Drehmann et al. (2010) claims that the Credit/GDP ratio gives the accurate results among other credit indicators to depict credit cycle.

Another important step in carrying out the analysis is the selection of the filtering methods. Filtering, in a nutshell, means removing a trend from a time series. When we eliminate the effect of trend from our datasets, we are basically avoid of an interference that might distort our data. Statistical filters actually eliminate the noise, and let the researchers focus on the real story behind the scenes. The main aim is not creating a trend, but to separate the cyclical component by removing the already created nonlinear trend from the series. Looking at a time series data, by filtering techniques our objective is to construct a nonlinear trend from this series and separate it from the series.

There are some commonly used filtering methods to show the deviation. With the assumption that the trend is stochastic, Beveridge and Nelson separation method (1981), Hodrick-Prescott filtering method (1997), Baxter-King (1999)'s constant duration symmetric filter, Christiano-Fitzgerald (2003)'s constant duration symmetric and complete sampling asymmetric filtering methods are among some of the methodologies in the literature. Baxter-King filter is a symmetric and frequency pass filter, which eliminates the cyclical effects in the series in a certain frequency band and separates the trend and cyclical components (Baxter and King, 1999). Baxter-King filter also relies on the detrending features of moving average filters which are symmetric. As a later contribution to the literature, Hamilton filter (2018), does not use any smoothing parameter and it permits a fluctuating trend setting (Hamilton, 2018).

The deviation we find from detrending methodology is important in terms of showing us the credit boom/bust periods. Drehman et al. (2010) measure Credit/GDP gap by utilizing Hodrick-Prescott (HP) filtering methodology. This filter is a symmetric filter and with infinite number observations it is assumed that there will not be any shift in peak and bottom points. HP filter, whose theory depends on a

smoothing method, is a commonly preferred technique while estimating credit cycle and business cycle patterns (Kayacan and Birecikli, 2018). Because we will use a huge sample, we prefer to use HP filter in our thesis. Supporting our choice, Çolak et al. (2019) states that HP filter is a commonly applied technique in macroeconomic research to obtain a decent estimate of long-term trend, specifically in business cycles. They say that, large number of academic analyses apply this procedure to examine financial cycles over credit growth and asset prices.

Before using Hodrick-Prescott filtering methodology, we have to determine the threshold levels to mark the boom and bust periods. If credit gap indicator, created by filtering method, are above a certain threshold, this episode is marked as a credit expansion and if it is below the threshold, it is called a credit crunch period. In the literature we see that the related threshold level is obtained by multiplying credit gap series by a certain ratio of standard deviation. Drehmann (2010) explains the credit booms as the periods when the gap between per capita real credit level and its trend exceeds 1.75 times standard deviation of the gap. Dell'Ariccia et al. (2016) identify the start of a credit boom when real credit growth exceeds a threshold and used 1.55 as a threshold value. Barajas et al. (2007) propose a threshold point to detect credit boom if Bank "Credit to Private Sector/GDP" ratio (BCPS ratio) deviates from its trend by more than 0.75 standard deviation. In IMF (2004) survey, one standard deviation was adopted to measure the amount of credit gap's deviation from the trend. Gourinchas et al. (2001) use 2% threshold for the Credit/GDP gap as the limit for excessive credit level. The proposal by Bank for International Settlements (BIS) (2010) suggests that if the cycle in Credit/GDP ratio exceeds 2%, this signals abnormally high credit level and capital buffers should be applied by regulatory authorities. In light of the discussions in the literature, the threshold value in our thesis has been taken as *plus/minus 1 standard deviation* of the gap series acquired through HP filter.

For the Turkish case, one of the most important studies was done by Binici and Köksal (2012) which tries to show the credit cycles in Turkey. Their analysis covers the period between December 2002 and April 2012. In their study, instead of implementing any statistical filters, they used twelve month moving averages to remove the effect of trend in granted loans. They found out that there are unusual credit figures seen in 2006, 2008 and 2011. In another important study, Aydın and

Yilmaz (2019) investigated credit gap indicators for financial institutions. Different from existing studies for Turkey, they employed a univariate filtering technique to identify the indicators. They chose to proceed with Hamilton filter and used +/- 1 standard deviation as a threshold level. They found out that there is extreme credit growth in Turkey following the period of global financial crisis. As one of the latest contributions to the literature, Çolak et al. (2019) identified credit cycles for Turkey. Different from similar studies, they implemented four major filtering methodologies simultaneously to identify the credit boom and bust periods in Turkey. Their work consists of applying Hodrick-Prescott filter, Butterworth filter, Christiano-Fitzgerald filter and Hamilton filter over the time period 2007-2019. Similar to previous work, they also used +/- 1 standard deviation as a threshold level to identify the boom and bust periods. Our study follows a similar pattern in terms of the threshold level. However, instead of using 4 different filtering methods together, we only proceed with HP filtering. In their study they were be able to develop a tool to monitor total loans as well as different loan breakdowns such as type, sector, FX denomination and so on. They also managed to identify the industry based features of commercial credits by examining credit registry data. A critical difference from our work is that, besides identifying the boom and bust periods with filtering method, they examined the credit cycles implied by macroeconomic factors with the help of factor-augmented regressions. Thus, they created 107 different time series from economic conditions, local financial variables, banking sector indicators, growth prospects and so on by using principal component analysis and dynamic factor models. Their work which is done for 2007-2019 period is found to be consistent with exogenous shocks affecting the credit market in the corresponding period. (Çolak et al., 2019) This work bears very complicated models and huge data pools in order to increase the robustness of the findings since the aim of that paper is the determination of boom and bust cycles only. Our study exhibits critical differences from this study and could be regarded as a very simplified version of identifying the credit cycles because credit boom and bust periods will only be an input to our models developed in Section 4.

So, different from what has already been done in Turkey, we employed a single filter (Hodrick-Prescott) for the period of 2006 till 2016 and used +/- 1 standard deviation as a threshold value for our analyses.

2.2.2. Filtering Methodology

Financial cycles have a deep-rooted past in economics literature and today it is still highly a focus of interest. Financial cycles deserve attention for several reasons. For policy makers to take stabilization steps on time during periods of economic recession, it is essential that they follow financial cycles carefully. Therefore, identifying the dates, duration and phases of financial cycles are important as well. Similarly, in order to find out the preliminary indicators of economic contraction, boom and bust features of financial cycles need to be studied elaborately. There are lots of parametric and non-parametric studies which focus primarily on the characteristics of financial cycles and their turning points.

Financial cycles are defined as fluctuations that can be seen almost regularly within economic activities but duration and amplitude of which can vary. This fluctuation process includes all of boom and bust phases from one peak point to another. In the first phase of financial cycle analysis, time series is separated from the trend component, and made stable. There are various methods being developed to separate time series freed of seasonal effects into trend and cyclical movements. In this study, we conducted analyses to determine the periods of credit boom/bust in Turkey for total credits between 2006 and 2016. For the determination of credit volume, Total Credits/GDP will be used as a credit indicator. The next step includes obtaining credit gap series separated from long term trend by HP filtering.

HP Filtering is the method in which the variation of original credit series around the trend is minimized and the gap between the present credit value and the previous one is added to the model as a smoothing parameter (Hodrick and Prescott, 1997). It is useful to distinguish seasonality and noise that the original series include while determining the date and duration of cycles. Thus, seasonal or extreme movements which depend on a specific event are separated and the real situation of financial cycles become clear. HP filter is shown as follows;

$$min_{\tau_1 \dots \tau_T} \sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} ((\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}))^2$$

The model works like this; a series y_t is separated to trend (τ_t) and cycle (c_t) components and the model calculates the smoothed trend τ_t of y_t, where λ represents smoothing parameter. To do so, the model minimizes the variance of original series. The cyclical component is then found as the difference between y_t and $\tau_t$which is named as credit gap. Hence, HP filter construct de-trended series.

Hodrick and Prescott (1997) applied this procedure on quarterly seasonally adjusted GDP data of United States by fixing the value of λ at 1600 to estimate cyclical (transitory) and trend (permanent) components. In their seminal work, they define this λ parameter as *"the ratio of the observed volatility in cyclical component over the volatility embedded in second difference of the trend component"*.

This parameter can be somewhere between zero and infinity. λ parameter going to infinity leads to linear trend. If λ value become closer to 0, then one can see small cyclical pattern. There are various studies in order to identify the optimal level of smoothing parameter. As the most commonly referred study, Ravn and Uhlig (2002) calculated the smoothing parameter as 129 600. So, their method is applied to our study, since this is the commonly used method while dealing with monthly data.

2.2.3. Data

As mentioned above there are various credit measures used in the literature in order to identify credit cycle series. In this thesis we use *Total Credit/GDP* as a credit measure. We can come across with several studies that use this parameter as a credit indicator (Gourinchas et al., 2001; Dell'Ariccia et al., 2016).

Banking Regulation and Supervision Agency (BRSA) provides valuable credit data for Turkish financial system. Therefore, we collected the monthly *Total Credit* data from BRSA. The data covers the period of 2006-2016. Furthermore, total credit series are adjusted for exchange rate effects because more than half of the commercial loans are Foreign Exchange (FX) denominated and movements in the exchange rate alter the total credit volume. The adjustment is done by using a basket rate consisting of US Dollar with 70% and Euro with 30% share. Total FX credit volume in a given month is divided by the basket rate of the month and multiplied by the average basket

rate of the whole sample. Then this adjusted FX loan volume is summed with total TL credits and we obtain the amount of total loans.

To scale down the credit data, we need to have quarterly Gross Domestic Product (GDP) be converted to monthly data. Quarterly GDP data is obtained from Turkish Statistical Institute (TSI). Since publicly available GDP data has a quarterly frequency, we needed to convert the series to monthly basis with an interpolation method. The interpolation technique found by Fernandez (1981) is a widely used methodology converting the quarterly GDP series to monthly frequency in the studies conducted by the Central Bank of Turkey (See for example Çepni et al., 2020). In this thesis, we also used this methodology to obtain monthly GDP series.

2.2.4. Empirical Results

In this part, the empirical results for credit cycle analyses are discussed. First, we want to present the Total Credit/GDP series without applying any filtering. As seen in Figure 2.1, there seems to be a constant increase in Total Credit/GDP. We can observe a significant drop in year 2009, which coincides with the period following the global financial crisis. After 2015, there is a rather stable growth in credits. By only looking at this figure, it might be very difficult to identify the credit boom and bust periods. That's why we need to cancel out the effect of trend in order to see the real cyclical movements of credit. To do so, we will apply HP filtering technique.

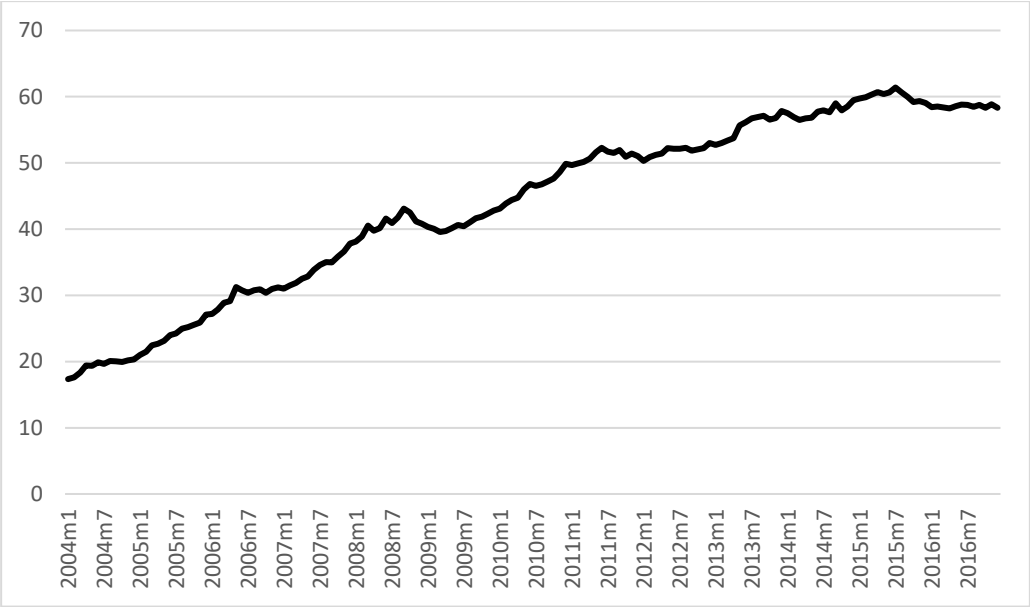

Figure 2.1. Total Credit/GDP (%)

HP filtering method is performed on *Total Credit/GDP* indicator so we can create a cycle series. In order to identify the extreme credit boom and bust episodes, one standard deviation of cyclical component of our credit measure is determined for a threshold value. When we find a point where the magnitude of credit cycle is bigger than the *mean + 1 standard deviation* of the series, we understand that this episode is associated with excessive credit growth (boom). Similarly, if the cycle value is smaller than the *mean – 1 standard deviation*, we conclude there is credit crunch (bust) in that period.

Figure 2.2 shows the band between minimum and maximum values of credit gap series of Total Credit/GDP obtained from HP filtering. The values below 0 refer to credit gap which is below the trend, the values above 0 refer to credit gap above the trend. When we have a credit gap series exceeds (+1) standard deviation, it is called credit expansion, and if it falls below (- 1) standard deviation, it is called credit crunch.

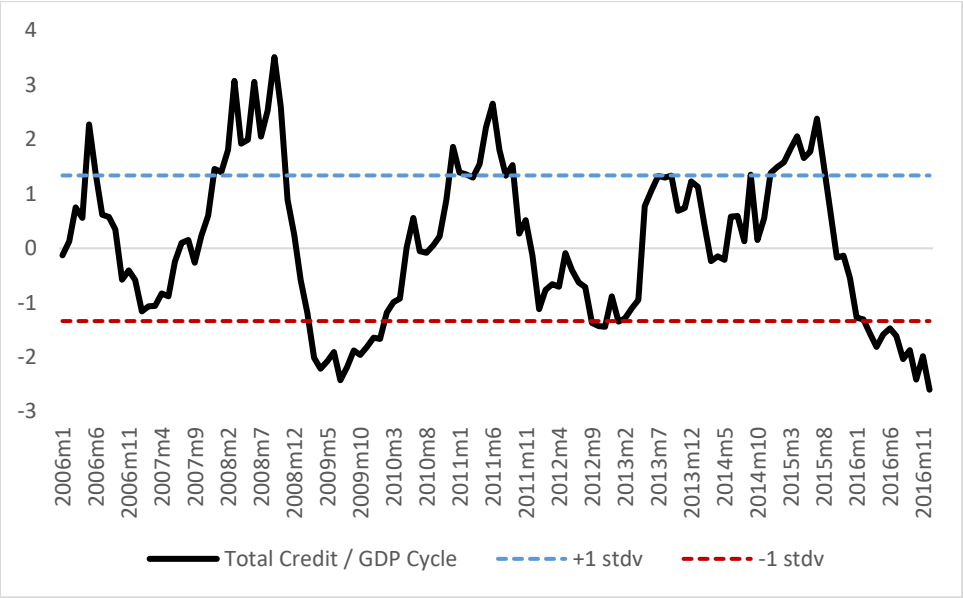

Figure 2.2. Cycle of Total Credit/GDP with HP filtering

Turkish economy has experienced many credit developments since 2001. One of the greatest financial crises in Turkey took place in 2001 resulting job losses and liquidation of several commercial banks. There was a political unrest and economic turmoil in Turkey in the 90s. Even though the country experienced a short relief after the 1994 crisis, the absence of structural reforms retarded the recovery process (Yeldan, 2002). Economic problems increased more and more as a result of the crisis in Russia in 1998, who was then one of the most important trade partners of Turkey, and the pressure Marmara Earthquake caused on the budget in 1999. Since the beginning of 2000, there had been warnings that Turkish economy might face with a crisis again. IMF program of the time applied by Turkey aimed at reducing the inflation that was at high levels. Within the scope of the program, free interest and fixed exchange rate regime was applied. While exchange rates which CBRT publishes daily on its website was kept constant, interest rates were determined by the market (Yeldan, 2002). The liquidity crisis in November of 2000 was the first blow to the economy. As banking sector started to search for the ways of covering their shorts towards the end of the year, interest rates rapidly and suddenly increased. The effects of the crisis that broke out in banking sector had impacts on real sector as well. Turkey signed a stand-by agreement with IMF on May 2001 and a new economy program which focused on making reforms in banking sector was launched.

As a result of a planned financial and operational reconstructing effort in the economy, and the international standardization of legal and institutional framework, Turkish banking sector has strengthened its place within Turkish financial system. Together with the atmosphere of mutual trust and macroeconomic stability provided in economy beginning in 2003, the sector started to carry out its intermediary service more efficiently. With the reconstruction of the banking sector, toxic banks were excluded from the system and the mergers and acquisitions of private banks were encouraged, which led to a considerable decline in the number of banks since 2001.

Following the banking system restructuring efforts in the outbreak of 2001 currency crisis, Turkish economy has witnessed a considerably rapid credit growth till global financial crisis in 2008. This crisis which broke out in 2007 and whose effects were mainly felt in 2008 was different as it did not root from Turkey but from global arena. Subprime mortgage credits were given to those with low income, but the repayment of credits didn't become easy and this led to the depreciation of bonds in a drastic way. The liquidity problems in the developed countries even got worse with the start of 2008. The central banks of developed countries including FED, Bank of England (BoE) and Bank of Japan (BoJ) decided to take common action so as to solve the liquidity problem and developed a series of implementations. At the time, the developed countries kept their interest rates at the lowest of all times and provided markets with huge liquidity.

In early period of the sample (midst of 2006), indicator for Total Credit/GDP exhibit extreme credit expansion which could be observed due to the financial concentration efforts in Turkey, in general. With the start of the global financial crisis, the developments in the credit market and local economic activity were worsened considerably; due to the fact that external liquidity dries and funding cost increased drastically (Çolak et al., 2019). Our credit indicator shows a credit crunch for this era, which takes places between February 2009 and January 2010.

One of the most important reasons why global financial crisis had limited effects on Turkish banking sector was the new regulations enacted following the crisis in February, 2001 (Kesebir, 2018). As the real sector and the financial sector are strongly dependent on each other, they would be affected in the same way in case of

a problem faced by one side. Likewise, the reforms to the banking sector would enable real sector to recover in a short time.

The global financial crisis and the following debt crisis resulted a balancing period with an important downsizing of the economic activity and lower expectations of economic players (Rudd, 2009). Additionally, this balancing involved the lending channel with the Turkish financial institutions being negatively impacted by international financing restrictions and stronger capital requirements. In regards, the balancing period coincides with a contraction in the supply and demand of credit.

After the global crisis, we can see the healing in Turkish economy. After the crisis, loose monetary policies in most of the developed countries caused a surge in capital flows to Turkish banking system and these flows are canalized as credit to private sector. Unconventional monetary policies implemented by FED and European Central Bank (ECB) led to huge international liquidity that flows into developing countries (Pattipeilohy et al., 2013). The developments in credit facility and credit demand started to increase thanks to external financing and recovering economic activity. In this era (2010-2011), Total Credit/GDP indicator points out the excessive credit growth.

Following early period of post-crisis, in addition to the ongoing economic normalization, Eurozone debt crisis erupted and developed economies conducted more aggressive easing policies. To limit the negative effects of this huge monetary easing coming from developed economies, Turkey implemented some economic policies (limiting the installments with credit cards, increasing the reserve obligations of the financial institutions etc.) to protect the economy from over-heating. The increased credit volume and current account deficit, which occurred after the expansionary policies carried out after the global financial crisis, started to pose a risk to financial stability and this came to the fore when CBRT increased required reserved ratio by 50 basis point and rose it to 5.5%. Therefore, we can observe the impact of these policies as a decline in the credit market. The indicator shows a credit bust during September 2012 and February 2013.

After the monetary easing observed in Turkey during 2013-2014, our indicator shows a credit boom in years 2014-15. Analysis also shows the negative outlook after

the coup attempt and the following high risk perception towards Turkey around midst 2016. Credit indicator shows that there was a credit crunch until the end of 2016. The indicators proves that the developments in the credit markets are aligned with general economic scene of the country.

2.3. Section Findings

In this section, we tried to produce quantitative measures for determining the periods of extreme boom and crunch in total loans in Turkey between 2006 and 2016. Even though this question has been the concern of academia for more than two decades in several developed and developing countries, this is the one of the few studies investigating the issue for Turkish economy. Different from the studies already done for Turkey, this part of our thesis used a single univariate filter in order to present a simple and accurate perspective for Turkish economy.

We obtained the credit cycle series for *Total Credits/GDP* by using HP filtering technique. This framework enabled us to obtain more informative and robust results in analyzing credit cycle series. Depending on the position of credit cycle based on the historical variation (proxied by one standard deviation from both sides), we were able to identify the extreme boom or bust periods precisely on a monthly basis. Results are consistent with the macroeconomic realities of the corresponding period and economic intuition (Table 2.1).

Table 2.1. Credit boom and bust periods in Turkey by HP filter

Credit Boom Periods		
Dec. 2007 - Oct. 2008	Dec. 2010 - Sept. 2011	Dec. 2014 - Aug.2015
Credit Bust Periods		
Feb. 2009 - Jan. 2010	Sept. 2012 - Feb. 2013	Mar. 2016 - Dec. 2016

According to our findings, we conclude that Turkey has witnessed three credit boom and three credit bust periods, all of which lasted less than a year. As seen in Table 2.1, identifying the exact dates of extreme credit episodes have been made possible by filtering analysis.

In addition to detection of the boom and bust periods, the current section also discussed the importance of the credits in revitalizing/regressing the economy. Note also that the section also explained to what extent excessive credit may cause overheating in the economy. Credit growth rates of companies, as one of the main consumers of credit, are of significant importance to make inferences about the progress of the ecosystem. In next section, we will be examining the balance sheet indicators of Turkish companies in order to comment on the firm level drivers of company credit growth rates.

These monthly data of boom and bust periods, which we found here in Section 2, will be an important input for Section 4, where we will be investigating the marginal effect of balance sheet indicators on credit growth rates during credit boom-bust episodes. This will be a unique approach in the credit channel literature.

3. FIRM LEVEL DYNAMICS OF CREDIT GROWTH

3.1. Credit Growth and Firm Level Factors

In this section, the dynamic interaction between credit growth and firm specific forces are examined. By correctly estimating the determinants of company credit growth, we will have an opportunity to identify the relevance of firm-specific factors as well as the role each firm specific factor plays in affecting the credit market dynamics. Therefore, an empirical analysis is carried out for Turkish firms by investigating micro-level data sets showing the financial statements and credit debt of the real sector firms. We then try to identify in Section 4 how these firm-specific variables may display different characteristics in credit boom and bust periods for Turkey during the last decades.

Finance is very critical for all businesses. Since operations evolves, the businesses require more money to build their all kinds of strategic as well as daily activities. Any business finances these kinds of operations with either internal or external resources. Obtaining credit from a bank is one the most important external financing options for a firm. Closely monitoring company financials has been an important duty for policy makers and governments because of the potential drawbacks that might emerge from misleading of those companies' financial health. The huge level of debt and possible lack of financial management agenda of those firms might easily put the economy in danger.

Since there are strong ties between companies and financial institutions, a negative incident happens on one side, might also have a negative impact on the other. In case of careless financial management and considerable amount of volatility in terms of loans might easily lead to bankruptcies in the overall economy. These types of common fails of firms, inevitably result into worsening of assets of the financial institutions, which might prevent them from granting further credits. This, at the end, can create a total dysfunctioning of the financial system. When we look at the Turkish case, one can easily prove that the periods of real sector financial distress and worsening of assets of the financial institutions usually overlap. To prevent this at least up to some point, lots of effort has been exerted to monitor and analyze the

financial circumstances of firms, evaluate the efficiency of monetary policy and its transmission mechanisms.

Main objective of the monetary policy in a country is to manipulate the pace of the activity in economic life. It has direct impact on inflation, interest rates, employment etc. Monetary policy affects these fundamentals through the transmission mechanisms (Meltzer, 1995). They can transfer these effects through bank channel, interest channel, balance sheet channel, exchange rate channel and so on. Monetary policy makers should be aware of the transmission mechanisms and their characteristics in order to obtain the expected results from monetary policies. Balance sheet channel represents the impact of financials performance of economic players have on the transmission mechanism. We take this channel into account because the change in monetary policy has impact on both the interest rates in the market and the balance sheet performance of the economic actors (Angelopoulou and Gibson, 2009). We see that these rates in the market have an influence on the balance sheet of economic agents because of their impact on profitability and market value of them.

The idea of firm Balance Sheet channel argues that monetary policy affects the investments of firms not only through interest rates, but also indirectly through the shifts in their balance sheet due to the effect of monetary policies (Bernanke and Gertler, 1995). The financial accelerator model developed by Bernanke et al. (1999) describes an economic environment where financial frictions magnifies the impact of economic shocks. In an environment in which there is financial friction, it is more difficult and costly for firms to fund their investments with external resources. While external finance premium is the main determinant of investment for firms, this premium is also related with the balance sheet of the firms. This relationship indirectly leads the result that the investments are affected by the own balance sheets of companies (Bernanke et al., 1999). Increased interest rates due to the monetary tightening worsens the expected future revenues and stock values of firms. This would lead a decrease in the credibility of the firm in question and increases the cost of external funding (Bernanke and Gertler, 1995). There are some other studies like Meltzer (1995), Gertler and Gilchrist (1994) examining the monetary transmission mechanism for developed countries.

In their study for Turkey, Koç et al. (2015) investigated the relation of investments with real interest, reel exchange rate, cash flow and sales. They found that the increase in real interest rates leads to an increase in the debt stock, diminishes the net market values, so increases the net marginal cost of external funding. As a result of this, firms lose their capacity to invest and create employment. In another study Elekdağ (2003) examined the different ways of monetary transmission mechanisms, specifically with regards to exchange rate effects.

In many emerging economies like Turkey, company performances are among the most important factors of overall economic growth. However, financial constraints might have a negative impact on the growth projections of firms in Turkey. Some studies showed that companies in Turkey are financially constrained. Thus, any shock coming to financial conditions of firms would have immediate and lagged impacts on investments, and eventually on overall productivity and economic growth potential (Yeşiltaş, 2009), (Gül and Taştan, 2018).

Central Bank of Republic of Turkey (CBRT) collects financial statement information of Turkish non-financial firms and present the findings at its website. We used this confidential micro-level data set, namely *Real Sector Company Accounts*, to analyze the impact of company performance on the credit growth rates. There are average 14 000 firms surveyed in this database and it covers the period 2007-2016.

In order to construct the ties between the company balance sheets and credit information, we used another critical and confidential database, named as *Credit Registry Dataset*. This data is compiled by the Banks Association of Turkey (BAT) and contains the credit loan information of almost 2 million Turkish companies. We employed this database to identify the total credit debt of real sector firms to banking sector and its change over time. Then, we matched the Real Sector Company Accounts database with Credit Registry database by using a special code given to firms, which is *IGSNO*. By doing so, we are able to find and match the credit information of companies which are also surveyed through Company Accounts.

As a unique contribution to the literature on firms and credit growth, we will be adding firm fixed effects to our model to find the impact of company specific factors on the credit growth in the country. Specifically, we will explain the movement

of total credit growth of real sector firms with firm level balance sheet indicators. We created some balance sheet indicator ratios to use as explanatory variables in our analysis, assumed to be the drivers of the firm credit growth in Turkey. There are lots of financial ratios in the literature to measure the financial performance of companies. These ratios open the path to create an idea on the general financial well-being of the businesses and also help to determine how the business is financed. Table 3.1 has been derived from some of the balance sheet metrics generally used in the literature (Ohlson, J., 1980, Chen and Shimerda, 1981, Feroz et al., 2003, Cleary, 1999). Later in this section, we will select some of these ratios as our independent variables for our model.

Table 3.1. Some balance sheet ratios in literature

Variable	**Definition**
Firm size	Logarithm of Total Asset Size of a Firm
Liquidity ratios	Short-term Assets / Short Term Liabilities
	Total Cash / Assets
Profitability ratios	Net Income / Total Assets
	Earnings before Interest and Tax / Total Assets
	Net Income/ Total Equity
Solvency ratios	Financial Expenses / Total Assets
	Earnings before Interest and Tax / Financial Expenses
Leverage ratios	Total Liabilities / Total Assets
	Financial Liabilities / Total Assets
Turnover ratio	Accounts Receivable / Net Sales

Since existing work done on Turkish firms in the literature usually include the data of larger firms listed in Borsa Istanbul (BIST), this thesis can be a critical

presentation of micro level data (nonpublic) with large and small firms, which is a more accurate representation of the economic climate in Turkey. One can state that these large firms listed in BIST might be enough to assess the credit growth of the country. However, to obtain a better and more reliable picture of real sector, we state that the analysis should include small nonfinancial firms, too. No one can deny that they have an important role in creating employment and driving the economic growth. Thus, we will employ the data of around 14 000 firms with over 1.2 million observation, instead of using the data of only large corporates listed on BIST. This will dramatically increase the interpretation power of the analysis compared to other studies for different countries. As for Turkey, this analysis stands as the only work done, since we used a huge, not publicly available dataset.

3.2. Literature on the Firms and Credit Growth

There are lots of studies in the literature which deal with the problem of identifying the drivers of credit growth. These papers try to present conclusions about the reactions of various variables against the credit developments in the country.

Geršl et al. (2010) analyze how GDP, current account deficit and inflation behave in times of credit expansion. On the other hand, Erdem et al. (2017) determines credit expansion and credit crunch periods by analyzing macroeconomic performance indices. So, they showed that household spending, business investment and GDP have significant effect on credit cycles. Brown et al. (2009) investigated whether information sharing among banks has affected credit market performance in the transition countries of Eastern Europe and the former Soviet Union, using a large sample of firm-level data. They show that information sharing is associated with improved availability and lower cost of credit to firms.

Claessens et al. (2012) conducted a study by using accounting data for 7 722 non-financial firms in 42 countries. They tried to examine how the 2007–2009 crisis affected firm performance. They found that the crisis had a bigger negative impact on firms with greater sensitivity to business cycles and trade developments, particularly in countries more open to trade. According to their findings, interestingly, financial openness made limited difference.

Drakos et al. (2011), analyzed the survey data for firms from Eastern European transition economies and investigated the determinants of credit rationing. They employed a bivariate probit with censoring approach that accounts for the underlying selectivity since rationed firms are a subset of those without a loan. They found that credit rationing depends on firm size, profitability, sales growth and the country-specific level of domestic credit.

There have been an ongoing interest on credit rationing in terms of theoretical and empirical studies. Credit markets are somewhat different from normal markets since in normal markets there are lots of economic agents to buy or sell a standard good. On the other hand, credit markets require a commitment from the borrower to pay back his debt in the future. So, it might be difficult to determine the possibility of that commitment to be true.

According to an evolving branch of literature, liquidity constraints coming from asymmetric information and incentive (principal-agent) problems might prevent investment and production. Financial institutions usually have a significant positioning to prevent these kinds of information asymmetries. Specifically, companies with a relatively short firm history, usually small firms, should choose to obtain bank credit to other types of external finance, since they are more likely to encounter asymmetric information problems (Angelini, P., 1998). This finding is usually seen in the related literature: smaller firms may not reach alternative financing options and may find it more appropriate to rely on bank credit. (Gertler M., Gilchrist, M., 1994). The difficulty of obtaining finance for small and obscure companies attracts important attention both from academicians and policy setters (Beck et al., 2008; World Bank, 2007). Ferri and Murro (2015) states that Banks, through adequate screening and monitoring procedures, can overcome asymmetric information and incentive problems and reduce firms' credit constraints. Thus, the production and use of information is crucial for avoiding credit rationing.

In many emerging economies, financial institutions have a tendency to be more reluctant in terms of releasing credits. They charge higher than normal interest fees to compensate the extra risk they are exposed to. A study shows that, in emerging

market economies, due to the observed deterioration of collateral values, companies experience much difficulties in obtaining credit (Gilchrist, S., 2008).

In the credit channel literature, the banks' decisions on approving credit applications by the firms depend on firm-specific factors as well as the average market interest rates. Therefore, these unobservable firm specific factors play significant role in the size of the credits by the banks.

Farinha et al. (2015) investigated the credit rationing behavior of financial institutions for Portuguese Small and Medium Sized Enterprises (SME). The results shows that credit supply depends positively on the amount of assets available to be provided as collateral and negatively on firms' indebtedness. In turn, credit demand depends negatively on the interest rate and on the amount of firms' internal resources, and positively on their working capital needs. The variables included in the analysis were computed using the Portuguese dataset Simplified Corporate Information, which comprehends detailed balance sheet information on the universe of Portuguese non-financial corporations. They showed that it is more difficult for indebted firms to have access to bank loans. In their work for Portuguese firms they also showed that smaller firms are expected to have more difficulties in accessing credit from sources other than bank loans and, simultaneously, are the most affected by credit restrictions due to their financial structure and their higher exposure to information asymmetries. Their results also showed that during the financial crisis Portuguese SMEs searched for bank credits mainly to finance their operational activities rather than making new investments. The smaller firms and those with smaller amounts of internal resources have higher demand for bank loans. On the other hand, firms with a higher capacity to pay their debt back and with more collateral could borrow more from banks. The results suggest that smaller and younger firms were the most credit constrained.

A decline in credits to firms may have two reasons. First, it might be due to a credit crunch, a general decline in loans, which is accompanied by worsening of the economic conditions in the country. These crunches harm companies' capital structure and prevent them from further growth. Cowan and Raddatz (2013) use industry-level data for 45 countries to show that industries dependent on external finance decline significantly more during a sudden stop, especially in less financially

developed countries. Second, negative demand shocks to companies might emerge from overall fall in the demand of households for companies' goods. These falls can be reasoned by factors like households' declining wealth, or the general depression in the economy. Nguyen et al. (2014) states that each type of factors has fundamentally different policy prescriptions. If credit factors are found to play the main role, the correct prescription involves providing more and cheaper credit, directly injecting credit and liquidity to banks, or issuing loan guarantees. On the other hand, if demand factors are the main drivers, the focus should be on boosting aggregate demand.

As depicted above, our thesis represents a unique way to deal with the determinants of credit channel transmission mechanism. The existing studies done in credit channel literature, as far as we reached out during our literature reviews, approach the relation coming from credit/macroeconomic developments to firm growth performance. However, in our study, we took quite opposite and looked at the relation stemming from firm performance to credit developments.

3.3. Data

We used two different micro-level data sets to analyze the financial performance of the companies and its effect on credit growth rates. The first micro-level data set is the *Company Accounts*. We use this confidential firm-level micro data set which is collected by Central Bank of the Republic of Turkey (CBRT). Due to the confidentiality, this detailed data for Turkish non-financial firms is not publicly released. CBRT uses this database to monitor the developments in the real sector and only presents annual outcome reports by firm sizes and sectors. The real sector data are being closely watched by decision makers and public in order to follow the general trends and the impacts of economic policies. Balance sheet studies have been conducted by the CBRT in order to keep track of the developments of firms in real sector. CBRT inform the related parties comprehensively on a regular basis. The financial accounts of the related firms are compiled as three-year period and findings are published on the official website.

The data is the collection of various financial and non-financial information of real sector firms which have credit balance by the end of analysis period in banking

system and whose data are available on CBRT Firm and Sector Analysis Data Base (FSVAT), and is a study of aggregating data by years on sectoral and scale basis. Our sample deals with small and medium firms as well as large publicly traded firms listed in BIST. According to a study on this dataset, of the firms included in the sample, 14.46% are large firms, 33.91% are medium, 37.49% are small and 14.14% are micro sized on average according to the EU classification scheme based on number of employees. (*Source: CBRT*)

The data goes back to 1990s but we see that the number of firms included in the database is considerably low before 2000s. On the other hand, during 2005 the accounting standards in the country had seen dramatic changes. Thus, in order to handle a reliable analysis, the company data used in this analysis covers the period 2007-2016. As balance sheets are prepared annually, the balance sheet ratios are assumed to be constant throughout the year.

In addition to company balance sheet data, the second confidential micro-level data we will use is the credit information that is taken from The Banks Association of Turkey (BAT). Thus, we have the information about the total commercial credits given to almost 2 million Turkish businesses in a certain period. This data set contains the information about the firms who have credit balance in banking system and is provided by Credit Registry Bureau on behalf of the BAT's Risk Center. The dataset covers various credit data such as the name of the bank that extends the credit, the name of the company who takes the credit, the type of currency, sector of the company, maturity of the loan etc. The data set covers the period of 2006-2019. This credit information is provided monthly.

These two data sets have been matched with IGSNO, which is a firm identifier code. By doing so, we carefully merged two data sets to obtain meaningful financial and non-financial information. Thus, we had the chance to see both the balance sheet information (from CBRT) and credit data of a firms (from Credit Registry Bureau) in one table.

3.3.1. Overview of the Data

Average number of firms included in the Company Accounts database is somewhere around 14 000. The total monthly observations in this database can reach up to 1.5 million. Figure 3.1 demonstrates the variations of firms included in the survey by years. The changes in the number of firms included in the database occurs due to several reasons such as bankruptcies, mergers, and acquisitions and so on. Therefore, in 2012, the number of firms was at its peak. This database continues to be one of the most significant data set representing the real sector firms in Turkey.

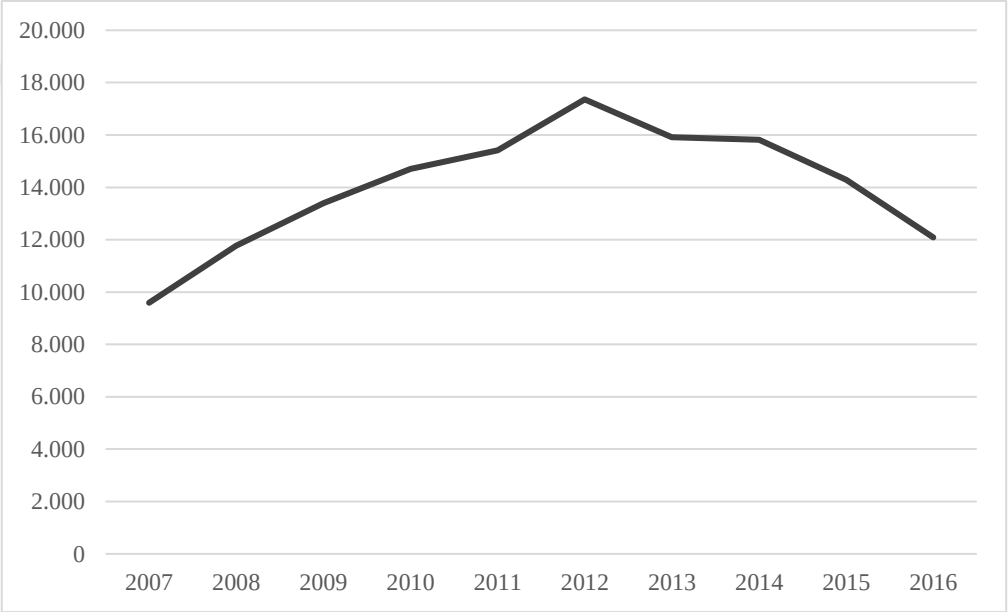

Figure 3.1. Total number of firms included in the Company Accounts survey

As depicted in Figure 3.1, the total number of firms included in the database changes between 17 360 in 2012 as the highest and 9 592 in 2007 as the lowest figure. The average number of firms is around 14 000, which makes this database to stand as a very important and unique resource for firm level studies, and a perfect representation of Turkish business ecosystem. It also covers nearly all of the biggest industries in Turkey, so that the analysis made with this database will be a meaningful estimation of real life.

The distribution of firms by sectors is shown in Table 3.2. We see that firms in the database are operating mainly in *Manufacturing* and *Wholesale&Retail* industries. Then comes the Construction industry followed by Services. The Agriculture, Communication and Mining industries are among the least represented sectors in the database.

Table 3.2. Firms by sectors in company accounts survey

Year	Agr.	Comm.	Const.	Energy	Manuf.	Mining	Real Estate	Services	Tou. & Rest.	Trans.	Whole. & Ret.	Total
2007	66	78	931	192	4244	164	63	496	451	461	2446	9592
2008	101	108	1220	259	4817	172	82	902	574	583	2950	11768
2009	149	153	1386	331	5213	214	100	1118	637	647	3454	13402
2010	217	160	1555	391	5509	237	110	1156	705	683	3978	14701
2011	283	155	1676	471	5636	228	147	1143	742	686	4247	15414
2012	344	169	1970	518	6233	232	184	1218	857	735	4900	17360
2013	320	150	1801	511	5734	218	173	1124	797	646	4436	15910
2014	304	161	1814	585	5592	212	205	1122	887	674	4259	15815
2015	254	148	1602	533	5058	186	183	970	835	571	3952	14292
2016	236	119	1351	479	4167	152	151	784	742	494	3408	12083

The Company Accounts database contains thousands of firms in various industries with different asset share. Table 3.3 shows the asset share of each sector in total assets of all firms. Here it is clear that, with an average share of 37%, manufacturing industry has the highest stake in the economy in terms of total assets. Whole & Retail industry has the second highest share with a 15% of assets. It is followed by the Construction and Energy industries with around 12% asset share. The smallest portion of total assets comes from the Agriculture industry with an average share of 0.33%.

Table 3.3. Asset shares of firms by sectors

Year	Agr.	Comm.	Const.	Energy	Manuf.	Mining	Real Estate	Services	Tou. & Rest.	Trans.	Whole. & Ret.
2007	0.13%	6.64%	11.99%	8.46%	40.52%	2.07%	0.88%	3.70%	2.90%	7.30%	15.41%
2008	0.15%	6.43%	11.70%	11.77%	37.45%	1.98%	0.90%	4.37%	2.84%	7.54%	14.88%
2009	0.19%	6.19%	11.81%	12.76%	35.64%	1.99%	1.33%	4.44%	2.71%	7.47%	15.48%
2010	0.25%	5.77%	11.30%	12.46%	36.73%	2.11%	1.13%	4.14%	2.60%	7.49%	16.02%
2011	0.36%	4.55%	11.18%	10.86%	38.04%	2.33%	1.58%	4.33%	2.66%	7.70%	16.41%
2012	0.41%	4.19%	11.95%	10.25%	37.48%	2.21%	1.69%	4.79%	2.82%	7.46%	16.74%
2013	0.39%	4.85%	10.98%	10.62%	36.83%	2.45%	1.33%	6.81%	2.67%	7.10%	15.97%
2014	0.51%	3.74%	12.83%	12.99%	34.99%	2.34%	1.67%	4.51%	3.27%	7.68%	15.46%
2015	0.50%	4.25%	13.63%	10.74%	35.89%	2.40%	1.94%	3.88%	3.33%	7.92%	15.53%
2016	0.46%	5.32%	13.50%	12.87%	34.52%	2.58%	2.02%	3.16%	2.94%	8.53%	14.10%

By matching Credit Registry data and Company Accounts data we could be able to monitor the total credits of the firms surveyed in Company Accounts. Thus, we can see the course of total commercial credits that belong to those average 14 000 companies during 2007 and 2016. Results are shown in Figure 3.2. We can track the movements of total credit by the Turkish Lira (TL) as well as Foreign Exchange (FX) denomination. These movements are important as to show the related parties about the magnitude and volatility of total credits, which might be regarded as a significant indicator of the economic activity in the corresponding period. As depicted in Figure 3.2, while TL credits are in a relatively steady increase, Total Credits and FX Credits seems to have higher growth rates. TL credits started around 40 Billion TL in 2007 and reached a maximum of 200 Billion TL at the end of 2016. However, at the same period, Total Credits spanned from 100 Billion TL in 2007 to 700 Billion TL at the end of 2016, which is a significant increase in such a short period. It was generally on the rise even though there was a decline in 2013 and 2015. FX credits also has a similar pattern, starting from 100 Billion TL in 2007 and reaching up to 500 Billion TL in 2016.

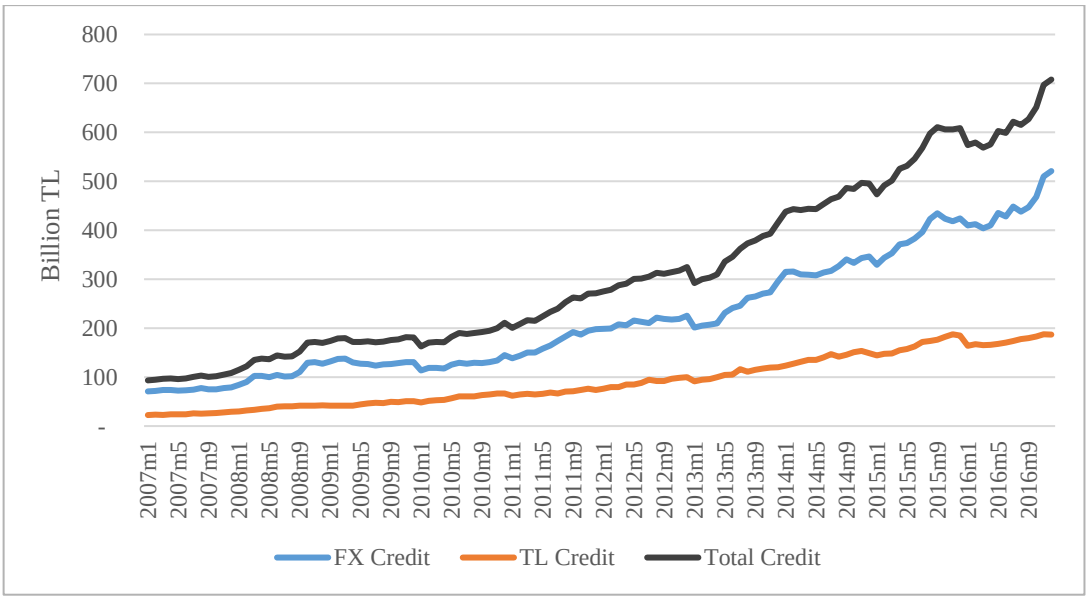

Figure 3.2. Total credits and TL/FX credits by years

Figure 3.3 shows the average credit growth rate of all firms included in the data set. We can see the negative effects of global financial crisis in 2009 with lower credit growth. That year, while average firm-level TL credits decreased by 30% and was 70% on average, the credit growth rate of FX dramatically fell, which resulted in negative rate of growth.

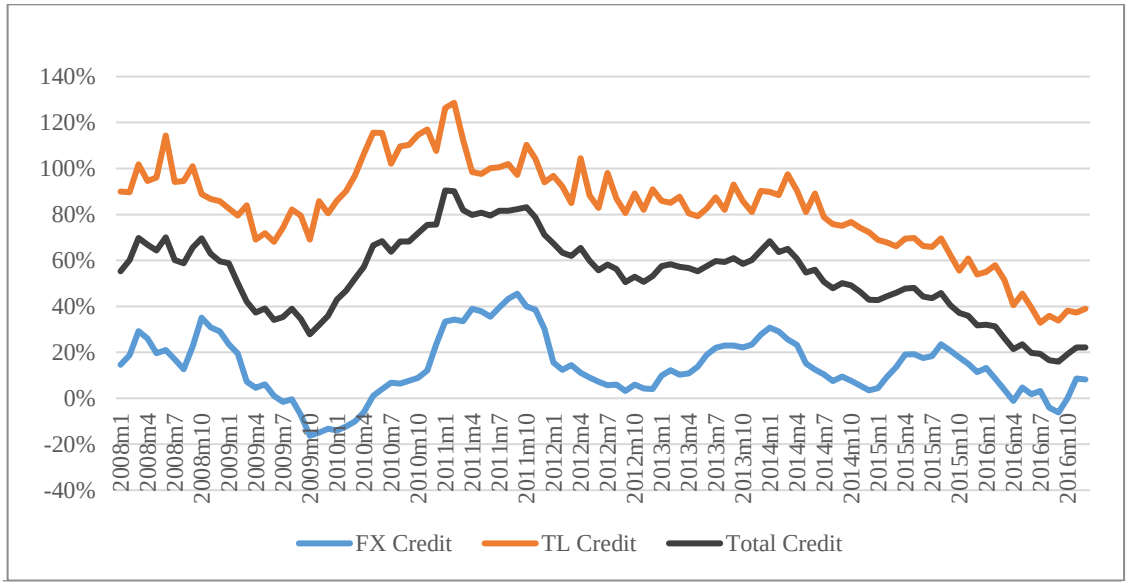

Figure 3.3. Mean credit growth rates (%) of firms in company accounts by years

Following the expansionary responses of the central banks of the developed countries, an abundance of funds was observed in developing economies and thus led to high credit growth rates in 2010 and afterwards. For example, in 2011 FX credits are 40% higher than the previous year. As a result of the macro prudential measures taken in Turkey in 2012, there happened a cooling effect on the credits and the credit growth rates started to decrease again. In 2012, total credit growth rate fell to 60%. The credit growth followed a fluctuating course until 2016. In parallel with the developments in the country in 2016, there occurred a significant decrease in credit growth.

So far we have showed the *mean value* of firm-level credit growth rates in our sample. Nevertheless, one might question that outlier credit growth rates might excessively increase or decrease the mean growth rate. For this reason, in Figure 3.4 we also depicted the *median growth rates* of the sample over the same period. When we list the credit growth rates of companies in increasing order, then median value, which is the growth rate of, say the 7000^{th} firm, shows us that, in 2010, there was a 30% growth in total credits. The fluctuations between years follow a similar pattern with mean growth rates. [2] For instance, in 2009 median FX credit growth rates fell significantly around minus 25%.

[2] Although the growth rate in total credit volume of the firms in the sample might also be a logical presentation of credit conditions in our sample, since the number of firms has been changing from year to year, we obtain very volatile and incomparable growth numbers. Therefore, total credit growth rate, rather than mean and median, is not presented in the thesis.

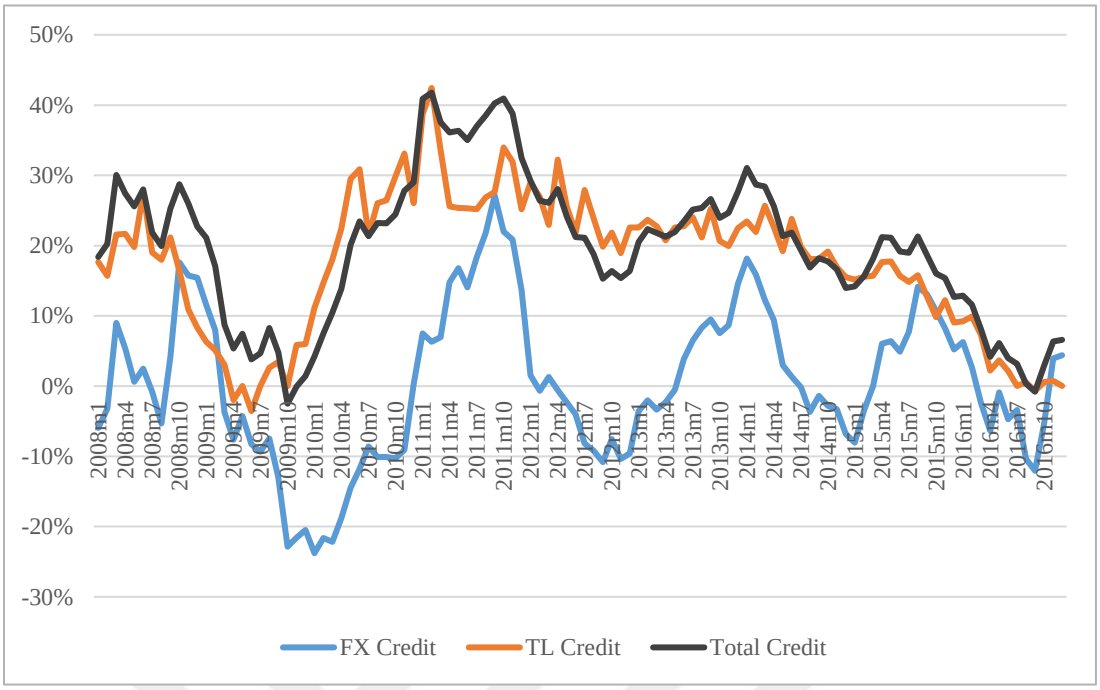

Figure 3.4. Median credit growth rates (%) of firms in company accounts by years

However, this method of showing the averages might be a better representation of what is really going on in the economy, because it disregards some of the most distorting outliers. So that we can obtain cleaner and more realistic growth rates. For example, when we use the mean average rate, say at the beginning of 2011, growth rate of TL credits is somewhere around 128%. On the other hand, median growth rates of TL credits gives us an increase of 41% for the same period. This huge difference might be due to some very large outliers which increases the mean growth rate dramatically. Some big companies might obtain huge credits which might drive the growth rate to very high figures. That's why looking at the median growth rates could be more meaningful in terms of reaching a conclusion on the state of the economy.

Table 3.4 shows the portion of credits which goes to each specific industry. We see that the biggest share of commercial credits (44.86% in 2008 as the highest) went to *Manufacturing* industry. The average share for Manufacturing industry is around 40% of all commercial credits, thus we can state that almost half of the credits go to Manufacturing businesses in Turkey between 2007 and 2016. As the second biggest receiver of credits, Wholesale & Retail industry gets around 18% of credits.

Contrary to the common belief, Construction industry receives only 11% of total credits in Turkey and stands as the 3rd largest receiver. Mining industry obtains around 10% of total credits and takes the 4th position. We saw that, these sectors also have the biggest size of assets as shown in Table 3.3. As the smallest player, Agriculture industry takes a tiny portion of all credits with a figure of 0.46%. Credit portions by sectors seems to be alike despite the changing economic conditions during these years. We can state that these allocations are compatible with the intuition of economic development. In Turkey, biggest share of the pie goes to manufacturing, the main driver of economic development in a country. Manufacturing industry can create new investments with these proceedings and can help to solve the unemployment problem in the country. Thus, allocation of credit among sectors does not prove anything wrong in Turkey.

Table 3.4. Credit shares of firms by sectors

Year	Agr.	Comm.	Const.	Energy	Manuf.	Mining	R. Estate	Services	Tou. & Rest.	Trans.	Whole. & Ret.
2007	0.23%	1.73%	8.01%	5.11%	46.86%	1.38%	1.23%	4.87%	3.83%	7.53%	19.21%
2008	0.24%	2.42%	10.11%	6.60%	44.36%	1.32%	1.50%	6.16%	3.90%	6.12%	17.26%
2009	0.30%	3.08%	11.00%	8.24%	40.97%	1.19%	1.31%	6.39%	3.99%	4.96%	18.55%
2010	0.39%	2.77%	11.22%	8.09%	42.75%	1.04%	1.20%	4.83%	3.93%	4.42%	19.36%
2011	0.56%	2.04%	10.31%	9.71%	42.01%	1.02%	2.10%	5.09%	4.35%	4.83%	17.99%
2012	0.61%	1.15%	11.08%	9.67%	40.82%	1.07%	2.09%	5.68%	4.05%	4.65%	19.13%
2013	0.52%	2.71%	9.65%	11.25%	39.78%	1.19%	1.69%	6.59%	4.19%	3.97%	18.47%
2014	0.62%	1.24%	11.96%	13.75%	35.61%	1.32%	2.04%	6.52%	4.72%	4.45%	17.77%
2015	0.58%	2.52%	12.95%	13.30%	34.88%	1.69%	3.10%	4.14%	5.11%	4.64%	17.10%
2016	0.49%	5.06%	14.98%	14.23%	30.41%	2.43%	3.59%	4.02%	5.34%	5.35%	14.11%

3.3.2. Summary Statistics

Company Accounts database stands as the most critical resource in Turkish economic domain. Before moving on to the empirical studies on firm performance and credit growth, we will try to present valuable descriptive information about the financial conditions of companies listed in our database. This will be a unique source of information for researchers to ignite further studies on the firms' financial health in Turkey. Table 3.5 shows the selected variables to be summarized. We chose to proceed with these variables since these are the most common ratios while working with company balance sheets. We calculated various descriptive ratio statistics that belong to the approximately 1.5 million observations of around 14 000 firms included in the data set.

Table 3.5. Descriptions of variables used in ratio analyses

Variable	**Definition**
EBIT/Financial Expenses	Earnings before Interest and Tax / Financial Exp.
Current Ratio	Short-term Assets / Short Term Liabilities
Cash/Asset	Total Cash / Assets
Net Income/Asset	Net Income / Total Assets
EBIT/Assets	Earnings before Interest and Tax / Total Assets
Receivables/Sales	Accounts Receivable / Net Sales
Fin. Exp./Assets	Financial Expenses / Total Assets
Net Income/Equity	Net Income/ Total Equity
Liabilities/Assets	Total Liabilities / Total Assets
Fin. Debt/Assets	Financial Liabilities / Total Assets

Financial Ratio Analysis is mainly based upon the analysis and the interpretation of at least two classes or groups within financial accounts. It is a technique in which the percentage and multiples of items are examined as long as there exists a mathematical relation among the items in financial accounts. These items actually refer to items such as, liquid assets, short term liabilities etc. Financial ratio analysis is a quantitative tool that business executives make use of so as to gather information about firms' profitability, ability to pay, efficiency, liquidity, business and market value. That data is quite precious for other parties such as executives and investors who need to make right financial decisions, to evaluate the financial health of the company.

In this regard, we used these descriptive ratios to see the characteristics of the Turkish firms. Since we have a huge number of firms and observations, these initial ratios in Table 3.6 have great value in terms of showing the related parties a perfect summary of what the Turkish business ecosystems looks like.

Table 3.6. Selected descriptive statistics for company accounts database

Variable	**Observation**	**Mean**	**Std. Dev.**	**Min**	**Max**
EBIT/Financial Exp.	1,347,937	3.63	7.25	-7.10	51.50
Current Ratio	1,492,726	1.61	1.04	0.36	6.63
Cash/Assets	1,485.418	0.08	0.09	0.0001	0.39
Net income/Assets	1,493.376	0.01	0.05	-0.15	0.16
EBIT/Assets	1,493.374	0.05	0.05	-0.07	0.20
Receivables/Sales	1,457.182	0.23	0.19	0.005	1.03
Fin. Exp./Assets	1,574.850	0.02	0.02	0	0.10
Net Income/ Equity	1,493,317	0.08	0.18	-0.62	0.69
Liabilities/Assets	1,493,380	0.67	0.20	0.17	1.03
Fin. Debt/Assets	1,570,425	0.30	0.21	0	0.77

EBIT / Financial Expenses

EBIT simply means pre-tax business profits of a company. To make it more clearly, EBIT is the abbreviation of *Earnings before Interest and Tax*. By using EBIT, we can see the profit a company makes from its main operations. Thus, we can separate the profit of main operations from the effects of non-core business decisions, and of legal regulations. In short, this value shows how much profit a company can make from the operations before tax and interest expenses. For instance, interest expenses result from company borrowings. However, firms sometimes get into debt for the operations which are actually out of their core business. Investors and creditors generally take EBIT into consideration while evaluating the success of a firm's core activities.

EBIT to Financial Expenses is an indicator which shows the amount of earnings (EBIT) over its financial expenses (interest payments). A ratio of 4 means that a firm is earning four times its financial expenses. Firms might face with some periods with low EBIT ratios to cover their interest expenses, but their cash on hand could protect them to survive in these less productive periods. On the other hand, firms which frequently have a low EBIT ratio, that is not enough to cover their interest expenses, might find themselves struggling with solvency problems and might not be able to pay their interest fees. This would lead the firms into default. So, a higher EBIT/Financial Expenses ratio is better, and gives an important signal about the well-being of the firm. If this ratio is less than 1 for several consecutive periods, than one might easily argue that the firm's financial well-being is going worse.

In our study for Turkish companies listed in Company Accounts database, by analyzing around 1.35 million observations covering 2007-2016 we ended up an average EBIT/Financial Expenses ratio of 3.63. This can be interpreted as Turkish firms earns 3.63 times their financial expenses.

Current Ratio

Current ratio is found by dividing liquid assets by short-term liabilities and it is one of the most basic ratio used in balance sheet analysis. It equals to the ratio of total current assets and short term liabilities. As an important symbol of liquidity, it is used for analyzing the performance of coverage of short term liabilities. The result of this calculation is usually expected to be above 1. It means that current assets meet the conditions of short term liabilities. For example, if the result is 3, it shows that the company has 3 Turkish Liras in return for debt of 1 Turkish Lira.

As stated above, current ratio is a liquidity ratio which shows the financial strength of a firm to meet its short term liabilities. Our surveyed companies have an average current ratio of 1.61. This shows that the Turkish companies have 1.61 times more current assets than liabilities to pay its short-term liabilities. In related literature, a good current ratio is between 1.2 and 2 (Needles et al, 2010). So, one can conclude that Turkish companies have enough resources to pay their short term debt, which is a good signal in terms of showing the financial health of the firms.

Cash/Total Assets

Total Assets are composed of internal sources like buildings, equipment, inventory and so on. Companies usually spend too much money on acquiring these assets so they have to generate a decent amount of cash from those assets in order to survive. *Cash/Total Assets* ratio is a proper balance sheet measure that shows the level of cash in hand. This metric calculates the cash created for each TL assets the firm have. A higher ratio is a good signal that can be interpreted as how efficiently the company benefits from his assets. The Cash/Assets ratio is shown as a percentage and is the net cash in hand divided by total assets, multiplied by 100.

According to Cash/Total Assets ratio, Turkish companies keep as much cash as 8.21% of their total assets. A high figure may represent an indicator for the financial strength of a firm, however, a high ratio also signals an inefficiency in financial management since too much excess cash might be regarded as inefficient.

Net Income/Total Assets (Return on Assets - ROA)

ROA indicates how effective the assets are in terms of creating profit and is a significant measure for the profitability of firms. It represents the net income generated by total assets for a specified accounting year. It shows how much profit firms make with an asset of 1 TL, so it tells us how successful a firm is to transform the initial money spent to buy assets to net income. Thus, higher ROA ratio is usually better since this indicate the firm is effectively using its assets to generate net income. Return on Assets is calculated by dividing a corporate's annual earnings by its total assets. This is sometimes called *investment return*. The calculation of ROA refers to a ratio and it is generally shown as per cent.

It is considered to be a bad sign if a company has a ROA rate much more than normal. It may imply that company has not improved its equipment or invested in new machines or equipment. While this strategy increases ROA rate in the short term, it damages the long term outcome of assets as the equipment efficiency decreases. Generally, firms with ROA ratio which is less than 5% have high amount of assets. As for firms with ROA more than 20%, they usually need lower assets in order to finance its operations. ROA is a critical tool for investors and executives. A reasonable ROA ratio is a crucial target for a company and it should be actively monitored in terms of trends and performance for comparison with other companies.

Our analysis shows that Turkish firms have as much net income as 1.69% of their total assets. The optimal amount of ROA changes depending on the industry. As a rule of thumb, an ROA higher than 5% seems to be good in the daily practice (Needles et al, 2010). This shows us that, with a ratio of 1.69% Turkish firms in general have a low to moderate level of profitability.

EBIT/Total Assets (Return on Total Assets-ROTA)

This ratio shows the power of assets to generate operating income. It measures a firm's net income relative to its total assets and is a good indicator of how successful a business is in terms of benefiting from its assets to create earnings. Different from the calculation of ROA, rather than using net income we use EBIT in order to better

concentrate on earnings generated from core operations, freed from the effect of interest and tax. A higher ratio seems to be more efficient that the firm is more successful in terms of managing its assets. This ratio is shown as a percentage, and demonstrates us how much earnings the firm creates from every TL invested to the company. Results show us that, of the 14 000 Turkish companies with almost 1.5 million observations, the EBIT/Total Assets is calculated as 5%. This means that Turkish companies generate 0.05 TL for each 1 TL invested.

Accounts Receivables (AR) / Sales

Accounts Receivables (AR) shows the amount of sales which are done on credit, that the firms did not get the money straight away from these transactions. AR account is located in the current assets part of a company's balance sheet. *Sales* means the total of cash and credit sales a firm has done in a given period.

The AR/Sales ratio is a liquidity ratio which shows the part of a firm's sales made on credit. When a firm owns a large portion of his sales on credit, it might encounter with liquidity issues. As a rule of thumb, having a lower AR/Sales ratio is desirable because it presents a good signal about the cash accumulation process of a firm, which is a wished indicator in terms of proving lower liquidity risk. This means that major part of sales is in cash that could be used to finance operations. Additionally, when a company has low AR/Sales, one can argue that the company is creating a good cash flow from his activities. The company depends less on financing operations for generating liquidity. On the other hand, a high AR/Sales ratio could be interpreted as a bad signal by Banks, because a high amount of cash tied up to credit sales may challenge the company to pay interest installments. Also a very high ratio shows that a firm might not have enough cash buffer to cope with economic crises and downturns in the country. Lastly, the AR/Sales ratio is beneficial in terms of showing how much a firm is intended to make sales on credit. By looking at this ratio, it is possible to reach a conclusion about the operational structure of the firm.

In our analysis, as AR/Sales ratio suggests, Turkish firms have 23.5% of their sales on credit. If it is close to 100%, it might be regarded as very high because a big portion of cash is tied up with customers. The ratio shows that Turkish firms

moderately depend on credit sales, having some of their cash proceedings in customer's disposal. This might be regarded as a volatile signal for Turkish companies in terms of creating a risk about liquidity.

Financial Expenses/Total Assets

Every organization has its own activities, and sustaining of which requires funding. In search for these resources, companies seek for funds, credits and external sources for their costs and investments. Financial Expenses is the account through which some expenses such as interest payments, exchange rate differences, commissions, fees etc. are monitored.

The Financial Expenses/Total Assets ratio measures how much of a company's assets are spent on financial expenses and is important because a higher ratio decreases the earnings investors will obtain. This ratio is calculated by dividing a company's financial expenses by the total assets. The ratio shows the costs the firm is supposed to bear in order to access to finance. This ratio is a critical indicator because it lets the owners and/or investors to have an idea on the amount of money they are spending in interest expenses in a specific period. Lower financial expenses ratio is favorable since it provides that the company is paying less interest expenses which eventually increases the returns the investors will gain.

When we have a look at 1.57 million observations acquired from Turkish companies included in the survey, Turkish firms spend nearly 2.62% of their assets for financing expenses. This ratio rises as the economic downturn and the hikes in interest rates get more visible.

Net Income / Equity (Return on Equity – ROE)

ROE, accepted as one of the most important financial ratios, shows how much profit a company makes in return for each 1 TL capital it has. It is basically calculated by dividing a company's after tax amount by equities. This ratio shows the return on the investment which the owners are obtaining depending on the equity they put into the company. ROE is regarded as an indicator for the profitability of a company,

taking into account the shareholders' equity. This shows how decent the firm benefits from its equities and is a proper ratio for comparison with peers and sector averages. As a rule of thumb, the corporations generally require around 10 to 15% ROE for financing their further expansion and growth. A very low level of ROE ratio signals a bad business performance or an intensively conservative business aptitude. However, a high ROE could be regarded as a signal of a well-functioning business performance. ROE is shown as a percentage and could be measured for companies those of which have positive net income and equity numbers.

In our analysis for Turkish companies, the ROE is found as 8%, which might be regarded as a moderate to low figure compared with the rule of thumbs. Turkish investors receives 8% of the equity they invested in the company as net income. This low figure might hinder the growth prospects of Turkish companies. One might argue that Turkish firms in general have limited profitability. The reasons behind this phenomenon could be a topic of another study.

Liabilities / Assets (L/A)

The definition of liability, in short, could be some value a company is in under obligation to pay back in case of request. It is generally a certain amount of cash. Liabilities are monitored on the right side of the company balance sheets and composed of debts, accounts payable, interest payments, deferred revenues, bonds, etc. There are two types of liabilities which are grouped as current (short term) and long term. Short term liabilities are a firm's financial obligations that are due within a year. Whereas, long term liabilities are obligations expected to be paid in a year or more.

Commonly known as a solvency ratio, Liabilities/Assets ratio shows the portion of a firm's assets which is composed of liabilities. Firms with low Liabilities/Assets ratio signals having a few liabilities. This might be regarded as a good indicator of the financial well-being of that firm. The ratio is calculated as liabilities (both short and long term) divided by the total assets.

Briefly, this ratio represents the amount of a firm's assets that is financed with debt. A ratio below 50% means that the firm is mostly financed with equity. A ratio higher than 50% shows that the firm is financed mostly with debt. Firms with a fast growth path usually have a higher ratio. Similarly, those firms who are struggling with financial problems also bears high ratios. In our analysis, the average L/A ratio of the Turkish companies is 67%, which shows that the firms in Turkey mostly finance their needs through external debt.

Financial Debt / Assets

Debt ratio sheds light on the level of debt dependence of a firm to continue its activities. The ratio makes a comparison of assets with net financial debt. A high Financial Debt/Total Assets ratio might raise a firm's financial risk. However, a higher rate and risk might also be regarded as a potential for increased returns in the near term.

Debt/Asset ratio could be regarded as the percentage of a firm's assets which are financed with loans. Thus, investors carefully examines this ratio to determine the amount of financial debt in a firm, the possibility of paying back his debt, and whether or not to grant extra credit to this firm. Additionally, banks and investors benefit from this ratio to understand whether the firm is healthy and solvent or not. Also they can gain insight about the capability of firm to pay short and long term liabilities and its position to generate a return on their investment.

A ratio of 1 shows that the firm has equal amount of assets as its financial debt. This demonstrates that the firm is leveraged highly. If the ratio is bigger than 1, we can argue that the firms has more debt than his assets. It shows that the firm is extremely leveraged. It could be very risky for investors to invest or bankers to grant more credit to this company. If the ratio is smaller than 1, we can conclude that the firm has more than enough assets than his financial debt. This shows that the firm can successfully meet its liabilities if needed. So, we can state that the lower the Financial Debt/Assets, the less risky the firm is.

Our study on Company Accounts database indicates that Financial Debt/Total Assets ratio for Turkish companies is 29.2% which suggests that firms have financial debt as much as 29.2% of their total assets. This is a low ratio and might be regarded as good signal for Turkish companies in terms of showing us, on average, companies has the ability to pay back their obligations smoothly. This rate might increase if economic slowdown turns out to be a structural problem.

Thanks to this summary statistics presented in recent pages, researchers could extract lots of questions by looking at the ratios since these figures are a good representation of the overall business climate in Turkey. We run these analysis with the data of almost 14 000 companies and around 1.5 million observations, which makes it an unprecedented sampling in Turkey's scale.

3.3.3. Winsorizing the Data (Eliminating the Outliers)

In order to conduct a more reliable and meaningful analysis we did some data cleaning. The outliers within data have been winsorized by applying the Winsor method and a more proper data set has been acquired. Winsor method was developed by biostatistician Charles P. Winsor in 1946 for a new method of eliminating the outliers in the dataset. However the first one to apply this procedure in a scientific setting with enhanced implications was Wilfrid Dixon in 1960.

Winsorizing is a method of eliminating the impact of outliers from a statistical dataset by restricting the extreme points (Dixon, 1960). As we know, outliers can have distorting effects on the distribution of statistics and those values in analyses might be significantly affected by outliers. So, Winsorizing is regarded as an efficient method to take care of this issue, enhance the power of the statistical analyses and the robustness of interpretations.

Winsorizing is a method to diminish the effect of extreme values in the dataset by changing the extreme data point so that it become closer to the other normal values. In this method we could set all extreme points to an identified percentage of the dataset. Namely, a 80% Winsorizing will set all the points below 10^{th} percentile and above 90^{th} percentile to the corresponding percentile. These extreme outliers are simply

changed rather than deleted as in the trimming method. It is important to highlight that by Winsorizing we do not delete or remove a data, we just modify the extreme points. Simply deleting the data is the topic of another method, which is trimming. In trimming, outliers are removed however in Winsor method outliers are modified by specific percentiles. In Winsorizing, a data point with an extreme value hence a big residual effect is changed by a new value in order to minimize the effect of that extreme point (Dixon, 1960).

In our study, to eliminate the outliers, we winsorized the data at each tail at 0.5%. Thus, we ended up with 1 107 226 observations for the period of 2007-2016.

3.4. Methodology

In this part, we will be presenting what firm level factors imply about credit growth. With our model, we will try to analyze the relation between firm specific balance sheet ratios and credit growth rate of companies. Thus, we could see the value of credit growth implied by firm dynamics. We used a *Fixed Effect Regression Model* in this section, which is an important tool to work with panel data. Regressions with firm fixed effects focus the analysis on within-firm variation over time and alleviate the potential endogeneity problem that these unobservables might be correlated with the included indicators of informational asymmetries (Kirschenmann, 2016).

3.4.1. Panel Data Models

In econometric studies, there are mainly three types of data used, which are; time series data, cross section data and pooled data. Time series data includes the observations of one variable or variables based on units of time. In other words, it shows the course of observation values depending on time. Time series data are mostly collected daily, weekly, monthly, quarterly and annually. On the other hand, cross section data is the observation at one specific point of time of different variables.

One other type of data used in econometric researches is the pooled data, which is the combination of cross section and time series data. Panel data is a special type of pooled data, which shows the course of the same cross section variables

according to a specific period of time. In time series and cross section analyses, the changes based on time and units can be examined separately. Panel data includes time and unit dimensions and allows us to make analyses according to time and/or units. In other words, panel data shows the changes based on both time and units. The advantages of using panel data are as such; it allows for more observations, thus provides more data, and increases the degree of independence and it provides more efficient and reliable estimations.

The specification structure of panel data models changes depending on whether they contain unobservable unit and/or time effects. Those models which do not contain unit or time effects are called classic models. The models which contain either unit or time effects are called one way (one-factor) panel data models and those with both effects are called two way (two factor) panel data models. Unobservable unit and time effects are added to panel data models under fixed effect and random effect assumptions.

3.4.2. Fixed Effect Panel Data Models

Panel data models in which unobservable unit and/or time effects are considered under fixed effect assumptions are called fixed effect panel data models. The unobservable effects within this models are considered as parameters to be estimated. Fixed effect models with either unit or time effects are called one way (one factor) models whereas models with both time and unit effects are called two way (two factor).

One-way Fixed Effect Models

The unobservable unit effects on panel data model with one-way fixed effect are added to the model through fixed parameter. It is assumed that each unit on model has a different fixed parameter for the control of unit effect. The panel data model where fixed parameter differs based on unit, but slope parameter remains stable is as follows:

$$Y_{it}=\alpha_i + \Sigma\beta_k X_{kit} +\varepsilon_{it};\ i=1,\ldots,;\ t=1,\ldots,T;\ k=1,\ldots,K$$

As shown in the model above, fixed parameter differs based on unit but doesn't change by time. If we define fixed parameter in order to show the unit effect as $\alpha i=\alpha+\mu i$ where α represents joint fixed parameter and μi shows unit effect, then the model above can be rewritten as below.

$$Y_{it} = \alpha + \Sigma\beta_k X_{kit} + \mu_i + \varepsilon_{it};\ i=1,\ldots,;\ t=1,\ldots,T;\ k=1,\ldots,K$$

Panel data model with one-way fixed effect may contain only unit effects just as it may only contain time units.

Two-way Fixed Effect Models

Unit and time effects, which are unobservable can be considered together. In two way fixed effect models, they are included in the panel data model through fixed parameter. That's, fixed parameter depends on units and time. The model is based on the idea that each period of time and each unit has a fixed parameter. Two-way fixed effect panel data model, in which fixed parameter changes depending on time and unit but slope parameters don't, is as following.

$$Y_{it} = \alpha_{it} + \Sigma\beta_k + \varepsilon_{it};\ i=1,\ldots,;\ t=1,\ldots,T;\ k=1,\ldots,K$$

Here, fixed parameter can be defined as $\alpha it=\alpha+\mu i+\lambda t$ where α shows joint fixed parameter (average fixed parameter), μi shows unit effect and λt; time effect. Thus, the model above can be shown as follows:

$$Y_{it} = \alpha + \Sigma\beta_k X_{kit} + \mu_i + \lambda_t + \varepsilon_{it};\ i=1,\ldots,;\ t=1,\ldots,T;\ k=1,\ldots,K$$

3.4.3. Random Effect Panel Data Models

In a random effects model, the unobserved variables are accepted to be uncorrelated with all of the observed variables. In this model, the idiosyncratic effect is a random variable which is uncorrelated with the independent variables, thus we presume the idiosyncratic effect is a random one which is uncorrelated with the independent variables.

If we assume in our study that there are no omitted variables, then using a random effects model most likely be better. Namely, if we think that the omitted variables are uncorrelated with the explanatory variables, we can use a random effects model. By benefiting from all the data in hand, random effects model might give unbiased estimates and create the least errors.

In random effects model, unobservable effects are assumed to be random unobserved variables such as error terms. In fixed effects models, unobservable effects are assumed as parameters to be estimated, whereas in random effects models these unobservables are contained in the model as random variables. Due to these critical differences, random effects models has distinct assumptions and estimation methods based on this fact. Random effect models which contain only unit or time effect are called one way (one factor) random effects models. Random models which studies both unit and time effects at the same model are called two way random effects models.

3.4.4. Choice of Fixed vs. Random Effects

In this thesis, we used a *Fixed Effects* model rather than random effects model due to intuitional and econometric reasons. Fixed effects model assumes that unobserved time-invariant variables are correlated with observed explanatory variables. If we do not eliminate the impact of unobserved variables, we might face an omitted-variable bias which leads to biased and inefficient coefficient estimators.

Fixed effects model overcomes this problem and permits considering the firm specific impacts while estimating the regression model, since it has different values for all cross section. All the time-invariant differences among cross sections are being controlled in the fixed effect model. Due to the omitted time-invariant features, the estimators of fixed effect model are not biased. Additionally, as being the other commonly used model in the literature, the *random effects* model permits for two different kinds of unobserved impacts influence the dependent variable. The first one is the firm-specific time-invariant effect, assumed to be random. The second one is the firm-specific time varying random error. Different from fixed effects method, the random effects method states that the variations among sections are random and

uncorrelated with the independent variables. Thus, considering the likelihood of containing time-invariant effects, random effects model might be regarded as a nice and proper alternative. However, in fixed effects model the effect of these time-invariant variables are hidden in the intercept. In order to choose between fixed effects or random effects models, we can present intuitional and formal analyses. To begin with, we hereby give some intuitional insights.

For example, in our case, we hypothesize that firm-level profitability ratios have an impact on credit growth rate. Nevertheless, profitability ratios might also be related with the firm-level unobserved factors and due to this relation we might wrongly measure the impact of profitability on credit growth rate. The unobserved factors might be the location or sector of the firm, managers' profile, the banks that firms work with, employees' benefits and many more. If we take the location as an example, firms in large cities, like İstanbul tend to have high profits compared to firms in small cities like Siirt due to large number of customers. And depending on the city differences, the profitability level and its impact on credit growth rate might change. Our main aim is to identify the pure impact of profitability on credit growth rate independent of where the firm locates. Nevertheless, we cannot control this factor with an observed variable since our data set includes no location information as well as the number of customers.

Similar to location, the managers' profile might have a significant impact on profitability. While a manager of the firm might be risk-lover and tend to operate with low-profits, invest in new factories and use excessive credit from banks, another firm's manager might be risk averse and have high profits and less credit. In this case, it is clear that the impact of profit on credit growth rate is not free from the managers' behavior and this manager factor should be controlled in our regressions. Since we cannot observe the managers' profile in our data set, we control this factor by including firm-level dummies, namely fixed effects, in our regressions. By using fixed effect dummies we are able to control for all firm-level unobserved time-invariant factors which might bias our coefficients. In this way, we can measure the pure impact of independent variables on credit growth rate.

In addition to this intuitional explanation on the choice of fixed effects methodology, there is also a formal test on making decision on whether to use fixed effects or random effects is more appropriate and the formal test is labeled as the *Hausman Test*. The basic econometric assumption in fixed effects is that unobserved factors are correlated with regressors, and in random effects they are not correlated. Hausman test basically tests whether the unique error terms are correlated with the explanatory variables. The null hypothesis of the test is that they are not correlated in favor of random effects. If we reject the null hypothesis as a result of Hausman test, then we end up with fixed effects model. All our regressions reveal the rejection of the null hypothesis and suggest fixed effects estimation. Hausman test results are presented in Table 3.7.

Hausman Test:

$$H = (b_1 - b_0)' \left(\mathrm{Var}(b_0) - \mathrm{Var}(b_1) \right)^{\dagger} (b_1 - b_0),$$

H_0: *Regressors are uncorrelated with unique errors (Random effects)*

H_a: *Regressors are correlated with unique errors (Fixed effects)*

Table 3.7. Hausman test results

Hausman Statistics	2391.86
Prob>chi2 = 0.0000	

We applied Hausman test for the baseline regression in order to see whether the fixed effect methodology is appropriate in our setting. The Hausman Chi-square statistics is *2391.86*, which is evidently very large. Hence we reject the null hypothesis that regressors are uncorrelated with unique errors (random effect). We accept the alternative hypothesis that the fixed effects is appropriate model in our regressions.

3.5. Model

In this part of the thesis, we conducted an empirical analysis on our panel data. As mentioned in Section 3.3, we studied with company data that spans from 2007 till 2016. Unobservable firm effects are considered in the model to run estimations for fixed effect. With the help of this model, we tried to analyze the direction and magnitude of possible effects of firms' characteristics on company credit growth rates.

We used Ordinary Least Squares (OLS) estimator for the fixed effect model. OLS is a form of finding unknown values in a linear regression by using linear least squares. This model finds the values of parameters in a linear regression by minimizing the sum of squares of the differences among the observed dependent and estimated values of the variable. So we can say that this is the sum of the squared distances, which is parallel to the observed variable's axis. When we have a smaller difference between each observation and the corresponding estimation in the regression line, then we can say that the model has a good fit with the data. The definition of error could be best explained as the distance between estimation and real life. Graphically, it is the vertical distance between an observed value and the regression line. Thus, OLS method deals with the squares of the errors and struggles to identify the line passing from the data which minimizes the sum of the squared errors. By using OLS, we could obtain an equation which uses the independent variable as an input, and tries to find the dependent variable as an output.

During OLS method, we use the theoretical regression model, as in the simple model below,

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i,$$

and we try to have an estimated regression equation like in the model below;

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i.$$

To sum up, the aim of this section is to analyze the effects of certain balance sheet ratios on the growth of credits with the help of fixed effect models by applying

OLS method. To identify the explanatory variables in the model, we conducted several model trials in light of the related literature.

The balance sheet ratios, which are selected to be the explanatory variables, are grouped under Profitability, Liquidity, Total Indebtedness and Firm Size. The data set is crafted through the financial ratios of firms enlisted in Company Accounts survey. In this regard, we established our model in order to better grasp a picture of what is the total amount of credit growth rate among these firms and the effects of several balance sheet indicators on credit growth.

The model is structured as follows;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Firm\ Size_{y-1}$ = Firms Size *(Logarithm of Total Assets)* of firm i at year y-1

$Cash/Assets_{y-1}$ = Cash / Total Assets of firm i at year y-1

$Net\ Income/Assets_{y-1}$ = Net Income / Total Assets of firm i at year y-1

$Fin.Exp./Assets_{y-1}$ = Financial Expenses / Total Assets of firm i at year y-1

$Fin.Debt/Assets_{y-1}$ = Financial Debt / Total Assets of firm i at year y-1

$Receivables/Sales_{y-1}$ = Accounts Receivable / Sales of firm i at year y-1

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

We take the lagged values of independent variables in our model while looking at the credit growth at *year y* and *month m*. The reason behind this is straightforward. We consider the value of independent variable for *year y-1* not to create an endogeneity issue because if we take the value of *year y*, credit growth rate of *year y* might also influence our explanatory variables. Thus we take the value of previous year for our explanatory variables. The value of *year y-1* shows the impact of the explanatory variable on credit growth at *year y* conveniently.

3.6. Empirical Results

In this section, we present the results of our initial regressions. The p-values of the regression support that *all the explanatory variables are statistically significant*.

Total credit growth is the average credit growth rate of firms through the survey period (2007-2016). This is derived from the Credit Registry data provided by the Banks Association of Turkey. We monitor the annual variation of credit growth on a monthly basis. That is, we can consider this value as an average annual credit growth rates of around 14 000 firms in Turkey.

Here, the regressions are run depending on the *IGSNO*, which stands for the masked taxpayer identification number assigned to represent firms. The regression results are as follows;

Table 3.8. Regression results for credit growth rates

VARIABLES	Credit Growth
Firm Size	-0.144*** (0.018)
Cash/Assets	0.167** (0.075)
Net Income/Assets	0.248*** (0.088)
Fin. Exp./Assets	-7.133*** (0.269)
Fin. Debt/Assets	2.294*** (0.054)
Receivables/Sales	-0.103*** (0.018)
Constant	2.021*** (0.213)
Observations	1,107,226
Adjusted R-squared	0.018
Firm FE	YES

*** p<0.01044, ** p<0.05044, * p<0.1044
Robust Standard Errors in parenthesis

3.6.1. Effect of Firm Size on Credit Growth Rate

We know that firm size is the size of total assets and it points to the overall collection of assets owned by the firm which are items of economic value. These assets are expected to create an economic gain for the firm for a specific period of time. In company accounts total assets are shown in the balance sheets which include assets like cash, inventory, intangible assets, accounts receivable, etc.

The value from the regression model is -0.144. Results of the analysis show that *total credit growth rate tends to decrease as firm size gets bigger*, thus our regression depicts an inverse relation. It might be regarded as counterintuitive, since we might expect bigger companies to reach external finance easier, which could lead

a growth in credits. However, here we see that credit growth rate slows down as firms get bigger.

Big firms are more likely to have long term total debt. They are more mature in terms of their operations. On the other side, small firms have an inclination to present bigger risk-adjusted returns than big firms. This will lead the small firms to be more enthusiastic in terms of using credit.

Our explanation to this finding is as follow; the credit growth of big firms is lower since they have more financial alternatives. For instance, the firms with high assets might prefer to issue bond instead of receiving a bank credit. Additionally, big firms are also seasoned firms which have mature businesses. They would be more selective when using credit to expand their businesses, thus their credit usages do not change dramatically from one year to another. Firms those who have large amount of assets also have strong capital structures so they will eventually reach a capacity to run their operations and investments without depending on further debt.

3.6.2. Effect of Cash/Total Assets on Credit Growth Rate

Cash/Assets is a significant indicator for the *liquidity*. It shows the firms' ability to make necessary payments with the funds they obtain in short term. It proves how liquid the firm is, because cash is the most liquid asset a company owns. Firms require cash to be able to run their operations smoothly. A company might have perfect sales figures, however, if it does not hold the necessary cash in hand, it might eventually face with challenges to run its business. Liquidity is a ratio that shows the ability of a company to transform his assets into cash. That's why, by just looking at the cash position of a company does not give the exact interpretation on the liquidity of the company, but still gives an important insight. Healthy cash-on-hand, would serve the firms to take care of financial challenges and make stronger financial plans for future. So, the Cash/Assets ratio can give us a quick picture on the financial health of the company. Assessing the differences between the short-term obligations and the cash on hand helps a company and investors better understand the financial position of the company and present meaningful liquidity metrics.

The value from the regression model is 0.167. According to our analysis, *total credit growth rate tends to increase as the cash ratio of firms increase*. We can interpret this in two ways: First, as the relative value of cash increases, by keeping that cash as a kind of collateral, firms could find favorable terms for obtaining credits for their payments. Investors and banks carefully monitor the liquidity and cash-in-hand before reaching a conclusion whether to grant credit or not. Cash is important in terms of creating a positive signal for the investors and make it easy for companies to obtain credit with less interest expenses. Therefore, increase in cash ratio might lead a growth in credits.

Secondly, firms might prefer to save up their cash and take loans for their investments since using credit has a leverage effect. We must admit that cash has some certain boundaries, like being a finite source than loans. Even financially strong and highly profitable companies might face certain periods with shortages of cash. Firms which depend solely on cash for running their operations will eventually create a boundary on their capacity to make important investments. Overdependence on available cash sources and avoiding from external loans can prevent companies enjoying the benefits of obtaining credit. In this manner, credit usage presents lots of advantages, such as enabling more flexibility for businesses and increasing their investment power by injecting more money to the cash already in hand. Usually firms prefer to use the cash in hand for certain activities such as paying salaries, rental costs and so on. Credit usage enables companies to channel the cash in hand to the financing needs of these important daily routines while leveraging the credit for big investments and purchases. So, the increase in Cash/Assets ratio will lead the companies to be more self-confident in terms of obtaining more credits and investing more. This might ultimately increase the overall credit growth rate.

3.6.3. Effect of Net Income/Total Assets on Credit Growth Rate

Net Income/Asset shows the net income that firms earn and makes a comparison of a firm's total assets with the magnitude of income it pays back to the owners. This ratio shows how decent a firm's investments create value, so we can say that it is a critical metric of profitability for a company.

Earning high income levels enables firms to increase the likelihood of coming across with advantageous opportunities that companies can benefit from so that keeping themselves successful and up-to-date in a competitive market. By looking at this measure, banks and potential investors could reach a conclusion about the capacity of the company to create returns over the invested assets. Without enough investments done to sustain and operate a firm, business failure is inevitable. Thus, in order to prevent themselves from this trap, companies could obtain credits to grow. Growth for a company is specifically an enlargement, moving towards a bigger business, enhancing its market and eventually becoming a more profitable business. The current profitability of a business might be well enough, but companies should always focus on searching for options for further growth. By doing so, they would grasp different opportunities for increased profitability which might attract the attention of potential banks and investors.

We can say that as the Net Income/Assets ratio increases, firm profitability also rises, which might be interpreted as the scope of the firm is getting wider, and the firm flourishes in a general sense. The value from the regression model is 0.248. In our analysis, the regression depicts that *the rise of this ratio has a positive impact on the total credit growth*. As an explanation for this case we can say that when their revenues increase, firms resort to new credits in order to get bigger and finance their growth. Since they earn a good income, their willingness and hope for further growth is stimulated. In other words, they now have a higher self confidence in terms of investing and growing more. This idea encourages firms to borrow more money. We might not want to consider this sort of credits as debt refinancing or debt turnover. Rather, it is more convenient to see these funds as a means to develop capacity. On the other hand, these kinds of customers are more appealing for the Banks. Since these firms have strong financials and high asset quality, Banks find it less risky to grant credits to these firms. This would eventually increase the credit growth rates of companies.

3.6.4. Effect of Financial Expenses/Total Assets on Credit Growth Rate

This ratio shows the ratio of the financial expenses (interests, fees etc) to the total assets of the firm. The rise of this ratio shows that firms may end up with high costs to reach finance. Increases in financial expenses, especially interest rates, affect firms in lots of ways. When the interest rates become higher, companies in need of commercial loans can face with higher interest payments and less disposable revenue. In high rates environment, it is common to come across with firms those could only afford to pay the interest installments, rather than the main debt. A business which cannot pay its loans back might be less attractive to potential lenders, which also put a burden on their new loan applications, even with less favorable terms. So, the increase in financial expenses might change the borrowing behavior of the companies. That is, higher financial expenses may imply credit constraints for some firms.

Considering the examples from many countries, the Financial Expenses/Total Assets ratio is usually supposed to be maximum 2% of the firm's total assets. As we found out in *Section 3.3,* Turkish companies spend nearly *2.62%* of their total assets for financing expenses. This ratio is sensitive to countercyclical developments within the economy. In other words, it is a countercyclical issue for the firm. Interest rate differences would emit fluctuating impacts throughout the economy. The rise of financial expenses due to overall state of the economy, that's, the rise of the price of money, discourages firms from searching for extra loans from financial institutions. Firms might end up in a situation that they do not have the necessary motivation and financial power to apply for extra credits. They would also choose to postpone new investments, which ultimately decrease their credit consumption.

The value from the regression model is -7.133. Our analysis show that *total credit growth rate tends to decreases as this ratio increases.* To put it numerically, for example, if the credits grew by 15% in the previous year, then total growth rate would become around 8% in the following year. Thus, we can say that Turkish companies are significantly sensitive to the developments in financial expenses. An increase in financial expenses in Turkey, discourages Turkish firms severely in terms of using further credits.

3.6.5. Effect of Financial Debt/Total Assets on Credit Growth Rate

This ratio shows the ratio of total financial debt of a company to its total assets. An excessive increase in the ratio is not desirable. One interpretation, a high debt ratio can be regarded as a signal for a structural problem of the firm. It shows that the firm is somewhat *debt addictive*, which means that it needs more debt to continue its business. The increase in the debt stock will result in more credit growth. That's, firm will have more credit debts in order to refinance their existing loans. This is how the firm reacts and might show there is an unhealthy financial situation. On the long term, it is highly probable that these kinds of companies, those of which are financing their debt by refinancing, might face with financial stress, like insolvency or bankruptcy.

A second perspective on the increase in debt stock could be explained by the leverage effect of debt. When a business starts to rely on credit, the leverage effect of debt would be more appealing and attractive as time passes. And ultimately, becomes a way of doing business, and becomes irreversible. Shareholders usually object the idea to decrease the debt stock, rather encourage to increase debt when a new market opportunity emerges. There is an important disincentive for owners to reduce the credit usage. The most likely risk of increased loan level is the increased risk of facing with financial problems, even insolvency. However, rising leverage can also make firms motivated to invest in promising new businesses.

The value from the regression model is 2.294. Our analysis for Turkish companies indicates that *when debt ratio increases total credit growth rate tends to increase as well.* As the firm gets into more and more debts, the ratio of the credit rapidly increases. Explained above, Turkish firms enhances their credit consumption due to either servicing their existing debt to survive, or benefit from the leverage effect of debt to invest more.

3.6.6. Effect of Accounts Receivables/Sales on Credit Growth Rate

This is the ratio of short-term trade receivables of firms to its total sales. An increase in this ratio shows that the firms' cash-in-hand will decrease in the short term because of the high amount of receivables. Accounts Receivables (AR) is accepted to

be an asset since this amount can be transformed to cash in a later period. Buyers sometimes find it more advantageous to keep their cash, for other purposes, and delay their payments to sellers. This time it becomes a challenge for the seller to keep Accounts Receivable under control and does not let it rise too much. If it fails to do so, the company will face with extra financial costs and cash shortages. Changes in AR have a significant effect on the cash flow of the business. The cash levels do not rise until the company gets his money from the buyers.

The value from the regression model is -0.103. Our analysis indicates that the *increase in AR ratio have a negative effect on the total credit growth*. As an intuitive explanation to this case; not being able to collect the receivables might put the firms in danger. Hence, the banks find it risky to lend money to these kind of firms. So, this might decrease the credit growth rate of firms. On the other hand, depending on the increased level of money tied up to the customers, companies will be more reluctant to obtain further loans, because they know that there is a danger not being able to pay the interest payments. This will eventually create a disincentive for firms to request more credit, thus decrease their credit growth rate.

3.6.7. Interpreting the R-Square

R-square is a measure of explanatory power in a regression analysis. It is a ratio which shows the proportion of the variance for a dependent variable that's explained by independent variables. For example when we have an R-Square of 0.75, then we would say that the 75% of the observed variation can be explained by the independent variables in the regression model.

To obtain a concrete dataset, as explained in *Section 3.3.3*, before moving further to regression analyses, we have done some data cleaning by using *Winsor method*. The total observations in this database can reach up to 1.5 million. However, to eliminate the outliers, we winsorized the data at each tail at 0.5% and a more proper data set has been obtained. Thus, we ended up with 1 107 226 observations.

One might question the absolute level and practical significance of R-Square value, *which is 0.018 in our analysis*. We conducted further investigations for the

reason behind low R-Square and run different regressions to see whether the R-Square will increase or not. To do so, we grouped the independent variables in 4 different ways and run separate regressions. We included *Firm Size* and *Financial Debt ratio* variables in all 4 regressions, because these are very critical in order to see the pattern of credit growth rate. We then added other variables one by one each time.

The groupings of independent variables are as follows.

i. Firms Size, Fin.Debt/Assets, Receivable/Sales

ii. Firms Size, Fin.Debt/Assets, Cash/Assets

iii. Firms Size, Fin.Debt/Assets, Financial Exp./Assets

iv. Firms Size, Fin.Debt/Assets, Net Income/Assets

Trials with Selected Independent Variables

In our first trial, we studied the effect of 3 independent variables to the credit growth rate to see whether the R-Square will increase or not. Table 3.9 shows that although the individual independent variables are statistically significant, the R-Square did not increase and got a value of *0.013*.

Table 3.9. Results of trial 1

VARIABLES	**Credit Growth**
Firm Size	-0.086***
	(0.018)
Fin. Debt/Asset	1.902***
	(0.051)
Receivables/Sales	-0.090***
	(0.018)
Constant	1.251***
	(0.213)
Observations	1,108,914
Adjusted R-squared	**0.013**
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

In our 2nd trial, we included *Cash/Total Assets* ratio as the third independent variable. As seen in Table 3.10, all the individual variables are statistically significant. Looking at the R-Square, we still come across with a low value of *0.013*.

Table 3.10. Results of trial 2

VARIABLES	**Credit Growth**
Firm Size	-0.086***
	(0.018)
Fin. Debt/Asset	1.900***
	(0.050)
Cash/Asset	0.306***
	(0.074)
Constant	1.192***
	(0.210)
Observations	1,123,253
Adjusted R-squared	**0.013**
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

As our 3rd trial, in addition to Firm Size and Financial Debt/Asset, we included the *Financial Expenses/Total Assets* ratio to the equation. Again, Table 3.11 shows there is individual significance, however the R-Square ratio is still low with a value of *0.018*.

Table 3.11. Results of trial 3

VARIABLES	**Credit Growth**
Firm Size	-0.139***
	(0.018)
Fin. Debt/Asset	2.261***
	(0.052)
Fin. Exp./Asset	-7.189***
	(0.265)
Constant	1.961***
	(0.210)

Observations	1,124,512
Adjusted R-squared	**0.018**
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

In Table 3.12, we present the findings by inserting *Net Income/Total Assets* as a third independent variable to the equation to see whether the R-Square rise or not. Based on the results we still have a low R-Square of 0.014.

Table 3.12. Results of trial 4

VARIABLES	**Credit Growth**
Firm Size	-0.098***
	(0.018)
Fin. Debt/Asset	1.996***
	(0.052)
Net Income/Asset	0.692***
	(0.087)
Constant	1.316***
	(0.209)
Observations	1,124,776
Adjusted R-squared	**0.014**
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

As seen from the trials above, the R-Square values have not increased dramatically. All the separate regressions had small values of R-Square. The reason behind this phenomenon is straight forward. The literature showed that low R-Square values are normal while working with very large panel data. Since we have almost 1.2 million observation in our regressions, having a low R-Square will not violate the regression findings.

Researchers could create many datasets with low R-Square values because being able to include all the explanatory variables to estimate an outcome will not be practically possible in real life cases. Specifically when it comes to social sciences

and economics, things get more complicated. We must accept that small R-Square values can be statistically significant, letting our regression equation to have significant explanatory power. In some research areas, we can end up with higher R-Square values since it is easier to establish well-structured models. However, in social sciences low R-Squares are more common because it is difficult to create such models. Social facts are complicated, multi-disciplined and multidimensional, hence explaining a big variation with a model would be hard to accomplish. For example, in presenting human behavior and economical topics, even very small R-Square values could be very meaningful.

R-Square also differs according to the sample size; when you increase the sample size, keeping the explanatory variables constant, R-Square values starts to decrease. In panel data analysis, we can rely more on individual significance and overall significance of the model instead of R-Square or Adjusted R-Square. We can state that low Adjusted R-Square should not be worried as long as all variables are significant.

The reason of low R-Square is not the independent variables we put in the regression. In our case, the R-Square did not increase even if we only included Firm Size as independent variable (*trial is not shown*). If we had a few observations, we could obtain a higher R-Square. To conclude, we can say that R-Square value in our analysis does not signal any violation, or address any multicollinearity issue.

3.7. Section Findings

In Section 3 we conducted critical analyses and tried to explain the determinants of credit growth from the companies' perspective. By using Company Accounts database, with 14 000 firms and 1.2 million observations on average, we presented some identifiers of firm credit growth rate. Thus; we can state that Firm Size, Financial Expense ratio and Accounts Receivable ratio have *negative effects* on the credit growth rate. Whereas any increase in Cash, Net Income and Financial Debt ratios, have positive effects on the credit growth rates. Results are summarized in Table 3.13.

Table 3.13 Summary of findings

VARIABLES (one point increase)	**Decreases Credit Growth by**
Firm Size	-0.144
Fin. Exp./Assets	-7.133
Receivables/Sales	-0.103
	Increases Credit Growth by
Fin. Debt/Assets	2.294
Cash/Assets	0.167
Net Income/Assets	0.248

So far, in Section 3 we have identified the effect of balance sheet explanatory variables on company credit growth rates. In next section, we will be incorporating the effects of *credit boom and bust* periods we found in Section 2 into our original model we developed in Section 3. We will enhance our model with dummies to show the marginal impact of our explanatory variables in extreme credit cycle episodes.

4. DYNAMICS OF CREDIT GROWTH IN BOOM/BUST CYCLES

In this section, we will explore the credit growth dynamics of companies in extreme credit cycle episodes (boom and bust). We want to show how do the effects of explanatory balance sheet ratios we have found out in Section 3 differ in boom/bust periods and how contraction/expansion in overall loan market in Turkish Economy affect firms' credit growth rates.

In Section 2, we have already identified the credit boom and bust periods in Turkey between 2007 and 2016 in a monthly period (see Table 2.1). Taking into consideration the Credit/GDP as our credit measure and applying HP filtering methodology, we found three credit expansion periods (2007, 2010, 2014) and three credit crunch periods (2009, 2012, 2016) which have lasted for several months. So, what we will do in this section is, we will try to incorporate the credit boom and bust periods (months where the episodes continues), with the findings of Section 3. Thus, we will be able to measure the marginal effect of our balance sheet indicators on credit growth rates.

This part of the thesis represents a unique contribution to the literature since it is the only work done to depict the impact of company performance on overall credit growth during extreme credit episodes. During our literature review, we cannot find any such study for Turkey, nor does any study exist for other countries in overall literature. Thus, this analysis will open the path for similar studies to be conducted for Turkey and other countries as well.

4.1. Revised Model for Credit Crunch Periods

In order to understand the role of our explanatory variables on credit growth rates in bust periods, we are going to use the interaction of crunch dummies with the independent variables.

As a unique approach, by applying this procedure, we will be able to see whether the impact of our explanatory variables in crunch periods differs from the

impact in normal periods. In other words, we try to see whether the effect of bust period magnifies or lessens the effect of independent variables on firm credit growth. We will use six different models with six interaction dummies to be able to see the additional impact of crunch periods.

i. Firm Size x Crunch
ii. Cash/Asset x Crunch
iii. Net Income/Asset x Crunch
iv. Fin. Exp./Assets x Crunch
v. Fin. Debt/Assets x Crunch
vi. Receivables/Sales x Crunch

Here, the coefficient of *interaction term* shows the *additional impact* of the particular ratio being interacted in crunch periods. It shows whether the impact is larger or smaller in crunch periods than the normal periods. We know from previous section that the coefficient of each balance sheet ratio shows the impact of the ratio on credit growth rate in normal times.

Similar to our base analysis in Section 3.6, we take into consideration the lagged values of explanatory variables in our revised models. We do not take the lagged values of crunch variables for revised models. Crunch variable takes the value of 1 if there is credit bust in *month m of year y*, zero otherwise. Let's assume we will look at the credit growth at *year y* and *month m*. To do so, we multiply the value of explanatory variable at *year y-1* with the crunch value (if any) at *year y, month m*. So, we can see the effect of explanatory balance sheet ratio of year y-1, in the crunch occurrence year of y and month m. As explained in Section 3.6, the reason why we take the value of explanatory variable pertaining to *year y-1* is to prevent any endogeneity problem.

4.1.1. Effect of Firm Size in Credit Bust Periods

In order to incorporate the effect of credit bust into our model we modified it by including a dummy variable. The modified model is;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Firm\ Size_{i,y-1} x\ Crunch_{y,m}} + \beta_8 Crunch_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Firm\ Size_{i,y-1}\ x\ Crunch_{y,m}$ = Firms Size (at crunch periods) of firm i at year y-1

$Crunch_{y,m}$ = Crunch Dummy, takes value 1 if there is crunch at year y month m, and otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.1. Effect of firm size during credit crunch

VARIABLES	**Credit Growth**
Firm Size	-0.142***
	(0.019)
Cash/Asset	0.146*
	(0.075)
Net Income/Asset	0.251***
	(0.087)
Fin. Exp./Asset	-6.818***
	(0.267)
Fin. Debt/Asset	2.232***
	(0.054)
Receivables/Sales	-0.095***
	(0.018)
Firm Size*Crunch	**0.002**
	(0.007)
Crunch	-0.347***
	(0.079)
Constant	2.092***
	(0.215)

Observations	1,107,226
Adjusted R-squared	0.024
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

In our regression results in Table 4.1, we observed an *insignificant coefficient* for the interaction of crunch with Firm Size. This result depicts that Firm Size do not create a heterogeneity in credit growth rates in crunch periods. Firm Size affects the credit growth rate nearly the same in normal and crunch periods. The intuition behind this phenomena could be the increased risk aversion during crunch periods. In normal periods, as we saw in Section 3, as firm size increases credit growth rate tends to decrease. However, during crunch times big sized firms seems to be more inclined to use credit as other firms. The reason behind this might be creating a buffer for the unforeseen circumstances of the crisis periods. On the other side, banks might be more willing to extend credits to big sized firms during crisis times to protect themselves from the risks of lending money to small risky businesses. Thus, different from the case in normal times, firm size does not present a difference in crunch times. Overall credit crunch in the country neutralizes the negative relation between firms size and credit growth.

4.1.2. Effect of Cash/Assets in Credit Bust Periods

In order to see the effect of Cash ratio in credit bust periods we modified our model by including a dummy variable for bust period. We used the following model;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Cash/Assets_{i,y-1} x\ Crunch_{y,m}} + \beta_8 Crunch_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Cash/Assets_{i,y-1}\ x\ Crunch_{y,m}$ = Cash to Total Assets ratio (at crunch periods) of firm i at year y-1

$Crunch_{y,m}$ = Crunch Dummy, takes value 1 if there is crunch at year y month m, and otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.2. Effect of cash ratio during credit crunch

VARIABLES	**Credit Growth**
Firm Size	-0.142***
	(0.018)
Cash/Asset	0.138*
	(0.079)
Net Income/Asset	0.251***
	(0.087)
Fin. Exp./Asset	-6.819***
	(0.267)
Fin. Debt/Asset	2.232***
	(0.054)
Receivables/Sales	-0.095***
	(0.018)
Cash/Asset*Crunch	**0.031**
	(0.074)
Crunch	-0.331***
	(0.011)
Constant	2.088***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.024
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

In our regression results in Table 4.2, we also find an *insignificant coefficient* for the interaction of crunch with Cash ratio. Similar to the Firm Size, Cash ratio also did not present a difference between crunch and normal periods. Cash ratio seems to have similar effect on credit growth in normal and bust times. As we found in

Section 3, in normal times cash ratio tends to increase the credit growth rates. However, during crisis periods cash ratio does not make any meaningful difference. The reason behind this result could be explained based on the increased risk aversion during crisis times. In normal times, firms with high amount of cash tend to increase their credits relying on the power of the cash they possess. By using this cash as a form of advantage, they have a motivation to obtain credits from banks with more favorable conditions. However, during crisis times this advantage might disappear and firms might prefer to stay with cash without resorting further credit.

4.1.3. Effect of Net Income/Assets in Credit Bust Periods

This time we modified our model as follows;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Net\ Income/Assets_{i,y-1} x\ Crunch_{y,m}} + \beta_8 Crunch_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Net\ Income/Assets_{i,y-1}\ x\ Crunch_{y,m}$ = Net Income to Total Assets ratio (at crunch periods) of firm i at year y-1

$Crunch_{y,m}$ = Crunch Dummy, takes value 1 if there is crunch at year y month m, and otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.3. Effect of profitability during credit crunch

VARIABLES	**Credit Growth**
Firm Size	-0.142***
	(0.018)
Cash/Asset	0.144*
	(0.075)
Net Income/Asset	0.133**
	(0.034)
Fin. Exp./Asset	-6.804***
	(0.267)
Fin. Debt/Asset	2.233***
	(0.054)
Receivables/Sales	-0.094***
	(0.018)
Net Income/Asset*Crunch	**0.479*** **
	(0.111)
Crunch	-0.335***
	(0.009)
Constant	2.084***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.024
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

The coefficient of the interaction of crunch period with net income ratio is positive. This means that the credit advantage of companies with larger net income even gets bigger during credit crunch times.

Marginal Impact of Credit Crunch = 0.479

Total impact = 0.133 + 0.479 = 0.612

During crunch periods increase in profitability tends to increase credit growth rates more compared to normal times. This is a meaningful result because in crisis times, banks are willing to extend credits to those having larger profits and these firms enjoy the credits with favorable terms and use this opportunity for getting their business larger.

In our original results in Section 3.6.3, which was done without including the dummy variable of crunch, the impact of Net Income/Assets on credit growth was *0.248*. After incorporating the effect of overall credit bust periods in Turkey into our model, this impact increased more than two hold and becomes *0.612*. So, we can conclude that credit crisis periods are more fruitful for high profitable firms in terms of reaching finance. These kinds of firms could be regarded as Counter-cyclical or non-cyclical firms. These kinds of companies do well in economic stress times, because the demand for their goods or services might not be affected by the downturn of the economy. Pharmaceutical companies, private school/universities and other educational companies, water, gas, electricity providers etc. could be some examples of non-cyclical industries in Turkey. During credit crunch times, these high profitable firms continue to increase their credit consumption to benefit from crisis.

4.1.4. Effect of Financial Expenses/Assets in Credit Bust Periods

Our modified model is presented below;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Fin.Exp./Assets_{i,y-1} x\ Crunch_{y,m}} + \beta_8 Crunch_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Fin.Exp./Assets_{i,y-1}\ x\ Crunch_{y,m}$ = Financial Expenses to Total Assets ratio (at crunch periods) of firm i at year y-1

$Crunch_{y,m}$ = Crunch Dummy, takes value 1 if there is crunch at year y month m, and otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.4. Effect of financial expenses during credit crunch

VARIABLES	**Credit Growth**
Firm Size	-0.142***
	(0.018)
Cash/Asset	0.146*
	(0.075)
Net Income/Asset	0.250***
	(0.087)
Fin. Exp./Asset	-7.019***
	(0.281)
Fin. Debt/Asset	2.231***
	(0.054)
Receivables/Sales	-0.095***
	(0.018)
Fin. Exp./Asset*Crunch	**0.769*** **
	(0.251)
Crunch	-0.355***
	(0.015)
Constant	2.091***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.024
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

We observe a positive coefficient of the interaction of crunch with Financial Expenses ratio, while total impact is still negative. There is an interesting result here. This demonstrates that in crisis times, while firms with large financial expenses still exhibit less credit growth (total impact), the degree of their access to loans improves compared to normal times. The credit crisis seems to be in their favor.

Marginal Impact of Credit Crunch = + 0.769
Total impact= - 7.019 + 0.769= -6.25

The intuition might be that firms with higher financial expenses are more exposed to insolvency issues because their interest burden of existing debt is so high that they might not be able to service their debt. In order to pay back their loan during crunch periods, these firms need more credit. They generally use loans not for new

investment but roll over their existing debt and handle interest payments. Banks also would accept the loan demands of these firms up to some level because otherwise their existing loans would not be repaid. Thus, to keep these companies alive, credit channel works to alleviate the problem a bit in favor of them.

Hence it is logical to see that during the crunch periods firms with higher financial expenses ratio experience less contraction in their credit growth rate compared to normal times. The negative impact of financial expenses on credit growth rate declines with the crunch.

4.1.5. Effect of Debt/Assets in Credit Bust Periods

Our modified model is presented below;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Fin.Debt/Assets_{i,y-1} x\ Crunch_{y,m}} + \beta_8 Crunch_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Fin.Debt/Assets_{i,y-1}\ x\ Crunch_{y,m}$ = Financial Debt to Total Assets ratio (at crunch periods) of firm i at year y-1

$Crunch_{y,m}$ = Crunch Dummy, takes value 1 if there is crunch at year y month m, and otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.5. Effect of debt ratio during credit crunch

VARIABLES	**Credit Growth**
Firm Size	-0.141***
	(0.018)
Cash/Asset	0.145*
	(0.075)
Net Income/Asset	0.251***
	(0.087)
Fin. Exp./Asset	-6.801***
	(0.267)
Fin. Debt/Asset	2.263***
	(0.056)
Receivables/Sales	-0.094***
	(0.018)
Fin. Debt/Asset*Crunch	**-0.119*** **
	(0.041)
Crunch	-0.289***
	(0.018)
Constant	2.071***
	(0.213)
Observations	1,107,226
Adjusted R-squared	0.024
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

The negative coefficient of Financial Debt x Crunch interaction term means that the advantage of firms with greater leverage ratio in accessing loans in normal times, worsens during credit crunch periods.

Marginal Impact of Credit Crunch = -0.119
Total Impact = 2.263 – 0.119 = 2.144

Here, the intuition is that, firms that have high levels of debt refrain from obtaining more credits during credit crunch times, because the terms become less favorable in crisis times. So, the companies calm down their credit and risk appetite and decrease their credit consumption a bit. In our original results in Section 3.6.5, which is done without including the dummy variable of crunch, the impact of

Financial Debt/Assets on credit growth was higher. After incorporating the effect of overall credit bust period in Turkey into our model, this impact decreases.

4.1.6. Effect of Receivables/Sales in Credit Bust Periods

Our modified model is presented below;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Receivables/Sales_{i,y-1} x\ Crunch_{y,m}} + \beta_8 Crunch_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Receivables/Sales_{i,y-1}\ x\ Crunch_{y,m}$ = Accounts Receivables to Total Sales ratio (at crunch periods) of firm i at year y-1

$Crunch_{y,m}$ = Crunch Dummy, takes value 1 if there is crunch at year y month m, and otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.6. Effect of Receivables Ratio during Credit Crunch

VARIABLES	**Credit Growth**
Firm Size	-0.142***
	(0.018)
Cash/Asset	0.146*
	(0.075)
Net Income/Asset	0.251***
	(0.087)
Fin. Exp./Asset	-6.821***
	(0.267)
Fin. Debt/Asset	2.233***
	(0.054)
Receivables/Sales	-0.079***
	(0.019)
Receivables/Sales*Crunch	**-0.059*** **
	(0.019)

Crunch	-0.309***
	(0.011)
Constant	2.080***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.024
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

Regression analysis indicates that firms having larger trade receivables as a share of sales tends to decrease their credit growth rate more in crunch periods compared to normal times.

Marginal Impact of Credit Crunch = -0.059
Total impact= -0,079 – 0,059 = -0,138

During crisis times, collecting the receivables might be very hard due to the tight economic situation. So, this puts these firms in a disadvantageous position. Thus, their credit growth rates diminish with an extra amount, compared to normal times. This also shows that the banks are not willing to lend money to firms with high level of receivables, since it is highly probable that these firms might experience shortness of cash during crunch periods because of not collecting their money. Thus, the crunch periods magnifies the already negative effect of Receivables on credit growth rate.

In our original results in Section 3.6.6, applied without including the dummy variable of crunch, the impact of Receivables/Sales on credit growth was -0.103. After adding the effect of overall credit bust periods, this value becomes -0.138. We can argue that, the *credit crunch periods worsens the situation of firms with high Receivables* ratio in terms of credit growth rates.

4.1.7. Overall Magnitude of Credit Crunch in Turkey

As a significant by-product to our analysis, we found another critical indicator about the magnitude of overall credit crunch in Turkey. This is a very important and beneficial indicator of Turkish ecosystem in terms of showing the related parties the amount of credit bust. To do so, we included a crunch variable in all of our six models. The coefficient of the crunch variable in Table 4.7 shows how much credit growth rate declines in crunch periods compared to normal periods. Above, we have conducted 6 different regressions which include crunch interaction. The findings about crunch variable are below in the table.

Table 4.7. Overall magnitude of credit crunch

REGRESSIONS	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	**Credit Growth**	**Credit Growth**	**Credit Growth**	**Credit Growth**	**Credit Growth**	**Credit Growth**
…						
….						
Crunch	-0.347***	-0.331***	-0.335***	-0.355***	-0.289***	-0.309***
	(0.079)	(0.011)	(0.009)	(0.015)	(0.018)	(0.011)
Observations	1,107,226	1,107,226	1,107,226	1,107,226	1,107,226	1,107,226

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

With almost 1.1 million observations from Turkish companies, we can state that the average growth rate of firms' credit consumption decreased around 0.32 (or 32 %) during credit crunch periods between 2007 and 2016. This number is important for decision makers to see the exact amount of the contraction in the loan market during crisis times.

4.2. Revised Model for Credit Boom Periods

In order to understand the role of explanatory variables on credit growth rate in credit boom periods, we will use interaction of boom dummies with the balance

sheet ratios. By using this procedure, we will be able to see whether the impact of balance sheet indicators on credit growth rate in boom periods differs from the impact in normal periods. In other words, we want to see the marginal effect our explanatory variables in credit boom times. To measure this effect, we added six interaction dummies to our analysis and run six separate regression to see individual effects.

i. Firm Size x Boom
ii. Cash/Asset x Boom
iii. Net Income/Asset x Boom
iv. Fin. Exp./Assets x Boom
v. Fin. Debt/Assets x Boom
vi. Receivables/Sales x Boom

The coefficient of the boom dummy shows how much credit growth rate changes in credit expansion periods compared to normal periods. The coefficient of each balance sheet ratio shows the impact of the ratio on credit growth rate in normal times. While, the coefficient of interaction term shows the additional impact of the particular ratio being interacted in boom periods. We want to see whether the impact is larger/smaller in boom periods than the normal periods.

4.2.1. Effect of Firm Size in Credit Boom Periods

In order to incorporate the effect of credit expansion into our model we modified it by including a dummy variable. The modified model is;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Firm\ Size_{i,y-1} x\ Boom_{y,m}} + \beta_8 Boom_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Firm\ Size_{i,y-1}\ x\ Boom_{y,m}$ = Firms Size (at Boom periods) of firm i at year y-1

$Boom_{y,m}$ = Boom Dummy, takes value 1 if there is Boom at year y month m, otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.8. Effect of firm size during credit boom

VARIABLES	**Credit Growth**
Firm Size	-0.144***
	(0.018)
Cash/Asset	0.153**
	(0.075)
Net Income/Asset	0.345***
	(0.088)
Fin. Exp./Asset	-7.637***
	(0.268)
Fin. Debt/Asset	2.314***
	(0.054)
Receivables/Sales	-0.097***
	(0.018)
Firm Size*Boom	**-0.002**
	(0.007)
Boom	0.322***
	(0.089)
Constant	1.956***
	(0.213)
Observations	1,107,226
Adjusted R-squared	0.023
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

In our regression results in Table 4.8, we observed an *insignificant coefficient* for the interaction of boom with Firm Size. The result shows that Firm Size does not create a heterogeneity in credit growth rates in boom periods. We can interpret the result as; firm size affects the credit growth rate nearly the same in normal and boom periods. In our original model developed in Section 3, we found that there is an inverse relation with Firm Size and credit growth rate. However, we now find that this negative relationship disappears in boom times. During boom times small and big

sized firms behave similar. An interpretation to this finding could be that the big firms might want to benefit from the favorable credit environment of the country during credit boom times. They might want to consume credits regardless of their size, with much favorable conditions and invest these proceedings for future projects. We assume that, credit market is much more appealing for big sized firms thus they may not need to search for alternative ways of raising funds (such as issuing bonds).

4.2.2. Effect of Cash/Assets in Credit Boom Periods

To add the impact of credit boom period into our model we modified it by including a boom dummy. We changed our model as follows;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Cash/Assets_{i,y-1} x\ Boom_{y,m}} + \beta_8 Boom_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Cash/Assets_{i,y-1}\ x\ Boom_{y,m}$ = Total Cash to Total Assets ratio (at boom periods) of firm i at year y-1

$Boom_{y,m}$ = Boom Dummy, takes value 1 if there is Boom at year y month m, otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.9. Effect of cash ratio during credit boom

VARIABLES	Credit Growth
Firm Size	-0.145***
	(0.018)
Cash/Asset	0.168**
	(0.077)
Net Income/Asset	0.345***
	(0.088)

Fin. Exp./Asset	-7.637***
	(0.268)
Fin. Debt/Asset	2.314***
	(0.054)
Receivables/Sales	-0.097***
	(0.018)
Cash/Asset*Boom	**-0.063**
	(0.081)
Boom	0.307***
	(0.013)
Constant	1.960***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.023
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

As we can see in Table 4.9, the coefficient of *Cash/Assets x Boom* dummy variable is insignificant. This findings shows that Cash ratio of a company does not make a meaningful difference in credit expansion periods in terms of credit growth rate. Similar to Firm Size, Cash ratio does not create a heterogeneity in credit growth rates in boom periods. It affects the credit growth rate of a company nearly the same in normal and boom periods. In our original model developed in Section 3 we found that any increase in cash ratio tends to increase credit growth rates in normal times. Interestingly, in boom times, companies those of which have good amount of cash, have no additional incentive to increase their credit consumption although there is an overall credit boom in the country. This could be interpreted as follows; boom times present an overall wellness in the country. There is a dynamic economic life, and businesses flourish accordingly. That's why firms will have an opportunity to accumulate more cash during these times which might alleviate the need for obtaining more credits. Thus, cash ratio's positive relation with credit growth rates in normal times, seems to disappear during boom times.

4.2.3. Effect of Net Income /Assets in Credit Boom Periods

To incorporate the effect of credit expansion in the county, we modified our model as follows;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Net\ Income/Assets_{i,y-1} x\ Boom_{y,m}} + \beta_8 Boom_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Net\ Income/Assets_{i,y-1}\ x\ Boom_{y,m}$ = Net Income to Total Assets ratio (at boom periods) of firm i at year y-1

$Boom_{y,m}$ = Boom Dummy, takes value 1 if there is Boom at year y month m, otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.10. Effect of net income during credit boom

VARIABLES	Credit Growth
Firm Size	-0.145***
	(0.018)
Cash/Asset	0.151**
	(0.075)
Net Income/Asset	0.436***
	(0.093)
Fin. Exp./Asset	-7.628***
	(0.268)
Fin. Debt/Asset	2.315***
	(0.054)
Receivables/Sales	-0.097***
	(0.018)
Net Income/Asset*Boom	**-0.282****
	(0.117)
Boom	0.303***
	(0.010)

Constant	1.960*** (0.212)
Observations	1,107,226
Adjusted R-squared	0.023
Firm FE	YES

Interestingly, the coefficient of the interaction of boom with net income ratio is *negative and significant*, which means that the advantage of companies with larger net income (profitability) ratio in accessing loans in normal times, lessens during credit boom times.

Marginal Impact of Credit Boom = -0.282

Total impact = 0.436 – 0.282 = 0.154

In our original results in Section 3.6.3, done without the dummy variable of boom, the impact of profitability on credit growth rate was 0.248. Including the effect of overall credit boom periods, this value decreases to 0.154. The intuition is that during boom periods, the banks' risk appetite is very high so that they are more willing to lend money to low profitable businesses as well. This might decrease the portion of credit that would otherwise go to high profitable firms.

On the other hand, during boom periods, high profitable firms might prefer to decrease their credit consumption because of their high profits and as a result high cash flow from their customers. Boom times are periods with high economic activity, so profits would be higher than normal, which might alleviate the need for further credits for profitable firms.

4.2.4. Effect of Financial Expenses/Assets in Credit Boom Periods

We modified our model as follows;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Fin.Exp./Assets_{i,y-1} x\ Boom_{y,m}} + \beta_8 Boom_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Fin.Exp./Assets_{i,y-1}\ x\ Boom_{y,m}$ = Financial Expenses to Total Assets ratio (at Boom periods) of firm i at year y-1

$Boom_{y,m}$ = Boom Dummy, takes value 1 if there is Boom at year y month m, otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.11. Effect of financial expenses during credit boom

VARIABLES	**Credit Growth**
Firm Size	-0.145***
	(0.018)
Cash/Asset	0.148**
	(0.075)
Net Income/Asset	0.348***
	(0.088)
Fin. Exp./Asset	-8.235***
	(0.279)
Fin. Debt/Asset	2.319***
	(0.054)
Receivables/Sales	-0.097***
	(0.018)
Fin. Exp./Asset*Boom	**1.702*** **
	(0.268)
Boom	0.239***
	(0.016)
Constant	1.983***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.023
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

Interestingly, we observe the positive coefficient of the interaction of crunch with financial expenses ratio, while total impact is still negative. This demonstrates that in boom times, while firms with larger financial expenses still exhibit less credit growth (total impact), the degree of their access to loans improves compared to normal times.

Marginal Impact of Credit Boom = 1.702

Total impact = -8.235 + 1.702 = -6.533

In our original results in Section 3.6.4, done without the dummy variable of boom, the impact of financial expenses ratio on credit growth was -7.133. After adding the effect of overall credit boom periods, this value increases to -6.533.

The intuition might be that during boom times Banks are more willing to grant loans. That's why, boom periods diminishes the negative attitude of the Banks to some extent and let the unhealthy firms to enjoy some more credits. Some companies, on the other side, prefer increasing their credit consumption during boom times and refinance their existing debt with the loans they now obtain in more favorable terms.

Hence it is logical to see that financial expenses ratio leads to less contraction in credit growth in boom periods compared to normal times. The negative impact of financial expenses on credit growth rate declines with the boom.

4.2.5. Effect of Debt/Assets in Credit Boom Periods

In order to incorporate the effect of overall credit boom period into our model we modified it by including a boom dummy. We changed our model as follows;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Fin.Debt/Assets_{i,y-1} x\ Boom_{y,m}} + \beta_8 Boom_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Fin.Debt/Assets_{i,y-1}\ x\ Boom_{y,m}$ = Total Financial Debt to Total Assets ratio (at Boom periods) of firm i at year y-1

$Boom_{y,m}$ = Boom Dummy, takes value 1 if there is Boom at year y month m, otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.12. Effect of debt ratio during credit boom

VARIABLES	**Credit Growth**
Firm Size	-0.145***
	(0.018)
Cash/Asset	0.152**
	(0.075)
Net Income/Asset	0.348***
	(0.088)
Fin. Exp./Asset	-7.641***
	(0.268)
Fin. Debt/Asset	2.301***
	(0.055)
Receivables/Sales	-0.097***
	(0.018)
Fin. Debt/Asset*Boom	**0.052**
	(0.046)
Boom	0.283***
	(0.020)
Constant	1.965***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.023
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

Table 4.12 indicates that, the coefficient of *Financial Debt/Total Assets x Boom* dummy variable is *insignificant*. Interestingly, this states that the debt ratio of a company does not make a meaningful difference in credit expansion periods in terms of credit growth. Similar to Firm Size and Cash ratio, Debt ratio does not create a

heterogeneity in credit growth rates of boom periods. Intuition might expect that Companies with high level of debt would benefit from the attractive financial environment of boom period. Result shows no difference. In our original model in Section 3, we have found out that an increase in Debt ratio tends to increase the credit growth rate. The reason behind this case could be that firms use extra credit for servicing their existing debt to survive in normal times. However, in boom times this positive relation between debt ratio and credit growth rate disappears. Our interpretation to this case could be that firms with high debt ratio now have more opportunities to service their debt, due to the increased level of economic activity and cash flow in boom times, hence they might not be in need for further credits to survive their business.

4.2.6. Effect of Receivables/Sales in Credit Boom Periods

We changed our model as follows;

$$\boldsymbol{\Delta Loan_{i,y,m}} = \beta_1 Firm\ Size_{i,y-1} + \beta_2 Cash/Assets_{i,y-1} + \beta_3 Net\ Income/Assets_{i,y-1} + \beta_4 Fin.Exp./Assets_{i,y-1} + \beta_5 Fin.Debt/Assets_{i,y-1} + \beta_6 Receivables/Sales_{i,y-1} + \boldsymbol{\beta_7 Receivables/Sales_{i,y-1} x\ Boom_{y,m}} + \beta_8 Boom_{y,m} + \gamma_i + \varepsilon_{i,t}$$

Where;

$\Delta Loan_{i,y,m}$ = Annual loan growth rate of firm i, at year y, and month m

$Receivables/Sales_{i,y-1}\ x\ Boom_{y,m}$ = Ratio of Accounts Receivables to Total Sales (at Boom periods) of firm i at year y-1

$Boom_{y,m}$ = Boom Dummy, takes value 1 if there is Boom at year y month m, otherwise takes zero.

γ_i = Firm fixed-effects

$\varepsilon_{i,t}$ = Error term

Table 4.13. Effect of AR ratio during credit boom

VARIABLES	Credit Growth
Firm Size	-0.145***
	(0.018)
Cash/Asset	0.153**
	(0.075)
Net Income/Asset	0.345***
	(0.088)
Fin. Exp./Asset	-7.639***
	(0.268)
Fin. Debt/Asset	2.314***
	(0.054)
Receivables/Sales	-0.097***
	(0.018)
Receivables/Sales*Boom	**-0.001**
	(0.022)
Boom	0.301***
	(0.013)
Constant	1.961***
	(0.212)
Observations	1,107,226
Adjusted R-squared	0.023
Firm FE	YES

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

In our modified results in Table 4.13, we see that the coefficient of *Receivables/Sales x Boom* dummy variable is *insignificant*. Thus, the Accounts Receivable (AR) ratio of a company does not present an important variance in credit expansion periods in terms of credit growth rate. Similar to Firm Size, Cash ratio and Debt ratio; AR Ratio does not create a heterogeneity in credit growth rates of boom periods. We could explain this case again in light of the favorable conditions of credit market and the heightened economic activity in the country. In our original model, we have found that an increase in AR ratio tends to decrease credit growth rates in normal times. However, this negative relation seems to disappear during boom times. Depending on the heightened economic activity, companies' risk of not being able to collect their receivables might decrease, so this might mitigate the liquidity risk from

the banks' point of view. So, firms with high AR ratio could also benefit from the favorable credit conditions of boom times.

4.2.7. Overall Magnitude of Credit Expansion in Turkey

We also found a significant by-product while doing our detailed analyses, which is a critical indicator about the magnitude of the overall credit expansion in Turkey between 2007 and 2016. It is important in terms of providing the related stakeholders with a significant picture of what the Turkish businesses look like in expansion periods. We added a boom variable in all of our six revised models. The coefficient of the boom variable is summarized in Table 4.14 and it presents how much credit growth rate increased in credit boom periods. In the previous sections we have run six different models with boom variable. So, we found that *average growth rate increased around 29 % during credit boom periods*. This number is important for decision makers to see the exact amount of the expansion in the loan market.

Table 4.14. Overall magnitude of credit expansion in Turkey

REGRESSIONS	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	**Credit Growth**	**Credit Growth**	**Credit Growth**	**Credit Growth**	**Credit Growth**	**Credit Growth**
…						
….						
Boom	0.322***	0.307***	0.303***	0.239***	0.283***	0.301***
	(0.089)	(0.013)	(0.010)	(0.016)	(0.020)	(0.013)
Observations	1,107,226	1,107,226	1,107,226	1,107,226	1,107,226	1,107,226

Robust standard errors in parentheses
*** p<0.01044, ** p<0.05044, * p<0.1044

4.3. Section Findings

In Section 4, we tried to understand the growth dynamics of credits in extreme credit cycle episodes. We showed the marginal effects of firm balance sheet ratios (*which are our explanatory variables used in Section 3*) in boom/bust periods. Hence, we presented our findings on how contraction/expansion in overall credit market in Turkish Economy affect the credit growth of companies. We combined the outcomes of Section 2, namely the credit boom and bust periods, with the findings of Section 3.

Thus, in credit crunch periods; Profitability, Financial Expense ratio, Debt ratio and Accounts Receivable ratio have marginal effects on the credit growth rate. Firm Size and Cash ratio are insignificant and do not make any difference in behaviors of companies between normal or crunch episodes.

In order to vitalize the credit market during credit crunch times, policy makers could design their set of interventions taking into account these characteristics of Turkish companies. For example, we saw that high profitable companies increased their credit usage during crises times. These non-cyclical firms continue to earn high profits during crunch and seems to increase their bank loans. So, any policy targeting these companies would lead more favorable result in terms of increasing credit usage. Rather than supporting all sectors, by looking at our results, policy makers could identify the industries that would respond quickly to a stimuli. This might alleviate the crunch in the credit market and help recover faster.

Another point to highlight here is that firms with high debt ratio tends to decrease their credit growth. Actually, these firms may be in need of funds to survive their business however, during crisis times, they are forced to decrease their consumption. This might lead to an undesired consequence of increasing the bankruptcy rates in the country, which might make it even more complicated and difficult getting out of the crisis. So, decision makers could support companies with high debt ratio to prevent further insolvencies which might otherwise inflame the crisis more. Failing to do that, as we found firms with high debt ratio forcibly decrease their credit growth, might leave lots of bankrupt firms at the end of the crisis.

In boom periods, only Profitability and Financial Expense ratio has significant marginal effect on credit growth rate. Firm Size, Cash ratio, Debt ratio and AR ratio do not possess any significant marginal effect on the credit consumption of companies in boom episodes. Results are summarized in Table 29.

Table 4.15. Summary of Findings

VARIABLES (in Crunch Periods)	**Marginal Effect on Credit Growth**
Net Income/Assets	0.479
Fin. Exp./Assets	0.769
Fin. Debt/Assets	-0.119
Receivables/Sales	-0.059
VARIABLES (in Boom Periods)	**Marginal Effect on Credit Growth**
Net Income/Assets	-0.282
Fin. Exp./Assets	1.702

5. CONCLUSION

Credits are the inevitable components of economic life in Turkey. Apart from limited number of big corporations, Turkish firms still did not reach the financial depth compared to their western counterparts. To run their operations smoothly, they rest on the credits they obtain from banks. Additionally, banks continue to be the main player in credit transfer mechanism due mainly to the lack of financial deepening. Other than banks, firms have limited options in terms of finding credits. For this reason, credit interest rates, credit boom and bust periods continue to be hot topics in Turkey and are monitored closely not only by politicians but also by ordinary people. Sometimes, policy makers and governments might feel anxious about the overdependence of economic life and firms to credits, so they might want to watch the developments in order to make the necessary interventions timely. As depicted in our results, Turkish companies mostly use credit either to continue their operations or to turnover their existing debt rather than using those proceedings for new investments.

Our thesis stands on to be a decent indicator in this regard. It is the first time in a thesis that a dataset from 14 000 companies has been used in the literature. Since it is a nonpublic data, this work constitutes to be first in its field of study. It provides researchers with various insights and inferences related to the economic life in Turkey.

As we have stated in the *Introduction* part, the main research question of this thesis is *how the firms' own performances affects the overall credit growth in the country and how this impact changes in extreme credit boom and bust cycles*. The main difference of this thesis from other credit channel literature is that, we explored the effect of firm balance sheet performances on the credit developments in the county, rather than focusing solely on the impact of credit developments on the firm performance. At this point we want to make an analogy. Assume that the human body represents the firms. It is certain that the abundance or scarcity of food has an impact on human body. From the opposite point of view, healthiness of the human body might also affect the amount of food required. This is a two way relationship. As being the main agents of the economy, firms have the potential to negatively affect the credit atmosphere in the country unless they fail to examine their own well-beings and

healthiness. In our thesis we managed to identify which characteristics of companies affect the credit climate in the country and how. Decision makers could implement policies considering these characteristics and it would be possible to attain a more productive and efficient financial market functioning.

In this thesis, we identified the periods of credit boom and credit bust between 2006 and 2016 on a monthly basis. For that, Total Credit/GDP indicator has been used as credit measure and extreme credit episodes have been identified by the de-trended credit series extracted from Hodrick-Prescott filtering method. Turkey has experienced credit expansion periods that lasted for nearly 8-10 months in 2007, 2010 and 2014. There were also credit crunch periods, the shortest of which lasted for 5 months and the longest 11 months, during 2009, 2012 and 2016. These credit cycles seems to be coherent with general economic outlook and global developments.

As part of the studies on Company Accounts Database, we conducted balance sheet ratio analyses. Thanks to this valuable analyses, we could make inferences on the business characteristics of Turkish companies. Then, the main analysis on the database was, through a fixed effect model, to identify the balance sheet components which have influence on firm credit growth rates. We numerically determined the marginal effects of these components on the credit growth rates. In this scope, it has been found that *Firm Size*, *Financial Expenses* ratio and *Receivables* ratio tend to negatively affect credit growth rates. On the other hand we saw that *Cash* in hand, *Profitability* and *Debt* ratio tend to increase credit growth rates of Turkish companies.

As a last step, we studied on what kinds of effects these components have on credit growth rates during credit boom or bust periods. To do so, we integrated the monthly boom and bust periods into our model with dummy variables. Thus, our model could carry the effects of extreme credit development periods. It has been found that in credit crunch periods, *Profitability* and *Financial Expense* ratio have an extra positive effect on credit growth rates whereas *Debt* ratio and *Receivables* ratio have negative marginal effects on growth rates. Surprisingly, in the periods of credit boom, we found that *Profitability* has a marginal negative effect on credit growth rates. Also, in boom periods, *Financial Expense* ratio seems to imply a positive effect on credit growth rates.

As a by-product to the analyses, it became possible to numerically show the phenomenon of credit crunch and credit expansion in Turkey. We identified that, commercial credits shrank by 32% on average in credit crunch periods between 2007 and 2016, the time period of our research. Within credit boom periods, occurred in same period, we found that commercial credits grew by %29 on average.

This thesis serves as an aggregate analysis for Turkish economy and aims to present a general outlook. It provides researchers with new questions for their further studies. There were many factors that influenced credit cycles in recent years in Turkey and we saw government interventions by means of various tools. We should accept that all of these had effects on credit cycles and firm balance sheet performances. However, the research of these effects could be a matter of different studies. It is obvious that quite a lot of studies can be conducted on this dataset through different models. For instance, researchers could group the companies as small, medium and big sized or group them as sectoral basis and conduct studies to investigate their credit growth rates. Or, one can select different sets of explanatory variables, and/or can conduct more data trimming to obtain a more dedicated dataset pertaining to a small period of time and construct models accordingly. Additionally, one could examine the government interventions, policy changes, structural breaks, etc. during a specific period and their effect on the credit atmosphere and firm performances. Researchers could conduct further studies in order to identify the marginal impact of these kinds of interventions on the company balance sheet performances. For our study, we disregard these topics and just tried to focus on presenting an aggregate and general outlook on credit growth and firm relation. We believe that with our aggregate analysis, we shed light on future detailed studies.

We have conducted quite valuable balance sheets ratio analyses of Turkish firms and they have been brought to the attention of researchers. For instance, the 1.2 million observations acquired from average 14 000 firms show that Turkish firms have a *Current Ratio* of 1.67 and the *Return on Assets (ROA)* ratio for Turkish companies turns out to be 1.69%, which is below the rule of thumb value of 5%. We believe that, by carefully examining these by-products, detailed studies about the balance sheet performance of Turkish firms could be conducted and international and sector wise assessments could be possible.

Here is what we can say in light of our findings: Firm performance has a significant effect on the growth ratio of commercial credits. When firms have successful and favorable balance sheets, they increase their loans. Thanks to these credits, they can contribute to employment and can reach a healthier financial position.

With our study we identified some specific characteristics of firms that stimulate or retard overall credit growth. So, we managed to provide policy makers with important indicators to focus on while designing their policies on increasing credit usage or, in time of excessive credit boom, ways to cool down the credit usage. First, what policy makers could do is to develop early warning systems against firms' balance sheets indicators (like we have presented in our study) that might be seen as a problem of accessing external finance and enable firm's success with proper regulations. Thus, firms can actively contribute to the economic system in Turkey as they can access more healthy loans. Hence, our balance sheets performance indicators of companies could be monitored by policy setters. For example, pre-determining the periods of extreme rises in Account Receivable/Sales ratio could be regarded as a signal of a forthcoming shrinkage in credit usage. To counter this, policy makers can make necessary amendments in order to make credit usage attractive for firms with high AR ratio. Firms' proper access to finance could contribute the credit channel be more active, which is critical for turning savings into investments. We know that decision makers sometimes prefer to make interventions to stimulate credit growth. One last example of this was Credit Guarantees extended to private sector by the Turkish Government. Policy makers might consider allocating these resources considering the firm specific characteristics which might ignite a better credit growth in order to obtain more efficient results. Additionally during crises times, we identified that as firms' profitability increase, credit growth rates also increase. These non-cyclical firms continue to get good profits from their business. Hence, targeting this group of firms might create more outcomes in terms of creating credit stimuli. This might help recover faster from a credit crunch. Also, policy makers should pay attention to protect high indebted firms of being bankrupt during crisis times. We found that firms with high debt ratio tends to decrease their credit growth rates, most probably forcibly rather than voluntarily. This might lead to increased bankruptcy

rates, which might make the crisis even worse. So, based on our findings policy setters could design policies in crisis times to invigorate these types of firms.

Finally, our study is a critical contribution to the literature because of the confidential data we used from CBRT's Company Accounts database and BAT's Credit Registry dataset. Current studies on Turkish firms in the literature can mostly benefit from the data of big firms listed in BIST. To obtain a more trustworthy outlook, we took advantage of the data of a huge set of firms which is a more complete picture of the economic atmosphere in Turkey. We managed to publicize these two major confidential database of Turkey with our aggregate analysis and presented a perspective for researchers for future studies.

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