DYNAMICS OF CAPITAL STRUCTURE: AN EMPIRICAL ANALYSIS OF TURKISH BANKING SECTOR

by
Nazan DEMİR

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AN EMPIRICAL ANALYSIS OF TURKISH BANKING SECTOR

Approved by:

Assoc. Prof. İnci Gümüş .....
(Thesis Supervisor)

Assoc. Prof. Cumhur Ekinci .....

Asst. Prof. Remzi Kaygusuz .....

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ABSTRACT

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Nazan DEMİR

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Thesis Supervisor: Assoc. Prof. İnci GÜMÜŞ

Keywords: capital structure, optimal leverage, partial adjustment model, crisis

This study examines the determinants of capital structure for deposit banks in Turkey during the period 1995-2016, focusing on the impact of macroeconomic factors and financial crises. The paper also analyzes whether different bank characteristics such as income variability, growth opportunity, tangibility, size, and profitability have a different effect on the capital structure of deposits banks during the crisis periods. The partial adjustment model is used to examine the determinants of capital structure and the adjustment speed toward the optimal capital structure. The model is estimated using the Generalized Method of Moments (GMM) technique. The results indicate that growth opportunity, GDP growth and inflation have a positive relationship with leverage, whereas profitability, tangibility, and crises have a negative relationship. Moreover, income variability is found to have a negative effect on leverage for crisis periods. The results also show that capital structure behaviour of deposit banks in Turkey is in line with the pecking order theory. The findings indicate that the rate of adjustment to optimal capital structure for deposit banks in Turkey is 30 percent per year.

ÖZET

SERMAYE YAPISI DİNAMİKLERİ: TÜRK BANKACILIK SEKTÖRÜNÜN AMPİRİK ANALİZİ

Nazan DEMİR

EKONOMİ YÜKSEK LİSANS TEZİ, TEMMUZ 2019

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Anahtar Kelimeler: sermaye yapısı, optimum kaldıraç, kısmi ayar modeli, kriz

Bu çalışma, makroekonomik faktörlerin ve finansal krizlerin etkisine odaklanarak, 1995-2016 döneminde Türkiye'deki mevduat bankaları için sermaye yapısının belirleyicilerini incelemektedir. Tez ayrıca, gelir değişkenliği, büyüme fırsatı, somutluk, büyüklük ve kârlılık gibi farklı banka özelliklerinin, kriz dönemlerinde mevduat bankalarının sermaye yapısına farklı etkileri olup olmadığını incelenmektedir. Sermaye yapısının belirleyicilerini ve optimal sermaye yapısına yönelik ayarlama hızını incelemek için kısmi ayar modeli kullanılmıştır. Model, Genelleştirilmiş Momentler Yöntemi (GMM) tekniği kullanılarak tahmin edilmiştir. Sonuçlar, büyüme fırsatı, GSYİH büyümesi ve enflasyonun kaldıraçla pozitif bir ilişki içinde olduğunu gösterirken, karlılık, somutluk ve krizlerin negatif bir ilişkiye sahip olduğunu göstermektedir. Ayrıca, gelir değişkenliğinin kriz dönemleri için kaldıraç üzerinde olumsuz etkisi olduğu tespit edilmiştir. Sonuçlar ayrıca Türkiye'deki mevduat bankalarının sermaye yapısı davranışının finansal hiyerarşi teorisi ile uyumlu olduğunu göstermektedir. Bulgular, Türkiye'deki mevduat bankaları için optimal sermaye yapısına ulaşma oranının yılda yüzde 30 olduğunu göstermektedir.

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To my loves Çağrı and Tuna

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1. INTRODUCTION

Banks fulfill a significant role in the financial system and the economy. As a vital component of the financial system, banks perform like a bridge between savers and borrowers to allocate excess funds efficiently. They also serve specialized financial services which help to reduce information asymmetries in the economy and as a result lead to a more efficient economy. On the other hand, shareholders of the banks expect the values of their shares to be at their maximum. Therefore, to carry out its services and operations, and maximize its market value, having the right amount and structure of capital is crucial for a bank. The capital structure of a bank is about how to construct the mixture of the capital out of differing amounts of equity and debt. The relative amount of debt a bank utilizes is called the debt ratio or the leverage ratio and will be the focus of this study.

There are many theoretical and empirical studies on the banks' capital structure and factors affecting banks financing decisions. However, researchers still struggle to gather conclusive results for determinants of capital structure under a universal theory. The most prominent of capital structure theories are Modigliani and Miller's theory, trade-off theory, and pecking order theory, which are explained in detail in the next section.

Empirical studies carried out on the capital structure of banks focus on the factors that affect the banks' capital structure and the relationship between banks' capital structure and its determinants. These studies are mainly about developed countries. Like other sectors, banking sector is also influenced by the state of the economy. One might expect that crises, which are episodes when the risk of lending increases and funding opportunities become scarce, would have an impact on the capital structure of banks. There are very few studies analyzing the capital structure of banks in developing countries which take the effects of crisis periods into account.

In this study, we analyze the capital structure decision of deposit banks in Turkey, estimating the determinants of capital structure by a dynamic model. In particular, we examine the banks' speed of adjustment towards optimal leverage and analyze how economic instabilities like crises and macroeconomic factors affect banks' decisions on capital structure. Our study is the first study that investigates banks' capital structure behaviour in Turkey during crisis periods, taking into account both the 2001 Turkish crisis and the 2009 global crisis. This is also the first study that investigates the adjustment speed to optimal capital structure in the Turkish banking sector.

Our empirical analysis is conducted using annual data for 58 deposit banks operating in Turkey through the 1995-2016 period. We use leverage ratio as the dependent variable which is calculated as the ratio of debt to total assets of a bank. The bank-specific characteristics that we use are income variability, growth opportunity, tangibility, size, profitability, and bank age. For the macroeconomic variables, we use GDP growth rate, inflation rate and a dummy variable for the crisis periods, which are the 2009 global crisis and the 2001 Turkish crisis. In addition, the effect of each bank characteristic during crises is measured by interacting each bank-specific variable with the crisis dummy.

We find that crises have a significant and negative effect on leverage. This result suggests that it becomes more difficult and costly for banks to use debt financing during crisis episodes and banks tend to reduce their leverage. The two macroeconomic variables, GDP growth rate and inflation, have a positive effect on leverage. Among the bank characteristics, growth opportunity has a positive, profitability and tangibility have a negative effect on leverage. These three variables are the only bank-specific variables that have a significant effect on leverage. Furthermore, despite being insignificant for the whole period, the effect of income variability becomes significantly negative during the crisis period. When evaluated according to different theories suggested in the literature, our findings are overall in line with the pecking order theory.

We also perform two robustness checks for our analysis. First, we analyze the effects of the 2001 Turkish crisis and the 2009 global crisis separately by using two separate dummy variables in the regression analysis. The results show that the negative effect of the general crisis dummy holds for both crisis episodes. Second, to check whether foreign

and state ownership of banks have any effect on leverage, we introduce two new variables. The effects of foreign-ownership and state-ownership are measured by two dummy variables which represent foreign-owned banks and state-owned banks. In addition, the effects of these two ownership characteristics during crises are captured by interacting the ownership dummies with the crisis dummy in respective regressions. The results show that foreign ownership has a weakly positive effect on leverage, while state ownership does not have a statistically significant effect, and the interaction terms are insignificant as well.

2. THEORIES OF CAPITAL STRUCTURE

In this section main theories on capital structure are reviewed. The starting point of the modern theory of capital structure is the Modigliani and Miller's proposition of 1958. Following this, different theories on capital structure have been developed. The most prominent of these theories are trade-off theory and pecking order theory, which are explained below.

2.1. Modigliani-Miller Theory

Modigliani & Miller's (1958) proposition which is also called the 'Irrelevance Theory' is the first study for modern finance by introducing an explicit theory about capital structure. They show that under the assumptions of perfect markets (that is a market with no taxes, no transaction costs and asymmetric information, no bankruptcy cost, full competition and no arbitrage opportunities), a firm's total market value is independent of its capital structure. That is, it does not matter what capital structure a firm has for financing its operations. They argue that the cost of capital is independent of the indebtedness of the firm. They show that investors who invest in a firm with a low debt ratio have the same returns as investors who invest in a firm with a high debt ratio. The theorem which was subject to criticism due to its unrealistic assumptions was later revised. In 1963, Modigliani & Miller proposed a new model including corporate taxes as a factor that affect capital structure choices. According to their revised theory, there is a linear relation between debt and the firm's market value in a world where there is a corporate tax. In other words, financing its operations only with debt and not using equity is the optimal decision for a firm. Value of firm increases with debt financing due to tax shield advantages. Modigliani & Miller's theory provides a theoretical framework for

understanding the capital structure but does not provide realistic descriptions of how firms should decide on an optimal capital structure (Frank and Goyal 2005).

2.2. Trade-off Theory

In contrast to the irrelevance theory, the trade-off theory, introduced by Kraus and Litzenberger (1973), takes market imperfections into account. This theory proposes that the optimal debt ratio is established by balancing the trade-off between the benefit and cost of debt. The foremost benefit of debt is the tax deductibility of interest cost of debt. However, debt causes agency problems between shareholders and debt holders and increases the firm's financial distress. According to this theory, the optimal capital structure is achieved when the marginal present value of the tax shield on additional debt is equal to the marginal present value of the financial distress cost of additional debt (Bradley et.al., 1984). Value-maximizing firms are supposed to choose the level of debt by balancing cost and benefits associated with debt financing (Frank and Goyal 2009). However, the optimal debt ratio varies across firms because tax rate, bankruptcy costs and the impact of financial distress differ across firms.

2.3. Pecking Order Theory

Another important theory of capital structure which was developed by Myers and Majluf (1984) is the pecking order theory. According to this theory, firms prefer internal funding over external funding for funding capital. The theory emphasizes the information asymmetry between the firm insiders (managers) and the outside investors. The level of asymmetric information may vary between firms and may be more severe when different parties have different levels of information. The pecking order theory ranks the financial sources according to the degree of influence of asymmetric information and follows a financial hierarchy in order to minimize the asymmetric information problem between insiders and outsiders. The firm has three sources of funding: retained earnings (internal funds), liabilities and equity (external funds). For funding and avoiding financial distress,

the firm first uses retained earnings and only then switches to debt and equity, respectively.

3. LITERATURE REVIEW

The literature on capital structure started primarily through studies on non-financial firms. In the past six decades, several theories have been developed and many empirical studies have been conducted for better understanding the relationship between the leverage ratio of non-financial firms and its determinants.

Most empirical studies explain capital structure of the banks in a similar way the empirical literature on non-financial firms explains. Excluding the services, they provide, the main difference between non-financial firms and banks are the specific regulations that banks are subject to. However, the studies suggest considerable similarities between capital structure decisions of banks and firms and emphasize that the minimum capital adequacy ratios that banks should adhere to have a secondary effect on the capital structures of banks. The early studies on bank capital structure using corporate finance approach such as Diamond and Rajan (2000), Barth et al. (2005), Berger et al. (2008), Brewer et al. (2008), Bakkar et al. (2019) observe that the bank capital ratio is much higher than the regulatory minimum which means that bank-specific regulations are not binding. Besides, Flannery (1994), Myers and Rajan (1998), Diamond and Rajan (2000), Allen et al. (2009) develop capital structure theories where capital structure requirements are not necessarily binding and of secondary importance. Moreover, Heider and Gropp (2010) argue that the similarities of capital structures of banks and non-financial firms are important. They find that the standard cross-sectional determinants of firms' capital structure also apply to large publicly held banks in the US and Europe. This paper also borrows from the capital structure literature on non-financial firms to explain the capital structure of deposit banks in Turkey.

Despite the vast literature on capital structure and its determinants, studies on capital

structure and its behaviour during crisis and non-crisis periods are relatively less. Besides, studies on developing countries are rare compared to the studies on developed countries. This paper brings together the literature on (i) the effect of macroeconomic variables and crises on banks' capital structure and (ii) the effects of bank characteristics on banks' capital structure during crisis and non-crisis periods in Turkey.

Davis and Stone (2004) show that crisis episodes have an effect on banks' capital structure. They examine 59 crises in 29 OECD countries from 1970 to 1999. They find that the decline in GDP during crises leads to a decrease in the leverage ratios of banks. Furthermore, if it is a banking crisis, they show that the effect of the crisis is greater compared to currency crises. The level of external financing options and bank lending opportunities make the effect of a crisis on banks' capital structure less severe. A similar paper by Ariff et al (2008) study the effects of the Asian crisis and macroeconomic variables on banks' leverage ratio. Their results are similar to Davis and Stone (2004) showing that banks reduce their leverage during crises because of scarce financing sources. Deesomsak (2004) analyzes the influence of crises on firms' capital structure and finds that because of lending market inefficiencies, the adjustment of the leverage ratio, which falls during a crisis, is slower in developing countries. Among more recent papers, Zarebski and Dimovski (2012) analyze the capital structure of firms in Australia before and after the 2009 Global crisis. They find that, although the significance of the influence of crisis depends on the maturity of debt used, the 2009 Global crisis affected the firms' leverage negatively.

There are also papers which find opposing results compared to the studies mentioned above on the effects of crises on capital structure. Campello et al (2010) examine 800 firms from 31 countries in Europe, Asia, and North America. They show that despite the restraining effects of the global financial crisis on the level of leverage, firms which have more internal funds do not change their leverage during a crisis. Moreover, they show that the 2009 global crisis did not cut the borrowing opportunities as much as the estimates found by previous studies. Forsberg (2012) investigates firms in the US and find similar results to Campello (2010). They show that the leverage ratio had in fact increased as a result of the global crisis. Furthermore, the effects of the crisis on the capital structure of firms have dissolved one year after the end of the crisis.

Besides macroeconomic factors and crises, there are also numerous papers examining the effects of bank characteristics on leverage. Despite a long list of bank-specific variables affecting the capital structure of banks, the results found in the literature on their effects are mixed. Bank characteristic which are widely examined in the literature are income variability, growth opportunity, tangibility, size and profitability.

Antoniou et al. (2008), Frank and Goyal (2009) and Aybar-Aries (2011) find that income variability has a negative effect on leverage. Frank and Goyal (2009) emphasize that firms with more volatile cash flow face higher expected financial distress and use less leverage. On the other hand, Heshmati and Tsoy (2017) analyze capital structure determinants for Korean listed companies over the period 1985-2015 and find a positive relation between income variability and leverage.

Kim and Sorensen (1986) show that firms with high growth opportunities tend to have low leverage ratios. The negative effect of growth opportunity is also confirmed by Deesomsak et al (2014). In a different study, Joong et al. (2008) examine a sample of 42 countries between 1997 and 2001 and find that growth opportunity has a significant and negative effect on the level of debt a firm uses. On the other hand, Aybar-Aries et al. (2011) examine the capital structure determinants for Spanish small-medium enterprises during the period 1995-2005 and find that growth opportunity is positively related to leverage.

Some studies in the literature have shown that tangibility is positively related to leverage. Among these studies, Titman and Wessel (1988), Rajan and Zingales (1995) and Antoniou et al. (2008) can be counted. On the other hand, Aybar-Aries et al (2011) find a negative effect and Heshmati (2001) finds no relationship between tangibility and leverage.

The results of the studies analyzing the effects of size on capital structure are also mixed. Rajan and Zingales (1995), who study firms from G-7 countries from 1987 to 1991, and Deesomsak et al. (2004), who examine firms from 10 developed countries for the period

1980-1990, find similar results. They show that size has a positive effect on the level of leverage of a firm. However, Kim and Sorensen (1986) find no effect of size on the capital structure of a firm.

Titman and Wessel (1988), Harris and Raviv (1991) and Rajan and Zingales (1995) find a negative relationship between profitability and the level of leverage. That is, more profitable firms tend to have a lower leverage ratio than less profitable firms. Morri and Beretta (2008) examine US firms and confirm previous findings on the relationship between profitability and capital structure. However, Kleff and Weber (2003) examine capital structure determinants for German Banks during the 1992-2001 period and find that profitability has a positive effect on banks' leverage.

Most of the studies in the literature are about developed countries and there are not many studies analyzing banks' capital structure for developing countries such as Turkey. The papers that study the capital structure of deposits banks in Turkey are reviewed in more detail below.

Sak and Caglayan (2010) examine the capital structure of banks using the static panel data analysis method. Their data consist of the 1992-2007 period, identifying two sub-periods as before and after the 2001 financial crisis. They show that size and growth opportunity have positive effects while tangibility and profitability have negative effects on leverage. Moreover, the effect of size on leverage is higher whereas the effects of tangibility and growth opportunity are lower after the crisis period. They also conclude that the results are consistent with the pecking order theory.

Baltaci and Ayaydin (2014) explore the effects of bank-specific and macroeconomic factors on leverage using data for the Turkish Banking Sector during the 2002-2012 period. Using dynamic panel data estimation, they conclude that size, GDP growth, and industry leverage are positively associated with leverage; tangibility, profitability, inflation, and financial risk are negatively associated with leverage. Their findings on tangibility and GDP growth are consistent with the predictions of pecking order theory whereas size is inconsistent. Their findings show the importance of macroeconomic factors on capital structure decisions and suggest that the capital structure of financial and

non-financial firms is ultimately determined by the same drivers.

Gocmen and Sahin (2014) investigate the bank-specific determinants on capital structure for Turkish deposit banks between 2004-2011 using a static panel data approach. To analyze the effects of different variables on capital structure before and during the global crisis, the overall sample period is divided into two sub-periods: the period before the global crisis, 2004-2007, and the period during the global crisis, 2008-2010. Their findings in general support the pecking order theory. They find a negative relationship between profitability and leverage for the full period they investigate. Their findings also show that larger banks and banks with more growth opportunities tend to use more leverage for the whole sample period. They also find Turkish deposit banks with highly volatile operating income tend to use less leverage before and after the crisis.

This study aims to fill a gap in the literature on capital structure of banks in Turkey by analyzing the effects of macroeconomic determinants and crises, taking into account both the 2001 Turkish crisis and the 2009 global crisis. This is also the first study that investigates the adjustment speed to optimal capital structure in the Turkish banking sector.

4. THE ECONOMETRIC MODEL

In the literature, two types of econometric models have been used to test the behavior of capital structure of firms: the static models and the dynamic models. Early studies use the static model by implicitly assuming the existence of an optimal (target) debt ratio and that all firms are already at their optimal ratio. These studies do not take into account the adjustment costs, information asymmetries and transaction costs. After the proposal of the trade-off theory by Kraus and Litzenberg (1973), numerous empirical studies have been conducted on capital structure. Some of these studies have attained inconsistent results with the trade-off theory. Myers (1984) introduces some adjustment costs as an explanation of why the change in capital structure does not occur as often as the static models predicts. The discrepancies between the empirical results and the predictions of the trade-off theory led to the development of a new capital structure model that has been widely used and supported by many studies: the dynamic capital structure model (see Heinkel and Zechner 1989; Heshmati 2001; Aybar-Arias 2011; Huang and Ritter 2009 among others). Dynamic models assume that firms' capital structure decisions are continuous decisions. In this continuous process, not only the costs and benefits of debt but also the adjustment costs and investment decisions are taken into consideration. The dynamic framework is based on the idea that the adjustment to the optimal capital structure would occur partially and gradually over time, hence the name partial adjustment model. This model is used in our analysis to analyze the impact of capital structure determinants and adjustment costs on capital structure. For this reason, our first assumption would be the existence of transaction costs that banks face and partial adjustment from their current leverage to their optimal leverage. Unlike static models, dynamic models assume banks face transaction costs that make it difficult for them to reach their optimal leverage level. So, banks reach progressively to their optimal leverage level in a sufficiently competitive market.

Following works by Heshmati (2001), Flanney and Rangan (2006) and Aybar-Aries (2011), a dynamic model is constructed. The optimal debt ratio of the bank is a function of a set of explanatory variables as denoted in Equation 1.

Lev_{it}^{*} = F (X_{it}, η_i, τ_t) (1)

where Lev_{it}^{*} is the optimal leverage ratio of bank i at time t, X_{it} is a vector of bank and time variant determinants of the optimal leverage, η_i is a vector of bank variant determinants that are constant over time and τ_t is a vector of time variant macroeconomic determinants.

In a perfectly frictionless environment (that is, with no adjustment costs), banks would immediately respond with a complete adjustment by equalizing existing leverage ratio and optimal leverage ratio. Then, observed leverage Lev_{it} should be equal to the optimal leverage Lev_{it}^{*}.

$Lev_{it}^{*} = Lev_{it}$ (2)

This implies that the change in observed leverage from the previous to the current period should be exactly equal to the change required for the bank to be at optimal leverage at time t;

Lev_{it}- Lev_{it-1}=Lev_{it}^{*} - Lev_{it-1} (3)

However, if there exist adjustment costs for banks to reach their optimal leverage, there can be cases when banks might find it easier and less expensive to adjust gradually. By introducing an adjustment speed factor δ, partial adjustment will take place and it will be represented by a standard partial adjustment model (Kim et al. 2005; Banerjee et al 2004) denoted as;

Lev_{it}- Lev_{it-1}=δ (Lev_{it}^{*} - Lev_{it-1}) (4)

where δ is the adjustment parameter which represents the magnitude of desired

adjustment between two subsequent periods or the rate of convergence of Lev_{it} to its optimal value.

Equation (4) represents the dynamic behaviour of a particular bank that adjusts to the target leverage ratio in the presence of adjustment costs. The existence of adjustment speed is represented by the restriction $|\delta| < 1$ and implies that $Lev_{it} \rightarrow Lev_{it}^{*}$ as $t \rightarrow \infty$. Clearly in the existence of adjustment costs, the adjustment coefficient δ is expected to be between 0 and 1. If δ greater than 1, that means banks over-adjust and if δ less than 0, that means banks deviate from target leverage over time. By rearranging Equation (4) and adding a statistical error term, ε_{it}, we reach the following econometric model;

$$Lev_{it} = (1-\delta)\, Lev_{it-1} + \delta Lev_{it}^{*} + \varepsilon_{it} \quad (5)$$

where Lev_{it}^{*} is a linear function of the form $Lev_{it}^{*} = \alpha_0 + \sum_{j=1}^{J} \beta_j X_{jit} + \sum_{s=1}^{S} \varphi_s \eta_{si} + \sum_{m=1}^{M} \lambda_m \tau_{mt}$ (6)

Combining Equation (5) and Equation (6), the following equation is derived:

$$Lev_{it} = (1-\delta)\, Lev_{it-1} + \delta\left(\alpha_0 + \sum_{j=1}^{J} \beta_j X_{jit} + \sum_{s=1}^{S} \varphi_s \eta_{si} + \sum_{m=1}^{M} \lambda_m \tau_{mt}\right) + \varepsilon_{it} \quad (7)$$

By re -arranging Equation (7), we obtain:

$$Lev_{it} = (1-\delta)\, Lev_{it-1} + \delta\alpha_0 \sum_{j=1}^{J} \delta\beta_j X_{jit} + \sum_{s=1}^{S} \delta\varphi_s \eta_{si} + \sum_{m=1}^{M} \delta\lambda_m \tau_{mt} + \varepsilon_{it} \quad (8)$$

By rewriting Equation (8), we obtain Equation (9), which will be used in our benchmark analysis;

$$Lev_{it} = a_0 + \delta_0\, Lev_{it-1} + \sum_{j=1}^{J} B_j X_{jit} + \sum_{s=1}^{S} \rho_s \eta_{si} + \sum_{m=1}^{M} \Upsilon_m \tau_{mt} + \varepsilon_{it} \quad (9)$$

where $\delta_0 = 1 - \delta$, $a_0 = \delta\alpha_0$, $B_j = \delta\beta_j$, $\rho_s = \delta\varphi_s$, $\Upsilon_m = \delta\lambda_m$.

5. DATA AND VARIABLES

Our empirical analysis covers the Turkish banking sector comprising 58 deposit banks over the years 1995 to 2016. We use annual data, which are obtained from several sources. The data on bank characteristics are collected from The Banks Association of Turkey (Türkiye Bankalar Birliği, TBB). The data for macroeconomic variables are obtained from the IMF's International Financial Statistics Database and Bloomberg Terminal. We use book value of leverage as the dependent variable. The explanatory variables that represent bank characteristics are income variability, growth opportunity, tangibility, size, profitability, and bank age. The macroeconomic explanatory variables are GDP growth rate, inflation rate and a dummy variable for the 2009 global crisis and the 2001 Turkish crisis. Time trend is also used as an explanatory variable. We removed investment banks from our sample since behavior of these banks does not correspond to the credit behavior of deposit banks. We also remove banks which contain less than 3 annual observations in any variable from our sample because they distort the analysis. The variables used in the econometric analysis are explained in detail below.

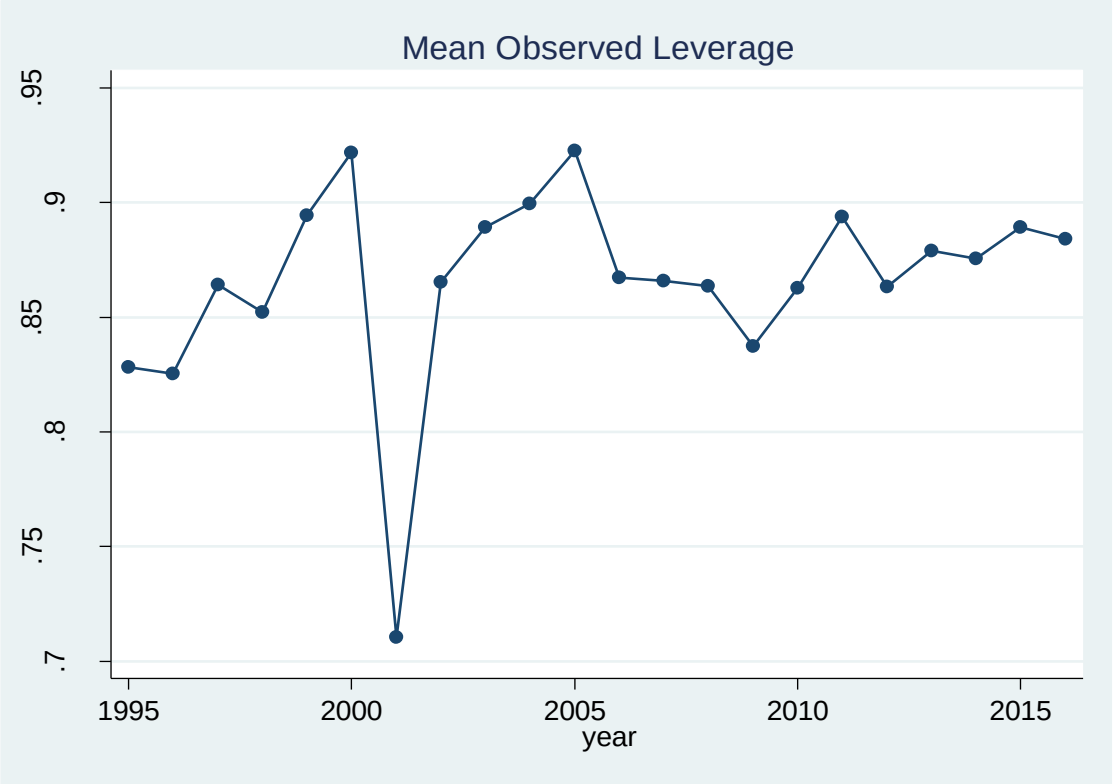
5.1. Dependent Variable

Leverage

In the capital structure literature, there are two different approaches to measure the leverage. Some studies use book value of debt to total assets to define leverage (Banerjee et. al. 1999; Fama and French 2002). These studies claim that the book values are independent of the factors that are not directly under the control of the bank. On the other hand, some studies use market values (Rajan and Zingales 1995; Flannery and Rangan 2006). They argue that the market values reflect agency problems between creditors and

equity holders. Some other studies use both book and market values (Titman and Wessels 1988). Because of availability of data, we use book value of leverage and measure it as the ratio of total debt-to-total assets. Figure 5.1.2 shows changes in the average leverage of deposit banks in Turkey over the years 1995 to 2016.

Figure 5.1.2 Mean Observed Leverage



5.2. Explanatory Variables

To examine the determinants of capital structure, we use six explanatory variables to represent bank characteristics, which are commonly used in the literature. We also add two macroeconomic variables and a crisis dummy variable since capital structure literature shows that macroeconomic variables and crises also have a significant effect on capital structure (Drobetz and Wanzenried 2006; De Jong et al. 2008; Mahakud and Mukherjee 2011; Heshmati and Tsoy 2017).

Income Variability

Variance of operating income is used to measure income variability. Volatility of operating income has a direct influence on default risk. Default risk acts as a mechanism that balances debt financing to protect companies from bankruptcy, thus preventing companies from over-utilizing debt (Aybar-Aries 2011). Default risk causes direct or indirect distress costs for the company and increases probability of bankruptcy (Mackie-Mason 1990). Therefore, it can be predicted that companies with higher volatility of operating income tend to reduce debt ratio according to the trade-off theory. From the pecking order perspective, companies with volatile stock prices are expected to be also highly volatile in terms of their market beliefs and may suffer from adverse selection problem. If that is the case, risky firms have a higher debt ratio than the others (Frank and Goyal 2009). Therefore, from the pecking order theory perspective income variability is positively related to the leverage.

Growth Opportunity

Empirical studies measure growth opportunity by using two proxies: market values-to-book values of banks (Sak and Caglayan 2010) and the annual percentage change in total assets (Heshmati 2001; Aybar-Aries 2011). Because of data availability, we use percentage change in total assets for our empirical analysis. According to trade-off theory, high cost of debt will lead companies to use more equity or retained earnings and less debt. Higher growth opportunities allow companies to take more risks by accepting riskier projects. Hence, banks would put into operation inefficient investments. This situation increases agency conflicts, and lenders would demand higher returns, which implies an increase in the cost of debt. Thus, there exists a negative relation between growth opportunity and debt ratio (Deesomsak et al. 2004). In addition to this point, according to Harrisoman and Widjaja (2014), banks with higher growth opportunities tend to shy away from using debt for financing because this may lead to lack of internal resources when there is an attractive investment opportunity. So, leverage will be negatively associated with growth opportunities. On the other hand, growing firms would need more funds, beyond internal financing, to fund their investments. So, they prefer external funding through debt financing. Therefore, pecking order theory predicts a positive relation between growth opportunity and leverage.

Tangibility

The ratio of tangible assets-to-total assets is used as a measure of tangibility for the study. Tangible assets are a kind of fixed assets and generally could not be converted to cash and similar assets rapidly. According to Rajan and Zingales (1995), tangible assets behave like a collateral and decrease adverse selection problem for the company. From this perspective, tangible assets automatically decrease the risk of the lender who are exposed to agency problem costs. As a result, lender would be more willing to supply loan to the bank in case of a high tangibility ratio which in return reduces the cost of debt. This means there exists a positive relation between tangibility and leverage which is consistent with trade-off theory. On the other hand, pecking order theory predicts that firms with less tangible assets confront higher information costs and prefers debt to equity. In other words, tangibility and leverage are negatively related.

Size

The logarithm of the total assets is used as a proxy for the size of bank. According to Titman and Wessel (1988), larger firms are more diversified, have a more stable cash flow (collateral) and offer less risk to lenders. As a result, cost of debt reduces, and firms tend to have more debt than equity and hence have higher leverage. In addition, Deesomsak et al. (2004) argue that large firms tend to borrow more because the degree of bankruptcy risk decreases with the size of the firm. Therefore, the firm size is expected to be positively related with leverage. Deesomsak et al. (2004) also argue that the factors like lower agency cost of debt, easy access to credit markets, less volatile cash flows, and requirement to fully benefit from the tax shield promote positive relation between size and leverage. Following the trade-off theory, it is expected that firm size is positively related to leverage. Regarding to pecking order theory, larger firms have less information asymmetry. As a result, the chance of issuing undervalued equity is reduced and firms encourage to use equity financing (Rajan and Zingales 1995). In addition, Frank and Goyal (2009) state that larger firms have easier access to the capital market than smaller firms. As a result, it is easier to utilize equity more than their smaller counterparts. So, these firms use less debt. Therefore, pecking order theory predicts a negative relation between size and leverage.

Profitability

The ratio of net income to total assets is used as a measure of profitability. Expected financial distress costs, agency costs, bankruptcy costs, and interest tax shields lead more profitable banks to have higher leverage ratios according to trade-off theory. In profitable banks, debt costs will be low due to the low risk of bankruptcy. Tax shield advantages also induce more profitable banks to finance themselves with debt. Trade-off theory expects a positive correlation between profitability and leverage. On the other hand, pecking order theory says that there exists asymmetric information between shareholders and creditors, which makes firms prefer internal funding to external funding for financing the company. Hence, asymmetric information causes firms to prefer retained earnings for financing investments and only use external funds in case of unavailability of internal funds. As a result, profitability is expected have a negative relationship with leverage.

Bank Age

Age of bank is measured in terms of years from the establishment year until the end of the sample period (if it is still alive on 31.12.2016) or the closure of the bank. Heshmati and Tsoy (2017) argue that there can be a positive or a negative relation between age of bank and leverage. That is, over the years, banks can increase leverage to increase capacity and survive. On the other hand, banks can also accumulate profits over the years and use it in case of financial needs instead of debt (Diamond 1989).

GDP Growth

GDP growth rate is measured as the annual percentage change in real GDP. GDP growth rate proxies the growth opportunities of firms in the overall economy (Joeveer 2013). In view of the pecking order theory, firm profitability is expected to rise, allowing firms to use externally generated earnings to finance future investments since external funds are preferred over internal funds in periods of economic growth. Therefore, the theory forecasts a positive relation between GDP growth and leverage. Regarding the trade-off theory, firms with higher growth opportunities are likely to suffer from financial distress and excess debt problems. Therefore, these firms tend to use equity more than debt.

Inflation

Inflation rate is measured as the annual growth in the Consumer Price Index (CPI). Inflation has two contradicting effects on the capital structure of banks. Since borrowing has higher tax advantages via tax deductions in high inflation periods, inflation has a positive effect on leverage (Taggart 1985). On the other hand, high inflation may cause high interest rates and therefore prevent banks from borrowing more (Drobetz and Wanzenried 2006). Empirical studies show mixed results meaning there is evidence in support of both effects (Deesomsak et al. 2004).

Crisis

The crisis dummy is used to measure the direct effect of crises on leverage. The dummy variable takes the value 1 if it is a crisis period (the 2001 Turkish crisis and the 2009 global crisis) and 0 otherwise.

Time Trend

Time trend is used to see whether bank leverage changes over time and has a drift. The relationship with time trend can be increasing or decreasing over time.
The following table shows bank-specific variables that are used in empirical studies and predictions of the main theories for the relationship of these variables with leverage.

Table 5.2.1 Common Capital Structure Determinants and Prediction of Theories

Variable	Trade-off Theory	Pecking Order Theory	Literature
Income Variability	-	+	Nivorozhkin (2004) Deosomak et al. (2004) Kim et al. (2006) Huan & Song (2006)
Growth Opportunity	-	+	Heshmati (1999) Ozkan (2001) Frank & Goyal (2009) Ayber-Aries et al. (2010)
Tangibility	+	-	Heshmati (1999) Ozkan (2001) Frank & Goyal (2009) Ayber-Aries et al. (2010)
Size	+	-	Myers (1977) Myers & Majluf (1984) Titman & Wessel (1988) Ozkan (2001)
Profitability	+	-	Bennett & Donnelly (1993) Deesomsak et al. (2004) Huang & Song (2006) Groop & Heider (2010)

The following table reports summary statistics for our dataset for the whole period (1995-2016).

Table 5.2.2 Summary Statistics

Variable	Mean	Std.Dev.	Min	Max
Leverage	0.863	0.168	-0.093	2.456
Income Variability	0.643	1.176	0.001	18.433
Growth Opportunity	2.713	39.627	-0.999	1010.328
Tangibility	0.031	0.049	0.001	0.519
Size	13.821	3.119	4.897	19.739
Profitability	0.012	0.207	-3.198	0.968
Bank Age	54.951	34.437	19	154
GDP Growth	0.056	0.046	-0.1	0.112
Inflation	0.074	0.06	0.016	0.213

6. ESTIMATION METHODOLOGY AND RESULTS

6.1. Estimation Methodology

To analyze the dynamic capital structure model, different estimation techniques such as OLS, fixed and random effect models, and instrumental variable techniques have been used in the literature. Ignoring fixed effects and endogeneity problems may cause these techniques to be biased and lead to inconsistent estimations. Taking into account possible correlation structures of error terms with delayed variables, we estimate the model using the Generalized Method of Moments (GMM) technique suggested by Arellano and Bond (1991). System GMM allows us to overcome endogeneity and serial correlation in the error terms, it is robust to heteroscedasticity, and deals with unbalanced panel data problems. GMM methods have two different estimation techniques: utilizing levels or differences of the variables. Since, in general System GMM gives more efficient and consistent results than Difference GMM, we use System GMM procedure for our analysis. Following Aybar-Aries et al. (2011) and Drobetz and Wanzenried (2006), two-step System GMM estimation technique is used in our study. The Hansen test and the AR-2 test are used to test the model fit. The Hansen test is a test of exogeneity of all instruments as a group and results confirm the validity of the instruments with significant p-values. The AR-2 test is a test of second order residual autocorrelation and results confirm the absence of second order serial correlation in the residuals.

6.2. Results

Estimation results are given in Tables 6.2.1 and 6.2.2. Table 6.2.1 shows the results for the benchmark model where leverage is explained by bank and time variant variables,

macroeconomic variables, and the crisis dummy.

The benchmark results show that lagged leverage has a positive and significant effect on leverage. That means, as predicted by the dynamic theory, the banks' leverage ratios in Turkey converge to an optimal leverage over time. Estimated coefficient of lagged leverage is 0.70 and has a significant effect on leverage. That shows banks adjust to their long-term target leverage, but they are under-adjusting with a speed of 0.30 ($\delta_0 = 1 - \delta$). Adjustment speed can also be viewed as units in terms of years with the help of a conversion formula: $(ln0.5)/\ (ln(1-\delta))$ or $(1/\delta)$, which give 1.94 and 3.33 years respectively (Huang Ritter 2009; Mukherjee and Mahakud 2010). Banks, on average, reach their target in 3.33 years or travel the half distance to their target from the current year in 1.94 years. That is, when a shock that moves a bank away from the optimal capital structure, it takes 3.33 year to completely cover the leverage gap. Relatively lower adjustment speed suggests that banks face higher adjustment costs. For example, De Miguel and Pindado (2001) find that adjustment speed for Spanish banks is equal to 0.2 which is a relatively slow rate. They argue that possible reason for the relatively low adjustment rate can be attributed to the less developed bond market in Spain. Although it is hard to compare countries' speed of adjustment rates due to different economic environments, differences in selecting determinants for estimation and differences of data sets, it is still possible to make similar comments for Turkey. That means, the findings of adjustment speed rate can be associated with the level of development of financial markets of Turkey. International evidence for developing and emerging economies shows adjustment speed range from 17.9%-60.2% per year. The result for Turkey is, therefore, consistent with international evidence.

Among the bank characteristics, growth opportunity, tangibility and profitability have significant effects on leverage, with tangibility and profitability being more significant. Profitability has a negative and strongly significant impact on leverage, which means that banks with higher profitability have a lower leverage ratio. This finding is consistent with pecking order theory which predicts that firms with higher profitability rely on retained earnings before borrowing debt. Tangibility also has a negative and significant effect on leverage. This is also consistent with pecking order theory which says that firms with less collateral face higher information costs and prefer debt to equity. This finding is also consistent with empirical results that Baltaci and Ayaydin (2014) suggest. Growth

opportunity is found to have a positive effect on leverage. This result is also consistent with pecking order theory which suggests that a firm with a higher growth opportunity would need more funds and tend to use external funding (Frank and Goyal 2009; Groop and Heider 2010). Income variability, size and bank age do not have a statistically significant effect on leverage. Overall, considering the coefficients of bank-specific determinants of leverage, the results reveal that capital structure behavior of deposit banks in Turkey is in line with the pecking order theory.

GDP growth rate has a significantly positive effect on leverage, and it is consistent with the pecking order theory. This result shows that banks prefer external financing through debt funding than internal financing in periods of economic growth.

Inflation rate also has a positive and statistically significant effect on leverage. Joeveer (2005) says that inflation is predicted to be positively related to leverage due to higher real value of tax deductions on the debt.

The crisis dummy has a significant and negative effect on leverage. This result suggests that it becomes more difficult and costly for banks to use debt financing during crisis episodes and banks tend to reduce their leverage.

To understand whether bank characteristics have a different effect on leverage during crises compared to normal times, interaction terms for banks characteristics with the crisis dummy are included as additional variables in the regressions and the results are reported in Table 6.2.2. The results show that only the interaction term for income variability has a statistically significant effect on leverage. It has a negative effect during crises while its effect is positive for normal times. As shown in Table 6.2.1, its effect is insignificant for the whole period. That is, income variability, which is a proxy for default risk, works in opposite directions in terms of its effect on leverage during crisis and non-crisis periods, and these effects cancel out when the whole period is considered. All other interaction terms are insignificant, which suggests that the other bank-specific variables do not have a different impact on leverage during crises.

Table 6.2.1 Benchmark Regression Results

Variables	Leverage
Leverage(t-1)	0.707***
	(4.31)
Income Variability	-0.000943
	(-0.11)
Growth Opportunity	0.000146*
	(1.95)
Tangibility	-0.263**
	(-2.10)
Size	-0.00162
	(-0.38)
Profitability	-0.866***
	(-11.77)
Bank Age	0.0000789
	(0.45)
GDP Growth	0.371***
	(3.06)
Inflation	0.311***
	(3.51)
Time Trend	-0.000116
	(-0.07)
Crisis	-0.0594***
	(-4.07)
Constant	0.271**
	(2.30)
Number of Observations	574
Number of Groups	58
Hansen Test (p value)	0.337
AR (2) Test (p value)	0.551

*Note: Robust t-statistics in parenthesis, * significant at 10%, ** at 5%, *** at 1%*

Table 6.2.2 Regression Results with the Interaction Terms

	(1)	(2)	(3)	(4)	(5)
Leverage(t-1)	0.664***	0.694***	0.703***	0.686***	0.706***
	(4.33)	(4.19)	(4.37)	(4.50)	(4.37)
Income Variability	0.0256*	0.00000350	-0.000154	0.00230	-0.00241
	(1.65)	(0.00)	(-0.02)	(0.28)	(-0.29)
Growth Opportunity	0.0000518*	0.000146*	0.000143*	0.000139*	0.000152**
	(1.76)	(1.97)	(1.87)	(2.00)	(2.05)
Tangibility	-0.277**	-0.279**	-0.293**	-0.259**	-0.249*
	(-2.38)	(-2.14)	(-2.15)	(-2.38)	(-1.86)
Size	-0.00100	-0.00141	-0.00151	-0.00255	-0.00107
	(-0.24)	(-0.34)	(-0.36)	(-0.57)	(-0.26)
Profitability	-0.868***	-0.875***	-0.882***	-0.847***	-0.921***
	(-19.15)	(-13.99)	(-12.68)	(-10.73)	(-12.24)
Bank Age	0.000132	0.0000806	0.0000426	0.000110	0.0000199
	(0.83)	(0.47)	(0.29)	(0.61)	(0.12)
GDP Growth	0.340***	0.343**	0.349***	0.284***	0.367***
	(2.98)	(2.56)	(3.16)	(2.98)	(2.92)
Inflation	0.314***	0.306***	0.304***	0.276***	0.330***
	(3.32)	(3.55)	(3.41)	(2.88)	(3.85)
Time Trend	0.000867	-0.000226	-0.000235	0.0000956	-0.000319
	(0.82)	(-0.15)	(-0.15)	(0.06)	(-0.21)
Crisis	-0.0348**	-0.0555***	-0.0459	-0.354	-0.0634***
	(-2.30)	(-3.43)	(-1.51)	(-1.60)	(-4.58)
Crisis*Income Variability	-0.0385**				
	(-2.11)				
Crisis*Growth Opportunity		-0.0170			
		(-0.51)			
Crisis*Tangibility			-0.593		
			(-0.44)		
Crisis*Size				0.0195	
				(1.44)	
Crisis*Profitability					0.130
					(0.83)
Constant	0.277***	0.284**	0.279**	0.305***	0.270**
	(2.71)	(2.33)	(2.36)	(2.89)	(2.28)
Number of Observations	*574*	*574*	*574*	*574*	*574*
Number of Groups	*58*	*58*	*58*	*58*	*58*
Hansen Test (p value)	*0.498*	*0.305*	*0.393*	*0.612*	*0.333*
AR (2) Test (p value)	*0.575*	*0.548*	*0.556*	*0.593*	*0.533*

*Note: Robust t-statistics in parenthesis, * significant at 10%, ** at 5%, *** at 1%*

7. ROBUSTNESS ANALYSIS

7.1. Separation of the 2001 Turkish Crisis and the 2009 Global Crisis

As a first robustness analysis, we separate the 2001 Turkish crisis and the 2009 global crisis to understand whether these two crises have different effects on leverage. The 2001 Turkish crisis is a banking crisis that originated in Turkey. The 2009 global crisis is different from the 2001 Turkish crisis since it originated in the US and globally affected all economies. In order to analyze the effects of these crises on leverage separately and check whether our results still hold, we re-run our benchmark regression with the separate crisis episodes. The first column in Table 7.2.1 shows the results for the case where the two crisis periods are represented by two separate dummy variables. The results show that both of the crises have a negative and statistically significant effect on leverage. The other results are similar to the benchmark regression, with only the significance level of some of the variables changing.

7.2. Effects of Foreign Ownership and State Ownership

As a second robustness analysis, we include two separate dummy variables for foreign banks and state banks in order to check whether our findings still hold when we expand our regression with these new explanatory variables.

Foreign-owned banks reduce the concentration in the banking sector and increase competition in the country they start to operate in. Foreign banks also reduce bankruptcies and non-performing loans with risk mitigation techniques and play a pioneering role in the process of bank risk management. These banks increase financial diversity by offering

new financial services (Akgüc 2007). However, foreign banks may also increase the effects of economic instability by carrying it from their home country, deepen the crises by abruptly leaving the country they are operating in or over-restrict their activities in case of crises because of the global risk reduction policies of the headquarters, thus leading to a more severe crisis. (Akgüc 2007). Because of these reasons, foreign banks may act differently in terms of their capital structure.

State banks may also display different behavior in capital structure decisions since they may be affected by political influence. Thus, we may observe a different effect on leverage for state banks.

In order to capture the effect of foreign-ownership of deposit banks on leverage, we use a dummy variable that takes 1 if the bank is foreign-owned and 0 otherwise. To capture the effect of state-ownership of deposit banks on leverage, we use a dummy variable that takes 1 if the bank is state-owned and 0 otherwise. With newly created foreign ownership dummy and state ownership dummy, we re-run our main regressions to understand the effect of these variables on leverage for the whole sample period and the crisis period. Regression results are reported in Table 7.2.1.

The results indicate that foreign ownership has a positive effect on leverage, but this effect is not strongly significant. State-ownership and the interaction terms of these variables with the crisis dummy have no significant effect on leverage for deposit banks in Turkey. The significance and signs of all other variables are similar to our benchmark regression. These results show that foreign banks resort to debt more than domestic banks, even though this effect is not very strong.

Table 7.2.1 Robustness Analysis Results

Variables	(1)	(2)	(3)	(4)	(5)
Leverage(t-1)	0.681***	0.703***	0.709***	0.704***	0.709***
	(4.53)	(4.21)	(4.33)	(4.22)	(4.40)
Income Variability	0.00406	-0.00122	-0.000890	-0.00153	-0.000796
	(0.40)	(-0.15)	(-0.11)	(-0.18)	(-0.10)
Growth Opportunity	0.000137*	0.000142*	0.000145*	0.000139*	0.000144*
	(1.84)	(1.88)	(1.95)	(1.82)	(1.95)
Tangibility	-0.319*	-0.278**	-0.265*	-0.286**	-0.262*
	(-2.61)	(-2.16)	(-1.97)	(-2.39)	(-1.98)
Size	-0.00116	-0.00159	-0.00177	-0.00171	-0.00180
	(-0.28)	(-0.36)	(-0.42)	(-0.37)	(-0.43)
Profitability	-0.888***	-0.870***	-0.867***	-0.863***	-0.865***
	(-20.13)	(-11.69)	(-11.73)	(-9.21)	(-11.43)
Bank Age	0.0000866	0.000155	0.0000712	0.000156	0.0000717
	(0.50)	(0.87)	(0.39)	(0.89)	(0.39)
GDP Growth	0.206*	0.366***	0.371***	0.384***	0.372***
	(2.10)	(2.98)	(3.06)	(3.04)	(3.09)
Inflation	0.293**	0.316***	0.311***	0.324***	0.312***
	(3.40)	(3.58)	(3.51)	(3.60)	(3.52)
Crisis		-0.0602***	-0.0593***	-0.0411**	-0.0594***
		(-4.09)	(-4.07)	(-2.11)	(-3.84)
Time Trend	-0.000442	-0.000232	-0.0000834	-0.000226	-0.0000522
	(-0.29)	(-0.14)	(-0.05)	(-0.14)	(-0.03)
2001 Turkish Crisis	-0.122***				
	(-3.66)				
2009 Global Crisis	-0.0199**				
	(-2.78)				
Foreign		0.0129		0.0174*	
		(1.39)		(1.99)	
State			0.00356		0.00279
			(0.31)		(0.23)
Crisis*Foreign				-0.0444	
				(-0.77)	
Crisis*State					0.00970
					(0.25)
Constant	0.302**	0.268**	0.272**	0.266**	0.271**
	(2.77)	(2.27)	(2.24)	(2.31)	(2.29)
Number of Observations	574	574	574	574	574
Number of Groups	58	58	58	58	58
Hansen Test (p value)	0.415	0.361	0.321	0.655	0.551
AR (2) Test (p value)	0.567	0.521	0.552	0.571	0.531

*Note: Robust t-statistics in parenthesis, * significant at 10%, ** at 5%, *** at 1%*

CONCLUSION

This study explores the determinants of capital structure for deposit banks in Turkey during the period 1995-2016. The partial adjustment model is used for dynamic panel data approach. The model is estimated using the Generalized Method of Moments (GMM) technique. The results of the econometric analysis show that growth opportunity, GDP growth, and inflation are significantly and positively; tangibility, profitability, and crises are significantly and negatively associated with leverage. On the other hand, income variability, size and bank age have no statistically significant effect on leverage. Additionally, income variability has a negative effect on capital structure during crisis periods.

Using a dynamic model, we also examine the speed of adjustment towards the target leverage. According to the estimation results, deposit banks in Turkey reach their target in 3.33 years on average.

The results also show that the 2001 crisis and 2009 crisis have a negative and statistically significant effect on leverage when analyzed separately. We also find that foreign ownership has a positive effect on leverage, even though this effect is not very strong, and state ownership does not have a significant effect.

The results, overall, show that other than bank characteristics, macroeconomic factors and crises have a significant effect on capital structure of banks in Turkey. Hence, these factors should be taken into account in analyzing the capital structure decisions of banks. The results also suggest that the behavior of banks in Turkey is in line with the predictions of the pecking order theory.

There are points one may consider for future research. First, variables such as size and growth opportunity can be reconstructed by using market value of banks instead of total assets. Second, country specific variables such as level of stock market development and bond market development may be used in the model.

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