Finans Politik & Ekonomik Yorumlar (658) Aralık 2021: 101-136
Araştırma Makalesi

THE DETERMINANTS OF THE ADJUSTMENT SPEED TOWARDS TARGET LEVERAGE RATIO: EVIDENCE FROM TURKEY

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Gönderim tarihi: 18.08.2019 Kabul tarihi: 25.11.2021

Abstract

The main aim of this study is to estimate adjustment speed towards target capital structure and to examine the determinants of adjustment speed for Turkish firms traded on BIST during the 2005 – 2020 period. To this end, we first examine the determinants of the target capital structure and find that the profitability, tangibility, and size are key determinants of the target leverage ratio. Next, by using the two-step Generalized Methods of Moments, we estimate the adjustment speed as being approximately 31% when long-term debt is used as leverage proxy, and as being 14% when total-term debt is used as leverage proxy. Finally, we examine firm-specific and macroeconomic determinants of adjustment speed. Among firm-specific determinants, adjustment speed is negatively related with size and distance from the target ratio but positively related with profitability and growth. As for macroeconomic determinants, short-term interest rate is negatively related while term spread is not significantly related with adjustment speed.

Key Words: adjustment speed, capital structure, target leverage ratio, Generalized Methods of Moments

JEL: G31, G32, C22

Özet

Bu çalışmanın temel amacı, 2005 – 2020 döneminde BİST üzerinde işlem gören Türk firmalarının, sermaye yapılarını hedef sermaye yapısına ayarlama hızlarını hesaplamak ve ayarlama hızlarını belirleyen etmenleri incelemektir. Bu amaçla, çalışmada önce hedef sermaye yapısının belirleyicileri incelenerek kârlılık, varlık yapısı, ve büyüklüğün hedef kaldıraç oranının temel belirleyicileri olduğu bulunmuştur. Daha sonra, iki aşamalı Genelleştirilmiş Momentler Methodu kullanılarak ayarlama hızı hesaplanmış ve kaldıraç uzun vadeli borç ile ölçüldüğünde ayarlama hızı %31, kaldıraç toplam borç ile ölçüldüğünde ise ayarlama hızı %14 olarak bulunmuştur. Son olarak, ayarlama hızına etki eden firmaya özgü ve makroekonomik etmenler incelenmiştir. Firmaya özgü faktörlerden, büyüklük ve hedef orana olan mesafenin uyum hızı ile ters orantılı olduğu, karlılık ve büyümenin ise uyum hızı ile pozitif bir ilişkisi olduğu bulunmuştur. Makroekonomik faktörlerden ise kısa dönem faiz oranlarının ayarlama hızı ile negatif yönlü bir ilişkisi olduğu, getiri eğrisinin ise ayarlama hızı ile bir ilişkisi olmadığı gözlenmiştir.

Anahtar Kelimeler: ayarlama hızı, sermaye yapısı, hedef kaldıraç oranı, Genelleştirilmiş Momentler Methodu

JEL: G31, G32, C22

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1. Introduction

Starting from the irrelevancy theorem of Modigliani and Miller (1958), numerous studies have examined whether value of firms and the capital structure are actually irrelevant, and if not, what factors have a possible role on capital structure. For instance, pecking order theory says that capital structure is related with information asymmetry. According to pecking order theory, firms first use funds which they internally generate. If the internal fund is inadequate, then they should use debt as capital and equity should be the last option. The reason is that issuing equity may signal that share price of the company is overvalued, which is a bad signal to outsiders that asymmetrically have a lower level of information on the fundamental value of firms. However, according to trade-off theory, there is an optimal capital structure maximizing value of a firm. The optimal point is where the marginal cost, and benefit of having leverage exactly offset each other (Jensen, 1986).

Trade-off theory specifies an optimal debt ratio and hypothesizes that firms tend to converge on this long-term target, which is supported by studies reporting that real decision-makers target an optimal long-run leverage ratio mainly for ensuring financial flexibility (Barclay & Smith, 1999; Brounen et al., 2004; Drobetz & Wanzenried, 2006; Graham & Harvey, 2001). However, the market timing hypothesis model offered by Baker and Wurgler (2002), says that capital is based on the cumulative ability of selling stocks when they are overvalued. Therefore, there is no convergence to any target leverage ratio. Similarly, the managerial inertia hypothesis offered by Welch (2004) says that stock return is the main factor that determines leverage level and attempting to a target ratio is not the ultimate aim. Besides, it is also argued that capital structures are mainly determined by an unobserved time-invariant effect which leads to a surprising stability in the leverage ratios (Lemmon et al., 2008).

To test the hypothesis of the theories, most empirical studies use a static capital structure model which regards observed leverage ratio as a sound proxy for the optimal leverage ratio. However, actual debt ratio may not always be a sound proxy for target leverage level because some market or firm-specific shocks may force firms to move away from their target debt ratio. Besides, deviations from the target leverage ratio may have higher persistency if high adjustment costs are present. In this sense, static capital structure models fail to catch the dynamic features of capital structure (Heshmati, 2001).

Given that the static capital structure model has shortcomings that cause it to fail to capture the real capital structure decisions of firms, it has recently been argued that a dynamic capital structure framework is more relevant for testing capital structure theories.

Dynamic frameworks can take various forms, the common point being that they allow for deviations from the target and observed leverage ratios[2]. For example, Auerbach (1985), and Jalilvand and Harris (1984) provide some of the earliest forms of these dynamic models. They argue that companies partially adjust to their long-run target leverage ratios and build a model in which the adjustment speed is determined by firm-specific characteristics[3]. With a different dynamic model methodology, Fischer et al. (1989) measure target debt ratio within the range of the highest and lowest debt ratio of a firm during a specific period of time. Similarly, Fama and French (2002), Taggart (1977), and Shyam-Sunder and Myers (1999) use a firm's mean leverage ratio over a period of time as target ratio. Ozkan (2001), and De Miguel and Pindado (2001) use a novel dynamic capital structure model which includes lag value of the leverage ratio as explanatory factor together with the widely-known firm-specific determinants of capital structure. In order to overcome the endogeneity problem in the model, the authors use a generalized methods of moments (GMM) estimation developed by Arellano and Bond (1991) rather than an ordinary or generalized least square. Recently, this dynamic framework is among the most widely used.

Although dynamic models have been increasingly used in the last decade, there are few studies interpreting the factors determining adjustment speed. Existing studies suggest that adjustment speed is related to firm-specific factors such as size, profitability, growth, and distance from the target debt ratio as well as with macroeconomic factors such as default spread, term spread, ted spread, and the short-term interest rate. In this study, we have two main aims. First, given that dynamic capital structure models have not yet been examined sufficiently for Turkey, we test whether a target leverage ratio exits for Turkish firms and in the case that it exists; what is their average adjustment speed to their target leverage ratios. Second, we examine the possible factors that may determine the adjustment speed for Turkish firms because, to our best knowledge, there is no study examining determinants of adjustment speed in Turkey. We initially test firm-specific factors such as size, profitability, growth, and distance from the target leverage ratio. Then, we examine macroeconomic factors which are short-term interest rate, and term spread. We cover the years from 2005 to 2020 and exclude the finance and service firms due to their specific nature and requirements of leverage ratios. We use two-way system GMM estimation technique in order to resolve the endogeneity problem. We believe that our study will contribute to the relatively limited literature by providing further empirical findings with a recent data on an emerging market.

[2] However, it is worth noting that different methodologies provide different adjustment speeds. (Huang & Ritter, 2009; Iliev & Welch, 2010).

[3] The model of both Auerbach (1985), and Jalilvand and Harris (1984) are theoretically reasonable. However, the main shortfall of these studies is the endogeneity problem that cannot be resolved by econometric techniques.

The rest of the sections is organized as follows. The second section elaborates on the existing literature. The third section provides the model specifications. The fourth section introduces data and the methodology. The fifth section reports the empirical results of our analysis. The sixth section provides a discussion on our results. Finally, section seven concludes the research by providing summary and further suggestions.

2. Related Literature: Adjustment Speed

In a capital structure setting, the adjustment speed corresponds to the assessment of how fast a firm moves towards its target leverage ratio when it is not on its optimum leverage. Adjustment speed is generally argued to be tied to the adjustment cost in such a way that adjustment speed is decided by the trade-off between adjustment cost and the cost of not achieving the target leverage (Antoniou et al., 2002; Hovakimian et al., 2001). Although studies assess the adjustment speed of different markets via dynamic capital structure setting, the reasons why adjustment speed varies from firm to firm or from country to country have not been well-examined yet.

Some existing studies on adjustment speed revealed that adjustment speed may change between firms because of firm-specific factors. For example, Banerjee et al. (1999) cover US and UK markets between 1990-1996 and find that adjustment speed is positively related with size and negatively related with growth. Gaud et al. (2005) report that the adjustment speed for larger firms are higher than with relatively smaller firms by covering 104 Swiss firms during the period of 1991-2000. Drobetz and Wanzenried (2006) report that Swiss firms with a higher growth rate and with a higher distance from the optimal debt ratio adjust more rapidly during 1991 - 2001. Heshmati (2001) report that deviations from the optimal leverage is positively related with the adjustment speed, while growth and profitability are negatively associated with the speed of adjustment for micro and small firms in Sweden during 1994-1997. Faulkender, et al. (2012) offer that adjustment cost is related with explicit transaction costs as well as with the firm's incentive to access capital markets for other reasons. By covering CRSP firms during 1965–2006, they state that cash flow realization enables lower marginal adjustment cost; and thus, increases the adjustment speed. Berger, et al. (2008) report that poorly or merely adequately capitalized bank holding companies in the US during 1992-2006 have faster adjustment speeds than well-capitalized ones. Warr, et al. (2012) find that mispricing of equity influences the adjustment speed in such a way that over-levered US firms adjust at a higher rate in case their equity is overvalued during 1971 - 2008. On the other hand, Byoun (2008) report that most rapid adjustments are observed for over (under)-levered firms with a financial surplus (deficit).

Based on data from 41 countries, An, et al. (2015) argue that firms with a higher crash-risk exposure tend to have a slower adjustment speed. Dang, et al. (2012) show that UK firms with large financing imbalance or a deficit, lower earnings or high investment, tend to have a higher speed of adjustment. Elsas and Florysiak (2011) cover all industrial Compustat firms during 1965 – 2009 and find that adjustment speed is higher for firms which has the higher default risk, higher expected bankruptcy costs, and higher opportunity cost of having different debt ratios than the target debt ratio.

As for emerging markets, Getzmann, et al. (2010) report that the industry-fixed effect plays a role in the variance of adjustment speeds across 1301 firms in the Asian market during 1995-2009. Aybar-Arias et al. (2012) find that size, growth opportunities, and financial flexibility are associated with adjustment speed positively while the distance to the target is negatively related with adjustment speed for Spanish firms during 1995-2005. Haron et al. (2013) report that a higher distance from the target level slows down the adjustment speed while a larger size and higher profitability increases the speed of adjustment in Malaysia during 2000-2009. Qian, et al. (2009) report that the distance from the target level is positively linked with the adjustment speed in the Chinese market during 1999–2004. Nivorozhkin (2004) documents that the speed of adjustment is positively associated with distance from target leverage and size for Bulgarian companies while adjustment speed of Czech companies is neutral across the distance from target level and negatively related with size, probably because of the conservative policies of Czech banks. Guha-Khasnobis and Bhaduri (2002) report that the speed of adjustment higher for older firms but lower for larger firms in India during 1990-1998. Mahakud and Mukherjee (2011) reports that adjustment speed is positively related with profitability, size, growth, non-debt tax shield, distance, and group affiliation while it is inversely related with dividend and tangibility for India. Similarly, Mukherjee and Mahakud (2010) find that adjustment cost is positively related with both size and distance from the target debt ratio for Indian firms.

Some studies argue that macroeconomic factors influence the adjustment speed. For example, Hackbarth et al. (2006) report that booms are better states for firms to make adjustment than recessions. A consistent result (i.e. higher adjustment speed in good states and lower adjustment speed for bad states) is also provided by Cook and Tang (2010) for the period of 1977– 2006 for the US market. Camara (2012) shows that multinational companies adjust faster to good macroeconomic conditions than domestic companies in the US during 1991-2009. Drobetz and Wanzenried (2006) also documents that adjustment speed is highest when the term spread is high. Mahakud and Mukherjee (2011) find that financial constraints, external financing cost, distress cost, ownership, and macroeconomic conditions have a role on the adjustment speed for Indian manufacturing companies.

Another external factor that determines the speed of adjustment is institutional differences. Öztekin and Flannery (2012) cover 37 countries for 16 years from 1991 to 2006 and report that institutional features reduce the adjustment cost, which results in a higher adjustment speed. A very similar result is reported by Öztekin (2015) as well. Clark, et al. (2009) report that legal, institutional, and other country-level factors can explain the variation in the adjustment speed of 40 countries by nearly 16 percent; however; the effects of these factors are different for developed and developing countries. Lööf (2004) and Antoniou et al. (2002, 2008) argue that adjustment speed is faster in the equity based-systems compared to the debt-based system.

Adjustment speed has only been examined by a small number of studies in Turkey. Karadeniz, et al. (2009) estimate the dynamic leverage model by using the Arellano-Bond System GMM method for 65 lodging companies in Turkey and cover years 13 years starting from 1994 to 2006. They find that the adjustment speed is 0.284[4], Asarkaya and Ozcan (2007) test the dynamic model for financial institutions in Tukey during the period of 2002-2006 by using GMM estimation and find a high adjustment rate for Turkey, which is around 0.77[5]. Arioglu and Tuan (2014) find that adjustment speed is approximately 0.29 for Turkish firms during 1998-2010. More recently, Yildiz (2018) covers the non-financial firms during 2003-2016 and report that the adjustment speed is nearly 12% - 14% each year. The author also reports that before the global finance crisis the adjustment speed is almost 14-16% and for the post-crisis period it decreases to 10%, revealing that a global crisis slows the adjustment speed to target leverage ratio. However, to our best knowledge, there is no study examining determinants of adjustment speed for Turkey for neither firm specific nor macroeconomic levels.

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[4] Found by (1-0.716). We only take the adjustment speed documented by system GMM. See Karadeniz et al. (2009, p. 601).

[5] Found by (1-0.33). We took the average adjustment speed of different versions of GMM estimation. See Asarkaya and Ozcan (2007, p. 107).

3. Model Specification

In this study, we use a dynamic setting for modeling the determinants of capital structure as well as the determinants of adjustment speed[6] Let the optimal leverage ratio for firm i in period t be expressed by LEV_{it}^{*}, specified as a linear function determined by a vector of firm specific variables denoted as X'_{it}. Assuming that the target ratio is both firm and time specific (i.e. it changes across firms and across years), LEV_{it}^{*} can be formulized as follows:

$$LEV_{it}^{*} = \beta X'_{it} \tag{1}$$

Also let LEV_{it} show the actual (or observed) leverage ratio for firm i in period t. In a perfect market without frictions, firms would choose a leverage ratio that maximizes their value (optimal leverage ratio); therefore LEV_{it}^{*} and LEV_{it} should be equal. However, if adjustment costs are present, then firms may fail to fully adjust. Therefore, in the case that adjustment costs are non-zero, there is not a full but a partial adjustment as shown below:

$$(LEV_{it} - LEV_{it-1}) = \delta_{it}(LEV_{it}^{*} - LEV_{it-1}) \tag{2}$$

Where δ_{it} represents the adjustment speed from leverage ratio observed in year t-1 to the target ratio at year t. If $\delta_{it} = 1$, this means that the observed ratio and the optimal ratio are equal to each other, which implies that firms makes the adjustment instantaneously. If the condition that $|\delta_{it}| < 1$ is satisfied then it implies $\lim_{t\to\infty} LEV_{it} = LEV_{it}^{*}$, which represents the partial adjustment. If the adjustment cost is not negligible in the market, then δ_{it} is expected to be less than 1, which means that the adjustment from the previous year to the current year is lower than the required adjustment for reaching the target level at t. If $\delta_{it} = 0$, then it can be interpreted that there is no adjustment because of the extremely high adjustment cost. If $\delta_{it} > 1$, it means over adjustment[7]. By rearranging (2) and combining with (1), we can write:

$$LEV_{it} = (1 - \delta_{it}) LEV_{it-1} + \delta_{it}\beta X'_{it} + \eta_i + \eta_t + \varepsilon_{it} \tag{3}$$

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[6] The dynamic model specified in this study is one that is widely used by studies that aim to measure the adjustment speed as well as the determinants of the adjustment speed. However, the model notation is mainly adopted from Drobetz and Wanzenried (2006).

[7] Antoniou et al. (2002) state that if $\delta_{it} > 1$, no target leverage ratio exists though.

where η_i, η_t, and ε_{it} denote firm-specific effect (unobserved), time-specific effect, and error term respectively. In the model specified in (3), the target debt as well as the adjustment speed is endogenized in such a way that they are not determined externally. Since we also aim to examine the adjustment speed (δ_{it}) determinants, we next endogenize the determinants of adjustment speed to the model as well. We specify δ_{it} as a linear function determined by a vector of firm-specific variables denoted as Z'_{it} as in (4) and by a vector of macroeconomic variables denoted as Y'_t in (5). Note that Y'_t does not have a firm cross-sectional dimension since the macroeconomic variables are firm invariant.

$$\delta_{it} = \alpha + \phi_1 Z'_{it} \tag{4}$$

$$\delta_{it} = \alpha + \phi_2 Y'_t \tag{5}$$

For the sake of making the estimation process more tractable, we do not define δ_{it} as sum of firm-specific and macroeconomic variables. Rather we apply them separately. Therefore, to investigate the firm-specific determinants of adjustment speed, we integrate (3) and (4):

$$LEV_{it} = (1-\alpha)LEV_{it-1} - \phi_1 Z'_{it}LEV_{it-1} + (\alpha + \phi_1 Z'_{it})\beta X'_{it} + \eta_i + \eta_t + \varepsilon_{it} \tag{6}$$

And to investigate the macroeconomic determinants of adjustment speed, we integrate (3) and (5):

$$LEV_{it} = (1-\alpha)LEV_{it-1} - \phi_2 Y'_t LEV_{it-1} + (\alpha + \phi_2 Y'_t)\beta X'_{it} + \eta_i + \varepsilon_{it} \tag{7}$$

Note that in (7) there is no the time-specific effect (η_t) because it may reduce the potential explanatory power of macroeconomic variables which change across years (Drobetz & Wanzenried, 2006). When (6) and (7) are estimated, our primary interest is in ϕ_1 and ϕ_2 which are the coefficients on the interaction term between lagged leverage (LEV_{it-1}) and the related determinant adjustment speed (variables in vector Z'_{it} and Y'_t respectively). However; in the case that some or all of them are not significant, it still does not mean that the firms do not make any adjustment. It only means that the adjustment speed is not related with the relevant hypothesized determinants of the adjustment speed. We can interpret that the firms do not make any adjustment in the case when both $(1-\alpha)$ and ϕ_1 are not significant for (6) and both $(1-\alpha)$ and ϕ_2 are not significant for (7). Finally, it should be noted that the negative signs just before ϕ_1 and ϕ_2 will impact the interpretation of these coefficients. Hence a negative coefficient estimation of ϕ_1 or ϕ_2 should be interpreted as a factor that increases the adjustment speed while a positive coefficient estimation should be taken as a factor that decreases the adjustment speed.

4. Data and Methodology

This study covers firms that traded in Borsa, Istanbul during 2005-2020. The data used in the study are completely retrieved from the Refinitiv Eikon database. The time period that we cover starts from 2005 because the earliest available government bond yields obtained from Refinitiv Eikon database is from 2005. Since they have different capital structure features and requirements, we exclude 85 firms operating in "Finance, Insurance, and Real Estate" industry.[8] We also exclude firms with fewer than two consecutive years as some of our model specifications include lagged variables. Hence, we have an unbalanced panel of 227 firms during 16 years, making 2,987 firm and year observations. Table 1 represents cross tabulation of year and industry based on two-digit SIC codes. As can be seen, the number of firms has an increasing trend over the years for all of the industries except the mining sector which only has two firms for a long time. During 2005 and 2020, the fastest growing industries are "Agriculture, Forestry, & Fishing", "Retail Trade", and "Construction". The industry with the largest number of companies by far is "Manufacturing". The second most populous industries are "Services" and "Transportation & Public Utilities".

[8] Two-digit SIC code range is 60 – 67.

Table 1: Number of Firms in each Industry across Years

Year	Agriculture, Forestry, & Fishing (SIC code: 01 -09)	Construction (SIC code: 15 -17)	Manufacturing (SIC code: 20 -39)	Mining (SIC code: 10 -14)	Retail Trade (SIC code: 52 -59)	Services (SIC code: 70 -79)	Transportation & Public Utilities (SIC code: 40 -49)	Wholesale Trade (SIC code: 50 -51)	Total
2005	0	6	84	1	3	14	15	8	**131**
2006	1	7	83	2	4	16	14	8	**135**
2007	1	8	88	2	5	16	16	8	**144**
2008	2	8	92	2	7	16	17	8	**152**
2009	2	8	100	2	8	19	18	9	**166**
2010	3	8	106	2	9	18	19	9	**174**
2011	4	9	113	2	9	19	20	10	**186**
2012	5	10	115	2	9	20	20	10	**191**
2013	5	11	117	2	9	20	21	10	**195**
2014	5	12	118	2	9	21	24	10	**201**
2015	5	12	118	2	10	22	24	11	**204**
2016	4	13	124	2	10	26	24	12	**215**
2017	5	13	127	2	10	28	25	12	**222**
2018	5	13	128	2	10	27	28	11	**224**
2019	5	13	125	2	10	28	27	11	**221**
2020	5	13	128	2	10	28	28	12	**226**
Total	**57**	**164**	**1766**	**31**	**132**	**338**	**340**	**159**	**2987**

Our analysis has three main steps The first step is to estimate the target ratio or equivalently to estimate equation (1). To this end, we must decide what firm-specific factor should be included in the X'_{it} vector. The second step is to estimate equation (3) in order to observe whether $\delta_{it} < 1$ which means the adjustment costs are present. Besides, the magnitude of δ_{it} estimated by the equation (3) sheds light on the adjustment speed of the Turkish firms on average and enable us to make a comparison with the previous studies on Turkish markets. The Final step is to estimate equations (6) and (7) so that we can examine the firm-specific and macroeconomic determinants of adjustment speed. For the last step, we must specify the firm-specific factors to be included in Z'_{it} and macroeconomic factors to be included in Y'_{t}. In each step of the analysis we measure the observed leverage ratio by two proxies for robustness: long term leverage over total asset (denoted by LTD/TA) and the total leverage over total asset (denoted by TD/TA). Instead of using the market value we used the book value of leverage because the market value of leverage may be influenced by numerous external factors which is difficult to control (Fama & French, 2002; Thies & Klock, 1992). We use STATA.15 to conduct all analysis. The remainder of this section will elaborate on each step of the analysis one by one.

4.1 Fixed Effect Estimation: Determinants of Target Leverage

While testing the determinants of the capital structure, we use robust fixed effect estimators to control unobserved time invariant effects. Besides this, we also include year dummies to absorb potential macroeconomic deviations. We report the result of the over identification[9] test to see whether our fixed effect assumption is valid. We also apply the Wald test in order to make sure that determinants included in X'_{it} are jointly significant.

Based on previous literature, the most considerable firm-specific determinants of capital structure are profitability, growth, tangibility, non-debt tax shield, and size. Uniqueness – generally measured by research and development expenditure – can also be regarded as one of the important determinants. However, according to data retrieved from Refinitiv Eikon, research and development expenditure is available for only 44 firms. Besides, not all of these companies regularly report their research and development expenditures every year. Recent studies on research and development also include a more limited number of

[9] Instead of using the Hausman test we used the over identification test (Stata command: xtoverid) because the over identification test extends straightforwardly to heteroskedastic- and cluster-robust versions and is safe to use when the model is estimated with the “robust” option.

firms due to data availability (Çağlak & Meder Çakır, 2018; İşseveroğlu & Gücenme Gençoğlu, 2018; Kiracı & Arsoy, 2014). Since the inclusion of the uniqueness variable will decrease the number of observations considerably, X'_{it} vector contains all major firm-specific determinants offered by the literature except for uniqueness. A detailed explanation for each variable is as follows:

Profitability (denoted by PROF): Since higher profitability reduces financial distress cost, the trade-off theory argues that profitability and optimal debt ratio are positively related. Besides, Jensen (1986) offers that debt has agency benefit because it reduces the agency conflict stemming from the excess free cash flow. Thus, profitability is also positively associated with the leverage ratio according to the free cash flow hypothesis. However, pecking order theory states that the information asymmetry forces firms to give good signals to the market; hence, they tend to use the internal cash flows initially, then debt, and finally they use equity as a last resource. Because high profitability increases internal cash, pecking order theory implies a negative association between profitability and debt ratio. In this study, we employ EBIT/Total Asset as a proxy for measuring the profitability of firms.

Growth (denoted by GROWTH): Myers (1977) argues that firms relying mainly on their growth opportunities face an underinvestment problem which results in a conflict between debtholders and equity holders. Therefore, agency theory expects an inverse association between leverage ratio and growth. On the contrary, pecking-order theory, associates growth and target leverage positively because internal financing may fall short of satisfying the capital requirements of firms with high growth. Most studies measure growth either with market value over book value or the percentage of change in sales. We think that the reason for the high market to book ratio may also be overvaluation rather than high growth opportunities. Thus, we believe that the use of the percentage of change in the sales may be a better measure for growth.

Tangibility (denoted by TAN): Theories about capital structure generally associate leverage and tangibility positively. It may be argued that debt holders and equity holders have a conflict of interest stemming from the fact that leverage enables shareholders to replace low risk assets with risky ones (Jensen & Meckling, 1976). Tangibility reduces this agency cost because tangible assets are a kind of collateral in the case of a default. Besides, according to pecking order theory, asymmetry in information makes it difficult to understand the value of an intangible asset for an outsider; thus, higher tangibility eases issuing the debt. For measuring tangibility, we use Fixed Asset /Total Asset, one of the widely-used proxies to measure tangibility.

Non-debt tax shield (denoted by NDTS): DeAngelo and Masulis (1980) argue that non-debt tax shields can be perceived as the substitutes of tax shields coming from debt financing. Hence, an alternative tax-shield decreases the usage of debt, especially when debt is preferred mainly because it has a tax advantage. Similar to the other empirical studies, we measure a non-debt tax shield with Deprecation/ Total Asset.

Size (denoted by SIZE): Larger firms have lower bankruptcy costs, higher diversification and larger economies of scale, which make it easier for them to access capital markets (Altman, 1984; Warner, 1977). Therefore, trade off theory states that larger firms can tolerate high leverages. However, there is less asymmetric information for larger firms because they are visible in the market (Fama & Jensen, 1983; Rajan & Zingales, 1995), enabling them to issue equity without giving a bad signal to the market. Therefore, pecking order theory hypothesize that larger firms use less leverage. This study uses natural logarithms of total asset as the measure of size similar with most empirical studies.

4.2 Two-Stage System GMM Estimations

The rest of our models include a lagged value of leverage ratio, which violates the strict exogeneity assumption of fixed effect estimation and which causes inconsistent estimations. One way of overcoming this problem is to apply the instrumental variable approach offered by Anderson and Hsiao (1982). In cases where one lag of dependent variable is added as an independent variable to the model, Anderson and Hsiao (1982) suggest to take the first difference and using the second lag or difference between second and third lag of the dependent variable as instrument variables. However, instrumental variable approach provides consistent but not necessarily efficient estimations since it is not able to benefit from all of the available moment conditions. A more efficient approach – the difference Generalized Method of Moments (GMM)- is offered by Arellano and Bond (1991). The difference GMM estimation increases the efficiency by increasing the number of instrumental variables using the orthogonality conditions between the error terms and the lagged values of the dependent variable. However, there are some shortcomings of the difference GMM as well. First, lag levels often perform poorly as instrumental variables. Second, the first difference transformation applied by difference GMM for the sake of resolving endogeneity may magnify gaps in unbalanced panels when some observations are missing. These weakness of difference GMM is resolved with system GMM (Arellano & Bover, 1995; Blundell & Bond, 1998). For the sake of overcoming the poor instrument variable problem, system GMM assumes that fixed effects and first differences of instrumenting variables are uncorrelated. Therefore, both lagged levels and lagged differences are included as instrumental variables in the model, which considerably increases the efficiency. Since it develops a system of two equations (difference equation and the original equation), it is called system GMM.

In this study, we use two-stage system GMM for estimating dynamic panel regression specified in equation (3), equation (6), and equation (7) to obtain consistent and efficient estimations. We take not only the lag value of leverage but also all of the determinant included in X'_{it} as endogenous because firm-specific variables may also not be strictly exogenous. For example, shocks impacting capital structure also influence some or all of the determinants of capital structure (Ozkan, 2001). The number of lag values are arranged in accordance with the requirements of the relevant model. We report the results of Hansen test for examining whether employed instrumental variables are exogenous. Since the null hypothesis of the Hansen test is that instruments are exogenous, a sound model should not reject the null hypothesis. However, Roodman (2009) argues that if the p-value of a Hansen test exceeds 0.25, it may be viewed as a potential sign of trouble. Additionally, we report the results of Arellano-Bond test for examining first and second order serial correlations. Roodman (2006) states that a first order correlation is expected and uninformative but no second-order correlation should be present. While evaluating the results of the Hansen test and Arellano-Bond test, we take confidence level as 0.90 in order to be more conservative for detecting any endogeneity and serial correlation. Finally, we also report the results of Wald test to test the joint significance of the independent variables.

4.2.1 Firm-Specific Determinants of Adjustment Speed

In vector Z'_{it}, we will include the most cited firms-specific determinants of adjustment speed, which are size, profitability, growth, and distance from the target ratio.

Size: Larger firms are more visible in the market because of higher analyst and media coverage, which eases access to market capital for them. Besides, larger firms tend to be less influenced by the fixed cost of the adjustment process. Therefore, size is predicted to be positively related with adjustment speed (Drobetz & Wanzenried, 2006; Mahakud & Mukherjee, 2011). On the other hand, since larger firms have less volatility in their internally generated cash flows, their distress cost is lower, which may slow down the speed of adjustment (Flannery & Rangan, 2006; Mahakud & Mukherjee, 2011; Touil & Mamoghli, 2020).

Profitability: Firms that have lower internally generated cash flows will need external financing, making them financially inflexible. In other words, a lower level of profitability increases adjustment costs by putting constraints on reaching the optimal target ratio. Therefore, the relationship between profitability and speed of adjustment can be hypothesized positively. (Mahakud & Mukherjee, 2011). Together with this, some studies argue that adjustment speeds may decrease as profitability increases because more profitable and financially flexible firms can tolerate the cost of being distant from their optimal leverage ratio, which decreases the speed of adjustment (Drobetz et al., 2007; Flannery & Hankins, 2007; Touil & Mamoghli, 2020).

Growth: Since high growth firms are generally young and low-profitable firms with almost negative operating income, they are usually in need of external financing (Drobetz et al., 2007). Altering their capital structure may be easier for firms with higher growth opportunities because they can arrange the composition of their external financing in accordance with the target ratio. Besides, high growth firms do not necessarily give bad signals to the market by changing their capital structures because market participants are aware of the external capital requirements of high growth firms. Therefore, we hypothesize growth and adjustment speed are positively related (Drobetz et al., 2007; Drobetz & Wanzenried, 2006; Heshmati, 2001).

Distance (denoted by DISTANCE): The relationship between distance and adjustment speed may hypothesized as being both positive and negative. In the case that a major part of adjustment cost is the fixed cost, then firms tend to adjust toward their target ratio when their current leverage ratio is distant enough from their target (de Haas & Peeters, 2006; Drobetz et al., 2007; Drobetz & Wanzenried, 2006; Mahakud & Mukherjee, 2011; Touil & Mamoghli, 2020). Hence, the relationship between distance and adjustment is expected to be positive. On the other hand, firms may avoid having external financing to change the capital strıcture due to the high fixed cost of changing capital structure. In this regard, they may tend to change their dividend policy to increase the internal fund rather than external financing. Unlike fixed costs, the cost of sub-optimal dividend policy becomes higher as the firm become distant from their target leverage ratio. Therefore, distance and adjustment speed are expected to be negative for firms using internal capital (Drobetz & Wanzenried, 2006). We measure distance as the absolute difference between actual leverage and target leverage for firm i at period t.:

$$DISTANCE_{it} = |LEV_{it}^{*} - LEV_{it}| \quad (8)$$

4.2.2 Macroeconomic Determinants of Adjustment Speed

For vector Y'_{it}, which stands for the macroeconomic determinants of adjustment speed, we will include term spread and short-term interest rate following Drobetz and Wanzenried (2006).

Term spread (denoted by TERM): The slope of the term structure is generally taken as an indicator of general well-being of the economy. A high term spread is assumed to be a sign of a good economic state and vice versa (Estrella & Hardouvelis, 1991; Harvey, 1991). According to Hackbarth et al. (2006) and Drobetz and Wanzenried (2006) adjustment speed should be faster (slower) when economy is in a good (bad) state. We measure the term spread by the difference between yield on long-term Turkish government bonds (5 years of maturity) and short-term Turkish government bonds (1 month of maturity).

Short-term interest rate (denoted by I-SHORT): Short-term interest rates are the measure of the sovereign risk of a country. Higher interest rate means higher risk and a higher cost of accessing capital. If the hypothesis of higher (lower) adjustment speed in a good (bad) state of the economy is valid, then there should be a negative association between short-term interest rate and adjustment speed. We measure the short-term interest rate with the yield on short-term Turkish government bond (1 month of maturity).

Table 2 presents the summary for the variables we used to examine the determinants of adjustment speed.

Table 2: Determinations of Adjustment Speed – Variable Summary

Variable	Employed Proxy	Denoted by	Hypothetical Relationship with δ_{it}
Size	ln (Total Asset)	SIZE	Positive or Negative
Profitability	EBIT/Total Asset	PROF	Positive or Negative
Growth	[Sales (t) – Sales (t-1)] / Sales (t-1)	GROWTH	Positive
Distance	$\lvert LEV_{it}^{*} - LEV_{it}\rvert$	DISTANCE	Positive or Negative
Term Spread	(Yield on Turkish Government bond with 5 years maturity) – (Yield on Turkish Government bond with 1 month maturity)	TERM	Positive
Short-term interest rate	Yield on Turkish Government bond with 1 month maturity	I-SHORT	Negative

4.3. Multicollinearity

Table 3 indicates correlation coefficients among all the variables used in this study. There is a high correlation between two distance proxies, which is expected but poses no multi-collinearity problem because they will be never used in the same model simultaneously. Some of the variables planned to be included in the same model are also highly correlated. For example, non-debt tax shield and tangibility are strongly correlated, which is observed in other empirical models as well (G. Huang & Song, 2006). Correlation between short-term interest rate and term-spread is very high, which is reasonable in theory. Therefore, multicollinearity is further tested by the variance inflation factor (VIF) as well as the tolerance value. The VIF value gives the role of the remaining variables on the standard errors while tolerance value is calculated as 1/VIF. Multicollinearity is low when we attain low VIF values and high tolerance values. For models with a VIF higher than 10 and a tolerance value that is lower than 0.10 (which are the standard thresholds to check multicollinearity), we assume there is a multicollinearity problem in the model. In particular, models specified in equation (6) and equation (7) have a VIF score because multicollinearity has been inflated by the interaction terms. Thus, for these models we do not put all the variables in the model simultaneously but put them in one by one following Drobetz and Wanzenried (2006), and Mahakud and Mukherjee (2011).

Table 3: Correlation Table

	PROF	GROWTH	TAN	NDTS	SIZE	DISTANCE (long-term debt ratio)	DISTANCE (total debt ratio)	TERM	I-SHORT
PROF	1.000								
GROWTH	0.212	1.000							
TAN	-0.188	-0.021	1.000						
NDTS	0.020	-0.066	0.553	1.000					
SIZE	0.116	0.077	-0.035	-0.031	1.000				
DISTANCE (long-term debt ratio)	-0.160	0.012	0.069	0.021	0.173	1.000			
DISTANCE (total debt ratio)	-0.097	-0.025	-0.074	-0.062	0.042	0.595	1.000		
TERM	0.019	-0.141	0.025	0.084	-0.034	-0.043	-0.011	1.000	
I-SHORT	0.023	0.137	0.002	0.008	0.012	0.020	0.009	-0.810	1.000

5. Results

This part includes the results of the empirical analysis. Table 4 presents the descriptive statistics of all variables used in the study. The number of observations change in accordance with data availability. The observation number for TERM and I-SHORT is 16 because as a macroeconomic variable they do not have cross-section dimensions.

Table 4: Descriptive Statistics

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
LTD/TA	2882	0.100	0.054	0.113	0.000	0.329
TD/TA	2955	0.238	0.208	0.194	0.001	0.577
PROF	2864	0.063	0.061	0.075	-0.058	0.189
GROWTH	2829	0.157	0.139	0.230	-0.196	0.580
TAN	2969	0.292	0.277	0.203	0.016	0.631
NDTS	2387	0.024	0.021	0.016	0.003	0.053
SIZE	2987	12.624	12.519	1.661	10.244	15.334
DISTANCE (long-term debt ratio)	2174	0.087	0.080	0.061	0.000	0.345
DISTANCE (total debt ratio)	2221	0.178	0.133	0.147	0.000	0.584
TERM	16	0.002	0.005	0.024	-0.071	0.037
I-SHORT	16	0.124	0.103	0.056	0.072	0.293

Table 5 shows the fixed effect estimation of equation (1) which serves for controlling whether the variable included in X'_{it} determines the target leverage ratio efficiently. Profitability gives negative and significant coefficients – supporting the pecking order theory- while positive coefficients on size supports trade-off theory. There is a positive relation between leverage and tangibility as hypothesized by most capital structure theories. Growth and non-debt tax-shield are not significant for both of the models. The null hypothesis for the over identification test is that the random effect is valid. Since the null hypothesis is rejected in both cases, the fixed effect estimation is valid as we assumed. Because the fixed effect estimator demeans variables by subtracting time series means of each entity from the related observation, it is also known as within an estimator. Therefore, the within-R square is our main interest. The within-R square value is 0.147 and 0.219 for the first and second models respectively. It is worth noting that R squares obtained from cross section models are not as high as the ones obtained from time series model. Hence, the models are expected to have relatively lower R squares if the panel data has longer cross-section dimension and a relatively shorter time series dimension like our sample. Because we reject the null hypothesis of the Wald test that independent variables are jointly equal to zero, the five independent variables are jointly significant. After considering all, Table 5 implies a good fit, which means determinants included in X'_{it} and their proxies can explain the target leverage ratio.

Table 5: Capital Structure Model

	(1)	(2)
Variable Coefficients	**LTD/TA**	**TD/TA**
PROF	-0.207***	-0.599***
t- statistic	*[-4.46]*	*[-6.60]*
p value	*(0.000)*	*(0.000)*
GROWTH	0.014	0.022
t- statistic	*[1.64]*	*[1.60]*
p value	*(0.102)*	*(0.111)*
TAN	0.116***	0.181***
t- statistic	*[2.92]*	*[2.81]*
p value	*(0.004)*	*(0.005)*
NDTS	0.326	0.612
t- statistic	*[1.13]*	*[1.22]*
p value	*(0.258)*	*(0.222)*
SIZE	0.024**	0.046***
t- statistic	*[2.06]*	*[2.60]*
p value	*(0.040)*	*(0.010)*
R square – (within)	0.147	0.219
Over-identification test		
Chi-Square	14.91**	13.97**
(deg.of.free.)	*(5)*	*(5)*
p value	*(0.011)*	*(0.016)*
Wald test		
Chi-Square	8.03***	12.89***
(deg.of.free.)	*(5)*	*(5)*
p value	*(0.000)*	*(0.000)*

Table 6 shows the results for the dynamic panel model in equation (3). Most of the estimations are similar to those in Table 5. The only main difference is that tangibility is not significant when TD/TA is used as a proxy for measuring the leverage ratio. The first lag value of the observed leverage ratio is significant with a positive coefficient in two of the models, which means that Turkish firms have a target leverage ratio and make partial adjustments. Adjustment speed δ is calculated by deducting the coefficient on $\mathbf{LEV_{t-1}}$ from unity, which is found as 0.309 for the first model and 0.138 for the second model. Half-life[10] represents number of years implied by adjustment speed for a firm to move halfway toward its target capital structure (Flannery & Rangan, 2006; R. Huang & Ritter, 2009). AR(1) and AR(2) shows the Arellano-Bond test results for the first and second order serial correlation respectively, with the null hypothesis being that no serial correlation exists. There is no second order correlation in our model (p value > 0.1), however, first order correlation exists (p value<0.1) as expected (Roodman, 2006). The Hansen test (p value > 0.1) does not reject the null hypothesis of valid overidentifying restrictions, meaning that instrument variables included in the GMM estimation are not correlated with the error term. The P values of the Hansen test are around 0.25, p value for the second model is a little bit higher though. Finally, results of Wald test show that overall the independent variables are significant.

Table 6: Dynamic Capital Structure Model

		(1)	(2)
Variable Coefficients		**LTD/TA**	**TD/TA**
$\mathbf{LEV_{t-1}}$		0.691***	0.862***
	t- statistic	*[16.05]*	*[20.40]*
	p value	*(0.000)*	*(0.000)*
PROF		-0.124***	-0.329***
	t- statistic	*[-2.75]*	*[-2.59]*
	p value	*(0.006)*	*(0.000)*
GROWTH		0.007	0.045
	t- statistic	*[0.91]*	*[1.22]*
	p value	*(0.366)*	*(0.225)*
TAN		0.036**	0.013
	t- statistic	*[2.40]*	*[0.73]*
	p value	*(0.017)*	*(0.467)*
NDTS		0.214	0.126
	t- statistic	*[1.37]*	*[0.58]*
	p value	*(0.172)*	*(0.566)*
SIZE		0.008***	0.007***
	t- statistic	*[4.11]*	*[3.06]*
	p value	*(0.000)*	*(0.002)*

[10] Half-life is found as ln(0.5)/ln(1− δ)

Table 6: Dynamic Capital Structure Model (continue)

	(1)	(2)
Variable Coefficients	**LTD/TA**	**TD/TA**
δ (adjustment speed)	0.309	0.138
Half -life	1.87	4.66
AR(1)		
z-value	*-5.55****	*-6.92****
p value	*(0.000)*	*(0.000)*
AR(2)		
z-value	*0.28*	*0.29*
p value	*0.777*	*0.776*
Hansen Test (df)		
Chi-Square	155.19	148.81
(deg.of.free.)	*(138)*	*(140)*
p value	*(0.150)*	*(0.289)*
Wald (df)		
Chi-Square	151.44***	404.20***
(deg.of.free.)	*(6)*	*(6)*
p value	*(0.000)*	*(0.000)*

Table 7 shows the result when firm-specific determinants of adjustment speed is endogenized in the model, which is equation (6). Once again note that since equation (6) specifies a negative coefficient for ϕ_1 or ϕ_2; we should therefore interpret negative coefficient as a positive association with adjustment speed and vice versa. The coefficients for the lag value of leverage is different than what we found in Table 6, which is expected because equation (6) specifies (1-α) as coefficient as LEV_{it-1} not (1-δ_{it}). The coefficients on size and distance are positive and significant for both models, implying a negative relation with adjustment speed. However, the adjustment speed of Turkish companies seems to be positively related with growth and distance given that their coefficients are negative and significant. The results of Hansen test show that overidentifying restrictions are valid (0.1 < p value < 0.25). The second order serial correlation is not present because AR(2) values are not significant. The Wald test for all of the models are significant at a 99% confidence level.

Table 7: Firm-Specific Determinants of Adjustment Speed

	LTD/TA				TD/TA			
Variable Coefficients	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
$\mathbf{LEV_{t-1}}$	0.150	0.710***	0.633***	0.272***	0.710***	0.892***	0.884***	0.721***
t- statistic	*[0.63]*	*[17.46]*	*[15.86]*	*[4.16]*	*[11.24]*	*[27.29]*	*[33.72]*	*[13.53]*
p value	*(0.531)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
$\mathbf{LEV_{t-1}}$ x SIZE	0.041**				0.033***			
t- statistic	*[2.19]*				*[3.40]*			
p value	*(0.030)*				*(0.001)*			
$\mathbf{LEV_{t-1}}$ x PROF		-0.798**				-0.432***		
t- statistic		*[-2.34]*				*[-2.71]*		
p value		*(0.020)*				*(0.007)*		
$\mathbf{LEV_{t-1}}$ x GROWTH			-0.104**				-0.088***	
t- statistic			*[-2.25]*				*[-2.75]*	
p value			*(0.025)*				*(0.006)*	
$\mathbf{LEV_{t-1}}$ x DISTANCE				2.227***				0.412**
t- statistic				*[9.05]*				*[2.28]*
p value				*(0.000)*				*(0.024)*
AR(1)								
z-value	-6.48	-6.50	-6.41	-4.58	-8.25	-7.87	-7.93	-6.83
p value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AR(2)								
z-value	*0.71*	*0.64*	*0.87*	*0.45*	*0.05*	*-0.15*	*-0.31*	*0.59*
p value	*(0.475)*	*(0.520)*	*(0.384)*	*(0.656)*	*(0.962)*	*(0.883)*	*(0.755)*	*(0.552)*
Hansen Test								
Chi-Square	151.79	144.03	160.37	171.19	142.30	134.05	166.68	166.89
(deg.of.free.)	*(134)*	*(131)*	*(140)*	*(152)*	*(129)*	*(118)*	*(153)*	*(152)*
p value	*(0.127)*	*(0.206)*	*(0.115)*	*(0.137)*	*(0.200)*	*(0.148)*	*(0.213)*	*(0.193)*
Wald Test								
Chi-Square	138.62	159.39	127.34	156.94	126.27	533.43	570.67	323.74
(deg.of.free.)	*(2)*	*(2)*	*(2)*	*(2)*	*(2)*	*(2)*	*(2)*	*(2)*
p value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 8 presents the estimation result of equation (7) which includes the macroeconomic determinants of adjustment speed. The term spread has a positive and insignificant coefficient for both models. However, short-term interest is significantly and negatively related with adjustment speed as theoretically expected. No second order correlation is observed. The Hansen test statistics are again insignificant with p value below 0.25, confirming that overidentifying restrictions are valid. The Wald tests are significant at 99% for all of the models.

Table 8: Macroeconomic Determinants of Adjustment Speed

	LTD/TA		TD/TA	
Variable Coefficients	**(1)**	**(2)**	(3)	(4)
LEV_{t-1}	0.939***	0.763***	1.000***	0.950***
t- statistic	*[73.94]*	*[25.77]*	*[174.68]*	*[66.07]*
p value	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
LEV_{t-1} x TERM	0.026		0.075	
t- statistic	*[0.58]*		*[1.05]*	
p value	*(0.565)*		*(0.293)*	
LEV_{t-1} x I-SHORT		0.155***		0.094***
t- statistic		*[6.92]*		*[3.93]*
p value		*(0.000)*		*(0.000)*
AR(1)				
z-value	-7.01	-6.88	-8.27	-8.22
p value	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
AR(2)				
z-value	*1.06*	*0.97*	*0.01*	*0.05*
p value	*(0.291)*	*(0.332)*	*(0.991)*	*(0.962)*
Hansen Test				
Chi-Square	143.46	150.61	160.91	157.36
(deg.of.free.)	*(132)*	*(132)*	*(145)*	*(145)*
p value	*(0.234)*	*(0.128)*	*(0.173)*	*(0.228)*
Wald Test				
Chi-Square	2733.89	1649.58	16421.40	11770.70
(deg.of.free.)	*(2)*	*(2)*	*(2)*	*(2)*
p value	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*

6. Discussion

Our findings can be examined in three parts. First, we test determinants of the target capitals structure offered by the literature. Our results show that the most considerable determinants of capital structure for non-financial Turkish firms are profitability, tangibility, and size because they are significant with robust effect sizes for almost all of the fixed effect and GMM estimations regardless of the leverage ratio being measured by long-term debt ratio or total debt ratio. As predicted by pecking order theory, a negative association of profitability with the leverage ratio implies that non-financial Turkish firms are using internal financing when possible, which is well-established by other empirical studies on the Turkish market as well (Acaravci, 2015; Bayrakdaroglu et al., 2013; Durukan, 1997; Gonenc, 2003; Güner, 2016; Karadeniz et al., 2009; Köksal & Orman, 2015; Sayilgan et al., 2006). Consistent with trade-off theory, larger firms use more leverage thanks to lower bankruptcy costs, higher diversification rates, lower volatility in their cash flows, and lower asymmetric information. This is consistent with several empirical studies reporting higher leverage ratios for larger firms (Bayrakdaroglu et al., 2013; Durukan, 1997; Gonenc, 2003; Köksal & Orman, 2015; Sayilgan et al., 2006). As for tangibility, it is positively tied to leverage ratio for Turkish firms as hypothesized by most of the capital structure theories. Interestingly some studies report that tangibility has a negative effect on leverage ratio. (Acaravci, 2015; Bayrakdaroglu et al., 2013; Gonenc, 2003; Karadeniz et al., 2009; Sayilgan et al., 2006). One of the reason that our results are different is that we include a longer and more recent period of time starting in 2005 and ending in 2020. Besides, some of those studies include only a specific industry in their analysis while we include all industries except “Finance, Insurance, and Real Estate”. Karadeniz et al. (2009), for example, cover only lodging firms and tie the inverse relation between tangibility and leverage ratio to the lack of sufficient long-term capital sources in Turkey. Sayılgan et al. (2006) and Acaravci, (2015) include only manufacturing firms. Our result is consistent with Köksal & Orman (2015) who cover a wider range of sample. The authors find that as tangibility increases the leverage ratio is higher by testing their model on publicly-traded and private firms from both manufacturing and non-manufacturing industries. Our results show that growth does not significantly influence the leverage ratio, consistent with results of Karadeniz et al. (2009). Bayrakdaroglu et al. (2013) also report that growth and long-term debt ratio are not significantly associated. We find no significant relationship between non-debt tax-shield and leverage ratio similar with Titman and Wessels (1988) results. This result is also consistent with some recent studies reporting an insignificant relationship between non-debt tax shield and leverage ratio for the Turkish market (Acaravci, 2015; Güner, 2016).

Secondly, we examine the speed of adjustment of Turkish fims toward their optimal capital stucture by testing equaiton (3). We find a significant $(1-\delta_{it})$, implying that non-financial Turkish firms have a target ratio as trade-off theory suggests. Besides, our results suggest that firms partially adjust towards their target ratios due to adjustment cost because we find that δ_{it} is smaller than unity. Speed of adjustment (δ_{it}) is 0.309 when we measure leverage ratio by long-term leverage scaled by total assets. This means, on average, non-financial Turkish firms traded on BIST tend to close almost 31% of the leverage gap between their actual and targeted long-term leverage ratio. Therefore, assuming this speed remains the same, half of the gap is covered after almost 1.87 years. δ_{it} is 0.138 when leverage ratio is calculated as total debt over total asset. Hence almost 14% of the leverage gap of total debt is closed and it takes almost 4.66 years to adjust half of their targeted total debt ratio if the speed rate is maintained. Given that total debt is the sum of short-term and long-term debt, an almost two and a half times slower speed of adjustment for the total debt ratio could be explained by the features of short-term debt financing. The adjustment cost towards short-term debt can be regarded as being relatively higher than the cost of not being on the target short-term leverage ratio. Although the short-term debt incurs less interest rate cost than long-term debt, it requires periodic renewal. This makes short-term financing riskier and costlier especially for firms that have a longer maturity on the asset side. Hence, firms may be less willing to change their exposure to short-term debt and put more effort into adjusting towards the long-term debt ratio.

Studies on adjustment speed for Turkish firms are very limited in numbers. Karadeniz et. al (2009) cover 65 lodging companies between 1994-2006 and report δ_{it} as 0.284. Asarkaya and Ozcan (2007) find a considerably higher speed for financial institutions in Tukey during the 2002-2006 period, which is 0.77. There are two recent studies that are more comparable with our study. First, Arioglu and Tuan (2014) find that δ_{it} is approximately 0.29 and half-life is 1.96 for Turkish firms during 1998-2010, which is close to δ_{it} that we found towards long-term debt ratio. However, the leverage ratio proxy used by Arioglu and Tuan (2014) is long-term debt plus current debt (excluding accounts payable) scaled by total assets. More recently, Yildiz (2018) covers non-financial firms during 2003-2016 and found that adjustment speed is nearly 12% - 14% (half-life: 5.42 – 4.59) each year by measuring the leverage ratio with total debt over total asset. This is consistent with what we have found when we used total debt over total asset as leverage proxy.

Öztekin and Flannery (2012) compare the adjustment speeds of various countries. In their analysis, the leverage ratio is calculated as (Long-Term Debt + Short-Term Debt)/(Total Asset). According to their results, Turkey is the 6th slowest country among 39 countries with an adjustment speed of 0.123 (half-life: 5.28) and is placed between Greece (5th slowest) and Argentina (7th slowest)[1]. Although, Öztekin and Flannery (2012) cover the period between 1991-2006 and include only 43 firms from Turkey, their result is comparable with adjustment speed that we find when we use total debt over total asset. Therefore, we conclude that when leverage ratio is calculated (Total Debt / Total Asset), the adjustment speed for Turkey remains in the range of the same level and it is slow when compared with developed countries. However, when leverage ratio is calculated (Long-Term Debt / Total Asset), we find a higher rate of speed adjustment which is arguably not slow but moderate.

Thirdly – and most importantly- we examine firm-specific (size, profitability, growth, and distance) and macroeconomic determinants (term spread, and short interest rate) of adjustment speed for non-financial Turkish firms. Among firm-specific determinants, size is found to be negatively related with adjustment speed, meaning that larger firms are adjusting toward their target leverage at a slower rate. Our finding contradicts most studies on international markets which find that larger firms have a higher rate of adjustment speed (Banerjee et al., 1999; Drobetz et al., 2007; Haron et al., 2013; Heshmati, 2001; Lööf, 2004; Mahakud & Mukherjee, 2011). The reasons cited for a higher adjustment speed for larger firms are the ease of accessing capital, the ability to tolerate fixed costs of adjustment, and lower information asymmetry for larger firms. On the other hand, our results are consistent with Guha-Khasnobis and Bhaduri (2002) and Nivorozhkin (2004) who finds smaller companies adjust faster towards their target ratios for Indian and Czech markets respectively. Guha-Khasnobis and Bhaduri (2002) argue that government intervention in the credit allocation in some emerging markets may cause a negative relationship between size and adjustment speed. Nivorozhkin (2004) offers that because of their conservative policies, Czech banks tend to lend limited capital for larger firms in order to avoid higher exposure, slowing down adjustment speed for larger firms. However, these reasons do not perfectly fit the features of the Turkish market. On the other hand, some studies argue that size and adjustment speed could be hypothesized to be negatively related because larger firms have lower distress cost thanks to lower volatility in their cash flows, making them more tolerant of being away from their target ratio and thus adjust more slowly (Flannery & Rangan, 2006; Mahakud & Mukherjee, 2011; Touil & Mamoghli, 2020). We find this reasoning more relatable to the Turkish market. An over-levered large firm may adjust to its target leverage ratio more slowly than a smaller firm because the first one has a lower distress cost. Our discussion is mainly about over-levered large firms for two main reasons. First, we find that larger Turkish firms use more debt in our fixed effect estimation. Second, Yildiz (2018) reports under-levered non-financial Turkish firms already tend to adjust more slowly to their target leverage ratio on average.

As for profitability, our results show that it is positively related with adjustment speed which is consistent with the results of studies on international markets (Haron et al., 2013; Lööf, 2004; Mahakud & Mukherjee, 2011; Mukherjee & Mahakud, 2010) except Touil & Mamoghli (2020) who reports an inverse relationship. Hence, we can argue that non-financial Turkish firms with high profitability have higher financial flexibility, enabling them to change their capital structure more rapidly. For growth, we find high growth firms have higher adjustment speed as found by other empirical studies for other markets (Drobetz et al., 2007; Drobetz & Wanzenried, 2006; Haron et al., 2013; Mahakud & Mukherjee, 2011; Touil & Mamoghli, 2020). This means that a high growth non-financial Turkish firm tends to change its capital at a rapid rate because it may find it easier to change the composition of outside financing sources. Finally, we find distance and adjustment speed are strongly and negatively related, implying that firms closer to their target leverage adjust more quickly. While some studies also find similar results to our findings (Aybar-Arias et al., 2012; Banerjee et al., 1999; Haron et al., 2013; Lööf, 2004), some studies report that the further the distance, the higher the adjustment speed (Drobetz & Wanzenried, 2006; Heshmati, 2001; Mahakud & Mukherjee, 2011; Mukherjee & Mahakud, 2010). However, as Drobetz & Wanzenried, (2006) argue, the relationship between adjustment speed and distance can be hypothesized as being both positive or negative and sorting out between the two hypothesis is merely an empirical matter. Since our empirical findings address a negative linkage between adjustment speed and distance, we can conclude that non-financial Turkish firms find the fixed cost of external financing high and would rather go for internal financing by changing their dividend policy. This reinforces our previous finding that profitability and leverage is inversely related because it also implies that non-financial Turkish firms prefer internal financing on average. It even supports the positive association between profitability and adjustment speed because if firms use internal capitals to adjust their target ratios, then it means a higher adjustment speed for high profitability firms.

As for macroeconomic determinants, the term spread is not significantly related to adjustment speed. However, short-term interest is significantly and negatively related with adjustment speed as theoretically expected. It seems that Turkish firms adjust faster when short-term interest rates are lower and accessing the external capital is cheaper. Therefore, the hypothesis of adjustment speed is higher when the economy is in a good state is empirically valid at least when the short-term interest rate is used as the proxy for economic well-being. This result is consistent with Yildiz (2018) who finds that before the global finance crisis the adjustment speed is almost 14-16% (half-life: 4.59 – 3.97) and for the post-crisis period it decreases to 10% (half-life: 6.58), revealing that the global crisis slows the adjustment speed to target leverage ratio.

7. Conclusion

The main aim of this study is to estimate the adjustment speed of Turkish firms and examine firm-specific and macro-economic determinants of the estimated adjustment speed. To this end, we build a dynamic capital structure setting and use two-step GMM for estimating our models. We exclude the finance, insurance, and real estate firms due to the different natures of their capital structure and cover the period of 2005 - 2020.

In our analysis, we initially test the determinants of target capital structure, which are profitability, growth, tangibility, non-debt tax shield, and size. As their proxies, we use widely offered measures by the related literature. Results of static fixed effect model show that profitability, tangibility, and size are the main determinants of capital structure for

Turkish firms. Then, we test a dynamic model which contains the first lag of the leverage ratio as the independent variable in order to assess the average adjustment speed for Turkish firms. The results of the dynamic capital structure model indicate that Turkish firms have a target ratio and adjust toward it partially. Average adjustment speeds for Turkish firms are calculated as 0.309 (half-life: 1.87) and 0.138 (half-life: 4.66) when long-term leverage ratio and total leverage ratio is employed as proxies for the leverage ratio respectively. When compared with other countries, Turkish firms adjust towards their targeted total debt ratio at a slower rate while their adjustment towards targeted long-term debt ratio can be regarded as moderate. Finally, we test the firm specific (size, profitability, growth, and distance) and macroeconomic determinants (term spread, and short-term interest rate) of adjustment speed. Results show that size and distance is negatively related with adjustment speed, while profitability and growth have a positive association with adjustment speed. As for macroeconomic determinants, adjustment is faster when the short-term interest rate is lower while it is not significantly affected by changes in the term spread.

The determinants of adjustment speed in Turkey does not receive enough attention and empirical studies are quite limited. Thus, the main contribution of this study is providing a general empirical framework of firm-specific and macroeconomic determinants of adjustment speed for Turkey. Therefore, this study is expected to provide further insights in understating the capital structure decision of firms - which is one of the core issues of corporate finance. Considering that capital structure decisions play a vital role regarding firm value and risk, our results are of great practical importance for investors in terms of shedding additional light on interpreting, predicting, and evaluating the shareholders' wealth maximization process of Turkish firms - which is the ultimate aim of a firm. However; due to the lack of data availability, we are only able to include some of the macroeconomic factors that could have a relation to adjustment speed. Further studies may examine the macroeconomic factors of adjustment speed in Turkey more comprehensively by including additional factors, such as GDP, country default rates (CDS etc.), inflation rate, unemployment rate, political risk factors etc. Besides, further research may investigate firm-specific determinants of adjustment speed further. For example, by grouping the firms into several groups based on some of their features such as industry, size, performance etc., the cross-sectional change of adjustment speed could be examined further.

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