

# The Impact of Debt Structure on Firm Investments: Empirical Evidence from Turkey

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## ABSTRACT

The purpose of this study is to examine the impact of corporate debt structure on firm investments in Turkey. The regression and correlation analysis reveal a significant positive effect between corporate debt structure and firm investments. This effect is relatively strong for companies with high growth opportunities compare to companies with low growth opportunities. Consistent with the existent literature these findings provide support that a higher level of long-term debt in total debt structure reduces investments for firms with high growth opportunities. These effects need, therefore, to be incorporated in debt structure for Turkish firms to support their assets with proper financing sources.

**Keywords:** Debt maturity, investment, capital structure, leverage

## INTRODUCTION

One of the challenging issues in corporate finance, academics and practitioners trying to find out an answer is how a firm's debt level in its capital structure effects on its investments decisions [1]. It is important because capital structure choices debt level and equity level affect a firm's Return on Equity (ROE) and its financial risk. Miller and Modigliani (MM) [2] in their most influential financial article provided evidence that a firm's values is unaffected by its capital structure decisions in perfect capital markets. If their assumptions are correct, a firm's capital structure decision is irrelevant. Although some of their assumptions might be unrealistic, their conclusion irrelevancy is very crucial. Because, their work of MM irrelevancy was recognized the beginning of modern capital structure research and later studies have focused on relaxing some of MM assumptions in order to developed a more realistic capital structure theories [3].

A capital structure decision has a significant effect on firm's investments. In addition, a firm's debt maturity structure decision is important for its sustainability. Because this decision may have an impact on firm's cost of capital, capital budgeting and financial risk.

In previous studies on debt maturity structure are focused on the factors impacting debt maturity structures. A partial list of those studies include Brick and Ravid [4], Barclay and Smith [5], Kim et al. [6], Stohs and Mauer [7], Guedes and Osler [8], Chen et al. [9], Goswami [10], Scherr and Hulburt [11], Elyasiani et al. [12], Ozkan [13], Barclay et al. [14], Jun and Jen [15], Johnson [16], Antoniou et al., [17], Korner [18] and Majumdar [19].

Although a number of studies have been conducted on firm's debt level and its investments, they reveal the mixed results. In other words, the impact between firm's debt level and on its investment might be negatively or positively significant. Some of the studies found out a negative effect are Lang et al. [20], Aivazian et al. [21], Ahn et al. [22], Odit and Chittoo [23] and Franck and Huyghebaert [24]. On the other hand, Cleary [25] and Marchica & Mura [26] show a positive significant effect. Therefore, the results of those studies are not necessarily applicable to different countries; each country must be studied to determine the impact of debt maturity structure on a firm investment. This paper adds to the growing literature the impact of debt maturity structure on firm investment in emerging markets namely Turkey.

The regression and correlation analysis reveal a significant positive effect between corporate debt structure and firm investments on Turkish firms. This effect is relatively strong for companies with high growth opportunities compare to companies with low growth opportunities. Consistent with the existent literature these findings provide support that a higher level of long-term debt in total debt structure reduces investments for firms with high growth opportunities.

The results of this study have practical implications for Turkish firms. The firms need to incorporate these effects in their debt maturity structure to support their operations with proper financing sources.

The rest of the paper is organized as follows. Section 2 presents literature review, Section 3 discusses the model and methodology, Section 4 presents data, Section 5 reports the results, and finally Section 6 concludes the research.

## LITERATURE REVIEW

In the last couple of decades, the choices between debt and equity in financing a firm operation have been extensively examined in finance literature. However, there are limited number of studies on the impact of debt maturity structure and firm investment in emerging markets [27]. In other words, whether debt maturity structure has effect on investments is still in question. Myers [28] investigates the relationship between debt maturity structure and a firm with a growth option. He shows that a firm with higher growth opportunity affects its debt maturity structure choice due to underinvestment problems. When a firm has a profitable investment opportunity, benefits generated by the projects will go not only to shareholders also to debt holders partially. This may lower the incentive to implement such projects and create underinvestment problem. Therefore, to solve this problem, firms with higher future growth opportunity can issues short-term debt [28].

Another study conducted by Barclay and Smith [5] examines determinants of financial leverage and debt maturity. They use a sample of firms comprising 39,949 firm-year observations of 5,545 listed industrial firms for period of 1974 to 1992. Their findings show strong support for the contracting-cost hypothesis. Firms with low growth options tend to have more long-term debt in their capital structure. They document that the relationship between debt maturity and leverage is a negatively significant. In addition, the market to the book value ratio is a statistically significant determinant of debt maturity. Guedes and Opler [8], Scherr and Hulburt

[11], Barclay et al. [14], Antoniou et al. [7] also find strong support that this ratio has a significant impact on debt maturity.

Stohs and Mauer [7] investigate determinants of debt maturity structure using a measure of weighted average debt maturity. They find that an inverse relationship between debt maturity and a firm's effective tax rate. However, debt structure maturity is directly related to the firm asset maturity. The findings show strong support for the prediction of a nonmonotonic relation between debt maturity and bond rating and liquidity risk. However, they find out that the market to book value ratio is not a significant determinant of debt maturity.

Korner [18] examines the determinants of the corporate debt maturity structure of Czech firms. He shows that long-term debt increases with company size, leverage and asset maturity. However, the impact of growth options, collateralizable assets, corporate tax rate, and company level volatility is statistically insignificant. Another study conducted by Ozkan [13] examines also the determinants of corporate debt maturity structure on UK firms. He provides evidence consistent with the hypothesis that firms with more growth opportunities in their investment decisions tend to use more short-term financing. In addition, the findings provide strong support for the maturity-matching hypothesis that firms match debt maturities with asset maturities. They seem to place great emphasis on maturity matching.

The most of these earlier studies focus on the factors that determine debt maturity choice in capital structure. However, recent studies examine the impact of debt maturity on a firm investment. Aivazian et al. [1] investigate the effect of debt maturity structure and a firm investment on US firms for the period of 1982 to 2002. They show that the debt maturity structure has a significant effect on firm investments decisions. By controlling for the effect of financial leverage, they provide evidence that a firm with a higher level of long-term debt in its capital structure significantly reduces investment for firms with high growth prospects. The results also show that leverage level is significantly negatively related to a firm investment.

## DATA AND METHODOLOGY

The sample period for this study extends from 1992 to 2007. The study uses a dataset of 135 Turkish firms publicly listed on the Istanbul Stock Exchange (ISE) in Turkey. Due to the different asset's structures, firms in financial sectors are excluded.

The study employs an approach for the impact of debt structure on a firm investment in Turkey that is similar to the methodology used by Aivazian et al. [21]. The model measuring the debt maturity structure impact is as in the following equation:

$$INVEST_{it} = \alpha + \beta_1(MAT_{it-1}) + \beta_2(LEVER_{it-1}) + \beta_3(CF_{it}) + \beta_4(TOBIN'S Q_{it-1}) + \varepsilon_{it} \quad (1)$$

Where  $INVEST_{it}$  is the firm investment, the ratio of firm's net capital expenditures to its net fixed assets at the beginning of the year,  $MAT_{it-1}$  is the debt maturity of firm  $i$  in period  $t-1$ , calculated as percentage of the firm's total debt to its total assets.  $LEVER_{it}$  is the firm's financial leverage of firm  $i$  in period  $t-1$ .  $CF_{it}$  is cash flow, measured as ratio of net income and depreciation to total assets.  $TOBIN'S Q$  in year  $t$ , measured as the market value of the firm's total assets divided by the firm's book value of total assets.  $\varepsilon_{it}$  is the random error term,  $\alpha$  is constant,  $\beta_1, \beta_2, \beta_3$  and  $\beta_4$  are the parameters to be estimated.

In addition, following Aivazian et al. [21] study, this research separates firms into two groups: high and low growth prospects and examines the impact of debt maturity on the two types of firms.  $TOBIN'S Q$  is used to measure growth prospects. High and low growth firm prospects are identified and the median Tobin's  $Q$  is calculated. If the firm's Tobin's  $Q$  is below the

median Tobin's Q, this firm is classified as a low growth prospect. On the other hand, if the firm's Tobin's Q is above the median Tobin's Q, this firm is identified as a high growth opportunity.

### EMPIRICAL RESULTS

Table 1 summarizes the descriptive statistics of variables used in this research. The mean of net investment to fixed assets is 8.77 percent with a standard deviation of 25.81 percent. This indicates a high variation in the investment rate of Turkish firms. The mean of debt maturity is 25.8 percent. In other words, the weight of long-term debt in total debt is 25.8 percent. The average leverage level is 48.42 percent with a standard deviation of 20.24 percent. The sample average TOBIN'S Q is 2.4191, which indicates Turkish firms have strong growth opportunities for the sample period.

**Table 1: Descriptive Statistics**

Variables	Mean	Minimum	Maximum	Standard Deviation
INVEST	.0877	-.06	.80	.09968
MAT	.2581	.00	.92	.18239
LEVER	.4842	.01	.98	.20240
CF	.1225	-.38	.85	.12384
TOBIN'S Q	2.4191	.00	44.97	2.5605

N=2031

**Notes:** Variables are a firm investment (INVEST), debt maturity (MAT), a firm leverage (LEVER), cash flows (CF) and TOBIN'S Q.

Table 2 reports the correlations coefficient among the variables in this study: firm investment, debt maturity, firm leverage, cash flow and Tobin's Q. The findings in Table 3 reveal that a firm investment (INVEST) significantly positively related to debt maturity (MAT) at the 1 percent. Besides, a firm investment (INVEST) also significantly positively related to cash flow (CF) and Tobin's Q at the 1 percent. However, there is a negative significant relationship between among cash flow (CF), maturity (MAT) and leverage (LEVER) at the 1 percent statistically. The relationship between debt and TOBIN'S Q is a statistically positive at the 1 percent. On the other hand, maturity significantly negatively related to TOBIN'S Q.

**Table 2: Correlation Matrix of Variables**

	INVEST	MAT	LEVER	CF	TOBIN'S Q
INVEST	1.00				
MAT	.165**	1.00			
LEVER	.008	-.012	1.00		
CF	.227**	-.059**	-.344**	1.00	
TOBIN'S Q	.081**	-.033	.267**	.090**	1.00

N=2031

**Notes:** Variables are a firm investment (INVEST), debt maturity (MAT), a firm leverage (LEVER), cash flows (CF) and TOBIN'S Q.

\*\* ,\*Significant at 1 and 5 percent levels, respectively.

The results of regression equation are presented in Table III. Column 2 in Table III shows the estimators for the full sample. Inconsistent with the findings of Aivazian et al. [1] the results reveal that debt maturity structure (MAT) has a positive impact on investment (INVEST) at the 1 percent significance level. The results also show that there is a positive significant relationship between debt maturity structure (MAT) and financial leverage (LEVER) at the 1 percent. These results may indicate that the firms use external short-term and long-term funds

to finance their investments. TOBIN's Q, which measures growth opportunity, is significantly positively related to firm investments (INVEST). Consistent with findings of previous studies [1] cash flow (CF) is significantly positively related to investments (INVEST).

Debt maturity structure might have a different effect on investment for firms with a high or a low growth opportunity. A firm with a high growth opportunity can be more subject an underinvestment problem compared to a firm with low growth opportunity [28]. The results of this impact are reported in Column 3 and 4 in Table III. As it can be seen, coefficients of variables except TOBIN's Q for a firm with a low growth prospect are positive and significant at the 1 percent for both firms with a high and a low growth opportunity. In addition, one can see the impact of debt maturity structure on investment is higher for firms with a high growth opportunity in Table III. These results are inconsistent with Aviazian et al [1] show that debt maturity structure is significantly positively related to investments of Turkish firms. However, the findings consistent with results of previous studies [20, 21] the coefficient of cash flow (CF) is significant and positive for both types of firm prospects. TOBIN's Q, which measures growth opportunity, has a significant positive effect on firm investment with a high growth opportunity but the effect is insignificant for a firm with a low growth opportunity.

**Table 3: Results of Regression Analysis**

$$INVEST_{it} = \alpha + \beta_1(MAT_{it-1}) + \beta_2(LEVER_{it-1}) + \beta_3(CF_{it}) + \beta_4(TOBIN'S Q_{it-1}) + \epsilon_{it}$$

**Dependent Variable: INVEST**

	All Sample	Growth Opportunities	
		Low	High
<b>Constant</b>	0.010 (1.356)	0.014 (0.725)	0.015 (1.568)
<b>MAT</b>	0.183*** (8.626)	0.107*** (2.341)	0.208*** (8.640)
<b>LEVER</b>	0.091*** (3.836)	0.159*** (3.430)	0.062*** (2.237)
<b>CF</b>	0.265*** (11.519)	0.167*** (3.537)	0,268*** (9.935)
<b>TOBIN'S Q</b>	0.039* (1.762)	-0.022 (-0,490)	0.043* (1.708)
<b>R<sup>2</sup></b>	0.097	0.045	0.092
<b>F Statistic</b>	52.717***	6.559***	43.085***
<b>Observations</b>	2031	471	1560

**Notes:** Variables are a firm investment (INVEST), debt maturity (MAT), a firm leverage (LEVER), cash flows (CF) and TOBIN's Q. Z-statistics are provided in the parenthesis below to the coefficient estimates.

\*\*\*, \*\*, \* Significant at 1, 5 and 10 percent levels, respectively.

## CONCLUSION

The study examines the impact of corporate debt structure on firm investments in Turkey. Following Aivazian et al. [21] the regression and correlation analysis reveal a significant positive effect between corporate debt structure and firm investments. This research separates firms into two groups: high and low growth prospects and examines the impact of debt maturity on the two types of firms. The effect of debt maturity is relatively strong for companies with high growth opportunities compare to companies with low growth opportunities. Consistent with the existent literature [22, 1, 21] findings provide support that a higher level of long-term debt in total debt structure reduces investments for firms with high

growth opportunities. These effects need, therefore, to be incorporated in debt structure for Turkish firms to support their assets with proper financing sources.

## References

- [1]. Aivazian, V. A., Ying G.E. and Jiaping, Q. (2005a), "Debt Maturity Structure and Firm Investment", *Financial Management*, winter, 107-119.
- [2]. Modigliani, F. and Miller, M. (1958), "The Cost of Capital, Corporation Finance and the Theory of Investment", *American Economic Review* 48, 261-297.
- [3]. Brigham, E.F. and Ehrhardt, M.C. (2011), *Financial Management Theory and Practice*, South-Western Publishing Co.,
- [4]. Brick I. E. and Ravid S. A. (1985), "On the Relevance of Debt Maturity Structure", *Journal of Finance*, Vol. 40, No. 5, 1423-1437.
- [5]. Barclay, M.J. and C.W. Smith, C.W. (1995), "The Maturity Structure of Corporate Debt," *Journal of Finance*, 50, 609-632.
- [6]. Kim, C., Mauer D.C. and Stohs, M.H. (1995), "Corporate Debt Maturity Policy and Investor Tax-Timing Options: Theory and Evidence", *Financial Management*, 24, 1; 33-45.
- [7]. Stohs, M.H. and Mauer, D.C. (1996), "The Determinants of Corporate Debt Maturity Structure," *Journal of Business* 69, 279-312.
- [8]. Guedes, J. and Opler, T. (1996), "The Determinants of the Maturity of Corporate Debt Issues," *Journal of Finance* 51, 1809-1834.
- [9]. Chen, S., Ho, K. and Yeo, G. H.H. (1999), "The Determinants of Debt Maturity: The Case of Bank Financing In Singapore", *Review of Quantitative Finance and Accounting*, 12, 4; 341-351.
- [10]. Goswami, G. (2000), "Asset Maturity, Debt Covenants and Debt Maturity Choice", *The Financial Review*, 35, 4; 51-68.
- [11]. Scherr, F. and Hulburt, H. (2001), "The Debt Maturity Structure of Small Firms," *Financial Management* 30, 85-111.
- [12]. Elyasiani, E., Guo, L. ve Tang, L. (2002), "The Determinants of Debt Maturity at Issuance: A System-Based Model," *Review of Quantitative Finance and Accounting*, 19, 4; 351-378.
- [13]. Ozkan, A. (2000), "An Empirical Analysis of Corporate Debt Maturity Structure", *European Financial Management*, Vol. 6, No. 2, 197-212.
- [14]. Barclay, M.J., Marx, L.M., and Smith, C.W. (2003), "The Joint Determinant of Leverage and Debt Maturity," *Journal of Corporate Finance* 9, 149-167.
- [15]. Jun, S.G., and Jen F. C. (2003), "Trade-Off Model of Debt Maturity Structure," *Review of Quantitative Finance and Accounting*, 20, 1, 5-35.
- [16]. Johnson, S.A. (2003), "Debt Maturity and The Effects of Growth Opportunities and Liquidity Risk on Leverage", *The Review of Financial Studies*, 16, 1; 209-236.
- [17]. Antoniou, A., Guney, Y and Paudyal, K. (2006), "The Determinants of Debt Maturity Structure: Evidence from France, Germany and The UK", *European Financial Management*, Vol. 12, No. 2, 161-194.
- [18]. Korner, P. (2007), "The Determinants of Corporate Debt Maturity Structure: Evidence from Czech Firms", *Czech Journal of Economics and Finance*, Vol. 57, 142-158.
- [19]. Majumdar, R. (2010), "The Determinants of Corporate Debt Maturity: A Study of Indian Firms", *The IUP Journal of Applied Finance*, Vol. 16, No. 2, 70-80,
- [20]. Lang, L.E., Ofek, E. and Stulz, R. (1996), "Leverage, Investment and Firm Growth," *Journal of Financial Economics* 40, 3-29.

- [21]. Aivazian, V. A., Ying G.E. and Jiaping, Q. (2005b), "The Impact of Leverage on Firm Investment: Canadian Evidence", *Journal of Corporate Finance*, 11, 277-291.
- [22]. Ahn, S., Denis D.J. and Denis, D.K. (2006), "Leverage and Investment in Diversified Firms", *Journal of Financial Economics*, 79, 317-337.
- [23]. Odit, M. P. and Chittoo, H.B. (2008), "Does Financial Leverage Influence Investment Decisions? The Case of Mauritian Firms", *Journal of Business Case Studies*, Vol.4, Number 9, 49-60.
- [24]. Franck, T. and Huyghebaert, N. (2008), "The Impact of Leverage on Investment Expenditures Revisited", [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1101321](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1101321)
- [25]. Cleary, W.S. (1999), "The Relationship between Firm Investment and Financial Status," *Journal of Finance*, 54, 673-692.
- [26]. Marchica, M.T. and Mura, R. (2007), "Financial Flexibility and Investment Decisions: Evidence from Low-Leverage Firms", *Financial Management Association*, Barcelona, Spain.
- [27]. Frederic, S.C., Hulburt, H.M. (2001), "The Debt Maturity Structure of Small Firms" *Financial Management*, Spring, 30, 85-111.
- [28]. Myers, S. (1977), "Determinants of Corporate Borrowing," *Journal of Financial Economics* 5, 147-175.