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THE RELATIONSHIP BETWEEN DEBT MATURITY AND FIRMS INVESTMENT IN FIXED ASSETS

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Abstract: *This paper examines the relationship between debt maturity and firms investment in fixed assets. This research considered the financial information of 113 industrial firms listed in Tehran Securities Exchange during 2004 – 2014 (1243 firm-years). The results showed that the maturity structure of a firm's debt has a significant effect on its investment decisions. But additional tests on high and low growth firms and on industry levels including (medical materials and productions, Automobile and components, chemical materials and productions, metals, tile and ceramic) shows that there is no meaningful relation between debt maturity and firms investment in fixed assets in selectedindustries and in low growth firms. But this relationship in high growth firms is significant at the 10% level.*

Keywords: *Debt Maturity, Fixed Assets, Investment.*

INTRODUCTION

The effect of a firm's level of debt and the maturity structure of the debt on its investment in fixed assets are fundamental issues in corporate finance. In a world with incomplete markets, agency problems inherent in interactions between shareholders, creditors, and management, and associated with the level of leverage and its maturity composition, give rise to under investment or overinvestment incentives. Afirm's financial policy may have a significant effect on its investment. Several empirical studies have investigated the relationship between firm leverage and investment. For example, Aivazian, Ge, and Qiu (2005a) and Noravesh and Yazdani (2000) directly test the effect of leverage on firm investment and find that leverage is significantly negatively related to investment. Aivazian, Ge, and Qiu (2005b), also have investigated the relationship between firm debt maturity and investment and find that debt maturity is significantly negatively related to investment. However, no empirical study was done about it in Iran.

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In this article, we directly test for the relationship between debt maturity and firm investment in fixed assets. We find that longer debt maturity is associated with more investment in fixed assets.

The rest of the article proceeds as follows. Section I reviews the theoretical underpinnings of the linkage between debt maturity and investment. Section II presents Data and empirical method, Section III presents results on the relationship between debt maturity and investment and Section IV concludes the article.

THE DEBT MATURITY-INVESTMENT RELATIONSHIP

Myers (1977) finds that debt maturity could affect corporate investment. If debt matures after the expiration of the firm's investment option, it reduces the incentives of the shareholder-management coalition in control of the firm to invest in positive net-present-value investment projects since the benefits accrue, at least partially, to the bondholders rather than accruing fully to the shareholders. Hence, compared to firms with shorter debt maturities, firms with long-term debt are less likely to exploit valuable growth opportunities.

Firms can resolve the under investment problem by including the shortening of the maturity of debt to enable refinancing before the investment option expires. Stohs and Mauer (1996) argue that firms trade off the benefits and costs of alternative debt maturity structures by taking into account the under investment costs of debt, the signaling effects of debt, liquidity risk, asset maturity structure, and tax status. They find that debt maturity is inversely related to firm quality and to the firm's effective tax rate and risk, and directly related to its asset maturity. But, they find only mixed support for the hypothesis that debt maturity is inversely related to growth opportunities.

Other studies such as Barclay, Marx, and Smith (2003) and Scherr and Hulburt (2001) provide strong evidence that corporate debt maturity is negatively associated with growth opportunities. Stohs and Mauers (1996) results support liquidity risk theory and the implied non-monotonic relationship between bond ratings and debt maturity structure.

Liquidity risk is the risk that a viable and solvent firm may become illiquid and unable to get refinancing; it is engendered by debt that is of shorter maturity than the cash flow stream generated by the firm's assets (Aivazian, Ge, and Qiu, 2005b).

The above studies imply that potential under investment costs induced by longer maturity debt lead firms to reduce debt maturity when anticipating growth opportunities. Although these results are consistent with Myers (1977) under investment hypothesis, they do not provide direct evidence on the effect of debt maturity on investment expenditures. Aivazian, Ge, and Qiu (2005b) examine

whether and to what extent debt maturity influences firm investment. In this study, we examine whether their findings is compatible in Iran.

Aivazian, Ge, and Qiu (2005b) discussed, the under investment incentives generated by debt could be mitigated by the firm's financing through short-term debt or, if future growth opportunities are recognized sufficiently early, by the lowering of the level of leverage and its maturity when the firm has outstanding debt. It is important, therefore, to distinguish between the cases where growth opportunities are anticipated and those where they are unanticipated. In the former case, the firm can simply issue short-term debt or, if it has outstanding debt, lower leverage and its maturity by renegotiating with its debt holders, thereby attenuating potential under investment problems. In fact, if bargaining costs are small, renegotiations between debt holders and shareholders to buy back debt can internalize externalities generated by leverage, in effect attenuating the under investment problem. In general, the structure of anticipations concerning future growth opportunities and the costs of recontracting are both crucial for determining the impact of debt maturity on corporate investment. Unanticipated growth opportunities, on the other hand, leave less scope for attenuating under investment problems. Renegotiations with debt holders tend to be more time constrained and hence more costly in comparison to the case in which growth is anticipated. Also, with unanticipated growth, negotiations may have to be completed quickly before the growth opportunities dissipate through competition. Time-constrained negotiations are likely to result in higher transaction or adjustment costs in the buying back of debt. The implication is that anticipation of growth opportunities and renegotiation costs are negatively correlated, which implies that long-term debt has a much more pronounced negative influence on investment when growth is unanticipated than when it is anticipated since the adjustment costs of debt are higher in the former case.

On the above discussion, we can find several reasons about why debt maturity can influence a firm's investment in fixed assets. First, as the extant empirical results suggest, firms shorten debt maturity *ex ante* in response to anticipated growth opportunities. However, various costs constrain firms from fully adjusting debt maturity so that longer debt maturity could result in under investment ex post. Second, if investment opportunities are not fully anticipated, longer debt maturity may have a more significant influence on investment since there is less scope for shortening the maturity structure of debt. Recent empirical evidence suggests that the rebalancing of corporate capital structure to its optimal level is subject to significant adjustment costs. Such adjustment costs imply a sticky debt-maturity structure. Therefore, even if firms strive to attenuate the investment effect of debt maturity when anticipating growth opportunities, various costs associated with the adjustment of debt.

Thus, a negative empirical association between investment and the maturity composition of leverage when growth opportunities are fully anticipated reflects the actions of the firm to tailor leverage to growth opportunities,or the effect of growth opportunities on leverage. There may, of course, be offsetting benefits to longer maturity debt to trade off against these potential agency costs, but the optimal level of debt maturity that emerges till be influenced by (anticipated) growth opportunities.

So, we hypothesized as follow:

H1: There is a relationship between debt maturity and firm's investment

DATA AND EMPIRICAL METHOD

The data for this study are extracted from the firm's financial statements for the period 2004 to 2014. We exclude non-industrial firms from our sample due different calculation methods of some variable in the financial-services sector. We also exclude firms that have changed their fiscal year or their activities. We measure a firm's debt maturity as the percentage of the firm's long term debt to total debt. The leverage level is measured as the book value of total debt (the sum of short-term and long-term debt) divided by the book value of total assets. Specifically, we estimate the following equation:

$$Inv_{i,t}/AT_{t-1} = \beta_0 + \beta_1 STDebt_{i,t-1} + \beta_2 Sales_{i,t-1}/AT_{t-1} + \beta_3 CFO_{i,t}/AT_{t-1} + \beta_4 Q_{i,t-1} + \beta_5 lev_{i,t-1} + \varepsilon_{i,t}$$

where $Inv_{i,t}/AT_{t-1}$, is firm investment, measured as the cost of fixed assets minus depreciation and normalized by net fixed assets at the beginning of the year. $STDebt_{i,t-1}$, is the debt maturity of firm in period t-1. $lev_{i,t-1}$ is the leverage level of firm in period *t-1*, $CFO_{i,t}/AT_{t-1}$ is cash flow, which extracted form operating section of cash flow statement normalized by total assets at the beginning of the year. Tobin's Q in year t-1, $Q_{i,t-1}$ is defined as the market value of the total assets of the firm divided by the book value of assets and is a proxy for growth opportunities. We calculate the market value of the total assets as the sum of total liabilities and the market value of the common stocks.

Table I provides descriptive statistics on the variables used in this study. One can see that there is a low variation in the investment rate of Iranian firms. The mean ratio of net investment to fixed assets is 1.526 with a standard deviation of 9.348, which is which is almost six times the mean. The sample average Tobin's Q is 0.181, which reflects market expectations of growth opportunities over this sample period. This is reasonable for our sample period of the 1990s, and 2000s, a period marked by low growth in the Iran economy.

Table 1
Summary Statistics

Variables	*Average*	*Max*	*Min*	*Med*	*Std*
Investment on fixed assets	1.526	312.71	0.00	1.046	9.348
Debt maturity	0.132	1.0000	0.000	0.0122	0.221
Leverage	0.272	1.82	0.000	0.258	0.17
Cfo	0.69	475.85	-346.39	0.5146	19.634
Tobin's Q	0.181	10.12	-1.85	-0.08	1.054
Sales	6.352	828.13	0.000	4.191	24.92

The average of leverage level is 0.272 with a standard deviation of 0.17. The average proportion of the long-term debt to total debt is 13.2% with a standard deviation of 0.221, indicating that, on average, firms hold more short-term debt than long-term debt. This is expected due lending problems mentioned in public media.

Table 2
Correlation Matrix of Dependent and Independent Variables

	Investment on fixed assets	*Debt maturity*	*Sales*	*Cfo*	*Tobin's Q*
Debt maturity (*P – Value*)	0.037 (0.003)	1			
Sales (*P – Value*)	0.976 (0.000)	-0.028 (0.475)	1		
Cfo (*P – Value*)	0.718 (0.310)	0.032 (0.893)	0.713 (0.967)	1	
Tobin's Q (*P – Value*)	0.032 (0.000)	0.09 (0.000)	0.0062 (0.000)	0.0349 (0.123)	1
Leverage (*P – Value*)	-0.041 (0.000)	0.079 (0.000)	-0.052 (0.024)	-0.0147 (0.392)	-0.348 (0.000)

A potential problem in this estimation process is the possible high correlation between the various regressors. As mentioned earlier, firms with high growth

opportunities, i.e., high Tobin's Q, will reduce their leverage level and adjust the term structure of their debt in favor of short-term debt. This may lead to serious multicollinearity among the Tobin's Q, leverage,and the debt maturity variables. To ascertain the degree of multicollinearity, we report the correlation matrix between all the regressors in Table 2.

As this table shows, the correlation between Debt maturity, Tobin's Q and Leverage is not high, 0.09 and 0.079. But the correlation between Tobin's Q and leverage is high and equal -0.348. Thus, multicollinearity can be a serious problem in our study.

To deal with this potential bias, we apply the generalized method of moments (GMM) with an instrumental variable for leverage that is the tangibility of assets, which is measured as the proportion of the value of property, plant, equipment plus the value of inventory in total assets, and an instrumental variable for debt maturity is the maturity of firm assets, which is measured as the weighted average of the maturity of long-term assets and current assets. The maturity of long-term assets is measured as gross property, plant, and equipment divided by depreciation; the maturity of current assets is defined as current assets divided by the cost of goods. The weight for long-term assets is the share of gross property, plant, and equipment in total assets, and the weight for current assets is the share of current assets in total assets. These instrumental variables were used followingAivazian, Ge, and Qiu (2005b).

Both debt maturity and total leverage may be affected by expected investment opportunities. In theory, even if long-term debt generates underinvestment incentives, this effect could be mitigated by the firm taking corrective action and lowering the level and maturity of debt if growth opportunities are recognized sufficiently early. The maturity of debt is optimally reduced by management ex ante in view of anticipated ex post investment opportunities, so that the impact of debt on growth is mitigated. In the regression analysis, the independent variable Tobin's Q reflects publicly available information about investment opportunities. However, a firm's debt maturity and leverage choice may also reflect private information observed by managers. The essence of the instrumental-variable approach is to find exogeneous variables uncorrelated with investment, but strongly correlated with capital structure.

RESULTS

The results of the estimated investment equation are reported in Table 3 and IV. Column 2 of Table III reports the estimators for the full sample. The effects on investment of variables such as Tobin's Q, cash flow have the expected signs. Tobin's

Q, which measures growth opportunities, has a significant and positive impact on investment. Higher cash flow is associated with greater investment. These results are consistent with those of previous studies on the sensitivity of investment to cash flow (Kadapakkam, Kumar, and Riddick, 1998) and of investment to leverage (Aivazian, Ge, and Qiu, 2005b).

The variables of particular interest to our study are the maturity structure of debt, $STDebt_{i,t-1}$ and leverage level, $lev_{i,t-1}$. The results show that leverage level has a positive impact on investment at the 1% significance level. The estimated coefficient of, $lev_{i,t-1}$, is 1.73, which implies that a one-standard-deviation increase in the leverage level will lead to a 1.01 increase in investment. The results also show that the estimated coefficient of debt maturity is positive and significantly different from zero at the 0.1% level and one-standard-deviation increase in the debt maturity will lead to a 0.415 increase in investment.

Table 3
Debt Maturity, Leverage and Firm Investment

Variables	*Coefficients*	*Z*	*Estimated Std*	*p-value*
Intercept	-1.500	-8.70	.1724499	0.000
Debt maturity	1.1315	3.08	.3670058	0.002
Leverage	1.7315	2.95	.5870324	0.003
Cfo	.01619	2.82	.0057504	0.005
Tobin's Q	.21271	2.11	.1008204	0.035
Sale	.36724	96.79	.0037941	0.000

Number of obs = 1017
Number of groups = 113
Wald chi2(6) = 40201.91
Prob> chi2 = 0.0000

Thus, the effect of debt maturity on investment is not only statistically significant but also economically significant.

Debt maturity could have a different impact on investment for firms with different growth prospects. High-growth opportunity firms are more likely to face an underinvestment problem compared with low-growth opportunity firms. Therefore, the negative effect of longer debt maturity on investment—the underinvestment problem—should be stronger for high-growth opportunity firms (Aivazian, Ge, and Qiu, 2005b). To test this hypothesis, we separate firms into high

and low-growth opportunity groups and test the impact of debt maturity on the two groups separately.

Table 4
Debt Maturity, Leverage and Firm Investment

	Growth opportunity			
	High		*Low*	
Variables	*Coefficients*	*p-value*	*Coefficients*	*p-value*
Intercept	.6020193	0.244	.2682195	0.257
Debt maturity	.9318297	0.075	.2020765	0.657
Leverage	.3092976	0.716	-.6969705	0.499
Cfo	.036526	0.490	.4333387	0.000
Tobin's Q	-.0918016	**0.875**	-.0353138	**0.707**
Sale	.6020193	0.044	.1297505	0.000
Number of obs	186		144	
Number of groups	31		21	
Wald chi2(6)	13.04		239337.61	
Prob> chi2	0.0424		0.000	

Columns 2 and 4 of Table IV report estimators for 2 groups.

The results are not consistent with those of Aivazian, Ge, and Qiu (2005b) and suggest that, the effects of debt maturity are quite different for high- and low-growth opportunity firms. The coefficient on debt maturity is significant and positive for firms with high growth opportunities while it is insignificant for firms with low growth opportunities. The result suggests that the effect of debt maturity is economically significant for high-growth firms. These results may be affected by small size of sample for firms by high-growth opportunity due complying Gmm conditions.

Debt maturity also could have a different impact on investment for firms in different industries with different growth prospects. To test this hypothesis, we separate firms into 5 groups and test the hypothesis separately.

The estimation of the investment equation on industry levels yields different results: a higher proportion of long-term debt in total debt is not associated with investment.

Table 5
Debt Maturity and Firm Investment in industries

Industries	*No. obs*	*Coefficient*	*Result*
Medical materials and productions	143	0/06418 (0.4338)	Reject
Automobile and Components	231	0/0020 (0.8972)	Reject
Metals	165	-0/0013 (0.9907)	Reject
Chemical materials and productions	154	-0/0217 (0/8317)	Reject
Tile and ceramic	99	0/0903 (0/419)	Reject

CONCLUSION

This article investigates the impact of corporate debt maturity structure on investment in fixed assets. The under investment hypothesis predicts that debt maturing after the expiration of the firm's growth options deters investment incentives. Hence, shortening debt maturity is one effective way of mitigating such incentives and increasing firm investment. The extant literature focuses on how firms adjust debt maturity structure in response to growth opportunities to attenuate potential under investment costs of leverage. In this article, we examine the extent to which the maturity of debt influences firm investment expenditures, taking into account the restructuring of debt maturity in anticipation of investment opportunities.

We find that longer debt maturity increases firm investment.

This result is possible based on shortage of liquidity in market and problems of companies in having access to bank resources. Under such conditions, companies dedicate the resources of long-term loan to infrastructural investment and apply current loan for current affairs of company.

The results of this study are different from the results of Mayers (1997). He believes that manager is not intended that investment is funded mostly via funding debt as creditors can share investment output. Indeed, managers prefer to increase firm size (They increase their power in company), even this is at the expense of losing wealth of shareholders (reduced value of company due to acceptance of weak projects). The difference of results is due to the shortage of available

opportunities of managers for funding. Under such conditions, managers based on benefit-cost can use long-term debt funding to use growth opportunities. This reasoning is supported based on the positive effect of growth opportunities on investment of company.

Control variable of Q-Tobin measuring growth opportunities can have positive significant effect on investment.

Also, based on correlation coefficients matrix, investment in fixed assets has positive and significant correlation with operating cash flow. The sensitivity of investment to cash flows is positive, based on overinvestment problem as formed based on benefits conflict of managers and shareholders, managers are inclined to increase company size, although they are obliged to accept weak projects and reduce wealth of shareholders. If excess cash flow is not available, ability of managers to achieve this goal is limited but this limitation can be removed by debt funding. Thus, leverage is a mechanism to overcome overinvestment and justifies negative association between leverage and investment in companies with low growth opportunity. As the company value is increased via preventing the managers from accepting weak projects. Thus, the negative association between growth and leverage can be for the reason that the barrier is created for managers to prevent him from investing in the projects he doesn't want (Noravesh and Yazdani, 2010).

Kimyagari and Einali (2008) state that regarding fixed assets, it is assumed that it is given as collateral easily and in case of crisis and bankruptcy, it has low value compared to other assets. Also, tangible assets of company prevent that shareholders replace low risk assets with high risk assets easily as the companies with high fixed assets, despite high leverage ratio, they have low financial confusion.

Recommendations for further studies

1. The impact of risk of growth opportunities on the relationship between commercial cycle and investment in fixed assets.
2. The investigation of the relationship between operating cash flow and investment in fixed assets.

References

Noravesh, Iraj; Yazdani, Sima. 2010. The investigation of the impact of financial leverage one investment in the companies listed on TSE. *Journal of financial accounting.* Year 2. No. 2. Serial No. (4), 35-48.

Kimyagari, Ali Mohammad, Einali, Sudabe. 2008. Presenting comprehensive model of capital structure. Companies listed on TSE. *Financial researches.* 10(25), 91-108.

Aivazian, V., Ge, Y., Qiu, J. (2005). Debt maturity structure and firm investment. *Financial Management*. 34, 107–119.

Aivazian, V.A., Ge, Y., Qiu, J. (2005)."The Impact of Leverage on Firm Investment: Canadian Evidence," *Journal of Corporate Finance,* 11, 277-191.

Barclay, M.J., Marx, L.M., Smith Jr, C.W. (2003). "The Joint Detenninant of Leverage and Debt Maturity," *Journal of Corporate Finance,* 9, 149-167.

Kadapakkam, P., Kumar, P.C., Riddick, L.A. (1998). "The Impact of Cash Flow and Firm Size on Investment, the Intemational Evidence," *Journal of Banking and Finance,* 22, 293-320.

Myers, S. (1977). "Determinants of Corporate Borrowing," *Journal of Financial Economics.* 5, 147-175.

Scherr, F., Hulburt, H. (2001). "The Debt Maturity Structure of Small Firms," *Financial Management 30,* 85-111.

Stohs, M.H., Mauer, D.C. (1996). "The Determinants of Corporate Debt Maturity Structure," *Journal of Business, 69,* 279-312.