

The Impact of Leverage on Firm Investment: Evidence from Tehran Stock Exchange

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Abstract

The impact of financial leverage on firm investment is one of the most important issues in corporate finance. Debt overhang reduces the incentives of shareholder–management coalition in controlling the firm to invest in positive net-present-value investment opportunities. On the other hand, firms without debt in their financial structure face with a new problem known as over-investment. This study uses regression analysis to survey the effects of financial leverage on investment decisions of TSE¹ firms between years 2001-2010. The results show that in contrary to previous findings in literature, when using total liabilities to total assets as the measure of

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leverage, there is no relationship between the two parameters and by using long term debt to total assets, we see a positive impact.

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1. Introduction

Corporate firms play a significant role in contributing to economic growth. In order to attain their objectives, firms need to manage their funds efficiently. To respond to global competition, firms need to make massive capital investment in modern technologies, infrastructure, product development and product promotion and so on. Such investments may promote productivity and efficiency (Odit & Chittoo; 2008). Every investment requires financing. There are two ways of corporate financing: Internal funds and external funds. Firms also can use a combination of these two methods to finance their needs. In theory, finance impacts firm investments due to imperfect market conditions. Markets are imperfect, because of frictions such as transaction costs and information asymmetries. In a world with incomplete markets, agency problems arising from interactions between shareholders, debt holders, and management give rise to underinvestment or overinvestment incentives; these agency problems introduce a range in which investment may not be fully responsive, or may be over-responsive to changes in economic fundamentals (Aivazian et al., 2005).

Among various sources of corporate financing, financial leverage is perceived to have both positive and negative attributes as a debt financing instrument. The issuance of debt commits a firm to pay cash as interest and principal. A firm with significantly more debt than equity is considered to be highly leveraged. Leverage helps both the investor and the firm to invest or operate. However, it comes with greater risk. If an investor uses leverage to make an investment and the investment moves against the investor, his or her loss would be much greater than it would have been if the investment had not been leveraged. Therefore, leverage magnifies both gains and losses (Odit & Chittoo; 2008).

This paper attempts to contribute to the existing literature by bringing new evidence on the relationship between leverage and investment decisions over a period of 10 years for the case of 275 companies listed on Tehran Stock Exchange. In contrary to the prior findings, using total debts to total assets as a benchmark for measuring financial leverage, we did not find a meaningful relationship between the two parameters. Using long term debts to total assets as the alternative measure of leverage, the relationship is positive. The different results of the paper could be judged as the heavy dependence of Iranian firms on the banking system, the special environment of the financial system, the existence of arbitrary interest rates and the constraints of financing in the economy.

The remainder of the paper is organized as follows: Section 2 provides a brief empirical review of the relations between financial leverage and capital investment. Section 3 gives the data and description of variables. Section 4 indicates econometric analysis adopted to explain the relationship between financial leverage and investment. In section 5, we provide the reader with an overview of panel data estimation. Section 6 reports the results of the findings. We conclude in section 7.

2. The Link between Leverage and Investment

The impact of leverage on firm investment is among the critical issues of finance. If we assume Modigliani and Miller (1958) proposal, in a perfect environment, there would be no relationship between these two parameters and the investment policies of a company should be based on factors such as future demand on its products, production technology, market interest rates and other fundamental factors affecting profitability, cash flows and net worth of the firm. Many empirical evidences challenge this argument, as we live in a world of imperfections. Myers (1977) argues that debt overhang reduces the incentives of the shareholder–management coalition in controlling the firm to invest in positive net-present-value investment

opportunities, since the benefits accrue, at least partially, to the bondholders rather than accruing fully to the shareholders. Hence, highly levered firms are less likely to exploit valuable growth opportunities as compared to firms with low levels of leverage. Thus under-investment problem could be one of the reasons supporting the negative relationship between leverage and investment. On the other hand, Jensen (1986) argues that firms having more internally generated funds than positive net present value investment opportunities, the presence of debt in the firm's capital structure may force managers to utilize the funds in servicing the debt which could have been utilized in investing in negative net present value projects at the detriment of shareholder's interest. Such situation can be coined as the over-investment problem. Hence debt financing can be utilized as an instrument to curtail the over-investment problem by forcing managers to pay out excess funds to service debt. Hence for these types of firms debt financing has a positive impact on the value of the firm. Stulz (1990), Grossman et al. (1980), Zwiebel (1996) and Novaes & Zingales (1995) argued the same. However, too much debt is also not desirable and could lead to financial distress and agency problems (See Kraus & Litzenberger, 1973 and also Myers & Majluf, 1984).

Lang et al. (1996) examine a large sample of US industrial firms over the period 1970–1989 and show that the relationship between leverage and investment is negative for those firms with weak growth opportunities (with Tobin's Q less than one). Aivazian et al. (2005) analyze the impact of leverage on investment for 1035 industrial Canadian firms between years 1982-1999. Using different measures of leverage and various empirical methods, they conclude that the relationship between leverage and investment is negative and this negative relationship is more meaningful for companies with low growth opportunities.

McConnell and Servaes (1995) show that high debt would induce under-investment for firms with a low Tobin's Q; however, low debt would mitigate over-investment to firms with high Tobin's Q. Ahn et al. (2006) hold that within diversified firms, the negative impact of leverage on investment is significantly greater for high Q than for low Q segments and significantly greater for non-core than for core segments. The negative relationship between leverage and investment is also approved in emerging markets such as China. Firth et al. (2008) and Yao & Kong (2008) are among these findings. Also the survey of Odit & Chittoo (2008) for the case of 27 companies, which are listed on the Stock Exchange of Mauritius over a period of 15 years from 1990 to 2004 shows a negative relationship between leverage and investment for low investment opportunity firms. However, previous findings on Tehran Stock Exchange (TSE) are mixed. While Noravesh & Yazdani (2010) show a negative relationship between leverage and investment for 98 Iranian firms listed on TSE from 2001 to 2006, Afshari et al. (2012) examine a sample of 96 firms on the exchange from 2001 to 2005 and find no linear relationship between the two variables. Both surveys suffer from low sample size and short study period.

3. Data and Description of Variables

The data used in this paper are 275 non-financial firms listed on Tehran Stock Exchange over a 10 year period of 2001-2010. Financial institutions including banks, conglomerates, investment companies and other financial intermediaries are excluded from observations since the nature of their activities and investments differ from industrial firms.

After checking and screening for apparent coding errors and missing variables, an unbalanced panel of 2270 observations of 273 firms remained for estimation.

We use two alternative measures of leverage. One is book value of total liabilities divided by book value of total assets, while the other is book value of long-term debt divided by total assets.¹ Both measures have been used in the literature. The first measure does not distinguish between short-term debt and long-term debt while the second one emphasizes the dominant role of long-term debt as a determinant of investment. We try both definitions in our estimation. Tobin's Q is defined as the market value of 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 firm as the sum of total liabilities and the value of the common stocks. Cash flow is measured as the sum of earnings before extraordinary items and depreciation, and Sale is defined as net sales deflated by net value of fixed assets.

Table 1 provides descriptive information for the investment and the financial data. Inspection of the table reveals a high variation of investment among Iranian firms. The mean of the ratio of net investment to fixed assets is 1.34, while the standard deviation is 2.94, which is twice the mean. The sample average Tobin Q of 2.66 reflects market expectations of strong growth opportunities for Iranian firms over this sample period. The mean of the ratio of long-term debt to total assets is 0.10, while the ratio of total liabilities to total assets is 0.69; this suggests that there is a significant reliance on short-term debt finance in Iran's economy.

1. Lang et al. (1996) and Opler and Titman (1994) discuss the reasons for the use of book values.

Table 1: Summary statistics for growth, leverage, and investment opportunities

	Mean	Median	Standard deviation
Net Investment _t /Fixed assets _{t-1}	1.34	1.07	2.94
Cash Flow _t /Total Assets _{t-1}	0.17	0.92	54.22
Tobin's Q _{t-1}	2.66	2.46	54.47
(Long term debt/Total assets) _{t-1}	0.10	0.06	0.10
(Total liabilities/Total assets) _{t-1}	0.69	0.70	0.22
(Net sales/Fixed assets) _{t-1}	5.76	3.87	6.42
(Cash & Short-term investments/Total Assets) _{t-1}	0.63	0.20	5.38

4. Econometric Analysis

We estimate a short form of investment regression to examine the effect of leverage on investment. The model is similar to Aivazian et al. (2005) but is extended to include short-term investments. Specifically, we estimate the following equation:

$$I_{i,t} / K_{i,t-1} = b_1 L_{i,t-1} + b_2 D_{Q_{i,t-1}} * L_{i,t-1} + b_3 Q_{i,t-1} + b_4 (CF_{i,t} / K_{i,t-1}) + b_5 (CS_{i,t-1} / K_{i,t-1}) + b_6 (S_{i,t-1} / K_{i,t-1}) + \mu_{i,t} + e_{i,t} \quad (1)$$

Where $I_{i,t}$ is the net investment of firm i at time t ; $K_{i,t-1}$ is lagged net fixed assets; $L_{i,t-1}$ is lagged leverage; $CF_{i,t}$ is cash flow of firm i at time t ; $CS_{i,t-1}$ stands for short-term investments including cash; $Q_{i,t-1}$ is lagged Tobin's Q; $D_{Q_{i,t-1}}$ is a dummy variable which is equal to 1 if Tobin's Q > 1, and 0 otherwise; $S_{i,t-1}$ is lagged net sales of firm i ; $\mu_{i,t}$ is the individual effect of firm i , and $e_{i,t}$ is the error term.

Our variable of interest is leverage. We used the book value definition of leverage as to the market value of leverage. Lang *et al.* (1996) point that the market value leverage gives too much weight to the deviations in equity values. The book value of leverage does not reflect recent deviations in the market valuation of the firm. If leverage has a significant negative effect on investment, two interpretations can be adopted. First, it would mean that capital structure plays an important role in the firm's investment policies. Second, it can also be explained by an agency problem between the agents and the shareholders. If managers are overburden by debt, they may give up projects which may yield positive net present values. Also, there will be support for both the under-investment and over-investment theory.

We used two alternative measures of leverage to distinguish between total debt and long-term debt in firms' financial structure. According to this, we can rewrite equation (1) into following terms:

$$I_{i,t} / K_{i,t-1} = b_1 LTD_{i,t-1} + b_2 D_{Q_{i,t-1}} * LTD_{i,t-1} + b_3 Q_{i,t-1} + b_4 (CF_{i,t} / K_{i,t-1}) + b_5 (CS_{i,t-1} / K_{i,t-1}) + b_6 (S_{i,t-1} / K_{i,t-1}) + \mu_{i,t} + e_{i,t} \quad (2)$$

$$I_{i,t} / K_{i,t-1} = b_1 LLD_{i,t-1} + b_2 D_{Q_{i,t-1}} * LLD_{i,t-1} + b_3 Q_{i,t-1} + b_4 (CF_{i,t} / K_{i,t-1}) + b_5 (CS_{i,t-1} / K_{i,t-1}) + b_6 (S_{i,t-1} / K_{i,t-1}) + \mu_{i,t} + e_{i,t} \quad (3)$$

All the variables in the above equations are the same as equation (1), except in $LTD_{i,t-1}$ which denotes total debt to total assets and $LLD_{i,t-1}$ which denotes long-term liabilities to total assets.

To test for differences in the role of leverage for high versus low growth opportunity firms, we used the dummy variable of $D_{Q_{i,t-1}}$ in the above equations.

5. An Overview of Panel Data Estimation

Panel data sets for economic research possess several major advantages over conventional cross-sectional or time-series data sets (see Hsiao 2003). Panel data usually give the researcher a large number of data points, increasing the degrees of freedom and reducing the co-linearity among explanatory variables, hence improving the efficiency of econometric estimates. More importantly, longitudinal data allows a researcher to analyze a number of important economic questions that cannot be addressed using cross-sectional or time-series data sets.

Table 2: Correlation among independent variables

Corr.	Cash & Short-term Investments	Tobin's Q	Sales	Total Debt/ total assets	Long-term Debt/ total assets	Cash Flow
Cash & Short-term Investments	1	-	-	-	-	-
Tobin's Q	0.004	1	-	-	-	-
Sales	0.192	0.010	1	-	-	-
Total Debt/ total assets	-0.022	-0.011	0.127	1	-	-
Long-term Debt/ total assets	-0.036	-0.013	-0.109	0.157	1	-
Cash Flow	-0.896	0.003	0.008	0.032	0.019	1

We analyzed unbalanced panel data set using Eviews 7 software. Since our data set includes less than 15 periods, there is no need to control for data stationary. The estimates have been corrected for both heteroscedasticity and serial correlation. There is also a possibility of high correlations among the independent variables. Table 2 shows the correlation among independent

variables. The correlation between cash flow and short-term investments is high. We used variance inflation test to check for multi-co-linearity between these two variables. If $\frac{1}{1-R^2} > 10$; then multi-co-linearity is not a problem of concern (O'brien, 2007). In simple words, if R^2 coefficient is larger than 90%, then co-linearity is probable. After running variance inflation test, we saw R^2 coefficient of 84%, which means multi-co-linearity is not a matter of concern for the two variables.

6. Results

Table 3 reports the regression results for the investment equation using the two alternative measures of leverage and three different methodologies: Pooling regression, Random effect model, and Fixed effect model. To identify which empirical methodology—pooling, random effect, or fixed effect regression—is most suitable, we perform two statistical tests: First, to compare the pooled estimates and random effect estimate, the Lagrangian Multiplier Test is performed. The null hypothesis is that the individual effect is 0. The p-value statistics are reported in Table 3, and are equal to 0.186 and 0.209, respectively for the two alternative definitions of leverage. Thus, the null hypothesis is not rejected at 1% significance level for both measures of leverage.

Second, to compare the random effect estimates with the fixed effect estimates, the Hausman test is performed. If the model is correctly specified and if the individual effects are uncorrelated with the independent variables, the fixed effect and random effect should not be different. The random effect assumes that the error term is uncorrelated with the dependent variable. However, this is not the case when using the fixed effect method. According to the data in the table, fixed effect is not seen in the cross section and time series. Chi-square of zero also reveals that there is no random effect in the model. Thus the estimation of the data is based on pooling regression as the

appropriate model. The results suggest that considering total liabilities to total assets as the measure of leverage, there is no significant relationship between leverage and investment. On the other hand, by using long-term debt to total assets as the alternative measure of leverage which is more reliable to check its impact on investment, the relationship is positive.

Table 3: Regression analysis results

	Leverage= (Total liabilities /Total assets) $t-1$			Leverage= (Long term debt /Total assets) $t-1$		
	Pooling	Fixed effect	Random effect	Pooling	Fixed effect	Random effect
<i>Intercept</i>	1.379* (4.84)	1.042* (2.25)	1.253* (3.41)	-0.148 (-0.65)	0.811* (2.34)	0.976* (7.01)
<i>Leverage</i>	-0.169 (-0.58)	0.094 (0.28)	-0.169 (-1.15)	15.599* (9.91)	0.465 (0.44)	-0.612 (-0.90)
<i>Dummy Variable</i>	-1.443* (-3.33)	-0.291 (-0.67)	-0.092 (-0.22)	-11.751* (-6.33)	0.709 (1.09)	1.743* (3.34)
<i>* Leverage</i>	0.000 (0.38)	0.000 (1.16)	0.000 (1.01)	0.000 (0.22)	0.000 (0.81)	0.000 (0.74)
<i>Tobin's Q_{t-1}</i>	0.101* (4.35)	0.041 (1.00)	0.016 (0.90)	0.112* (4.85)	0.043 (1.04)	0.018 (0.87)
<i>(Net sales/Fixed assets)$t-1$</i>	0.582* (8.74)	0.275 (1.37)	0.263 (1.49)	0.587* (8.97)	0.275 (1.38)	0.263 (1.46)
<i>(Cash & Short-term investments/ Total Assets)$t-1$</i>	0.051* (7.77)	0.031 (1.37)	0.020 (1.51)	0.051* (7.86)	0.031 (1.37)	0.020 (1.49)
<i>LM Test</i>	Chi ² = 301.97	P-value=0.186		Chi ² = 299.94	P-value=0.209	
<i>Hausman Test</i>	Chi ² = 0	P-value=1		Chi ² = 0	P-value=1	
<i>Adj. R²</i>	0.060	0.048	0.047	0.090	0.048	0.048

* Significant at the 1% level

7. Conclusion

This paper extends earlier empirical studies on the relationship between leverage and investment in the bank-based economy of Iran. It examines the relationship of 275 Iranian corporations that are quoted on Tehran Stock Exchange for the years 2001 – 2010. Prior empirical works suggest financial leverage can have a negative impact on firm investment because of under-investment and over-investment theories reflecting agency problems among

different stakeholders of the firm. We used two alternative measures of leverage and found different results comparing to prior findings in the literature. Based on total liabilities to total assets, there is no significant relationship between leverage and investment. On the other hand, using long-term debt to total assets, we saw positive impact of leverage on firm investment. Our results suggest capital structure doesn't play an important role in Iranian firms' investment policies. One of the reasons of this finding could be the environment of the country's economy as a heavily bank-based financial system with arbitrary interest rates and the insignificant role of the capital market in financing. Thus debt overhang is not an issue of concern among Iranian firms and they seek to use the maximum level of bank leverage with no regard to investment opportunities. This could lead to misallocation of funds and resources. It should be noted that the findings of the paper are subjected to some limitations due to some trading restrictions such as price limit and trading halts. Although the figures are deflated using the value of assets at the beginning of each year, high inflation of the economy together with differences in the age and size of the companies could lead to different times of acquiring assets on the balance-sheet that might affect the results. Considering firms' age and size in the model and thinking of better alternatives to categorize investment opportunities could be a matter of interest for further research in the future.

References

- Afshari, A., A. Saeedi, A. & E. Reshadi, (2012). "The Impact of Leverage on Firms Investment Decision in Tehran Stock Exchange (TSE)". *Journal of Management Accounting*, Vol. 5, No. 13, 17-29.
- Ahn, S., D. J. Denis & D. K. Denis, (2006). "Leverage and Investment in Diversified Firms." *Journal of Financial Economics*, Vol. 79, 317-337.
- Aivazian, V. A., Y. Ge, & J. Qiu, (2005). "The Impact of Leverage on Firm Investment: Canadian Evidence". *Journal of Corporate Finance*, 11, 277-291.
- Firth, M., S. M. L. Wong, & C. Lin, (2008). "Leverage and Investment under a State-Owned Bank Lending Environment: Evidence from China. *Journal of Corporate Finance*", 14, 5, 642-653.
- Grossman, S. J., O. D. Hart, & University of Cambridge, (1980). *Corporate financial structure and managerial incentives*. University of Cambridge, Department of Applied Economics.
- Jensen, M. C. (1986). "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers". *The American Economic Review*, 76, 2, 323-329.
- Kraus, A., & R. H. Litzenberger, (1973). "A State-Preference Model of Optimal Financial Leverage". *Journal of Finance*, 28, 4, 911-922.
- Hsiao, C., (2003). *Analysis of Panel Data*, second edition, Cambridge University Press.
- Lang, L., E. Ofek, & R. M. Stulz, (1996). "Leverage, Investment, and Firm Growth". *Journal of Financial Economics*, 40, 1, 3-30.
- McConnell, J. J., & H. Servaes, (1995). "Equity Ownership and the Two Faces of Debt". *Journal of Financial Economics*, 39, 1, 131-157.
- Modigliani, F., & M. H. Miller, (1958). "The Cost of Capital, Corporation Finance and the Theory of Investment". *The American Economic Review*, 48, 3, 261-297.

Myers, S. C. (1977). "Determinants of Corporate Borrowing". *Journal of Financial Economics*, 5, 2, 147-175.

Myers, S. C., & N. S. Majluf, (1984). "Corporate financing and investment decisions when firms have information that investors do not have". *Journal of Financial Economics*, 13, 2, 187-221.

Noravesh, I. & S. Yazdani, S. (2010). "The Impact of Leverage on Firm Investments in Tehran Stock Exchange (TSE)". *Financial Accounting Researches*, Vol. 2, No. 2, 35-48.

Novaes, W., & L. Zingales, (1995). "Capital Structure Choice when Managers are in Control Entrenchment versus Efficiency". *NBER working paper* No. 5384.

O'brien, R. (2007). "A Caution Regarding Rules of Thumb for Variance Inflation Factors". *Quality and Quantity*, 41, 5, 673-690.

Odit, M.P., & H. B. Chittoo, (2008). "Does Financial Leverage Influence Investment Decisions? The Case of Mauritian Firms". *Journal of Business Case Studies*, 9, 49-60.

Opler, T., & S. Titman, (1993). "The Determinants of Leveraged Buyout Activity: Free Cash Flow vs. Financial Distress Costs." *Journal of Finance*, 48, 5, 1985-1999.

Stulz, R. (1990). "Managerial Discretion and Optimal Financing Policies". *Journal of Financial Economics*, 26, 3-27.

Yao M. & Y. Kong Y. (2008). "The Impact of Leverage on Firm Investment-The Empirical Study with Centralized Shares". *Accounting research*, 04:F2.

Zwiebel, J. (1996). "Dynamic Capital Structure under Managerial Management". *American Economic Review*, 86, 1197– 1215.