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DOES LEVERAGE INFLUENCE FIRMS' INVESTMENT DECISIONS? THE CASE OF BSE 500 INDEX COMPANIES

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Abstract

The present paper analyses the impact of leverage on investment for BSE 500 index Indian companies excluding the banking and financial companies. The empirical methodology involves application of random effects and fixed effects models on panel data with 320 cross-sections over a period of 17 years with 5440 observations. We find that Hausman test fixed effects model is appropriate and it has been able to capture significant negative association between investment and leverage for both measures, namely, total leverage and long-term leverage. All the other coefficients except cash flows are significant but the coefficient values are quite low. Therefore, the study applies Wald test wherein all the coefficients are significantly different from zero. Sales, firm size and Tobin's Q have positive whereas firm age has negative association with investment. The association between investment and leverage for low and high growth opportunities firms has been examined using a dummy variable and the results indicate that there is positive association between these variables for high growth companies.

Keywords : Investment, Leverage, Fixed Effects, Random effects, Instrumental Variable

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Introduction

Leverage is the key aspect of capital structure and has a significant in fluence on the solvency, stability and long-term assets decisions (investment decisions) of the firm. The earliest theory of capital structure of Modigliani and Miller (1958) disregarded the importance of financial considerations in long-term investment decisions of the firm. According to them, there are various other factors such as production, technology, demand conditions which influence the investment patterns of the firm. However, financial considerations are unavoidable for firms as they function in imperfect markets with presence of taxes, asymmetric information and transaction costs which confound the relationship between investment and financial decisions. One of the reasons behind the confounding relationship is agency problem due to the interaction between management and shareholders with investment being over-responsive and irresponsive at different points of time (Aivazian et al., 2005).Firms can get funds if they have good projects and leverage has a substantial influence on investment patterns of the firms. Nevertheless, average volatility in investment is higher for highly levered firms than their counterparts due to the limited scope of borrowing funds and fluctuations in cash flows (Cantor, 1990). Myers (1977) talks about under investment that may be present in highly leveraged firms. The firms with debt over hang may not get more money or enough funding to finance their projects, even when new investment is a good opportunity. The reason behind this phenomenon is the appropriation of earnings generated through new projects by the existing debt holders. The other related problem is overinvestment which arises on account of conflict of agency. Managers are considered as agents of the shareholders and they tend to invest in projects which are risky. The shareholders are the only one who bear the riskiness of these projects. However, if the returns from such projects are high, managers will get higher returns in terms of salaries and bonus. They prefer to invest in such projects, but due to high leverage free cash flow is not easily available. This in turn makes it difficult for them to overinvest even when they prefer to make an overinvestment.

The current paper studies the relationship between financial leverage and investment of S&P BSE 500 index companies using panel data regression. The paper applies instrumental variable methodlogy to deal with problem of endogeneity. The study has five sections, Section 2 reviews the literature on leverage and investment, Section 3 discusses the methodology applied for the study, Section 4 discusses the results of regression models and the last section provides the concluding remarks.

Review of Literature

Debt has both micro and macro impact in the economy; rising debt creates pressure on the corporates as well as on the economy as macroeconomic stabilisation of the country depends upon financial health of the corporates. Excessive increase in the level of leverage results in the economy and the corporates becoming more sensitive towards risk and macroeconomic challenges. At the company level, debt has both positive and negative implications. Debt component of financial structure safeguards from tax and increases the valuation of the firm but at the same time creates the problem of bankruptcy (Grossman and Hart, 1982;Umutlu, 2010).Proliferation in leverage ratio has negative impact on stock price of the firm as higher leverage ratio constrains the firm in getting more funds and restricts the future investment prospects. The adverse association between leverage and stock prices is strong in highly leveraged firms as compared to low leveraged firms, as latter face higher default risk. (Cai and Zhang, 2011).

The initial level of leverage depends on the growth prospects accessible to the firm. Later, financial flexibility plays a crucial role which allows the firm to change the future leverage level (Childs et al., 2005). Low leverage provides financial adaptability to the firms and allows them to invest more and such firms can make high investment and thereby improving their long-term performance (Marchica and Mura, 2010).However, firms reduce investment post financial crisis due to higher debt (Kalemli-Ozcan et al., 2018).

Future financing limitations enforce the firms to choose projects with shorter payback period which are less risky. The receipt of cash flow from such projects can help firm to finance future projects (Almeida et al., 2011). Therefore, the level of investment depends on financial flexibility, leverage ratio, agency cost and growth opportunities. However, diversified firms invest more than focused firms as they can shift their debt burden on to the low growth sectors. Debt can constraint managerial discretions that provides it a disciplinary role in poor performing and low growth opportunities firms (Ahn et al., 2006).However, a higher level of stock options for managers does away with this role of debt and the negative association between investment and leverage disappears (Francis et al., 2011).

Contradictory research findings indicate positive as well as negative association between the two variables in different countries as the association depends upon firm characteristics and macroeconomic environment (Gebauer et al., 2018).The negative influence between these two variables is more prominent in non-core sector than core sector (Ahn et al., 2006).Leverage plays a disciplining role for low growth opportunity Canadian firms and has a statistically negative influence on their investment (Aivazian et al., 2005). Another study on Chinese firms found similar results in case of government owned firms. (Yuan & Motohashi2014).A similar study by Firth et al. (2008)observed negative association between these two variables amongst the firms funded by state owned banks. Umutlu (2010) conducted a study on Turkish non-financial firms using error component models (ECM). One-way ECMresults indicated negativeinfluence on firms with low growth opportunities. Nevertheless, the results of two-way ECM (considering time effects) found no significant in fluence. Odit and Chitoo(2008) carried out a study on27 Mauritian firms using panel data and found the relationship to be negative. Similar results discovered by Vo (2019) in his study on Vietnam companies. However, Awan et al. (2010) reported positive association between firms with low and medium growth opportunities and leverage in Pakistani manufacturing companies. Ho et al.(2006)studied the impact of research and development investment (RDI)on firm growth opportunities in US companies and reported that when financial leverage was low and size of firm was increasing, RDIpositively influenced companies' growth opportunities.

The findings of Indian research studies provide contradictory results about the relationship between the two variables. Franklin and Muthusamy (2011) applied panel regression on top 25 listed pharmaceuticals companies. They found positive impact on large and small firms and negative on medium firms. Kannadhasan (2014) studied 95 pharmaceutical companies and found negative association between these two variables. Poddar(2015) analysed similar relationship for companies in textile sector and observed strong negative influence on low growth opportunities firms. The review indicates that there is research gap in the Indian context as limited number of studies are available in this area. Further, as the sample size is small and sample period is modest in the existing Indian studies, the application of panel data analysis may not be appropriate. The current study applies panel data regression for a comparatively larger sample size for longer period while considering other key influencing variables.

Methodology

The sample initially consisted of all the companies which were part of S&P BSE 500 index as on 31st of March 2018. However, the study excluded companies related to the financial, banking and other service sectors from the sample because the capital expenditure pattern is different for these companies. Finally, the sample consists of 320 companies with 5440 observations for the period from 2001 to 2018 thereby including the latest figures for the sample companies. The study has obtained data from the Prowess database.

Variables

The variables in the current paper are a mix of financial and market figures and two alternatives measures are used for computing leverage. First is total leverage which is measured as total debt of the company divided by book value of the assets. Second is long-term leverage computed by taking the value of only the long-term liabilities and divided by the book value of the total assets. As per prudent financial principle capital expenditure should get funded through long-term liabilities. But, several companies use medium and short-term debt to fund their capital expenditures. Therefore, both (total debt and long-term debt) have been used for the analysis. The other variables used and their measures are in table 1, similar to past studies (Aivazian et al., 2005; Franklin and Muthusamy2011).

Table 1 Variables description

Variables	Acronym	Measures
Dependent Variable		
Investment	INV	Change in net fixed assets scaled by lagged net fixed assets
Independent Variables		
Long-term liabilities	LEV	Long-term borrowings scaled by total assets
Total debt	TLEV	Total outside liabilities scaled by total assets
Cash Flow	CF	Earnings before extraordinary items and depreciation scaled by lagged total assets
Net Sales	SALES	Net sales scaled by net fixed assets
Tobin's Q	TQ	Total liabilities + Market value of equity + Estimated value of preference capital divided by book value of total assets
Control Variables		
Firm Age	AGE	Number of years from the date of incorporation of the firm
Firm Size	SIZE	Natural log of total assets

Source: *Authors' Formation*

Empirical Model

$$INV_{it} = \alpha + \beta_1 TLEV_{it} + \beta_2 CF_{it} + \beta_3 SALES_{it} + \beta_4 TQ_{it} + \beta_5 AGE_{it} + \beta_6 SIZE_{it}$$

$$INV_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 CF_{it} + \beta_3 SALES_{it} + \beta_4 TQ_{it} + \beta_5 AGE_{it} + \beta_6 SIZE_{it} \text{(ii)}$$

$$INV_{it} = \alpha + \beta_1 TLEV_{it} + \beta_2 CF_{it} + \beta_3 SALES_{it} + \beta_4 TQ_{it} + \beta_5 AGE_{it} + \beta_6 SIZE_{it} + \beta_8 DUM * TLEV_{it} \text{(iii)}$$

$$INV_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 CF_{it} + \beta_3 SALES_{it} + \beta_4 TQ_{it} + \beta_5 AGE_{it} + \beta_6 SIZE_{it} + \beta_8 DUM * LEV_{it} \text{(iv)}$$

Results & Discussion

Table 2 Descriptive Statistics

Statistics	INV	LEV	TLEV	SALES	CF	TQ	SIZE	AGE
Mean	0.809	0.215	0.476	7.087	0.302	1.998	7.542	40.000
Median	0.190	0.181	0.466	3.131	0.139	1.373	7.459	32.000
Maximum	2284.222	3.000	3.303	572.828	726.200	29.120	13.213	154.000
Minimum	-4.266	0.000	0.005	0	-0.531	0.035	1.613	2.000
Std. Dev.	31.950	0.203	0.260	23.645	10.148	1.917	1.671	24.494

Source: Authors' Calculations

Table 2 presents the results of descriptive statistics, out of eight variables six are ratios and two are absolute figures. The mean value of investment is 0.809 with a high level of variability as reflected in the standard deviation of 31.950. This may be due to the sample having companies in their different life cycle stages incurring different amount of capital expenditures. Further, companies do not undertake capital expenditure regularly but incur them at irregular intervals. The mean Tobin's q is 1.998 which shows attractive growth opportunities for the companies as reflected in the market expectations. The utilization of fixed assets to generate revenue has been efficient(7.087), but it has higher degree of variability (23.645). The average proportion of long-term leverage and total liabilities to total assets is 0.215 and 0.476 respectively which means corporates are relying more on short and medium-term debt as a mode of external financing. The average firm size and age are 7.542 and 40 years respectively indicating that the sample firms are large in size but have a high degree of variability for age asis evident from the minimum age of 2 years and maximum age of 154 years.

Table 3 Correlation Matrix

Variables	INV	LEV	TLEV	SALES	CF	TQ	SIZE	AGE
INV	1.000	-0.015	-0.026	-0.003	0.001	0.010	-0.007	-0.006
LEV	-0.015	1.000	0.650	-0.132	0.187	-0.293	-0.102	-0.111
TLEV	-0.026	0.650	1.000	0.054	0.131	-0.203	-0.007	-0.018
SALES	-0.003	-0.132	0.054	1.000	-0.002	0.009	0.036	-0.044
CF	0.001	0.187	0.131	-0.002	1.000	0.013	-0.021	-0.022
TQ	0.010	-0.293	-0.203	0.009	0.013	1.000	0.042	0.057
SIZE	-0.007	-0.102	-0.007	0.036	-0.021	0.042	1.000	0.203
AGE	-0.006	-0.111	-0.018	-0.044	-0.022	0.057	0.203	1.000

Source: Authors' Calculations

Table 3 presents the correlation matrix wherein all the independent variables except the two variables (cash flow and Tobin's Q)are having weak negative correlation with investment. The correlation amongst the independent variables is low and therefore multi collinearity does not affect the estimation procedures. Total leverage and long leverage have a correlation coefficient of 0.650 butthis does not affect the results as each of the variables have been taken separately in the estimation procedures.

Leverage and Investment

There are studies (Aivazian et al., 2005; Odit andChittoo, 2008;Umutlu, 2010) that have initially applied pooled regression while examining leverage and investmentrelationship. In pooled data, there is time series of cross-section but the observations in the cross-section do not necessarily remain the same over time.Pooling makes sense where the data is longitudinal with cross-section and randomly sampled. Pooled OLS regression does not get rid of the fixed effectsresulting in biased estimators. The data of current papercomprises figures of same companies over a number of years and therefore does not fit into the definition of pooled data.

Table 4 Results of Empirical model 1

	RE			FE		
Variables	Coefficient	SE	t-Statistic	Coefficient	SE	t-Statistic
TLEV	-3.159	1.78	-1.775*	-0.289	0.052	-5.524***
SALES	-0.002	0.019	-0.104	0.008	0.001	6.861***
CF	0.012	0.044	0.271	0.001	0.001	0.601
TQ	0.09	0.239	0.375	0.051	0.006	9.121***
SIZE	-0.12	0.274	-0.439	0.152	0.02	7.73***
AGE	-0.007	0.019	-0.354	-0.033	0.003	-9.826***
C	3.32	2.324	1.428	0.954	0.063	15.247***

Notes: *** indicates significance at 1 % level, ** indicates significance at 5% and * indicates significance at 10 % level

Source: Authors' Calculations

Table 4 presents output of random effects model (RE) and fixed effects model (FE) with total leverage. The results of RE indicates that out of all variables only total leverage is significant which has negative relationship with investment. Hausman test examines appropriateness of RE and the output indicates that it is inefficient and inconsistent (Chi-square statistic=27.605, p-value=0.050). Initially, the study applies the FE without cross-section weights wherein total leverage, firm size and age are significantly associated with the investment. But, the residuals from this equation exhibit cross-section dependence and to overcome this we apply the FE with cross-section weights. The results show that all the variables are significant except cash flow, but their coefficient values are quite low. Therefore, Wald test was applied to examine the coefficients of these variables. The results show that the coefficients are different from zero at 5% significance level. In both the models using total leverage the relationship is significantly negative between investment and leverage. As firms attain maturity their invetments decline as is evident from negative value of coefficient of age.

Table 5 Results of Empirical model 2

	RE			FE		
Variables	Coefficient	SE	t-Statistic	Coefficient	SE	t-Statistic
LEV	-2.569	2.39	-1.075	-0.327	0.069	-4.718***
SALES	-0.007	0.019	-0.353	0.007	0.001	5.641***
CF	0.011	0.045	0.242	0.001	0.001	0.878
TQ	0.099	0.245	0.405	0.048	0.006	8.177***
SIZE	-0.142	0.275	-0.517	0.138	0.02	6.767***
AGE	-0.008	0.019	-0.445	-0.037	0.004	-9.691***
C	2.616	2.306	1.135	1.162	0.076	15.256***

Notes: *** indicates significance at 1 % level, ** indicates significance at 5% and * indicates significance at 10 % level

Source: Authors' Calculations

Table 5 shows the results of REand FE with long-term leverage. The outputexhibits that under the REnone of the variables issignificant at 5% significance level. FE results have been able to detect thelink between investment and leverage as P value for leverage indicates that it is significant at 1% significance level and the relationship is negative with coefficientvalue of -0.327. The Hausman test (chi-square statistic = 16.198, P-value = 0.012), shows the RE is inconsistent and inefficient, thereby giving evidence that fixed effects model is more suitable at 1% level of significance.Wald test shows that all coefficient values aredifferent from zero.The signs of other coefficients are as anticipated and similar to the results of total leverage. The two different empirical models with two different leverage terms show the same relationship.

Influence of leverage and growth opportunities on investment

To examine how leverage is linked to investment for companies with different growth opportunities, a dummy variable is introduced which has a value of one if value of Tobin's Q is more than one and zero otherwise.The additional variable included in the equation is calculated by multiplying dummy variable with total leverage and long-term leverage separately as used by Aivazian et al. (2005).

Table 6 Results of Empirical model 3

	RE			FE		
Variables	Coefficient	SE	t-Statistic	Coefficient	SE	t-Statistic
TLEV	-3.295	2.368	-1.392	-0.353	0.058	-6.071***
DUM×TLEV	0.163	1.927	0.085	0.087	0.031	2.764***
SALES	-0.002	0.019	-0.106	0.007	0.001	6.65***
CF	0.012	0.044	0.268	0.001	0.001	0.524
TQ	0.083	0.254	0.327	0.048	0.006	8.535***
SIZE	-0.122	0.276	-0.443	0.149	0.02	7.526***
AGE	-0.007	0.019	-0.359	-0.033	0.003	-9.994***
C	3.364	2.388	1.408	1.019	0.066	15.339***

Notes: *** indicates significance at 1 % level, ** indicates significance at 5% and * indicates significance at 10 % level
Source: Authors' Calculations

Table 6 demonstrates the output of both the models for total leverage with dummy variable wherein none of the variables is significant under RE. Based on the output of the Hausman test (chi-square statistic = 12.353, P-value = 0.008), REdoes not appear appropriate. FE shows that all the variables except cash flows are significant. The relationship between investment and leverage for high growth firms is positively significant as indicated by the coefficient of dummy variable. The coefficients of all the variables are significantly different from zero as per the result of Wald test.

Table 7 Results of Empirical model 4

	RE			FE		
Variables	Coefficient	SE	t-Statistic	Coefficient	SE	t-Statistic
LEV	-2.414	3.088	-0.782	-0.385	0.073	-5.282***
DUM×LEV	-0.262	3.173	-0.083	0.129	0.051	2.501***
SALES	-0.007	0.019	-0.352	0.007	0.001	5.675***
CF	0.011	0.045	0.25	0.001	0.001	0.592
TQ	0.104	0.251	0.414	0.047	0.006	7.954***
SIZE	-0.14	0.276	-0.508	0.136	0.02	6.622***
AGE	-0.008	0.019	-0.441	-0.037	0.004	-9.787***
C	2.59	2.329	1.112	1.193	0.077	15.555***

Notes: *** indicates significance at 1 % level, ** indicates significance at 5% and * indicates significance at 10 % level
Source: Authors' Calculations

Table 7 shows the results of long-term leverage along with the dummy variable. RE indicates that none of the variables is significant and the coefficients for the dummy variable is negative. But in case of FE, all the variables are significant except cash flow. The coefficient of the dummy variable is positive and has higher value for long-term leverage than the total leverage under the FE. This indicates that there is positive association between the two variables for high growth firms. High growth firms can find opportunities to make investments in venturess with positive net present values leading to overinvestment due to more borrowings(Myers, 1977). The positive relationship between these variables can do away to a certain extent the agency conflicts identified by Jensen (1986),Stulz (1990) and Grossman and Hart (1982).But managerial discretion can still play an essential role in the investment decisions and high growth firms may invest less compared to the low growth firms (Ahn et al., 2006). Theoretically, investments are very sensitive to the cash flows and it is more prominent in case of firms that have high degree of leverage. Butnotably in our study, it is found that cash flows have no significant influence on investment even though the sign of the coefficients is positive. Our findings are in line with previous studies (Lang et al., 1996;Aivazian et al., 2005; Odit andChittoo, 2008; Umutlu, 2010; Kannadhasan, 2014).

Instrumental Variable

There is a possibility of endogeneity problem while analysing the relationship between these two variables. The current paper applies instrumental variable methodology using two-stage least square regression. Instrumental variable used is tangible assets similar to Aivazian et al., (2005). It is total of inventory, property, plant and equipment scaled by total assets. The correlation between leverage and tangible assets shows that it is an appropriate measure. The results of the regression validate the results of our earlier analysis. Therefore, the negative association identified in the study between leverage and investment cannot be attributed to endogeneity.

Conclusion

Past studies have paid attention to the association of investment and leverage, but limited work is available on Indian companies. Previous Indian studies have used OLS regression which may give misleading results in the presence of endogeneity. Further, panel regression has been applied to small sample size, thereby the methodology adopted has severely constrained the interpretation of the results.

The current paper has a large sample size for quite a longer period and addresses the problem of endogeneity. The paper fills the research gaps in the literature and observes the association between leverage and investment for 320 companies over a period of 17 years using two measures of leverage. The results express that in all regression results fixed effects model is suitable for analysing the relationship. The results of fixed effects model for both the measures of leverage indicate that there is significantly negative impact of leverage on investment which is consistent with the results of prior empirical studies. All other variables except cash flows are positively significant other than the variable of age. For examining the relationship in terms of high growth firms, the study uses a dummy variable. It indicates that there is positive association for high growth firms. Therefore, the study concludes that in case of large-cap companies in India leverage has played a constraining role for investment. However, in high growth companies, leverage is not acting as a deterrent for capital expenditures.

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