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**AN ENQUIRY INTO EFFECT OF CAPITAL STRUCTURE ON FIRM  
VALUE: A STUDY OF POWER SECTOR COMPANIES IN INDIA****Abhijit Sinha**DEPARTMENT OF COMMERCE, Vidyasagar University, West Bengal  
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**ABSTRACT**

*This empirical study is an effort to the existing field of effect of capital structure decisions on firm value. The investigation is made on eleven power companies selected from the 'BSE Power' from Capitaline database for the period 2007-2015. The firm value is proxied by Tobin's Q and the Enterprise value to profit before interest, depreciation and taxes ratio. The leverage is measured using debt-equity ratio. Panel data regression model is employed for analysis which supports the view that there is a negative influence of financial leverage on firm value (measured using Tobin's Q). However, the other measure is not significantly impacted by the extent of debt in the capital structure.*

**Keywords** - Capital structure, Firm value, Multi-collinearity, Levin-Lin-Chiu test, Panel data

**1. Introduction**

In the field of corporate finance, there are several issues that still seem like a mystery which are yet to be resolved. One such issue is that of capital structure and its impact on the firm. Due to this lack of consensus, researchers around the world have been dealing with it but have not been able to deliver concrete answers yet. Many theoretical discussions have taken place over the years with many theories in place like the Net Income Approach, Net Operating Income Approach, the Modigliani and Miller Hypothesis, the trade-off theory, Pecking Order theory and the Market timing theory.

The arena of capital structure came to light with the Modigliani and Miller theorem (1958) which points to the irrelevance theorem of capital structure in determining firm value. But, the consideration of a symmetric information, imperfect markets and taxes made Modigliani and Miller to rethink after which they proposed the relevance theory. Similarly, the trade-off theory proposed that since there are two aspects connected to capital structure viz. tax savings on interest payments versus increasing bankruptcy costs, it is likely to generate a situation of optimal capital structure as pointed by Kraus and Litzenberger (1973) and Scott (1976). It

therefore suggests that at a particular debt level, the firm value can be maximized which will be reflected in the stock price (Fama, 1978). In the same line, Brigham and Houston et al. (2004) recognized the importance of capital structure decision in improving company operations and performance. However, they add a word of caution mentioning that too much of debt might increase the chances of bankruptcy. Later, the Pecking order theory of Myers and Majluf (1984) proposed that organizational managers resort to financing following a hierarchical order, starting with own funds first and then resorting to external funds. However, the point is that no matter what the theories are, there is lack of agreement on the effect of capital composition on corporate performance. The relationship is found to be contingent upon the situation under which the theory is tested.

## 2. Literature review

It is known to us that financial management decisions hover around three decisions namely, financing decisions, investment decisions and dividend decisions. All these are extremely important in the context of any organization since they have / likely to have a long-term impact. Capital structure which the study deals with is the ratio between external funds and total capital (Riyanto, 1999). It is one of the key areas that aim to improve the efficiency and performance of a firm. Salvatore (2005) mentions that the main goal behind a firm tracking financial markets and going public to raise funds is to increase shareholder

welfare by maximizing the firm value. Firm value and shareholders wealth are closely related (Bringham and Gapensi, 2006). Hampton (1992) states that the prime objective of a firm is value maximization that is consistent with shareholders' wealth. One of the ways to achieve it is through capital structure decision (Marcus, 1983 and Ogbulu and Emeni, 2012). By a capital structure decision, we refer to the proportion of debt and equity in the total capital such that it minimizes the cost of capital (Agliardi and Kousisi, 2013, Kabir and and Nguyen, 2008 and Gersbach, 2013) and maximizes firm value. However, results relating capital structure and corporate performance differ across scholars. Solihah and Taswan (2002) demonstrate the positive but insignificant influence of leverage on firm value. However, the capital structure measure (measured by debt to equity ratio) finds a positive and significant effect on the price-to-book value ratio (Sujoko and Soebiantoro, 2007). Also, Andawasatya et al., (2017) points to the study of capital structure that acts as a mediator in the relationship between profitability and firm value.

There is controversy in literature due to lack of consensus with regard to the effect of these decisions on the valuation of firms. Since, this empirical study focuses on the issue of capital structure, the researcher highlights a few literatures that have looked into the effect of the decision on performance. This controversial topic has interested researchers across the world

with immense studies carried out in Asia, Europe, America and Africa. Some of the noteworthy European studies include the names of Gersbach (2013), Agliardi and Koussis (2013), Margaritis and Psillaki (2010), Kapopoulos and Lazaretou (2006), Bandt et al. (2006) and Iavorskyi (2013). The studies of Abor (2005), Oguna (2014), Anarfo (2015) and Dada and Ghazali (2016) are popular ones that studied the corporate environment in Africa. In the same light, some prominent names in the context of Asia include Chowdhury and Chowdhury (2010), Siddik et al. (2017), Singh and Bansal (2015) and Hasaudin et al. (2013). There are many other studies that unveiled the capital structure-performance relationship some of which include Ana et al. (2012), Oguna (2014), Memon et al. (2015) and Seetanah et al. (2014). The main controversy is the contradictory inferences drawn by researchers in different contexts and industry settings. Some of the studies that point to a positive effect of leverage on performance include Hadlock and James (2002), Mwangi (2010), Saaedi and Mahmoodi (2011) and Salim and Yadav (2012). Similarly, the study of Fadhilah (2011) recognizes a positive effect of capital structure leveraging on the price-to-equity ratio, a measure of firm's market value. In two recent studies, Akeem et al. (2014) and Hermuningsih (2013) also find a positive influence of leverage on firm value.

On the contrary, there are also empirical evidences to show the opposite

relationship between debt in the capital structure and corporate performance. The comparatively old studies include the likes of Wiwattanakantang (1999) study on Thai firms and Rajan and Zingales (1995) on G7 countries that recognize a negative relationship. Similarly, Abdul (2012), Mumtaz et al. (2013) and TPV and Phung (2013) note a similar relationship between the two variables. Ogbulu and Emeni (2012) supports the irrelevance theorem based on a Nigerian study. Furthermore, there are also evidences to prove a mixed effect of financial leverage on corporate performance. The investigation by San and Heng (2011) on Malaysian construction companies finds changing results with change in the firm size. Similarly, Salim and Yadav (2012) identify a negative influence of short-term debt on return on equity but revealed a positive impact on Tobin's Q. Shah (2014) identifies a negative effect of total debt on all forms of accounting measures but a positive relationship between proportion of debt and margin. The Fosberg and Ghosh (2006) research finds no relationship between leverage and performance. There are many more research evidences pointing to such results.

### **3.1 Objective of the study**

The research aims to identify the effect of leverage on firm value.

Null hypothesis ( $H_0$ ): There is no effect of leverage on firm value.

### **3.2 Research design**

The empirical investigation focuses on the 'power generating' or 'power transmitting'

companies in India. The main point of investigation is to determine the relationship between composition of the capital structure and value of the firm. Here, the investigator studied a total of seventeen such companies, but ends up with eleven because six companies are not in a true sense in the power sector as they are engaged in producing capital goods / equipments which are required by such power producing and / or transmitting companies. Based on the sample, analysis is done on a balanced panel considering data for the period 2007 to 2015. The source is collected from the Capitaline database. Because, the data set is in the form of a panel with both time series and cross-section data merging together, panel data analytical techniques are employed instead of ordinary least square method.

#### Choice of variables:

The regression model that we aim to predict has a dependent variable (proxy for firm value) and independent variable (proxy for capital structure) and control variables which are firm-specific variables. The dependent variables for this study are two, used in two separate models viz.

- (i) Price to book value ratio (PBV) and
- (ii) Enterprise value to Earnings before interest, depreciation and taxes (EVPBIDT)

On the other hand, the capital structure is proxied by debt-to-equity ratio. To negate the effect of some extraneous factors, some control variables are employed which are

- (i) Asset Tangibility (ASSETTANG) measured as fixed asset to total assets, considered relevant by Tehranian (2004) and Suh (2014).
- (ii) Size (SZ) computed using the natural logarithm of total sales, which is considered by Abor (2005) and Ehikioya (2007).
- (iii) Growth (GROWTH) measured by growth in total assets employed by Abor (2005 and 2007)
- (iv) Age (AGE) calculated as the natural logarithm of number of years in business.

## **4. Analysis and findings**

### **4.1 Nature of the data**

The table (No. 1) below depicts nature of the variables by employing descriptive statistics. As evident from the results, it is clear that there is a wide variation in the two market measures across the companies during the time period. The maximum and minimum values of PBV are 9.34 and a negative value of 6.10. Similarly, the EVPBIDT shows the maximum and minimum figures to be 123 and zero respectively. A look at the capital structure variables shows that different companies have employed different tactics of financing. The maximum is 7.090 whereas the minimum is nil with the mean score being 0.992. Therefore, on an average there is an equal amount of debt and equity in the capital structure. A noticeable point is that almost 80% of the borrowed fund is long-term debt.

**Table 1: Descriptive statistics of the variables**

Variable	Variable type	Mean	Standard Deviation	Minimum	Maximum
P/BV	Dependent	1.857	1.849	-6.100	9.340
EV/PBIDT		11.443	13.586	0.000	123.010
ASSETTANG	Independent	0.375	0.255	0.002	0.881
Growth		0.675	3.871	-0.175	38.171
SZ		9.671	1.281	5.582	12.062
DER		0.992	1.116	0.000	7.090
AGE		3.420	0.388	2.565	4.111
Current Ratio		1.289	0.671	0.160	3.630

Source: Computed by the author

#### 4.1 Testing for multi-collinearity

Before we move into the panel regression model, the researcher tests for multi-collinearity to see whether two or more independent variables are highly correlated. Generally, the variance inflation factor of more than 10 suggests multicollinearity problem.

Model		Collinearity Statistics	
		Tolerance	VIF
1	ASSETTANG	.532	1.881
	GROWTH	.772	1.295
	SZ	.431	2.323
	DER	.086	11.661
	LTD	.074	13.536
	AGE	.552	1.812
	CR	.552	1.812

Source: Computed by the author

Since, DER and LTD have VIF value exceeding 10, it points to multi-collinearity problem. Thus, we exclude LTD and keep DER in the model, it being a representative of the overall capital structure and re-check VIF values which are now found to

be within the desirable limit (see table 3) below.

Model		Collinearity Statistics	
		Tolerance	VIF
	ASSETTANG	.731	1.367
	GROW	.774	1.292
	SZ	.456	2.191
	DER	.632	1.582
	AGE	.561	1.783
	CR	.553	1.809

Source: Computed by the author

Thus, we have six independent variables for the panel regression model. However, before applying the panel data regression model, the data set is subject to unit root tests to test their stationarity property. This is necessary as the use of non-stationary data gives spurious regression results. In the present study, the Levin-Lin-Chu test is applied. The hypothesis tested is:

$H_0$ : The data is non-stationary.

$H_1$ : The data is stationary

**Table 4: Levin-Lin-Chu Unit root test results**

Variable	t-statistic
PBV	-18.371*
EVPBIDT	-20.598*
ASSETTANG	-11.807*
GROWTH	0.000*
DER	-6.204*
AGE	-11.824*
CR	-6.361*
SZ	-8.044*

Source: Computed by the author

\* significant at 1% level.

Since, the p-values are less than 0.05, null hypothesis is rejected leading to the conclusion that data are stationary at levels. Thus, the results obtained are not spurious (Gujarati, 2003). Hence, the panel data regression is carried out.

### 4.3 Application of Panel Data Analysis

The empirical study considers both time series elements for which 't' is used and cross-sectional elements captured using 'i'. The model that is tested is as follows:

$$FV_{it} = \alpha + \beta_1 \cdot ASSETTANG_{it} + \beta_2 \cdot GROWTH_{it} + \beta_3 \cdot SZ_{it} + \beta_4 \cdot DER_{it} + \beta_5 \cdot AGE_{it} + \beta_6 \cdot CR_{it} + \delta_{it}$$

where  $FV_{it}$  denotes firm value.

For this investigation, the two models tested are:

#### Model I:

$$PBV_{it} = \alpha + \beta_1 \cdot ASSETTANG_{it} + \beta_2 \cdot GROWTH_{it} + \beta_3 \cdot SZ_{it} + \beta_4 \cdot DER_{it} + \beta_5 \cdot AGE_{it} + \beta_6 \cdot CR_{it} + \delta_{it}$$

#### Model II:

$$EVPBIDT_{it} = \alpha + \beta_1 \cdot ASSETTANG_{it} + \beta_2 \cdot GROWTH_{it} + \beta_3 \cdot SZ_{it} + \beta_4 \cdot DER_{it} + \beta_5 \cdot AGE_{it} + \beta_6 \cdot CR_{it} + \delta_{it}$$

The panel data regression results can be analyzed only after we finalise the model that we can apply. The steps that is adopted are given below:

- Compare OLS with Fixed effect (FE) model using Restricted F test. If p-value is less than 0.05 (assuming a level of significance of 5%), OLS is rejected and the decision is in favour of the FE model.
- Compare OLS with Random effect (RE) model using Breusch Pagan test. If p-value is less than 0.05, OLS is rejected and the decision is in favour of the RE model.
- In case, OLS gets rejected in both the above two, we apply Hausman test to make a final choice. If the null hypothesis is rejected, decision is in favour of the FE model, else the RE model is used.

### 4.3.1 Testing Model 1 results: PBV is the dependent variable

The following lines show that the restricted F-test and the Breusch test reject the null hypothesis. Thus, the Hausman test is the concluding test. Restricted F-test result shows that Residual variance is 1.6302 and  $F(10, 82) = 7.4675$  with p-value of 0.000. Hence, the null hypothesis is rejected at 5% level of significance and the decision is in favour of the FE model. Similarly, the Breusch-Pagan test gives the Lagrange

Multiplier (LM) statistic value as 6.3879 with a p-value of 0.011, thereby rejecting the OLS model at 5% level. Hence, the Hausman test is applied which computes

the H-statistic as 57.6417 with prob (chi-square (6) > 57.6417) = 0.000. Thus, the FE model is the appropriate one in the given case. The results are given below.

**Table 5: Fixed-effects Model**  
**Dependent variable: PBV**

	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>
Const	37.592	16.867	2.228	0.028**
ASSETTANG	-29.919	17.499	-1.709	0.091*
GROWTH	-0.339	0.399	-0.849	0.397
DER	0.445	1.282	0.347	0.729
AGE	-2.816	4.919	-0.572	0.568
CR	-5.517	3.401	-1.622	0.108
SZ	0.185	2.370	0.078	0.937

Mean dependent var	11.443	S.D. dependent var	13.586
Sum squared resid	12655.48	S.E. of regression	12.274
R-squared	0.300	Adjusted R-squared	0.183
F(14, 84)	2.576	P-value(F)	0.003
Log-likelihood	-380.585	Akaike criterion	791.171
Schwarz criterion	830.098	Hannan-Quinn	806.921
Rho	0.054	Durbin-Watson	1.252

Source: Computed by the author

\* significant at 10% level

*Note: the Heteroscedasticity and autocorrelation consistent (HAC) standard errors are computed.*

For the above model, the researcher finds that only tangibility of asset has a significantly negative influence on the market value. None of the other variables show a strong effect on it. Hence, there is a lot of difference in the effect of the explanatory variables on the two market measures.

## 5. Conclusions

This study is another effort by the researcher to re-check the relationship/

effect of leveraging decisions of organizations on their firm value. The study investigates the power generating / transmitting companies as available from the 'BSE Power' of the Capitaline database. The study for the period 2007-2015 considers the effect of debt inclusion in the capital structure on the market value of firms which are measured using two variables, viz. Tobin's Q and the ratio of enterprise value to the profit before interest, depreciation and taxes. Some

control variables are also used to generate a level-playing analysis considering the different companies. The result is interesting and is an addition to the existing level of knowledge in this field of research. The analysis uses the balanced panel data for the eleven companies over a period of nine years. But, prior to its application, diagnostics checks have been made to identify if there is any problem of multicollinearity (using variance inflation factor) or unit root (using the Levin-Lin-Chiu test). Since, the method corrects for autocorrelation and heteroscedasticity using HAC estimates, it does not pose any problem to our estimates. The computation shows the significantly negative effect of DER, AGE and SZ on the price-to-book value ratio. But, the measure of growth reflects a positive effect on the performance measure. The negative effect of leverage on the PBV ratio is consistent with the findings of Soumadi and Hayajneh (2012) who reported a similar negative influence on Tobin's Q, a market measure. Moreover, the effect of size is in line with the conclusions drawn by Loncan and Caldeia (2014). With regard to the effect of tangibility, the insignificant effect is in line with the studies of Majumdar and Chhibber (1999) and Margaritis and Psillaki (2007) but goes against the findings of Zeitun and Tian (2007), Weill (2008) and Nunes et al. (2009). But, the result relating to effect of growth contrasts the finding of Andawasatya et al. (2017). Age has no significant effect on performance. In the second model that we employ, only

one variable represented by tangibility of assets has a positive effect on the EVPBIDT measure but negatively. None of the other independent or control variables have a significant effect on this market measure. Thus, this study is an addition to the controversial findings of early researchers which will give further opportunity for exploration with new lines of thought.

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