# Empirical Analysis of Target Adjustment Model with Target Determined by Capital Structure Determinants: An Experience of S&P BSE Metal

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**Abstract:**

Capital structure decision is a significant managerial decision in companies. Capital structure is like a pillar in a permanent construction, which bears the load of such construction. Capital structure, if properly blended, becomes a tool for taking managerial decisions at various levels. It provides a greater leverage besides ensuring liquidity. The study is based on the sample data taken from the Metal sector for the five years i.e., 2011-12 to 2015-16. The study scrutinizes the determinants of capital structure of metal sector listed firms in Bombay Stock Exchange. For examining the a mixture of determinants that affect the capital structure of the companies in the present study considers, leverage as a dependent variable, thirteen independent variables are included, all of which relate to the theory. These variables are divided into two group, firm characteristics variables and policy and decision variables. Econometrics is used for the analysis.

**Key words:** leverage, metal sector, Bombay Stock Exchange, determinants of capital structure, traditional trade- off theory, firm characteristics variable, stata, wald test and policy and decision variables.

## Introduction

Capital is needed for companies to go for the acquisition of fixed assets, intellectual capability and also to maintain modernization to meet the demand periodically. As long as the companies functions effectively, they can earn profit and thereby meet the obligations in terms of payment of interest on long term liabilities and tax. The companies can appropriate the funds if available for the payment of dividend i.e., both interim and final dividend. After apportioning, the residual amount can be deployed for the overall development of the companies. The companies prefer to have debt even before going for IPO. Under SEBI, the companies, whose shares are listed with the stock exchanges concerned, have their obligatory to maintain ideal capital structure. In case the capital structure crumbles, owing to more debt than that of the equity, such company loses credentials in all respects. The lending institutions will take this into considerations while sanctioning loan for further expansion. The creditors may stop supplying inventory, consumables and such other accessories, which hampers the production. The depletion of resources becomes a gray area for further investment, therefore expansion and diversification may come to standstill. The firm concerned may also be disabled to pay for the dividend which discourages prospective investors from investing on shares. Lack of maintaining the appropriate capital structure compel the government to take extreme steps through the board of directors meeting, if not general body meeting.

**Indian Corporate Debt:**

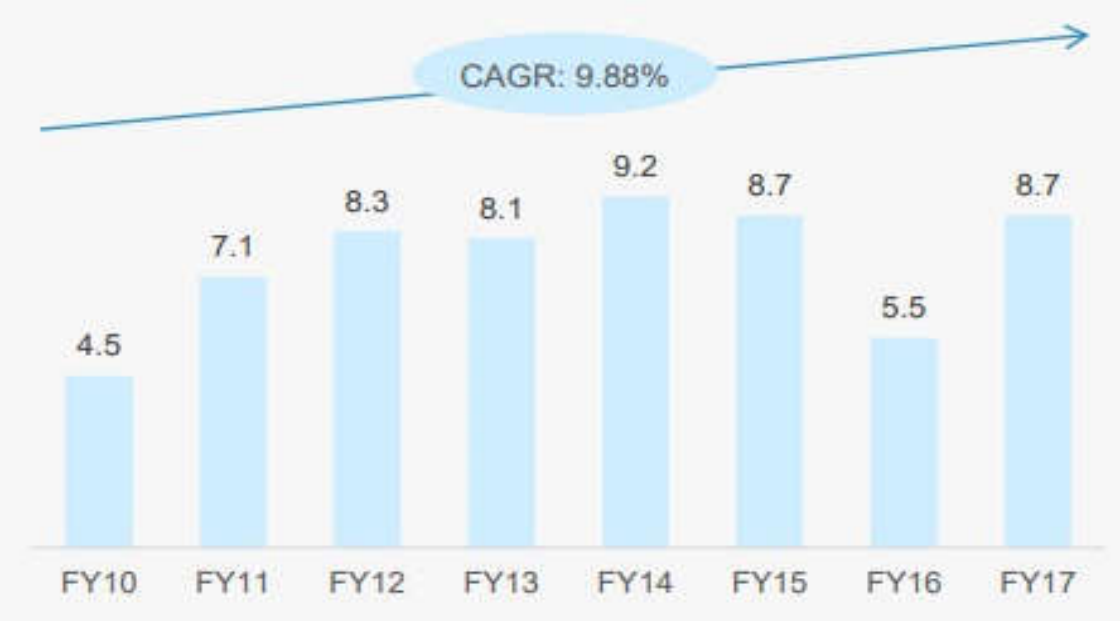
The rate of debt growth measured to single digit in financial year 2016 for the first time ever since financial year 2013. Corporate firm's debt repayment capability has remained fragile. Less profitability on slower demand and the crumple in commodity prices has worn corporate firm's debt repayment capability. It is estimated corporate firm's debt increases to 56% of gross domestic product in the year 2016 from 55% in the year 2014. The net profit of corporate firms in the BSE 500 reduced to 17% in 2015 from 18% in the year 2012. The interest coverage ratio measured by EBIT/interest on debt declined to 3.77 from elevated of 8.94 in the year 2005. The two key reasons for the Indian companies in depressed interest coverage ratio are high interest rates in India and the slower revenue growth of indebted companies

**Trade-Off Theory:** This theory is propounded by ***Kraus and Litzenberger*** Under this a decision maker of a firm evaluates the various costs and benefits of alternative leverage plans. When tax was added to the first irrelevance, advantage for tax shield was considered. Since the company's goal function is linear and there is no counterbalance for cost of debt.

**Metal and Mining Industry in India**

In Metals and Mining the country stands in the 3 rd place as the largest producer of coal. Coal production rose to 453.10 million tonnes in 2016-10, India has 8% of global deposit of iron ore Third largest steel producer in 2015 and also it is the 3 rd largest steel producer in 2015, while its production growth increased to 90 million tonnes in the year 2016. According to Ministry of Mines, India is the 7$^{th}$ largest bauxite reserves which were around 2,908.85 million tonnes in the year 2015-16. Foreign direct investment was allowed to100% in mining, mineral process, exploration, and metallurgy under the automatic route for all non-atomic and non-fuel including precious stones and diamonds from April 2000 to December 2016, Cumulative foreign direct investment inflows into the metals and mining industry raised to USD10.15 billion.

**Figure: Exports of Indian Steel and Metal Sector**




*Source : ibef, TechSci Research*

**Table: Indian Metal Sector's Production**

| Financial Year | Production (million metrics tonnes) |
|---|---|
| 2011 | 72 |
| 2012 | 77 |
| 2013 | 81 |
| 2014 | 87 |
| 2015 | 88 |
| 2016 | 89.79 |

*Source : ibef, TechSci Research*

## Review of Literature

In order to discover the gaps in this study it is significant to re-examine the available literature on the related aspects of the present study.

**Ram Kumar Kakani (1999)** evaluated determinants of Capital Structures applying econometrics. The author developed a model of capital structure for large manufacturing companies and evaluated the measures of debt, both short term and long term, investigated the empirical implications of liberalization, size were found to be insignificant on the firm's diversification strategy and non debt tax shields was significant on leverage level of the firm.

**Emilio Colombo (2001)**, studied on capital structure determinants with the respect to Hungarian companies. In this study the investigator has examined the capital structure using a cross-section and panel data model. The sample data set is collected balance sheet data and its information on 1100 company's market structure for the period from 1992 -1996.

**Bevan *et al.* (2002)** has investigated the capital structure determinants by intriguing 1054 United Kingdom companies from 1991-1999. Their analysis is based on various components of debt over the period 1991-1997, which is significantly related to size and level of the profitability is negatively related to the factors of debt apart from short term borrowings.

**Anila Çekrezi1(2013),** attempted to investigate the impact of company specific factors on capital structure decision by considering a sample of 65 non listed companies in Albania, from the period 2008 to 2011. The study used three capital structure measures they are long- term debt to total assets, short term debt to total assets, and total debt to total assets as dependent variables and four dependent variables they are liquidity, profitability, tangibility and size.

**Sasho Arsov and Aleksandar Naumoski (2016),** investigated empirically capital structure determinants of firms in Balkan countries and to determine if the existing capital structure theories are associated in their case. The paper applied panel regression on a sample consisting of joint-stock firms

from four countries. The findings reveal that the larger firms exhibit higher leverage, whereas the more profitable firms and firms with tangible assets use less debt.

**Research Model for Empirical Analysis**

The researcher has identified the dependent and the independent variables. Leverage (debt_ta) as the dependent variable while company characteristics variable and company policy and decision variable are considered as independent variables. The present study has thirteen independent variables. All these determinants are measured in the trade off theory of capital structure.

***Regression model:***

The study has considered the following regression model for the analysis to draw the conclusion for the objectives of the study.

$$(debt\_ta)_{it} = \beta_0 + \beta_1 (cdebt)_{it} \beta_2 (c\_i)_{it} + \beta_3 (d1)_{it} + \beta_4 (d2)_{it} +$$

$$\beta_5 (div)_{it} + \beta_6 (fscs)_{it} + \beta_7 (net)_{it} + \beta_8 (l\_ta)_{it} + \beta_9 (ndcl)_{it} + \beta_{10} (ndts)_{it} + \beta_{11} (r\_d)_{it}$$

$$+ \beta_{12} (srp)_{it} + \beta_{13} (mbq\_)_{it} + \varepsilon_{it}$$

**Independent Variables, its measures and expected relationship towards dependent variables**

| VARIABLES | MEASURES | EXPECTED SIGN |
|---|---|---|
| Total assets | Natural log of the firm's total asset | Positive |
| Capital intensity | PP&E/TA | Positive |
| Research and Development expenditures | Research and Development expenditures/TA | Negative |
| Tax loss carry forward | Tax loss carry forward/TA | Negative |
| Net income | NI/TA | Negative |
| Market to Book equity | Market to book equity ratio | Positive |
| Change in debt | Change in debt/ TA | Positive |
| Dividends | Dividends/TA | Negative |
| Sales | Sale of a common stock/TA | Negative |
| Stock repurchases | Stock repurchases/TA | Positive |
| Non debt current liabilities | Change in NDCL/TA | Negative |
| DUMMY 1 | D1/TA | Negative |
| DUMMY 2 | D2/TA | Positive |

## Research Methodology

**Objectives:**

1. To understand the capital structure adopted by the various metals and mining sector companies listed in the Bombay Stock Exchange.
2. To analyze the relationship between firm characteristics determinants, and policy and decision determinants with leverage of selected metals and mining sector companies listed in BSE.

**Sampling of the study:**
The systematic and multistage sampling techniques are employed in the present study.

**Data collection techniques:**
The research was collected from secondary sources from Capitaline database.

**Sample size:**
This study conducted to find the determinants of capital structure in metals and mining sector companies. The above multiple regressions have been applied on data ranging from year 2010-11 to 2015-16. The data collected from top 10 firms of metals and mining sector listed in Bombay Stock Exchange (BSE) according to their market capitalization.

**Analytical Software: Stata 12.0**
Both time-series and cross-sectional series are considered in the analysis. The panel data consist of fixed effect, random effect, pooled regression model and wald test.

**Hypothesis of the study:**
The main hypothesis is as below:
***Ho:*** *There is no relationship between the selected determinants and leverage decision of selected Indian metals and mining sector firms listed in BSE*
***HA:*** *There is relationship between the selected determinants and leverage decision selected Indian metals and mining sector firms listed in BSE*

## Data Analysis

*Empirical Analysis of Capital Structure determinants of Metals and Mining Sector:*

**Table: Fixed effect model for estimating capital structure determinants of Metal Sector:**

```
. xtreg debt_ta cdebt c_i d1 d2 div_ fscs netinc l_ta ndcl_ ndts_ r_d srp mbq_, fe noomitted vsqui
> sh noemptycells allbaselevels

Fixed-effects (within) regression               Number of obs      =        50
Group variable: crosssecti~d                    Number of groups   =        10

R-sq:  within  = 0.9258                         Obs per group: min =         5
       between = 0.4555                                        avg =       5.0
       overall = 0.5055                                        max =         5

                                                F(13,27)           =     25.93
corr(u_i, Xb)  = 0.0655                         Prob > F           =    0.0000
```

| debt_ta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| cdebt | .0876014 | .0779145 | 1.12 | 0.271 | -.0722661 | .2474688 |
| c_i | .1780912 | .0735337 | 2.42 | 0.022 | .0272125 | .3289699 |
| d1 | -.0349791 | .0211464 | -1.65 | 0.110 | -.0783679 | .0084098 |
| d2 | -.0290471 | .0317744 | -0.91 | 0.369 | -.0942428 | .0361486 |
| div_ | -.2623973 | .165335 | -1.59 | 0.124 | -.6016368 | .0768422 |
| fscs | -.0455773 | .1583362 | -0.29 | 0.776 | -.3704565 | .2793018 |
| netinc | .1071509 | .2015224 | 0.53 | 0.599 | -.3063389 | .5206407 |
| l_ta | .4686623 | .074143 | 6.32 | 0.000 | .3165334 | .6207913 |
| ndcl_ | -.2267214 | .0764984 | -2.96 | 0.006 | -.3836831 | -.0697597 |
| ndts_ | 1.325141 | 1.636 | 0.81 | 0.425 | -2.031653 | 4.681935 |
| r_d | 133.8918 | 31.80026 | 4.21 | 0.000 | 68.64304 | 199.1405 |
| srp | 2.129675 | 13.26781 | 0.16 | 0.874 | -25.09361 | 29.35296 |
| mbq_ | .0101926 | .0059348 | 1.72 | 0.097 | -.0019847 | .0223699 |
| _cons | -1.996611 | .3216289 | -6.21 | 0.000 | -2.656539 | -1.336683 |
| sigma_u | .1629266 | | | | | |
| sigma_e | .02688864 | | | | | |
| rho | .97348551 | (fraction of variance due to u_i) | | | | |

```
F test that all u_i=0:     F(9, 27) =    32.21                 Prob > F = 0.0000
```

**Table: Random Effect Model for estimating capital structure determinants of Metal Sector:**

```
. xtreg debt_ta cdebt c_i d1 d2 div_ fscs netinc l_ta ndcl_ ndts_ r_d srp mbq_, re noomitted vsqui
> sh noemptycells allbaselevels

Random-effects GLS regression                   Number of obs      =        50
Group variable: crosssecti~d                    Number of groups   =        10

R-sq:  within  = 0.7272                         Obs per group: min =         5
       between = 0.9707                                        avg =       5.0
       overall = 0.9063                                        max =         5

                                                Wald chi2(13)      =    348.12
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

| debt_ta | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| cdebt | .2240785 | .1799302 | 1.25 | 0.213 | -.1285782 | .5767351 |
| c_i | .0522891 | .0466326 | 1.12 | 0.262 | -.0391091 | .1436873 |
| d1 | -.1099885 | .043138 | -2.55 | 0.011 | -.1945375 | -.0254396 |
| d2 | .228024 | .040102 | 5.69 | 0.000 | .1494255 | .3066226 |
| div_ | .4027975 | .1979517 | 2.03 | 0.042 | .0148193 | .7907758 |
| fscs | .8005927 | .4125295 | 1.94 | 0.052 | -.0079503 | 1.609136 |
| netinc | -.8064636 | .2915202 | -2.77 | 0.006 | -1.377833 | -.2350945 |
| l_ta | .2412029 | .0567787 | 4.25 | 0.000 | .1299187 | .3524872 |
| ndcl_ | -.1846011 | .1893339 | -0.98 | 0.330 | -.5556888 | .1864866 |
| ndts_ | 1.28313 | 3.62818 | 0.35 | 0.724 | -5.827972 | 8.394231 |
| r_d | 101.6364 | 66.30805 | 1.53 | 0.125 | -28.32499 | 231.5978 |
| srp | 35.28679 | 35.90667 | 0.98 | 0.326 | -35.08899 | 105.6626 |
| mbq_ | .0124963 | .0074767 | 1.67 | 0.095 | -.0021577 | .0271503 |
| _cons | -.8687951 | .2727996 | -3.18 | 0.001 | -1.403472 | -.3341177 |
| sigma_u | 0 | | | | | |
| sigma_e | .02688864 | | | | | |
| rho | 0 | (fraction of variance due to u_i) | | | | |

To identify the best model among the two, the following hypothesis is drawn to examine under Hausman test.

$H_{0:}$ Random effect model is accurate to test determinants of capital structure of metals and mining sector.

$H_{a:}$ Fixed effect model is accurate to test determinants of capital structure of Metals and Mining sector

**Table : Hausman test for estimating Capital Structure determinants of Metal Sector:**

```
. hausman fe re
```

| | Coefficients (b) fe | (B) re | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| cdebt | .0876014 | .2240785 | -.1364771 | . |
| c_i | .1780912 | .0522891 | .1258021 | .056856 |
| d1 | -.0349791 | -.1099885 | .0750095 | . |
| d2 | -.0290471 | .228024 | -.2570711 | . |
| div_ | -.2623973 | .4027975 | -.6651949 | . |
| fscs | -.0455773 | .8005927 | -.8461701 | . |
| netinc | .1071509 | -.8064636 | .9136145 | . |
| l_ta | .4686623 | .2412029 | .2274594 | .0476798 |
| ndcl_ | -.2267214 | -.1846011 | -.0421204 | . |
| ndts_ | 1.325141 | 1.28313 | .0420117 | . |
| r_d | 133.8918 | 101.6364 | 32.25538 | . |
| srp | 2.129675 | 35.28679 | -33.15712 | . |
| mbq_ | .0101926 | .0124963 | -.0023037 | . |

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

           chi2(13) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                    =  -203.72    chi2<0 ==> model fitted on these
                                  data fails to meet the asymptotic
                                  assumptions of the Hausman test;
                                  see suest for a generalized test
```

From the above Hausman test, b is consistent under $H_o$ and $H_a$, and B is inconsistent under $H_a$. Therefore, fixed effect model is accurate model to examine the relationship between the leverage and its determinants.

**Interpretation:**

In the above analysis of fixed effect model for 10 companies, Overall R square shows that 50.55% variance of debt/total assets is explained by the 12 independent variables. Prob>F=0.000 which is less than 0.05. This shows the model is appropriate.
The coefficient of independent variables is explained according to firm characteristics determinants and policy and decision determinants.

The first determinant under firm characteristics variables is Firm size measured by natural log of total assets of firms in Metals and Mining sector. The coefficient of l_ta indicates negative relationship with capital structure. The coefficient is 0.4686. The P value of this determinant is 0.000. T-value is 6.32>1.95 (at 95% confidence level), this is shows that firm size has significant influence on the dependent variable debt/total asset. Accordingly the relationship is positively correlated with leverage.

The second determinant is Capital intensity which is measured by tangible assets/Total assets of companies in Metals and Mining sector. The coefficient of c_i is 0.1780 and the P value of this variable is 0.022. T-value is 2.42>1.95 (at 95% confidence level), this is shows that capital intensity has positive influence on the dependent variable debt/total asset. Hence the relationship is statistically significant with leverage of Metals and Mining firms.

The third determinant is Research and development expenditure which is measured as R and D/Total assets. The coefficient of r_d is 133.89. The P value of this determinant is 0.000. T-value is 4.21>1.95 (at 95% confidence level), this is shows that R&D has insignificant influence on the dependent variable debt/total asset For that reason the relationship is not significant with leverage.

The fourth determinant is non debt tax shield which is measured as ndts/Total assets. The coefficient of ndts is 1.3251. The P value of this determinant is 0.425. T-value is 0.81<1.95 (at 95% confidence level), this is shows that non-debt tax shield has insignificant influence on the dependent variable debt/total asset. Henceforth the relationship is insignificant with leverage.

The fifth determinant is net income which is measured as Net income/Total assets of Metals and Mining sector. The coefficient of net variable is 0.1071. The P value of this determinant is 0.599. . T-value is 0.53<1.95 (at 95% confidence level), this shows that net income has insignificant influence on the dependent variable debt/total asset. As a result the relationship is highly insignificant with leverage of Metals and Mining sector.

The sixth and the final determinant of firm characteristics of Metals and Mining sector is Market to book equity ratios. The coefficient of mbq_ is 0.101.The P value is 0.097. T-value is 1.72<1.95 (at 95% confidence level), this shows that market to book equity ratio has insignificant influence on the dependent variable debt/total asset. Hence the market to book equity ratios is not significantly related to Leverage of Metals and Mining sector.

The coefficient of independent variables will be explained according to policy and decision determinants of capital structure
The first determinant of Policy and decision of Metals and Mining is change in debt. the variable is measured by change in debt over the period/total assets. The coefficient of cdebt _ is 0.0876. The P value is 0.271. T-value is 1.12<1.95 (at 95% confidence level), this is shows that change in debt has significant influence on the dependent variable debt/total asset. Consequently the Change in debt variable is positively correlated related to Leverage of Metals and Mining sector.

The second determinant of Policy and decision of Metals and Mining is dividends. The variable is measured by dividends /Total assets. The coefficient of div is -0.2623. The P value is 0.124. T-value is -1.59<1.95 (at 95% confidence level), this is shows that dividends has significant influence on the dependent variable debt/total asset Thus the dividends variable is highly significant to Leverage of Metals and Mining sector.

The third determinant of Policy and decision of Metals and Mining is firm sale of common stock. The variable is measured by firm sales of equity shares /Total assets. The coefficient of fscs is -0.0455. The P value is 0.776. T-value is -0.29<1.95 (at 95% confidence level), this is shows that firm sale of common stock has significant influence on the dependent variable debt/total asset So the firm sale of common stock variable is statistically significant to Leverage of Metals and Mining sector.

The fourth determinant of Policy and decision of Metals and Mining is stock repurchase. The variable is measured by buy back of shares/Total assets of firms in the sector. The coefficient is 2.1296, P value is 0.874. T-value is 0.16<1.95 (at 95% confidence level), this is shows that firm stock repurchase has significant influence on the dependent variable debt/total asset Hence, the stock repurchase variable is statistically significant to Leverage of Metals and Mining sector.

The Fifth determinant of Policy and decision of Metals and Mining is Non debt current liabilities. The variable is measured Current liabilities of firms over the period/Total assets of firms in the sector. The

coefficient of ndcl is -0.2267, P value is 0.006. Consequently, the non-debt current liabilities variable is statistically significant to Leverage of Metals and Mining sector.

The sixth and seventh determinants of Policy and decision of Metals and Mining are Dummy variables. Dummy 1 variable coefficient is -0.0349 and P value is 0.110. This indicates all the companies of the sector have more than zero debt by total assets. As a result, Dummy 1 variable is highly significant with leverage of Metals and Mining sectors. This point out the company's debt policy that is different from other company's debt policies.

The final determinants of Policy and decision of Metals and Mining is Dummy2. The coefficient is -0.0290. The P value is 0.369. Few of the companies of metal sector has more than 50 per cent of debt by total assets. Thus, the determinant is negatively significant which indicates that, companies that had extremely high leverage in 2011 continue to have higher leverage in 2015.

## Conclusion

In metal and mining sector, the analysis of fixed model proved that firm size and capital intensity are significaant. Hence they adjust towards target leverage. Whereas, net income, non-debt tax shield and market-to book equity ratios R&D are insignificant. As a result they do not adjust towards target leverage. In policy and decision variables change in debt, dividends, dummy variable 1, firm sale of common stock, non-debt current liabilities, stock repurchase are significant. Consequently they adjust towards target leverage. Dummy variables2 are insignificant. Accordingly, they do not adjust towards taget leverage.

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