Impact of Select Independent Variables on Debt - An Analysis with reference to Indian Cement Industry

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The primary objective of the study is to test the effect of specific independent variables on the capital structure through long term debt, leverage measure. Statistical tools like simple regression technique help to predict the determinants of capital structure. Correlation matrix is used to find out the multi collinearity problem among the Independent variables. The study is limited to 10 years (2000-09) only. Depending on the availability of information 30 cement companies are chosen and while selecting the companies the availability of data on various aspects like profitability, tangibility, size, growth and non debt tax shield is given weightage. Non-debt tax shield is not included in small and micro cap because of the multi-collinearity problem. The simple regression results show that profitability, tangibility and non debt tax shield influence the capital structure of companies in Indian cement industry.

Keywords: profitability, tangibility, size, growth, non-debt tax shield.

1. INTRODUCTION

Capitalization refers to the act of deciding in advance the quantum of fund requirement of the firm and its pattern and administration of capital in the interest of the firm. But there is no such thing as the model capital structure for all business undertakings. What type of funds should a firm seek to meet its investment opportunities and in what proportion these funds would be raised are the basic issues that a financial manager has to deal with under capital structure. Among the different alternatives available, the optimum capital structure is to be determined which will maximize the market value per share. The value will be maximized when the marginal real cost of each source of fund is the same. In practice, however, the determination of an optimum capital structure is a formidable task. The capital structure

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differs from industry to industry and also from company to company within an industry. Since a number of factors influence the capital structure decision of a company, the judgement of the person taking the capital structure decision plays a crucial part.

In this study an analysis of capital structure in Indian cement industry is done with reference to selected independent variables. Cement industry has been chosen because it is a capital-intensive industry and requires a much bigger commitment of funds to setup a new business and to expand its capacity further.

2.   REVIEW OF LITERATURE

Modigliani and Sutch (1966)[1] in their article argued that "Optimal" debt structure is achieved at the point where debt and asset structure are matched so as to minimize the uncertainty associated with interest rate fluctuations.

Toy (1974)[2] reported that higher operating risk companies showed some tendency towards higher debt ratio. They found that debt ratios were positively related to growth, typically measured as sales growth and return on investment to be negatively correlated with the debt ratio. They also concluded that the corporate size and the Industry-class do not appear to be determinants of debt equity ratio.

Enrico C. Perotti & Kathryn E. Spier (1993)[3] analyzed the role of leverage in the dynamic conflict between the shareholders and more senior claimants such as creditors, employees and suppliers. They suggested which sectors of the economy may be prone to the use of leverage as a bargaining tool. Specifically industries that are currently very profitable but have strong investment prospects may use a phase of high leverage to transfer a large portion of the return from the new investment to shareholders.

Jitendra Mahakud & Bhole (2003)[4] suggested that the variables like the lagged leverage ratio, the cost of borrowing, the cost of equity, the size of company, the collateral value of assets, the liquidity, and the non-debt tax shield are the major determinants of corporate capital structure in India. They developed the dynamic panel data model, more specifically; the General method of moments (GMM) model for an empirical study of the capital structure in the case of private corporate sector in India. The period analysis has also been done to show the impact of liberalization on the determinants of the corporate capital structure.

Fitim DEARI and Media DEARI (2009)[5] attempted to analyze some determinants of the capital structure decisions of the Macedonian listed companies and a sample of Macedonian unlisted companies from the Pollog region in light of the Static-tradeoff theory, Pecking order theory, and Agency cost

theory. They have selected five independent variables with purpose to see their effect on capital structure. The analysis was conducted based on panel of data obtained from the financial annual reports for the period 2005-2007. The results are consistent with implications first of all of Pecking order theory and then of Static-trade off theory. Agency cost theory was not confirmed in their results, except at size variable for listed companies.

Sudhansu Mohan Sahoo and Omkarnath (2005)[6] analyzed the pattern of financing of the large Public limited companies of India from the year 1980-2003, and examined whether any shift has taken place in the financing pattern of the Indian Corporate Sector after the implementation of financial liberalization in early 1990s. They also discussed all those different factors that determine the debt-equity choice of Indian private sector firms. From this attempt, mixed results are found where profitability, asset structure were found to be most significant factors deciding the capital structure instead of firm size and growth opportunity.

3.   THEORETICAL FRAMEWORK

The capital structure that maximizes the value of the firm is optimal capital structure. To achieve this, the financial manager has to evaluate the relationship between the cost of capital, capital structure and value of the firm. The following approaches explain the impact of relationship among the above:

- Net income (NI) Approach (Relevance of capital structure)
- Net Operating Income (NOI) Approach (Irrevelance of capital structure)
- Traditional Approach (Midway between NI and NOI approaches)
- Modigilani-Miller (M-M) Approach (Irrelevance of capital structure)

4.   SCOPE OF THE STUDY

The present study is proposed to cover the following aspects in the cement companies.

1. Impact of leverage on companies' profitability.
2. Degree of relation between leverage ratio and tangibility of assets.
3. Significant relationship between growth and leverage.
4. Degree of relation between non-debt tax shield and leverage.
5. Significant relationship between size and debt.

5.   OBJECTIVE OF THE STUDY

The primary objective of the study is to test the effect of variables such as profitability, non-debt tax shields, tangibility, growth and size on the capital structure measures through long term debt.

6.   METHODOLOGY

6.1   SOURCES OF INFORMATION

The study is based on secondary data. The secondary data consists of Balance sheet and Profit and Loss Account collected from Prowess and official websites of the companies like money control.com., moneypore.com, etc.

6.2   SAMPLING DESIGN

According to the website, www.cmaindia.org/industry.html, accessed on 22 February 2010, the Indian cement industry comprises 134 large and about 350 mini cement plants, including public sector units. Of these, depending on availability of information 30 cement companies were chosen based on convenient sampling method. While selecting the companies the availability of data on various aspects like profitability, tangibility, size, growth and non debt tax shield was given weightage. The companies were classified into different sizes based on Market capitalization.

6.3   MARKET CAPITALIZATION

Market cap refers to the value or capitalization the market puts on a company. It is calculated by multiplying the price of the share by the number of shares issued. Since the share price typically varies from day to day, the market cap for a particular company also varies from day to day. Market cap helps to classify a company's size.

- Mega cap- Rs.20000 crores and greater.
- Big/large cap-Rs.1000 crores to Rs.20,000 crores. .
- Mid cap- Rs.200 crores to Rs.1000 crores.
- Small cap-Rs.30 crores to Rs.200 crores.
- Micro cap-Rs.5 crores to Rs.30 crores.

6.4   PERIOD OF THE STUDY

The study covers a period of 10 years from 2000 – 2009.

6.5   STATEMENT OF HYPOTHESES

H_{01} :   There is no significant relationship between leverage and profitability.

H_{02} :   There is no significant relationship between leverage and size.

H_{03} :   There is no significant relationship between leverage and tangibility.

H_{04} :   There is no significant relationship between leverage and growth.

H_{05} :   There is no significant relationship between leverage and non debt tax shield.

H_{06} :   There is no significant relationship between leverage and determinant of variables.

6.6   VARIABLES USED IN THE STUDY

6.6.1 DEPENDENT VARIABLE-LG-LEVERAGE

Leverage refers to the percentage of assets financed by debt. Each component of debt – long term, short term and total debt is divided by total assets.[7]

6.6.2 INDEPENDENT VARIABLES

• **PROFITABILITY**

The specific point measure of profitability is the ratio of Earnings before Interest and Tax divided by total assets.[8]

• **SZ-SIZE**

Size of the firm is measured by natural logarithm of the sales.[9]

• **GW-GROWTH**

The study measures the growth as a percentage change in total assets[10]. It is calculated with the help of simple growth rate or percentage increases over the previous year.   It is defined as,

Simple growth rate = $Y_t - Y_{t-1}/Y_{t-1} * 100$

In the above equation y_t stands for value of the variable in the year 't' and y_{t-1} refers to the value of the variable in the preceding year.

• **TG-TANGIBILITY**

Tangibility of assets is measured in this study as the ratio of fixed assets to total assets, taking the gross amount of fixed assets as a numerator.[11]

- **NON-DEBT TAX SHIELD (NDTS)**

In this study annual depreciation charges divided by total assets will be used to calculate Non-debt tax shield.[12]

7. TOOLS USED FOR ANALYSIS

For the purpose of analysis, descriptive statistics are used. Simple regression has been used in order to find out how far the independent variables influence the capital structure of the cement companies. A correlation matrix is used to find out the multi-collinearity problem among the independent variables.

7.1 SPECIFICATION OT THE MODEL

The study uses panel data regression analysis. The panel data analysis facilitates analysis of cross-sectional and time series data. The pooled regression type of panel data analysis is used. The pooled regression also called the constant coefficient model is one where both intercepts and slopes are constant. The cross section company data and time series data are pooled together in a single column assuming there is no significant cross section or temporal effects.[13]

The equation for the regression model will be:

$$LG = \beta_0 + \beta_1(PF) + \beta_2(GT) + \beta_3(TG) + \beta_4(SZ) + \beta_5(NDTS) + e$$

7.2 THE P-VALUE OF A TEST

The P-value test provides an alternative approach to make direct conclusions about the null hypothesis without referring to a table of critical values of the F distribution.

- If the p-value is greater than or equal to chosen level of significance, H_0 is not rejected.

- If the p-value is less than chosen level of significance, H_0 is rejected.[14]

8. LIMITATIONS OF THE STUDY

- The study is based on secondary data collected from the CMIE prowess package and official websites like moneycontrol.com. Therefore the quality of the study depends purely upon the accuracy, reliability and quality of secondary data.

- The size of the sample is limited to 30 cement companies. Therefore the probability of sample error could not be avoided.

- The study is limited to ten year data only (2000-2009). Therefore, a detailed trend covering a lengthy period has not been considered.

- The bases for market capitalization adopted in the study are not a conclusive one.

9.   MULTIPLE COLLINEARITY

Multiple collinearity is a problem of degree. When the degree of correlation is minor among independent regression variables, the effect of multicollinearity may not be serious. In contrast, when there is a strong correlation, then the effect of multicollinearity is serious on the regression as it affects it adversely. In such cases, it is advisable to find out the extent of multicollinearity existing in regression.

To find out multiple collinearity bivariate Correlation among the independent variables was examined. The existence of correlation of about 0.80 or larger indicates that there is problem of multicollinearity (Lewis-Back 1993) [15]. The reason is when variables are highly correlated they both express essentially the same information [16]

Table 1. **Correlation among independent variables in Large cap Companies (A check for multiple collinearity)**

	PROFITABILITY	TANGIBILITY	SIZE	GROWTH	NDTS
PROFITABILITY	1.000				
TANGIBILITY	.059	1.000			
SIZE	.417**	-.251**	1.000		
GROWTH	.433**	-.413**	.248**	1.000	
NDTS	.299**	.666**	-.193*	-.358**	1.000

*Correlation is significant at the 0.05 level (2 tailed)
** Correlation is significant at the 0.01 level (2 tailed)

As it can be seen from the Table1 the highest correlation value is .666 in the large cap. Hence the multiple collinearity is not too severe among the selected independent variables.

Table 2. **Correlation among independent variables in Mid cap Companies**
(A check for multiple collinearity)

	PROFITABILITY	TANGIBILITY	SIZE	GROWTH	NDTS
PROFITABILITY	1.000				
TANGIBILITY	-.033	1.000			
SIZE	.264*	-.335**	1.000		
GROWTH	.207	-.550**	.293**	1.000	
NDTS	-.009	.488**	.152	-.456**	1.000

*Correlation is significant at the 0.05 level (2 tailed)
** Correlation is significant at the 0.01 level (2 tailed)

As it can be seen from Table 2 the highest correlation value is -.550 in the mid cap. Hence examination of correlation among the explanatory variables found no multiple collinearity problems.

Table 3. **Correlation among independent variables in small cap**
(A check for multiple collinearity)

	PROFITABILITY	TANGIBILITY	SIZE	GROWTH	NDTS
PROFITABILITY	1.000				
TANGIBILITY	-.050	1.000			
SIZE	.322*	.027	1.000		
GROWTH	.247	-.504**	.240	1.000	
NDTS	.069	.868**	.016	-.528**	1.000

*Correlation is significant at the 0.05 level (2 tailed)
** Correlation is significant at the 0.01 level (2 tailed)

In small cap, coefficient of correlation for Non-debt tax shield (NDTS) is .868. In general, independent variables having collinearity at .80 or greater should not be included in regression analysis. Hence NDTS has to be removed because when variables are highly correlated they express the same information. The main reason is tangibility increases with every increase in NDTS. Firms subject to other tax shields like tax deductions for depreciation have less need to exploit debt tax shield. Yet, Scott (1977) and Moore (1986)[17] argue that substantial NDTS can act as attractive collateral and so it can induce high debt levels. Firms having large amount of tangibility can raise debt at cheaper rates because of the collateral value of those fixed assets. It shows that Non debt tax shield and tangibility are not independent of each other as NDTS is one of the components in tangibility.

10   ANALYSIS OF LONG TERM DEBT

10.1   ANALYSIS OF SPECIFIC INDEPENDENT VARIABLES

10.1.1 PROFITABILITY

TABLE 6. **RELATIONSHIP OF PROFITABILITY IN LONG TERM DEBT**

	LARGE CAP	MID CAP	SMALL CAP	MICRO CAP	ALL
INTERCEPT	.808 (35.751)*	.815 (4.996)*	1.135 (4.446)*	.855 (12.619)*	.977 (16.067)*
PROFITABILITY	-.515 (-5.886)*	-1.652 (-3.027)*	-1.657 (-6.525)*	-.722 (-1.320)	-1.585 (-12.429)*
R^2	.201	.094	.470	.088	.341
ADJUSTED ^{2}	.195	.084	.459	.038	.339
F-VALUE [p-value]	34.645 (.000)*	9.161 (.003)*	42.581 (.000)*	1.741 (.204)	154.484 (.000)*
D.O.F.	(1,138)	(1,88)	(1,48)	(1,18)	(1,298)

*** Sig. @ 5% level.   *Sig. @ 1% level.

Figures in brackets indicate student 't' values.

From the regression results presented in Table 6   it can be observed that in the capital structure of cement companies, profitability as a determinant of long term debt in case of large cap, mid cap, small cap and overall cement companies is negatively significant. This means that there will be decrease in the long term debt for every increase in profitability. So profitability is an important determinant for large, mid, small cap and overall cement companies. In micro cap it is statistically insignificant.

H_0 :   There is no significant relationship between Profitability and Long term debt.

H_1 :   There is significant relationship between Profitability and Long term debt.

Large cap: H_0 is rejected as per the F value 34.645(p-value.000<.01) and therefore it can be concluded that there is significant relationship between profitability and long term debt.

Mid cap: H_0 is rejected as per the F value 9.161(p-value.003<.01) and it accepts the alternative hypothesis.

Small cap: H_0 is rejected as per the F value 42.581(p-value.000<.01) and it accepts the alternative hypothesis.

Micro cap: H_0 is accepted as per the F value 1.741(p-value.204>.05) and it accepts the null hypothesis.

All: H_0 is rejected as per the F value 154.484(p-value.000<.01) and therefore it can be concluded that there is significant relationship between profitability and long term debt.

10.1.2 TANGIBILITY

TABLE 7. **RELATIONSHIP OF TANGIBILITY IN LONG TERM DEBT**

	LARGE CAP	MID CAP	SMALL CAP	MICRO CAP	ALL
INTERCEPT	.962 (23.695)*	1.559 (34.381)*	1.765 (10.740)*	.804 (12.593)*	1.702 (36.578)*
TANGIBILITY	-.217 (-6.883)*	-.749 (-34.041)*	-1.138 (-14.491)*	-.041 (-.548)	-.877 (-31.710)*
R^2	.256	.929	.814	.016	.771
ADJUSTED ^{2}	.250	.929	.810	-.038	.771
F-VALUE [p-value]	47.375 (.000)*	1.159E3 (.000)*	209.994 (.000)*	.300 (.591)	1.006E3 (.000)*
D.O.F.	(1,138)	(1,88)	(1,48)	(1,18)	(1,298)

*** Sig. @ 5% level.   *Sig. @ 1% level.

Figures in brackets indicate student't' values.

From the regression results presented in Table 7 it can be observed that in the capital structure of cement companies, tangibility as a determinant of long term debt in case of large cap, mid cap and small cap and overall cement companies is negatively significant. Negatively related means there will be decrease in the long term debt for every increase in tangibility. So tangibility is an important determinant for large, mid, small cap and overall cement companies. In micro cap it is statistically insignificant.

H_0 :   There is no significant relationship between Tangibility and Long term debt.

H_1 :   There is significant relationship between Tangibility and Long term debt.

Large cap: H_0 is rejected as per the F value 47.375(p-value.000<.01) and therefore it can be concluded that there is significant relationship between tangibility and long term debt.

Mid cap: H_0 is rejected as per the F value 1.159E3 (p-value.000<.01) and it accepts the alternative hypothesis.

Small cap: H_0 is rejected as per the F value 209.994(p-value.000<.01) and it accepts the alternative hypothesis.

Micro cap: H_0 is accepted as per the F value .300(p-value.591>.05) and it accepts the null hypothesis.

All: $H_{0\ is}$ rejected as per the F value 1.006E3 (p-value.000<.01) and therefore it can be concluded that there is significant relationship between tangibility and long term debt.

10.1.3 GROWTH

TABLE 8. **RELATIONSHIP OF GROWTH IN LONG TERM DEBT**

	LARGE CAP	MID CAP	SMALL CAP	MICRO CAP	ALL
INTERCEPT	.676	.366	.568	.765	.576
	(43.508)*	(2.618)***	(1.506)	(29.811)*	(7.630)*
GROWTH	.000	.003	.000	.000	.001
	(.191)	(1.533)	(.183)	(.857)	(1.028)
R^2	.000	.029	.001	.044	.004
ADJUSTED R^2	-.008	.017	-.022	-.016	.000
F-VALUE [p-value]	.036	2.350	.034	.734	1.056
	(.849)	(.129)	(.856)	(.404)	(.305)
D.O.F.	(1,124)	(1,79)	(1,43)	(1,16)	(1,268)

*** Sig. @ 5% level.   *Sig. @ 1% level.

Figures in brackets indicate student't' values

From the regression results presented in Table 8 it can be observed that in capital structure, growth(percentage change of total assets) as a determinant of long term debt is insignificant in large, mid, small, micro and overall cement companies. Here growth is not an important determinant for large, mid, small, micro and overall cement companies.

H_0 : There is no significant relationship between growth and long term debt.

H_1 : There is significant relationship between growth and Long term debt.

Large cap: H_0 is accepted as per the F-value .036(p-value.849>.05) and therefore it can be concluded that there is no significant relationship between growth and long term debt.

Mid cap: H_0 is accepted as per the F value 2.350(p-value.129>.05) and it accepts the null hypothesis.

Small cap: H_0 is accepted as per the F value .034(p-value.856>.05) and it accepts the null hypothesis.

Micro cap: H_0 is accepted as per the F value .734(p-value.404>.05) and it accepts the null hypothesis.

All: In the overall cement companies H_0 is accepted as per the F-value 1.056[p-value.305>.05] and therefore it can be concluded that there is no significant relationship between growth and long term debt.

10.1.4 SIZE

TABLE 9. **RELATIONSHIP OF SIZE IN LONG TERM DEBT**

	LARGE CAP	MID CAP	SMALL CAP	MICRO CAP	ALL
INTERCEPT	.945 (11.073)*	-.025 (-.043)	3.025 (1.673)	.560 (3.655)*	.641 (2.762)*
SIZE	-.083 (-2.981)*	.206 (.855)	-1.284 (-1.368)	.221 (1.403)	-.011 (-.126)
R^2	.060	.008	.038	.099	.000
ADJUSTED R^2	.054	-.003	.017	.048	-.003
F-VALUE [p-value]	8.885 (.003)*	.732 (.395)	1.870 (.178)	1.968 (.178)	.016 (.900)
D.O.F.	(1,138)	(1,88)	(1,48)	(1,18)	(1,298)

*** Sig. @ 5% level.   *Sig. @ 1% level.

Figures in brackets indicate student 't' values

From the regression results presented in Table 9 it can be observed that size as a capital structure determinant in long term debt is negatively significant in large cap. Negatively related means there will be decrease in long term debt for every increase in size and vice versa. In mid, small,

micro and overall cement companies size is insignificant. Hence size is an important determinant for large cap.

> H_0 : There is no significant relationship between size and long term debt.

> H_1 : There is significant relationship between size and long term debt.

Large cap: H_0 is rejected as per the F value 8.885 (p-value.003<.05) and therefore it can be concluded that there is significant relationship between size and long term debt and it accepts the alternative hypothesis.

Mid cap: H_0 is accepted as per the F-value .732(p-value.395>.05) and therefore it can be concluded that there is no significant relationship between size and long term debt.

Small cap: H_0 is accepted as per the F-value 1.870(p-value.178>.05) and therefore it can be concluded that there is no significant relationship between size and long term debt.

Micro cap: H_0 is accepted as per the F value 1.968(p-value.178>.05) and it accepts the null hypothesis.

All: In the overall cement companies H_0 is accepted as per the F-value .016(p-value.900>.05) and therefore it can be concluded that there is no significant relationship between size and long term debt.

10.1.5 NON DEBT TAX SHIELD

TABLE 10. **RELATIONSHIP OF NDTS IN LONG TERM DEBT**

	LARGE CAP	MID CAP	SMALL CAP	MICRO CAP	ALL
INTERCEPT	.722 (32.850)*	1.451 (.923)	NA	NA	1.448 (22.435)*
NDTS	-.470 (-1.593)	2.743 (.144)	NA	NA	-15.105 (-18.148)*
R^2	.018	.000	NA	NA	.525
ADJUSTED R^2	.011	-.011	NA	NA	.523
F-VALUE	2.536 (.114)	.021 (.886)	NA	NA	329.344 (.000)*
D.O.F.	(1,138)	(1,88)	NA	NA	(1,298)

*** Sig. @ 5% level.   *Sig. @ 1% level. NA-not applicable.

Figures in brackets indicate student't' values

From the regression results presented in Table 10 it can be observed that Non-debt tax shield as a capital structure determinant in long term debt is insignificant in large cap and mid cap. So non-debt tax shield is not a determinant for large and mid cap. Non debt tax shield is not included in small cap and micro cap because of multiple collinearity problems. However for the overall cement companies non-debt tax shield is negatively significant. Negatively related means that there will be decrease in the long term debt for every increase in non debt tax shield and vice versa.

H_0 : There is no significant relationship between Non-debt tax shield and Long term debt.

H_1 : There is significant relationship between Non-debt tax shield and Long term debt.

Large cap: H_0 is accepted as per the F-value 2.536 (p-value .114>.05) and therefore it can be concluded that there is no significant relationship between NDTS and long term debt.

Mid cap: H_0 is accepted as per the F-value .021(p-value.886>.05) and it accepts the null hypothesis.

Small cap and Micro cap: Non debt tax shield is not applicable because of multicollinearity problem.

All: In the overall cement companies H_0 is rejected as per the F-value 329.344(p-value.000<.01) and therefore it can be concluded that there is significant relationship between Non debt tax shield and long term debt.

11.   FINDINGS OF SPECIFIC INDEPENDENT VARIABLES IN LONG TERM DEBT

LONG TERM DEBT	LARGE CAP	MID CAP	SMALL CAP	MICRO CAP	ALL
PROFITABILITY	*	*	*	-	*
TANGIBILITY	*	*	*	-	*
SIZE	*	-	-	-	-
GROWTH	-	-	-	-	-
NDTS	-	-	NA	NA	*

Profitability and tangibility are statistically significant at 1% in large cap, mid cap, small cap and overall cement companies. In micro cap they are statistically insignificant.

Size is statistically significant at 1% in large cap but it is statistically insignificant in mid, small and micro cap.

Non debt tax shield is statistically significant in overall cement companies but it is statistically insignificant in large and mid cap. Non debt tax shield is not included in small and micro cap because of multi collinearity problem.

12.   CONCLUSION

Capital structure and the determinants have been the primary subjects of research in the area of corporate finance. The most appropriate capital structure is the one which is most advantageous to the shareholders. This can be done by analyzing and balancing all those factors which are relevant to the company's capital structure decision. Hence while designing the capital structure the interest of the shareholders should be kept in mind.

The determinants of capital structure in Indian cement companies are examined with the specific independent variables. The following table concludes the findings of the study.

SUMMARY OF IMPORTANT DETERMINANTS OF CAPITAL STRUCTURE FROM THE SPECIFIC INDEPENDENT VARIABLES

LARGE CAP	MID CAP	SMALL CAP	MICRO CAP	OVERALL CEMENT COMPANIES
Profitability, tangibility and size	Profitability and tangibility	Profitability and tangibility	nil	Profitability, tangibility and NDTS

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