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## Corporate leverage and its impact on profitability: A panel data approach

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### Abstract

The survival of a firm for a long period of time depends on its earning capacity. Earning capacity plays an essential role in leverage decision. In general the profitable companies are able to tolerate high level of debt, by virtue of their ability to meet the financial obligations on time. The profit earning companies can easily add more debt in their capital structure. In this backdrop, the study makes an attempt to examine the impact of leverage on profitability for the period 1995-96 to 2009-10. A panel data approach has been applied to analyse the data. The study reveals that the leverage has a significant influence on profitability.

**Keywords:** Earning capacity, Leverage, Profitability

### 1. Introduction

Funds can be mobilized from two major sources, namely, debt and equity. Debt is a cheaper source of funds which carries a regular rate of return. Generally the firms prefer to gear their equity capital with borrowed funds to enrich the shareholders' wealth. The survival of a firm for a long period of time depends on its earning capacity. Earning capacity plays an essential role in leverage decision. In general the profitable companies are able to tolerate high level of debt, by virtue of their ability to meet the financial obligations on time. The ability to make profits depends on the capacity and activity of a business. Capacity refers to the competence of a management to procure funds from right source at right time to finance the assets, whereas, activity measures the efficiency of a firm in the utilization of the assets in enhancing its earning capacity. Hence, the study focuses on the analysis of leverage and its impact on profitability.

### 2. Review of Literature

Debasish Sur, Kaushik Chakraborty and Parveen Begam (2009) <sup>[2]</sup> have conducted a study on "Financial leverage and owners' return: A study on their relationship with reference to selected Indian companies". A number of theoretical studies have stated that a company can increase Earnings per Share by employing a higher amount of debt funds in their capital structure; thereby the efficient management of financial leverage is essential to create shareholder value. The main aim of the research is to examine the relationship between financial leverage on owners' return and also to measure the effect of financial leverage on owners return. A sample of fifty Indian companies from different industries has been chosen by them for a period of 8 years from 1995-96 to 2004-05 by using purposive sampling procedure. They have used financial leverage ratios, such as, Debt Equity ratio and Interest Coverage ratio in their study. Owners return has been measured by Earnings per Share. The degree of relationship between financial leverage and owners return has been assessed through correlation coefficients. Multiple correlation and multiple regression techniques have been used to study the joint influence of the selected measures relating to financial leverage on owners' return. The computed values of correlation co-efficient, partial regression coefficient and multiple correlation have been tested by 't' and 'F' test. The study has revealed that in majority of the companies there has been a significant effect of financial leverage on owners' return during the post liberalization era.

Mehdi Moradi, Mahdi Salehi and Zakiheh Erfanian (2010) <sup>[3]</sup> have conducted a study on "Effect of Financial Leverage on Earnings Response Coefficient through Income approach;

Iranian evidence". The objective of the study is to examine the relationship between financial leverage and the earnings response coefficient. They have taken a sample of 98 companies from Tehran Stock Exchange. They have applied descriptive statistics and inferential statistics, namely, multiple regressions to analyse the data. Abnormal return of stock (actual return of stock – expected return of stock) has been taken as a dependent variable. The variables, such as, unexpected earnings (the difference of actual earnings per share and its foreseen earnings) and the degree of financial leverage have been taken as independent variables. They have calculated stock returns on annual basis. They have classified the firms into high levered firms and lowlevered firms on the basis of mean value. The study has revealed that there is a significant relationship between account earnings and stock return. The study has concluded that the earnings response coefficient is larger in low levered firms than the high-levered firms.

### 3. Miscellaneous Manufacturing Sector

According to Centre for Monitoring Indian Economy Pvt Ltd (CMIE database), the manufacturing companies, which have been not covered in any other major manufacturing groups, such as, Food and beverage, textiles, chemicals, non-metallic, metals, machinery and transport equipment fall under the miscellaneous manufacturing sector. For ex: paper industry, leather industry and wood industry.

Independent Variables	Formulae
Long Term Debt ratio (LTD)	Long Term Debt / Total Assets
Short Term Debt ratio (STD)	Short Term Debt / Total Assets
Interest Coverage ratio (IC)	PBIT net of P&E / Interest Paid
Financial Leverage(FL)	PBIT net of P&E / PBT net of P&E
Operating Leverage(OL)	Contribution / PBIT net of P&E
Combined Leverage(CL)	Contribution / PBT net of P&E
Working Capital Leverage(WCL)	Percentage change in Return on Investment / Percentage change in Current Assets Where, Return on Investment = PBIT net of P&E / Total Assets

The dependent variables are Return on Total Assets (ROTA), Return on Net worth (RONW), Return on Capital Employed (ROCE), Earnings per Share (EPS) and Price Earnings (P/E) Ratio.

Dependent Variables	Formulae
<b>Profitability Metrics</b>	
Return on Total Assets (ROTA)	PAT net of P&E / Average Total Assets
Return on Net worth (RONW)	PAT net of P&E / Average Net Worth
Return on Capital Employed (ROCE)	PAT net of P&E / Average Capital Employed
Earnings per Share (EPS),	Net profit after tax and preference dividend / No of equity shares
Price Earnings Ratio (P/E)	Market Price per Share / Earnings Per Share

## 7. Research Methodology

### 7.1 Source of Data

The study is primarily based on secondary data. The data has been collected from PROWESS 3.1 version maintained by Centre for Monitoring Indian Economy Pvt Ltd.

## 4. Objectives of the Study

- To analyse the profitability position
- To examine the impact of leverage on profitability

## 5. Hypothesis

The following null hypothesis has been framed for the purpose of the study:

- Leverage does not influence the profitability

## 6. Framework of the Study

To ascertain the impact of leverage from its different dimensions on profitability, the variables, namely, Long Term Debt ratio, Short Term Debt Ratio, Total Debt to Asset Ratio, Debt to Equity ratio, Capital Gearing ratio, Interest Coverage ratio, Fixed Assets to Funded Debt ratio, Current Liabilities to Proprietor Fund ratio, Ratio of Reserves to Equity Capital, Total Investment to Long Term Liabilities ratio, Financial Leverage, Operating Leverage, Combined Leverage, and Working Capital Leverage have been considered. To avoid inter-dependence of variables (multi-collinearity), correlational analysis has been employed with 0.75 as the cutoff point. Those variables with R values less than the cutoff point have been selected for the purpose of the analysis. The variables that are finally chosen as leverage dimensions to ascertain the impact on profitability are Long Term Debt (LTD) ratio, Short Term Debt (STD) ratio, Interest Coverage (IC) ratio, Financial Leverage(FL), Operating Leverage(OL), Combined Leverage(CL) and Working Capital Leverage(WCL), which are considered as independent variables.

## 7.2 Period of Study

The study has covered a period of 15 financial years from post-liberalisation era, namely, 1995 -1996 to 2009- 2010.

## 7.3 Sampling Design

A sample of 19 firms, which have been listed at both BSE and NSE stock exchange by applying purposive sampling technique have been taken for the study.

## 7.4 Tools for Analysis

- Summary statistics, such as, mean, median, standard deviation, co-efficient of variation, skewness and kurtosis have been applied to study the characteristics of the selected ratios. The growth measure, namely Annual Growth Rate (AGR), has been computed to study the growth of the selected ratios during the period of study.

## Panel Data analysis

- Pooled OLS regressions, Panel data regression with Fixed Effect and Random Effect have been applied to analyse the data. Two tests have been carried out to decide the appropriateness of these three models. Initially, the Lagrange multiplier test has been applied to find the existence of panel effect in the values. The classical

model (Pooled OLS) and the Random Effect model are compared and when there is no panel effect, the pooled OLS has been chosen for further analysis; otherwise, the Random Effect model has been chosen for the next step of application. As a second step, the Random Effect model is compared with Fixed Effect model using

Hausman Specification test and the appropriate model is chosen for further analysis based on the significance of the chi-square value.

## 8. Results and Discussion

### 8.1 Profitability

**Table 1:** Profitability measures

Years	ROTA	RONW	ROCE	EPS	P/E
1996	11.453	23.221	18.465	30.696	4.973
1997	5.927	11.232	9.827	27.349	3.669
1998	5.395	10.879	9.547	14.411	0.345
1999	4.138	5.941	6.568	9.185	3.353
2000	4.666	7.823	7.177	13.021	6.425
2001	3.566	5.211	5.976	7.471	3.805
2002	2.887	4.764	4.972	6.581	1.763
2003	2.982	3.748	5.192	8.191	4.541
2004	3.751	8.031	6.904	8.098	7.086
2005	4.283	3.106	7.323	9.830	10.392
2006	4.941	16.513	8.335	7.497	10.013
2007	4.904	14.353	8.289	9.243	8.672
2008	5.763	17.083	9.955	11.650	14.812
2009	3.339	10.012	5.238	9.144	16.377
2010	4.082	10.094	6.298	10.798	8.356
Mean	4.805	10.134	8.004	12.211	6.972
Median	4.283	10.012	7.177	9.243	6.425
S.D	2.067	5.672	3.331	7.177	4.559
C.V	48.257	56.653	46.411	77.650	70.956
Skewness	2.578	0.874	2.391	2.045	0.713
Kurtosis	8.208	0.426	7.160	3.359	0.032
AGR	-3.914	22.728	-3.958	-2.883	73.419

The table 1 reveals that the sector has registered an increasing trend in the profitability measures during the years 2000 and 2008. A decreasing trend has been found during the years 1997, 1998, 2001 and 2002. The sector has recorded a positive skewness and kurtosis for all the variables taken for the study. The sector has shown a positive annual growth rate for the variables, namely, RONW and P/E ratio.

#### 8.2.1 Return on Total Assets

The dependent variable (ROTA) has been regressed with the independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL with the following null hypothesis.

*H<sub>01</sub>: "The independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL do not have a significant influence on ROTA"*

#### 8.2 Impact of Leverage on Profitability – A panel data approach

The panel data analysis reveals the following results:

**Table 2:** ROTA -Pooled OLS and Panel Data Regression

	Pooled OLS			Fixed Effect			Random Effect		
	B	t-value	Sig.	B	t-value	Sig.	B	z-value	Sig.
(Constant)	5.161	4.603	**	13.94735	5.65	**	12.75369	6.36	**
Long term debt ratio	-11.017	-4.817	**	-12.37413	-3.32	**	-11.33313	-3.44	**
Short term debt ratio	-.205	-.086	NS	-4.859376	-0.94	NS	-.8891465	-0.23	NS
Interest coverage ratio	.283	8.570	**	.1158911	3.51	**	.118466	3.79	**
Financial Leverage	.247	1.305	NS	-.3040321	-1.70	NS	-.3076478	-1.79	NS
Operating leverage	-0.0246	-2.241	*	-1.008723	-5.27	**	-1.048431	-5.90	**
Combined leverage	-0.0244	-1.584	NS	.0271943	1.95	NS	.0277984	2.07	*
Working Capital Leverage	0.00203	.811	NS	.0042346	0.41	NS	.0035687	0.36	NS
R <sup>2</sup>	.388			0.5419			0.5385		
F-statistic	23.018		**	14.70		**			
Wald (chi square)							122.54		**
Hausman (chi square)				5.48		NS			
LM (chi square)							2.87		NS

**Source:** Computed \* significant at 5 per cent level \*\* significant at 1 per cent level

The table 2 has shown that the sign of the regression coefficient are similar for the independent variables in FE and RE models and they differ in the pooled OLS model. The R<sup>2</sup> values have shown a high correlation between the dependent and independent variables. The F-statistics and wald chi – square test have revealed that independent variables have explained the dependent variable.

The result of LM test shows that the chi-square value has not been statistically significant. Hence, the panel effect does not exist. Therefore, the pooled OLS model serves as an appropriate model to find the influence of leverage on ROTA. The pooled OLS model exhibits that the variable, namely, IC ratio has a significant positive effect on ROTA and the other variables, namely, LTD ratio and OL have a significant negative effect on ROTA. Hence, the null hypothesis (H<sub>01</sub>) has been rejected in respect of these variables.

The variables, namely, STD ratio, FL, CL and WCL have not had a significant influence on ROTA. Hence, the null

hypothesis (H<sub>01</sub>) has been accepted with reference to these variables.

In a nut shell, it is found that for the miscellaneous sector, the IC ratio has favored the ROTA, enhancing the profitability position of the sector. The other significant factors, namely, LTD ratio and OL have not significantly favoured the ROTA, which on establishment of an optimal capital structure would improve the profitability of this sector.

**8.2.2 Return on Net worth**

The dependent variable (RONW) has been regressed with the independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL with the following null hypothesis.

*H<sub>02</sub>: “The independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL do not have a significant influence on RONW”*

**Table 3:** RONW- Pooled OLS and Panel Data Regression

	Pooled OLS			Fixed Effect			Random Effect		
	B	t-value	Sig.	B	t-value	Sig.	B	z-value	Sig.
(Constant)	8.812	1.920	NS	16.59662	2.3	*	11.01865	2.52	*
Long term debt ratio	-22.232	-2.375	*	9.843049	0.9	NS	18.64353	2.28	*
Short term debt ratio	5.461	.558	NS	19.91863	1.32	NS	38.24729	4.58	**
Interest coverage ratio	.529	3.911	**	0.193739	2.01	*	0.191692	2.24	*
Financial Leverage	1.378	1.782	NS	-1.67264	-3.19	**	-1.81405	-3.68	**
Operating leverage	-.132	-2.949	**	-2.13646	-3.82	**	-2.54967	-5.38	**
Combined leverage	-.107	-1.692	NS	0.126739	3.1	**	0.139491	3.63	**
Working Capital Leverage	.014	1.384	NS	-0.01705	-0.56	NS	-0.0189	-0.66	NS
R <sup>2</sup>	.166			0.3714			0.3621		
F-statistic	7.223		**	7.34		**			
Wald (chi square)							84.19		**
Hausman (chi square)				9.53		NS			
LM (chi square)							0.10		NS

Source: Computed \* significant at 5 per cent level \*\* significant at 1 per cent level

It is clear from the table 3 that the signs of the regression coefficient of the independent variables have been the same for the FE and RE models and they differ in the pooled OLS model. The R<sup>2</sup> values have revealed a moderate correlation between the selected independent variables and the dependent variable. The F test and Wald chi-square test have shown a significant value at one per cent level implying the existence of significant correlation between the independent variables and the RONW.

The result of LM test reveals that the chi-square value (0.10) has not been statistically significant revealing that the pooled OLS model is considered better than RE model. In all the three models applied, the pooled OLS model is preferred to panel data model.

The pooled OLS model has exhibited that the IC ratio has a significant positive impact on RONW and the variables, namely, LTD ratio and OL have a significant negative effect on RONW. Hence, the null hypothesis (H<sub>02</sub>) has been rejected for these variables.

The rest of the variables, such as, STD ratio, FL, CL and WCL

have not had a significant influence on RONW. Hence, the null hypothesis (H<sub>02</sub>) has been accepted with reference to these variables.

To conclude, it is inferred that the IC ratio, LTD ratio and OL are the significant determinants of RONW. Among these, only the IC ratio has been found to have favoured the RONW and the other two variables, namely, LTD ratio and OL have not favored the RONW. The elimination of negative effect by altering its leverage position would strengthen the performance of a sector.

**8.2.3 Return on Capital Employed**

The dependent variable (ROCE) has been regressed with the independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL with the following null hypothesis.

*H<sub>03</sub>: “The independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL do not have a significant influence on ROCE”*

**Table 4:** ROCE- Pooled OLS and Panel Data Regression

	Pooled OLS			Fixed Effect			Random Effect		
	B	t-value	Sig.	B	t-value	Sig.	B	z-value	Sig.
(Constant)	6.051	3.074	**	19.3635	4.48	**	16.10994	5.2	**
Long term debt ratio	-18.878	-4.701	**	-20.8603	-3.2	**	-17.2022	-3.16	**
Short term debt ratio	8.230	1.961	NS	4.400257	0.49	NS	14.61259	2.41	*
Interest coverage ratio	.474	8.168	**	0.209808	3.64	**	0.203813	3.8	**
Financial Leverage	.412	1.243	NS	-0.49589	-1.58	NS	-0.53005	-1.77	NS
Operating leverage	-.053	-2.751	**	-1.68419	-5.03	**	-1.80444	-5.99	**
Combined leverage	-.042	-1.554	NS	0.043653	1.79	NS	0.046587	2	*
Working Capital Leverage	.0043	.988	NS	0.000446	0.02	NS	-0.00234	-0.13	NS
R <sup>2</sup>	.389			0.5508			0.5430		
F-statistic	23.111		**	15.24		**			
Wald (chi square)							133.16		**
Hausman (chi square)				7.35		NS			
LM (chi square)							2.70		NS

Source: Computed \* significant at 5 per cent level \*\* significant at 1 per cent level

It is evident from the table 4 that the sign of the regression coefficients have been similar for all the independent variables, except for the variable-WCL. The R<sup>2</sup> values have shown a high correlation between the selected independent variables and the ROCE both in the FE model and the RE model. A moderate correlation has noticed in the pooled OLS model. The F test and Wald chi-square test shows the significant values at one per cent level indicating the existence of significant correlation between the selected independent variables and the ROCE.

The LM test has depicted that the chi-square value (2.70) has not been statistically significant inferring that there is no panel effect. Hence the pooled OLS model serves as an appropriate model to study the influence of leverage on ROCE.

The pooled OLS model has evidenced that the IC ratio has a significant positive effect on ROCE and the variables, namely, LTD ratio and OL have a significant negative effect on ROCE. Hence, the null hypothesis (H<sub>03</sub>) has been rejected in respect of these variables.

Majority of the variables, such as, STD ratio, FL, CL and WCL have not been statistically significant. Hence, the null hypothesis (H<sub>03</sub>) has been accepted in respect of these variables.

In the miscellaneous sector, the LTD ratio, IC ratio and OL are the significant factors of ROCE. The IC ratio, which has supported the ROCE, would improve the profitability and the financial position of the sector. The elimination of negative effect of LTD ratio and OL by altering its debt – equity position would strengthen the performance of the sector.

**8.2.4 Earnings per Share**

The dependent variable (EPS) has been regressed with the independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL with the following null hypothesis.

*H<sub>04</sub>: “The independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL do not have a significant influence on Earning per Share”*

**Table 5:** EPS-Pooled OLS and Panel Data Regression

	Pooled OLS			Fixed Effect			Random Effect		
	B	t-value	Sig.	B	t-value	Sig.	B	z-value	Sig.
(Constant)	8.521	1.328	NS	-5.94922	-0.18	NS	15.79439	0.87	NS
Long term debt ratio	-7.372	-.563	NS	-21.771	-0.45	NS	10.19948	0.29	NS
Short term debt ratio	3.706	.271	NS	85.31915	1.25	NS	16.37059	0.48	NS
Interest coverage ratio	.488	2.578	*	0.385963	0.9	NS	0.426065	1.16	NS
Financial Leverage	.469	.434	NS	0.7069	0.3	NS	-0.8843	-0.41	NS
Operating leverage	-.035	-.552	NS	-1.27506	-0.49	NS	-1.99955	-0.95	NS
Combined leverage	-.030	-.335	NS	-0.0415	-0.23	NS	0.088113	0.52	NS
Working Capital Leverage	.0083	.582	NS	-0.01473	-0.1	NS	-0.03337	-0.25	NS
R <sup>2</sup>	.040			0.0516			0.0253		
F-statistic	1.512		NS	0.65		NS			
Wald (chi square)							3.88		NS
Hausman (chi square)				4.66		NS			
LM (chi square)							4.56		*

Source: Computed \* significant at 5 per cent level \*\* significant at 1 per cent level

It is inferred from the table 5 that the sign of the regression coefficients have been different in all the three models. The R<sup>2</sup> values have revealed a low correlation between the selected independent variables and the dependent variable. The F-value and Wald chi-square have not had a significant correlation between the selected independent variables and the EPS.

The result of LM test shows that the chi-square value (4.56) is significant at one per cent level. Hence, the RE model is more effective than pooled OLS model.

The Hausman specification test reveals that the chi square value (4.66) has not been significant. Hence, the RE model is preferred. In all the three models applied, the RE model serves as an appropriate model to analyse the influence of leverage

on EPS.

The RE model has evidenced that all the independent variables taken for the study have not had a significant influence on EPS. Hence, the null hypothesis ( $H_{04}$ ) has been accepted for all these variables. In a nutshell, it is found in the miscellaneous sector, the leverage has not effectively influenced the EPS.

### 8.2.5 Price Earnings Ratio

The dependent variable (P/E ratio) has been regressed with the independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL with the following null hypothesis.

$H_{05}$ : "The independent variables, namely, LTD ratio, STD ratio, IC ratio, FL, OL, CL and WCL do not have a significant influence on Price Earnings Ratio"

**Table 6:** P/E-Pooled OLS and Panel Data Regression

	Pooled OLS			Fixed Effect			Random Effect		
	B	t-value	Sig.	B	t-value	Sig.	B	z-value	Sig.
(Constant)	11.637	2.672	**	0.979685	0.05	NS	-6.27028	-0.43	NS
Long term debt ratio	-11.704	-1.318	NS	32.31131	1.1	NS	29.75914	1.2	NS
Short term debt ratio	-11.986	-1.291	NS	-44.8168	-1.09	NS	-21.7574	-0.76	NS
Interest coverage ratio	-.0085	-.066	NS	0.245023	0.95	NS	0.208816	0.88	NS
Financial Leverage	1.317	1.794	NS	-0.36898	-0.26	NS	-0.00424	0	NS
Operating leverage	.0082	.191	NS	4.085894	2.62	**	4.197201	3	**
Combined leverage	-.084	-1.404	NS	-0.02566	-0.23	NS	-0.05499	-0.54	NS
Working Capital Leverage	-.0011	-1.110	NS	-0.07414	-0.86	NS	-0.07102	-0.88	NS
R <sup>2</sup>	.023			0.1055			0.1009		
F-statistic	.850		NS	1.42		NS			
Wald (chi square)							10.60		NS
Hausman (chi square)				2.07		NS			
LM (chi square)							0.81		NS

Source: Computed \* significant at 5 per cent level \*\* significant at 1 per cent level

It is inferred from the table 6 that the sign of the regression coefficients have been the same in the FE and RE model and they differ in the pooled OLS model. The R<sup>2</sup> values of all the three models have revealed a low correlation between the selected independent variables and the P/E ratio. The F-value and Wald-chi-square value have shown that there is no significant correlation between the selected independent variables and the P/E ratio.

The result of LM test shows that chi-square value (0.81) is not significant; thereby the pooled OLS model has been preferred to RE model.

The pooled OLS model has revealed that all the independent variables have not had a significant influence on P/E ratio. Hence, the null hypothesis ( $H_{05}$ ) has been accepted for these variables. In respect of the miscellaneous sector, the leverage

has not revealed an effective influence on P/E ratio.

### 9. Conclusion

Among the years of the study period, 2000 and 2008 have been found to be a 'turnaround' year. There is no mentionable effect found on EPS and P/E due to its leverage policy. The LTD ratio and OL have played a very trivial role for the improvement of ROTA, RONW and ROCE. It is concluded that the interest coverage ratio has played a dominant role in influencing the profitability.

### Appendix 1

**A sample of 19 firms taken for the study is given below: Miscellaneous Manufacturing sector**

S. No	Name of the Companies
1	Andhra Pradesh Paper Mills Ltd
2	Bhartiya International Ltd
3	Camlin Ltd
4	Genus Power Infrastructures Ltd
5	Kirloskar Industries Ltd
6	Mangalam Timber Products Ltd
7	Mirza International Ltd
8	Novopan Industries Ltd
9	Pudumjee Industries Ltd
10	Pudumjee Pulp & Paper Mills Ltd
11	Rainbow Papers Ltd
12	RelaxoFootwears Ltd
13	Sambhaav Media Ltd
14	Sandesh Ltd
15	Seshasayee Paper & Boards Ltd
16	Shreyans Industries Ltd
17	Sirpur Paper Mills Ltd
18	South India Paper Mills Ltd
19	West Coast Paper Mills Ltd

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