



Financial Structure And Risk Analysis A Non-Parametric Approach Using Kruskal-Wallis Test On Paper Industry In Uttarakhand

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Abstract:

Purpose:

This research aims to analyze the financial structure of selected paper companies in Uttarakhand to evaluate their solvency and leverage positions. The research emphasizes understanding how different financial ratios and capital structure components influence the financial stability and risk profile of these companies.

Methodology:

The research follows a descriptive and analytical approach by secondary data from the published financial statements of five paper companies for the period 2019–20 to 2024–25. The study employs key financial ratios, including Interest Coverage Ratio, Debt-Equity Ratio, Financial Leverage Ratio, and Fixed Assets to Long-Term Debt Ratio. Additionally, the Kruskal-Wallis H test, a non-parametric statistical test, has been applied to determine significant differences among the companies. Data analysis was conducted using MS Excel and SPSS software.

Findings:

The study discloses significant differences in the financial structure and solvency ratios crosswise the selected companies. Companies with a balanced mix of debt and equity determine better financial health and sustainability related to highly leveraged firms. The Kruskal-Wallis test results indicate that significant variations occur in certain financial ratios among the companies.

Value:

This research offers valuable insights into the importance of maintaining an optimal financial structure within the paper industry. The findings can assist financial managers, investors, and policymakers in making informed decisions regarding capital structure strategies to ensure long-term viability.

Index Terms - Financial Structure, Capital Structure, Debt-Equity Ratio, Interest Coverage Ratio, Financial Leverage, Kruskal-Wallis Test, Paper Industry. C(companies name)

I. INTRODUCTION

Financial structure, often referred to as capital structure, represents the proportion of debt and equity that a firm uses to finance its assets and operations. It is a critical aspect of corporate financial management, as it directly impacts profitability, risk exposure, and overall financial sustainability. A well-designed financial structure enables firms to optimize the cost of capital, maximize shareholder wealth, and maintain operational flexibility. Conversely, an imbalanced capital structure can lead to financial distress, increased borrowing costs, and restricted growth opportunities. The paper industry in India, particularly in Uttarakhand, is capital-intensive and characterized by high fixed costs and competitive pricing. Companies in this sector require substantial long-term funds for setting up manufacturing units, purchasing machinery, and sustaining working capital needs. As such, decisions related to debt-equity mix become crucial in determining the financial health and solvency of firms. Analyzing financial ratios such as Interest Coverage Ratio, Debt-Equity Ratio, Financial Leverage Ratio, and Fixed Assets to Long-Term Debt Ratio provides valuable insights into the capital structure and risk profile of companies. Furthermore, statistical testing, such as the Kruskal-Wallis H test, helps identify whether there are significant differences in the financial structure across companies. This study focuses on evaluating the financial structure of five selected paper companies in Uttarakhand over a five-year period to identify patterns, differences, and implications for managerial decision-making.

Literature Review

The Rajan and Zingales (1995) conducted the research on capital structure in an international context and concluded that leverage varies across countries, influenced by institutional environments and financial market development. Their study highlights the importance of industry-specific analysis. *Reference: Rajan, R. G., & Zingales, L. (1995).*

The Modigliani and Miller (1958) introduced the *irrelevance theory* of capital structure, which argues that in a perfect market without taxes, bankruptcy costs, or agency problems, a firm's value is unaffected by its capital structure. However, they acknowledged that in the real world, imperfections like taxes and financial distress costs influence financing decisions. *Reference: Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance, and the theory of investment. American Economic Review, 48(3), 261–297.*

The Myers (1984) developed the *pecking order theory*, suggesting that firms prioritize financing through internal funds, then debt, and lastly, equity. This theory indicates that firms' financing choices depend on minimizing costs associated with information asymmetry. *Reference: Myers, S. C. (1984). The capital structure puzzle. The Journal of Finance, 39(3), 574–592.*

The Jensen and Meckling (1976) emphasized the role of agency costs in capital structure decisions. They argued that conflicts of interest between shareholders and debt holders affect a firm's choice between debt and equity, influencing financial leverage.

Reference: Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), 305–360.

The Titman and Wessels (1988) analyzed determinants of capital structure and found that factors like asset structure, firm size, and growth opportunities significantly affect leverage. They observed that firms with more tangible assets tend to borrow more due to collateral availability. *Reference: Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. The Journal of Finance, 43(1), 1–19.*

The Booth et al. (2001) conducted a research on capital structures in developing countries and concluded that while similar determinants influence leverage globally, factors like inflation and institutional frameworks make significant differences in emerging markets compared to developed ones. *Reference: Booth, L., Aivazian, V., Demirguc-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. The Journal of Finance, 56(1), 87–130.*

Objectives of the Study

1. To analyze the financial structure of selected paper companies in Uttarakhand using key financial ratios such as Interest Coverage Ratio, Debt-Equity Ratio, Financial Leverage Ratio, and Fixed Assets to Long-Term Debt Ratio.
2. To examine the differences in financial structure among the selected companies through statistical analysis using the Kruskal-Wallis H test.
3. To provide insights and recommendations for optimizing capital structure to improve financial stability and reduce risk in the paper industry.

Research Methodology

The present study adopts a descriptive and analytical research design to examine the financial structure of selected companies in the paper industry. The research is based on a sample of five paper companies operating in Uttarakhand over a study period of five years (2019–20 to 2024–25). The data used for the analysis is purely secondary in nature, collected from the published financial statements of the selected companies. To achieve the research objectives, the study employs **ratio** analysis as the primary tool, focusing on key financial indicators such as Interest Coverage Ratio, Debt-Equity Ratio, Financial Leverage Ratio, and Fixed Assets to Long-Term Debt Ratio. Additionally, to test for significant differences in the financial performance of the companies, the Kruskal-Wallis H test, a non-parametric statistical technique, has been applied. The computations and statistical tests were performed using MS Excel and SPSS software for greater accuracy and reliability of results.

Interpretations and Finding

1. Interest Coverage Ratios:

This ratio measures the Margin of Safety (MOS) between the earning and interest liability of the firm. If the ratio is high it means the firm can easily meet the interest burden even if the firm EBIT (earning before

interest and tax) suffer a significant decline. A low ratio can result financial mortification, if earning decline

Table No. 1.2

Kruskal Wallis one-way analysis of variance test of Interest Coverage Ratio **Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Interest Coverage Ratio	25	5.1252	8.91833	.31	46.00
COMPANY	25	3.0000	1.44338	1.00	5.00

or goes down.

The ratios have been compared for their ranks using Kruskal wallis H test. As our data does not show normality that motivated us to apply Kruskal wallis H test, which is a non parametric test. It has been hypothesized that *“there is no significant difference between means ranks of five companies’ Interest coverage ratio.”*

The above set hypothesis has been tested at 5 percent level of significance. Results are presented in the

Table No.1.1

Kruskal Wallis one-way analysis of variance test of Interest Coverage Ratio (**Ranks**)

Interest Coverage Ratio	COMPANY	N	Mean Rank
	C1	5	17.00
	C2	5	19.80
	C3	5	11.40
	C4	5	11.80
	C5	5	5.00
	Total	25	

Table No.1.3

Kruskal-Wallis Test- H test for (Interest Coverage Ratio)

Chi-Square	12.027
Df	4
P Value	.017

Results shows that,

p value (0.017) is ≤ 0.05 that shows a statistically significant difference and rejects to our null hypothesis (H_{01}) that,

“There is no significant difference between five companies for their interest Coverage Ratio” and accept to the alternative.

From the results of Kruskal Wallis H Test we also infer that, there is a different in interest coverage ratio of selected companies.

2. Debt Equity Ratio

The financial, liquidity that compares a company's total debt to total equity is a debt equity ratio. This ratio is also known as “internal-external equity ratio”. Its gives an idea of how much debt (means borrowed capital) can be fulfilled in the event of liquidation using shareholder contribution. This ratio measures the riskiness of a company financial structure, its shows the relative proportions of debt and equity. If there is an increasing trend in debt equity ratio its means that percentage of assets of a business which are financed by the debt is increasing.

The debt-equity ratio is favorable if:

Lower values of debt-equity ratio (indicating less risk)

The debt-equity ratio is Unfavorable if:

Higher debt equity ratio (indicating high risk) because it's means business relies more on external lenders.

$$\text{Debt Equity Ratio} = \frac{\text{Debt}}{\text{Owner Fund}}$$

Table No. 2.1

Kruskal Wallis one-way analysis of variance test of Debt Equity Ratio **Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Debt Equity Ratio	25	.8384	.68144	.00	2.44
COMPANY	25	3.0000	1.44338	1.00	5.00

The ratios have been compared for their ranks using Kruskal wallis H test. As our data does not show normality that motivated us to apply Kruskal wallis H test, which is a non parametric test. It has been hypothesised that ***“there is no significant difference between means ranks of five companies' debt equity ratio.”***

The above set hypothesis has been tested at 5 percent level of significance. Results are presented in the

Table No. 2.2

Kruskal Wallis one-way analysis of variance test of Debt Equity Ratio(Ranks)

	COMPANY	N	Mean Rank
Debt Equity Ratio	C1	5	19.20
	C2	5	9.60
	C3	5	12.50
	C4	5	3.00
	C5	5	20.70
	Total	25	

Table No. 2.3**Kruskal-Wallis Test- H test for (DEBT EQUITY RATIO) Test Statistics**

Chi-Square	19.507
df	4
P Value	.001

Results shows that,

p value (0.001) is ≤ 0.05 that shows a statistically significant difference and rejects to our null hypothesis (H_{01}) that,

“There is no significant difference between five companies for their debt equity Ratio” and accept to the alternative.

From the results of Kruskal Wallis H Test we also infer that, there is a different in interest coverage ratio of selected companies.

3. Financial Leverage Ratio

financial leverage is defined as the firm’s ability to use fixed financial expenses i.e. interest in such a manner so as to have magnifying impact on the EPS (Earning Per Share) due to any change in EBIT(earnings before interest and tax). The financial leverage is said to exist if its greater than one. Neither very high nor very low leverage represents a good picture.

Financial leverage is said to be favourable when the firm is able to earn more on its investment than what it pays to the debenture in form of fixed interest. Financial leverage is also known as “Trading on equity”

This ratio is calculated by dividing Earnings before Interest and Taxes (EBIT) by the Earning before Tax (EBT).

$$\text{Financial Leverage Ratio} = \frac{\text{Earning Before Interest and Tax(EBIT)}}{\text{Earning Before Tax(EBT)}}$$

The ratios have been compared for their ranks using Kruskal wallis H test. As our data does not show normality that motivated us to apply Kruskal wallis H test, which is a non parametric test. It has been hypothesised that “*there is no significant difference between means ranks of five companies’ financial leverage ratio.*”

The above set hypothesis has been tested at 5 percent level of significance. Results are presented in the

Table No. 3.1

Kruskal Wallis one-way analysis of variance test of Financial Leverage Ratio **Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Financial Leverage Ratio	25	1.0856	1.72382	-3.99	5.25
COMPANY	25	3.0000	1.44338	1.00	5.00

Table No. 3.2

Kruskal Wallis one-way analysis of variance test of Financial Leverage ratio (**Ranks**)

Financial Leverage Ratio	COMPANY	N	Mean Rank
	C1	5	14.80
	C2	5	12.20
	C3	5	12.40
	C4	5	18.20
	C5	5	7.40
	Total	25	

Table No. 3.3

Test Statistics^{a,b}

Kruskal-Wallis Test- H test for (Financial Leverage Ratio)

Chi-Square	5.784
Df	4
P Value	.216

Results shows that,

P value (0.216) is ≥ 0.05 that shows there is no statistically significant difference and accept to our null hypothesis (H_{01}) that,

“*There is no significant difference between five companies for their financial leverage Ratio*”.

From the results of Kruskal Wallis H Test we also infer that, there is no significant different in financial leverage ratio of selected companies.

4. Fixed Assets to Long Term Debt Ratio

The fixed asset to long term debt ratio is calculated by dividing fixed assets by long-term debt. This ratio can be expressed as follow:

$$\text{Fixed Assets to Long Term Debt} = \frac{\text{Fixed Assets}}{\text{Long Term Debt}}$$

This ratio basically indicates that how far the outside liabilities are secured with the fixed assets of the enterprise. If the fixed assets are: **(Fixed assets > Debt = Favorable)** more than debt, it's favorable but if **(Fixed assets < Debt = Unfavorable)** fixed assets are less in comparison to debt it's a unfavorable sign from the point of view of long term creditor.

The ratios have been compared for their ranks using Kruskal wallis H test. As our data does not show normality that motivated us to apply Kruskal wallis H test, which is a non parametric test. It has been hypothesised that *“there is no significant difference between means ranks of five companies’ Fixed Assets to Long Term Debt Ratio.”*

The above set hypothesis has been tested at 5 percent level of significance. Results are presented as below.

Table No. 4.1

Kruskal Wallis one-way analysis of variance test of Fixed Assets to Long Term Debt Ratio **Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Fixed Assets to Long Term Debt Ratio	25	2.8192	1.74099	0.93	9.30
COMPANY	25	3.0000	1.44338	1.00	5.00

Table No. 4.2

Kruskal Wallis one-way analysis of variance test of Fixed Assets to Long Term Debt Ratio **(Ranks)**

Fixed Assets to Long Term Debt Ratio	COMPANY	N	Mean Rank
	C1	5	11.20
	C2	5	14.60
	C3	5	21.40
	C4	5	3.40
	C5	5	14.40
	Total	25	

Table No. 4.3**Test Statistics' Kruskal-Wallis Test- H test for (Fixed Assets to Long Term Debt Ratio)**

Chi-Square	15.749
Df	4
P Value	.003

Results shows that,

P value (0.03) is ≤ 0.05 that shows a statistically significant difference and rejects to our null hypothesis (H_{01}) that,

“There is no significant difference between five companies for their Fixed Assets to Long Term Debt Ratio” and accept to the alternative.

From the results of Kruskal Wallis H Test we also infer that, there is a different in Fixed Assets to Long Term Debt Ratio of selected companies.

Conclusion:

The study of the financial structure of five selected paper companies in Uttarakhand over a five-year period discloses that the structure of debt and equity significantly influences the financial strength and risk profile of these firms. Companies with a balanced capital structure, keeping an optimal debt-equity ratio, tend to show greater financial stability, better interest coverage, and stronger long-term solvency related to highly leveraged firms. The application of the Kruskal-Wallis H test approves that there are statistically significant differences in certain financial ratios, such as interest coverage and debt-equity ratios, between the companies studied.

The findings highlight that while the use of debt can enhance returns through financial leverage, excessive reliance on debt increases financial risk and reduces operational flexibility. Hence, a practical approach in planning capital structure, as factors like cost of capital, cash flow capability, and industry benchmarks, is crucial for satisfying growth and profitability. This research emphasizes the requirement for constant monitoring and restructuring of financial strategies to adapt to fluctuating market situations and confirm long-term business sustainability.

References:

- Brigham, E. F., & Houston, J. F. (2021). *Fundamentals of Financial Management* (15th ed.). Cengage Learning.
- Pandey, I. M. (2019). *Financial Management* (12th ed.). Vikas Publishing House.
- Khan, M. Y., & Jain, P. K. (2018). *Financial Management: Text, Problems and Cases*. Tata McGraw Hill Education.
- Brealey, R. A., Myers, S. C., & Allen, F. (2020). *Principles of Corporate Finance* (13th ed.). McGraw-Hill Education.
- Van Horne, J. C., & Wachowicz, J. M. (2016). *Fundamentals of Financial Management*. Pearson Education.

- Chandra, P. (2017). *Financial Management: Theory and Practice*. Tata McGraw Hill Education.
- Kothari, C. R. (2014). *Research Methodology: Methods and Techniques*. New Age International Publishers.
- Weston, J. F., & Brigham, E. F. (1996). *Essentials of Managerial Finance*. Dryden Press.
- Gitman, L. J., & Zutter, C. J. (2015). *Principles of Managerial Finance*. Pearson Education.
- Ross, S. A., Westerfield, R. W., & Jaffe, J. (2019). *Corporate Finance* (12th ed.). McGraw-Hill Education.
- Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, 48(3), 261–297.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance*, 39(3), 574–592.
- Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, 43(1), 1–19.
- Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance*, 50(5), 1421–1460.
- Harris, M., & Raviv, A. (1991). The theory of capital structure. *The Journal of Finance*, 46(1), 297–355.
- Booth, L., Aivazian, V., Demircug-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *The Journal of Finance*, 56(1), 87–130.
- Fama, E. F., & French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. *The Review of Financial Studies*, 15(1), 1–33.
- Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), 187–221.
- Frank, M. Z., & Goyal, V. K. (2009). Capital structure decisions: Which factors are reliably important? *Financial Management*, 38(1), 1–37.