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IMPACT OF CAPITAL STRUCTURE ON PROFITABILITY OF NSE LISTED AGRICULTURAL COMPANIES IN INDIA

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ABSTRACT

The study analyses the effect of capital structure on the profitability of agricultural companies listed on national Stock Exchange of India. As agriculture is transitioning towards modernisation through agro-processing, agro-chemicals, it is necessary to understand the financial structure of companies. Using panel data from 2020 to 2024 for top 15 NSE-listed agricultural firms, the study uses quantitative methods such as Pooled OLS, Fixed Effects and Random Effects regression models to analyse the relationship between capital structure variables- Debt to Equity and Interest Coverage Ratio and profitability indicators- Return on Equity (ROE) and Return on Assets (ROA). Control variables include Current Ratio and Total Revenue. Diagnostic test such as Breusch-Pagan, Durbin-Watson, and VIF confirm the suitability of regression analysis. The results show a significant negative relationship between Debt to Equity and Return on Equity, indicating that higher leverage reduces shareholder returns. Conversely, ROA is positively influenced by Current Ratio and Total Revenue, highlighting the importance of liquidity and operational efficiency. The findings underscore that while debt may support asset utilization, excessive leverage can reduce equity returns. The study contributes to literature by offering sector-specific insights and provides practical implications for financial managers, investors and policymakers in optimizing capital structure strategies within the agricultural sector.

KEYWORDS: *Capital Structure, Profitability, Agricultural Companies, Return on Equity, Return on Assets.*

INTRODUCTION

Agriculture has been the backbone in the Indian economy. Its contribution to GDP of India is significant. Agriculture not only ensures food security but also encourages rural livelihoods, provides employment. The emergence of firms in agriculture sector like agro-processing, agro-chemicals, agri-engineering have modernised this sector. This transformation makes it necessary for greater access to capital and more structured financial planning.

National Stock Exchange (NSE) is India's leading stock exchange. NSE is not only the largest stock exchange in India by market capitalization, but also ranks among the top exchanges globally. The agricultural firms listed in NSE represent the transformed phase of agriculture, where technology, innovation and capital investments are crucial drivers of growth.

Capital Structure is the proportion of equity and debt used to finance operations in the business. Debt component includes loans, bonds and other borrowed capital. Equity represents the ownership of the company. Capital Structure is influenced by both internal factors of company and external conditions. Internal factors include company size, growth stage and type of industry. External conditions like interest rate, overall economic condition.

If a company uses only debt financing, then it will have burden of paying interest, which increases the cost of capital. If it only focuses on equity financing, it will dilute the ownership of business. When business borrows debt, it will have advantage of tax-deducting but once the debt level increases, the obligation to pay interest increases and it becomes a fixed expenditure to the business which it has to bear every year even though the business might not be doing well. Hence, optimal capital structure is necessary to run business in long run. By focusing on NSE-listed agricultural firms, this study offers a transparent, data-driven, and sector-specific analysis of how financing decisions impact performance.

LITERATURE REVIEW

There are many substantial body of literature which have explored the relationship between capital structure and firm profitability across different industries and countries, often yielding mixed findings. **Shubita and Alsawalhah (2012)** and **Musah (2017)** studied evidence from Jordan and Ghana, respectively, which shows there is negative relation between debt ratio and profitability, aligning with pecking order theory which suggested firms prefer internal financing over external debt due to financial distress costs. Similarly, **Tailab (2014)** studied on American energy firms and **Habibniya et al. (2022)** studied on US telecom sector, found that high leverage negatively affects profitability particularly short term debts. In Ethiopia's construction sector, **Agmas (2022)** also identified negative impact of short- term debt on profitability, emphasizing liquidity risks associated with short term financing. **Nguyen et al. (2023)** studied on Vietnamese non-financial firms reported negative relation between capital structure and profitability, particularly in emerging markets with under developed financial systems**. Ali and Faisal (2020)**

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studied on Saudi Arabia's petrochemical industry, found a declining profitability trend even though companies had equity based financing, hence they reported external economic pressures also affect rather than capital structure alone. Study by **Arhinful, Mensah and Owusu-Sarfo (2023)** show that debt-to-EBITDA negatively impacts profitability like ROA, but some debt measured positive impact specific operational metrics, showing nuanced effect of capital structure.

There are some studies that have examined the relationship between capital structure and firm profitability in the Indian context, there were both consistent and contrasting results. The study on firms listed on Bombay Stock Exchange found a significant negative impact between total debt and profitability, highlighting adverse effects of long term debt on Return on Equity and Return on Assets. This also aligns with the results of **Prajapati and Shah (2020**), through their analysis of NSE listed companies across various sectors from 2014 to 2019 reported that there is negative impact of both debt-equity and debt-asset ratios on financial performance. Similarly, **Chisti, Ali and Sangmi (2013)** found that higher long term debt levels among BSE listed firms between 2007 and 2012 reduced profitability.

On the contrary, some sector specific studies like **Ghayas and Akhter (2018)** studied on Indian pharmaceutical firms, reported a positive relationship between short term debt and profitability. **Singh and Bagga (2019)** told a mixed perspective of result, for which they had considered Nifty 50 firms, total debt negatively affected Return on Assets, while it positively impacted Return on Equity.

In agricultural sector, there are a few studies related to capital structure and profitability. **Ke and Xiong (2016)** analysed agricultural firms listed on China's Shanghai Stock Exchanges and found significant negative relationship between debt to asset and both Return on Assets and Return on Equity. Similarly, **Masavi et al. (2017)** analysed five agricultural firms listed on Nairobi Securities Exchange in Kenya over 5 year period and found a negative relationship between total debt and Return on Assets. A study from Nigeria by **Igwe, Ogar and Ogbuu (2017)** studied on agro-allied companies listed on Nigerian Stock Exchange and discovered significant negative effect of debt ratio on both Return on Assets and Return on Equity.

Most of the recent studies highlighted the importance of finding the appropriate predictive models and the relevant financial indicators for understanding the trends and for better decision making. A recent study by **Jahnavi M et. al. (2025)**, used various machine learning algorithms and econometric models for forecasting using different combinations of input variables which are inclusive of internal and external factors. From the analysis it is evident that econometric models out forms the machine learning models. This approach underscores the significance of structured analysis of financial data at the time of exploring the association between firms capital structure and its financial performance especially in agricultural sector which is undergoing drastic evolvement in terms of technological upgradation and integration with broader markets.

RESEARCH GAP

There are many studies which have considered the effect of capital structure on profitability on sectors like automobile sector, manufacturing sector, telecom sector and have given significant results. There is very less evidence from Agricultural Companies, especially in India.

OBJECTIVES

This research mainly focuses on effect of capital structure on profitability of selected NSE listed agricultural companies in India. Understanding how debt and equity financing decision impact profitability is crucial for firms.

- To analyse the impact of debt to equity ratio and interest coverage ratio on Return on Equity of NSE listed Agricultural Companies in India considering control variables Total Revenue and Current ratio.
- To analyse the impact of debt to equity ratio and interest coverage ratio on Return on Assets of NSE listed Agricultural Companies in India considering control variables Total Revenue and Current ratio.

METHODOLOGY

Research Design

This study uses quantitative research design which uses Panel Data for OLS, Fixed Effect and Random Effect Model of Regression by considering Return on Equity and Return on Assets as dependent variables. Hausman Test was used to determine which model to consider between Fixed effect and Random Effect Model.

Data Collection

Quota sampling was done for the purpose of research. Financial data of NSE listed top 15 Agricultural Companies in India according to market capitalization was collected. Ratio analysis data of companies and annual financial statements from Money Control website.
Data includes period from year 2020 to 2024.

Variables

Profitability:
Return on Equity - It measures how efficiently a company uses shareholder investments to generate profits.
Return on Assets – It measures how efficiently a company uses its assets to generate profit.
Capital Structure:
Debt to equity – It assess company's financial leverage by comparing its total debt to total equity.
Interest coverage – It measures company's ability to cover its interest expenses with its earnings before interest and tax(EBIT).
Current Ratio – It measures the company's ability to pay its short term debts.
Total Revenue- It is the overall income a business generates by selling its goods or services.

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Variable	Type	Formula
Return on Equity	Dependent	Net Income / Average shareholders' Equity
Return on Assets	Dependent	Net Income / Average Total Assets
Debt to Equity	Independent	Total Liabilities / Total Shareholders' Equity
Interest Coverage	Independent	EBIT / Interest Expense
Current ratio	Control	Current Assets / Current Liabilities
Total Revenue	Control	ln (Total Revenue)

Table 1: Variables and their formulas

Hypothesis

For Return on Equity

H_0: There is no effect of Capital Structure on Return on Equity

H_1: There is significant effect of Capital Structure on Return on Equity

For Return on Assets

H_0: There is no effect of Capital Structure on Return on Assets

H_1: There is significant effect of Capital Structure on Return on Assets

Regression Equations

Return on Equity = $\beta_0 + \beta_1$(Debt to Equity)+β_2(Interest Coverage)+β_3(Current Ratio)+β_4(Total Revenue)+ε

Return on Assets = $\beta_0 + \beta_1$(Debt to Equity)+β_2(Interest Coverage)+β_3(Current Ratio)+β_4(Total Revenue)+ε

Whereas β_1, β_2 , β_3 , β_4 are Regression Coefficients β_0 is intercept ε is the error term

Data Analysis Technique

- Descriptive Statistics: To know mean, median, minimum, maximum, standard deviation for the data.
- Min-Max Normalisation of data was done to ensure uniformity across all variables and also to improve model performance.
- Breusch-Pagan Test was done to check for heteroskedasticity in the regression model.
- Durbin-Watson Test was conducted to check for autocorrelation in the residuals of the regression model.
- VIF(Variation Inflation Factor) Test was done to assess the multicollinearity between independent variables.
- Breusch-Pagan Test, Durbin-Watson Test and VIF Test are done to check whether the data is suitable for linear multiple regression.
- Regression Analysis: Pooled OLS, Fixed Effects and Random Effects Regression was done using normalised panel data.

Descriptive Statistics

Variable	Mean	Median	Std_Dev	Min	Max	Skewness	Kurtosis
Current.Ratio	2.044940e-01	1.450893e-01	0.191367	0	1	2.13936	8.12684
Total.Revenue	5.617778e-01	6.078431e-01	0.203641	0	1	-0.59030	3.69253
Debt.to.Equity	4.794078e-02	2.162478e-02	0.140127	0	1	5.43126	33.5898
Interest.Coverage	7.525285e-02	5.519687e-03	0.200026	0	1	3.17001	12.3522
Return.on.Equity	1.243170e-01	9.410067e-02	0.144537	0	1	5.01304	27.9003
Return.on.Assets	1.489392e-01	9.762235e-02	0.202292	0	1	3.07608	11.7176

Table 2 : Descriptive Statistics

The financial data of 15 NSE-listed agricultural companies in India shows a mixed picture of financial health. The average current ratio of 0.204 indicates that most companies face challenges in covering short-term liabilities with available assets. The companies are generally not highly reliant on debt, as reflected in a low average debt-to-equity ratio of 0.048, though there is significant variation, with some firms carrying much higher debt levels. The interest coverage ratio has a low average of 0.075, meaning many companies struggle to cover their interest expenses. In terms of profitability, the average Return on Equity is 12.43% and Return on Assets is 14.89%, indicating moderate profitability. However, there is a wide range in performance, with a few companies outperforming others significantly.

Since the data shows high skewness, Min-Max Normalisation is done for the data. This ensures comparability across variables and reduces the influence of extreme values or outliers. This brings all variables to a common scale without distorting differences in the ranges of values. It also helps in improving the performance and interpretability of models or comparative analysis where assumptions of normality and uniformity are important.

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	Return on Equity	Return on Assets
Studentized Breusch-Pagan test	BP = 4.8013, df = 4, p-value = 0.3083	BP = 4.3796, df = 4, p-value = 0.3571
Durbin-Watson test	DW = 1.8531, p-value = 0.1713	DW = 0.54178, p-value = 2.056e-15

Table 3: Breusch-Pagan Test and Durbin-Watson Test

In Studentized Breusch-Pagan test, for Return on Equity, the p-value (0.3043) is greater than 0.05, it fails to reject the null hypothesis. For Return on assets, p value is more than 0.05. This means there is no significant evidence of heteroskedasticity in the model. The residuals likely have constant variance, which is a good sign for the reliability of regression estimates.

In Durbin-Watson test, for Return on Equity, DW value is 1.85 is close to 2, and the p-value (0.1721) is not significant, it fails to reject the null hypothesis. This suggests no strong evidence of autocorrelation in the model's residuals. Similarly, for Return on Assets, DW value is 0.5417, p value is not significant, hence no autocorrelation.

Debt.to.Equity	Interest.Coverage	Current.Ratio	Total.Revenue
1.084079	1.171788	1.172504	1.142550

Table 4: VIF Test

A VIF value of 1 indicates no multicorrelation between independent variables. Since, all these variables have VIF value close to 1, there is not multicollinearity between independent variables in the regression model. This result supports the statistical reliability of the regression model, as the absence of multicollinearity means that the estimated coefficients are stable and interpretable.

ANALYSIS AND INTERPRETATION

Model	Debt-toEquity	Interest Coverage	Current Ratio	Total Revenue	R^2	Adj. R^2	p-value
Ordinary Least Squares (OLS)	-0.1417 (0.2561)	0.0325 (0.7199)	**-0.166 (0.0826).**	0.1428 (0.1069)	0.0703	0.0172	0.2699
Fixed Effects Model	**-0.9507 (7.60e-14)*****	-0.0231 (0.8875	-0.0531 (0.6115)	**-0.6369 (0.0081)****	0.6417	0.5265	6.28e12
Random Effects Model	-0.1417 (0.2522)	0.0325 (0.7188)	**-0.1660 (0.0783).**	0.1428 (0.1024)	0.0703	0.0172	0.2586

Signif. codes: '***' 0.001, '**' 0.01, '*' 0.05, '.' 0.1, ' ' 1 Values in parentheses are p-values.

Table 5: Regression Results for Return on Equity

Hausman Test

- **p-value** = **0.0008971** (less than 0.05)
- **Conclusion**: Fixed Effects model is preferred (rejects Random Effects model).

Return on Equity measures how much profit is generated from shareholders equity, mainly focuses on financial leverage and investor returns. The p-value of OLS model suggests that it is not statistically significant. Both Fixed Effect and Random Effect Models are significant. Hence, Hausman test result indicates to choose Fixed Effects model. FE model explains 64% of variable in Return on Equity. So, according to FE model, Debt to Equity has negative effect on Return on Equity which is highly significant. Total Revenue also has negative relationship with Return on Equity.

Model	DebttoEquity	Interest Coverage	Current Ratio	Total Revenue	R^2	Adj. R^2	p-value
Ordinary Least Squares (OLS)	-0.1912 (0.2786)	-0.0671 (0.6003)	-0.0454 (0.7343)	-0.1697 (0.1744)	0.0498	-0.0045	0.4588
Fixed Effects Model	-0.0052 (0.8969)	0.0392 (0.5609)	**0.0838 (0.0553).**	**0.3507 (0.0005)*****	0.2676	0.0322	0.0014
Random Effects Model	-0.0092 (0.8167)	0.0395 (0.5461)	**0.0833 (0.0497)***	**0.3022 (0.0009)*****	0.2031	0.1575	0.0013

Signif. codes: '***' 0.001, '**' 0.01, '*' 0.05, '.' 0.1, ' ' 1
Values in parentheses are p-values.

Table 6: Regression Results for Return on Assets

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Hausman Test

- **p-value** = **0.5364** (greater than 0.05)
- **Conclusion**: Random Effects model is preferred (rejects Fixed Effects model).

Return on Assets measure how efficiently company generates profits using assets, which focuses on operational efficiency. OLS model is not statistically significant because p value is more than 0.05. Both Fixed Effect and Random Effect Models are significant. So, Hausman Test suggested to consider RE model. The RE model explains 20% of variables in Return on Assets. Current ratio has positive effect on Return on Assets. Total revenue also has significant positive effect on Return on Equity.

FINDINGS

The study finds that companies having high debt to equity ratio tend to have lower profitability in terms of return on equity. This is due to increased obligation to pay interest due to debt when company's revenue or profit is stagnant. Additionally, total revenue has significant negative relation with ROE. The cost of generating additional revenue involves higher cost, which decreases the profit margin.

On the other hand, Return on Assets is positively influenced by liquidity and revenue growth. Higher current ratio, which shows better working capital management, increases the asset profitability. Hence, managing working capital efficiently is very important for Return on Assets.

CONCLUSION

The study concludes that Return on Equity is equity driven, higher leverage (debt to equity ratio) reduces the total shareholders return. Moreover, although increased revenue indicate business expansion, it is often associated with rising operational costs for the company. In contrast, Return on Assets is asset driven, capital structure has no significant impact. Instead, it is influenced by current ratio and revenue growth where better liquidity leads to more efficient asset utilization. Total Revenue has opposite effects on Return on Equity and Return on Assets. While increase in revenue improves the efficiency of asset utilisation, it may simultaneously reduce shareholder return as increase in sales would incur more reinvestment and also higher costs. Therefore, while debt leverage does not impact operational efficiency, it has a substantial influence on shareholder profitability. These findings emphasize the importance of balancing leverage and liquidity to optimize both asset performance and shareholder value.

Agricultural companies should focus on efficient working capital management, ensuring that short-term assets and liabilities are well-balanced will improve operational efficiency and asset profitability. Firms should adopt cost control mechanisms and monitor the marginal cost of revenue generation. Expansion should be accompanied by efficiency strategies to protect profitability. Firms can use leverage carefully to enhance asset utilization but must avoid using it purely to increase ROE, as it can dilute shareholder returns in the long run.

Implications for Theory

This study adds theoretical value by revealing how capital structure impacts profitability in a sector characterized by seasonality, policy dependence, and climate-related risks. The findings contribute to the growing body of literature that connects financing decisions with financial performance, particularly by showing how leverage, equity, and capital mix influence return metrics like Return on Equity and Return on Assets.

Implications for Practice

This research can help financial managers and CFOs in the agricultural sector to make informed financing decisions. It helps corporate planners and consultants develop capital structure strategies that are not only theoretically sound but also aligned with sectoral realities. It also helps investors, banks to assess the financial performance of listed agricultural companies and make informed decisions.

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