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Enhancing Capital Structure to Impact Profitability: The Case of Software Industry

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ABSTRACT

Capital structure choices have become progressively crucial for businesses in the rapidly devolving software industry. This study examines the impact of capital structure within the software field using a panel data model. The research includes data from 22 firms over the period 2013-2022 obtained from annual reports. The regression analysis is built with four independent variables (assets, debt-assets ratio, debt-equity ratio, and age) and one dependent variable, Return on Assets. The outcomes show that all selected regressors are statistically significant, but only assets and the debt-to-assets, and debt-to-equity ratio have the expected direction. The results highlight the importance of avoiding generalized approaches to capital structure decisions, urging firms instead to conduct exhaustive valuations of the costs and benefits associated with different capital sources. This tactical approach can help managers guarantee profitability in their operations.

Keywords: Capital Structure, Performance, Software Industry, Return on Assets.

1. INTRODUCTION

Financing and investment decisions are two key areas for a company's decision-making, with capital structure being one of the most critical choices finance managers must make. Capital structure refers to the combination of financing options a company uses, particularly the balance between debt and equity (Vatavu, 2015). These decisions have a significant managerial impact, influencing both the risk and return for shareholders and potentially affecting the company's market value. Finance managers are

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tasked with selecting the most appropriate capital structure, ensuring the right mix of debt and equity for their company's financial needs (The and Duch, 2020).

The first significant theory of capital structure dates to 1958 when Modigliani and Miller (MM) introduced their pioneering work, arguing that capital structure is irrelevant in a world with perfect capital markets. Known as the 'Theory of Irrelevance,' MM proposed that no specific mix of debt and equity is inherently better than another. They also explained that while higher debt ratios may lead to higher returns, this is offset by the increased risk associated with debt financing. Modigliani and Miller's work sparked extensive research into capital structure, with scholars exploring various aspects of financing decisions.

This paper aims to assess the impact of capital structure on the financial performance of 22 software companies listed on the Frankfurt Stock Exchange from 2013 to 2022. The software industry has seen rapid growth in recent years, yet there is limited research specifically addressing the financial performance of companies in this sector. By focusing on the software industry and the chosen timeframe, this paper aims to fill a gap in the existing literature. Due to data limitations, many software companies are relatively new, and some do not publish the required information, accurate data for only 22 of the 50 listed companies was available for this analysis.

2. LITERATURE REVIEW

Finance literature has extensively explored the relationship between capital structure and financial performance, with particular emphasis on how capital structure decisions influence a company's performance. Understanding this relationship is crucial as it helps identify potential issues in both areas. Numerous studies have examined the optimal capital structure and whether companies should rely on different forms of debt financing.

For instance, Chinaemeren and Odita (2012) analyzed the financial performance of non-financial Nigerian firms from 2004 to 2010 using panel data and OLS analysis. Two models were constructed with ROA and ROE as the dependent variables, while asset turnover ratio, debt ratio, size, asset tangibility, growth, and industry sector were used as independent variables. The findings revealed that the debt ratio had a negative correlation with both ROA and ROE.

Similarly, Ajibola and Wisdom (2017) studied the effect of capital structure on the financial performance of manufacturing firms in Nigeria between 2003 and 2015. Using a panel model, they found that while the short-term debt ratio had `an insignificant positive effect on ROE, total debt ratio and long-term debt ratio were positively and significantly related to ROE. ROA, however, showed a weak negative relationship with all capital structure proxies, indicating that ROE may be a more accurate performance indicator. The authors recommended a higher reliance on long-term debt for improved financial performance.

Birru (2017) examined Ethiopian commercial banks' capital structure and financial performance from 2012 to 2016, using ROA and ROE as performance indicators. The study found that debt-equity ratio, size, and asset tangibility were negatively correlated with financial performance, while debt ratio had a positive effect. The loan-to-deposit ratio, however, was found to be insignificant in explaining banks' performance.

Mireku (2014) analyzed the relationship between capital structure and financial performance in 15 Ghanaian companies from 2002 to 2007, using ROE as the dependent variable. The results showed that financial leverage negatively impacted performance, with companies carrying less debt demonstrating

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higher profitability. The study also found that market value had a stronger correlation with financial performance than book value.

Githire and Muturi (2015) focused on firms listed on the Nairobi Securities Exchange from 2007 to 2013, using ROA as the dependent variable. Their findings revealed that while short-term debt had a significant negative impact on performance, equity and long-term debt had a positive and significant effect.

Nirajini and Priya (2013) studied the relationship between capital structure and financial performance in Sri Lankan trading companies from 2006 to 2010. Multiple regression analysis revealed a significant positive correlation between capital structure and financial performance, with variables such as long-term debt, debt-equity ratio, and profit margins showing strong relationships with ROA and ROE.

Cuong and Long (2020) analyzed pharmaceutical firms in Vietnam between 2015 and 2019. Their study found that long-term assets, financial leverage, and debt-to-assets ratios were positively correlated with firm performance, while self-financing had a negative effect on ROE.

Mumtaz (2013) investigated the effect of capital structure on financial performance in 83 private firms in Pakistan from 2006 to 2009. The results indicated that high levels of debt had a negative impact on ROE, ROA, and EPS, while net profit margin and price-to-earnings ratio showed no significant relationship with capital structure.

Chadha and Sharma (2016) studied Indian manufacturing firms from 2003 to 2013, finding that financial leverage negatively impacted ROE but did not significantly affect ROA. Other variables such as size, age, and sales growth were also found to be significant determinants of financial performance.

Finally, Vong (2017) examined the effect of capital structure on financial performance in UK companies from 2007 to 2016. The study found that long-term liabilities had a negative impact on performance, while short-term debt had no significant effect. Firm size and growth were identified as positive contributors to performance, but leverage had little bearing on EPS.

3. METHODOLOGY

This paper examines a sample of 22 corporations listed on the Frankfurt Stock Exchange since 1972, with data spanning the period from 2013 to 2022. The research employs a panel data approach, combining cross-sectional and time series data, which is considered more reliable and efficient by minimizing collinearity. This method is widely used by researchers due to its accuracy in delivering more precise results. After collecting raw data, the necessary analysis was conducted using EViews software. The data was sourced from secondary materials, specifically the annual reports available on the official websites of the companies.

All selected companies operate within the software industry. Focusing on a single sector was essential to ensure accuracy in the findings, as different industries can have varying impacts on capital structure decisions. Out of 50 software companies listed on the Frankfurt Stock Exchange, a sample of 22 is considered significant in proportion to the total. Limiting the study to one industry helps avoid biased calculations, as companies from different sectors may behave differently in terms of capital structure.

This paper aims to identify key variables that influence corporate performance through a panel data analysis. The performance model is structured as follows:

Financial performance = f (size, capital structure, age)
ROA= f(LOGASSETS, DEBT-EQUITY, DEBT-ASSETS, AGE)

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The study aims to investigate the degree to which capital structure influences the financial performance of companies in the software industry. Several methods are used to evaluate the static models, including Pooled Ordinary Least Squares, Random Effects, and Fixed Effects. The Hausman test is applied to determine the most appropriate model between Random and Fixed Effects. To address heteroskedasticity, a final regression with necessary adjustments will be conducted. Fixed Effects models assume that organizations have unique characteristics influencing the relationships between variables, focusing on the correlation between independent and explanatory variables within specific entities. In contrast, Random Effects models suggest random variations across firms that are not linked to the explanatory variables.

The dependent variable in this study is the Return on Assets (ROA), calculated as the ratio of net income to total assets. ROA measures how effectively a company generates profit from its investments in assets. The independent variables include assets, debt-equity, debt-assets, and age.
The first independent variable, assets, reflects the importance of including company size in the model. While size can be measured in various ways, assets are considered one of the most accurate indicators. The regression model incorporates the logarithmic value of assets to enhance its explanatory power and capture the true effect on the dependent variable. debt-equity and debt-assets ratios are used to evaluate the influence of total debt on capital structure. Debt-equity is calculated as total liabilities divided by total equity, while debt-assets is the ratio of total liabilities to total assets. The final independent variable, AGE, represents the number of years a company has been listed on the Frankfurt Stock Exchange, allowing for an analysis of how longevity impacts capital structure decisions."

4. RESULTS

Before selecting the most appropriate regression model, several assumptions must be met. The analysis below examines whether the model satisfies stationarity, determines whether a random or fixed effect model is appropriate, and tests for heteroscedasticity.
Data were subjected to unit root tests to prevent correlations among variables. The Levin, Lin, & Chu test confirms that all variables are stationary. The panel's unit root hypothesis was tested and rejected, indicating that all variables exhibit a stationary trend.
The Hausman test was employed to determine whether a fixed or random effects model is more suitable. The results indicate that the fixed effects model is the best fit for the regressors.
Heteroscedasticity testing ensures that the variance of error terms remains constant across all observations to avoid bias. The results confirm that the model is homoscedastic.
Multicollinearity assumes that no perfect correlation should exist between independent variables to ensure the model remains valid and unbiased. As shown in Appendix, a range of values can be observed, with no value exceeding 0.8, indicating that no perfect correlation exists between the regressors.
The summary statistics of the variables used in the regression model are presented in Table 1. A total of 220 observations were analyzed. The average ROA ratio is close to zero, indicating that many companies struggle to efficiently utilize their assets. The ROA values for the software companies range from -3.91 to 1.0891, with a small standard deviation of 0.2861, suggesting that the data is not widely dispersed. For the log assets variable, interpreting the logarithmic form is less meaningful, so the analysis focuses on assets. The average value of assets is $225 million. The debt-assets and debt-equity ratios have average values of 0.5262 and 1.3938, respectively. This indicates that about half of the investments in total assets are financed through debt, which is further supported by the debt-equity ratio showing that,

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on average, a company's total debt is 1.3938 times greater than its total equity. This suggests a higher reliance on debt compared to equity in the capital structure. Regarding the age variable, the oldest company in the sample has been operating for 60 years, while the youngest has been in the market for just 3 years.

Variable	ROA	ASSETS	DEBT-ASSETS	DEBT-EQUITY	AGE
Mean	0.0421	2.25E+08	0.5262	1.3938	28
Median	0.0529	1.37E+08	0.5535	1.2396	25
Maximum	1.0891	1.94E+09	0.8671	6.5236	60
Minimum	-3.9104	1574789	0.0356	0.0369	3
Std. Dev	0.2861	2.89E+08	0.1638	0.9379	12.05
Observations	220	220	220	220	220

Table 1 Descriptive Statistics

In this section, the model is analyzed to determine whether each regressor has a significant impact on the dependent variable. The analysis will also indicate whether a statistically significant regressor has a positive or negative effect on ROA.

Dependent Variable: ROA

Method: Panel Least Squares

Variable	Coeficient	Std Error	t-Statistic	Prob
log(assets)	0.239893	0.034570	6.939388	0.0000
debt-assets	−0.651448	0.0344834	−1.889162	0.0604
Debt-equity	0.084704	0.050782	1.667992	0.0969
Age	-0.019115	0.007824	-2.443037	0.0155
c	-3.636329	0.528321	-6.882804	0.0000
R-squared	0.333831	Mean dependent var		0.042151
Adjusted R-squared	0.247984	S.D. dependent var		0.286157
Prob (F-statistic)	0.000000			

Table 2 Regression Model.

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To begin with, the model must demonstrate statistical significance and explanatory power. An F-test is conducted to evaluate the model's significance. Given the F-test probability value, we can conclude that the model is statistically significant at any significant level, with an overall explanatory power of 33.38%. Having established the overall significance of the model, we will now examine each variable individually.

Assets are statistically significant at all levels, indicating that a 1% increase in assets is expected to lead to a 23.98% increase in Return on Assets (ROA), ceteris paribus. Debt ratios are significant at the 10% level of confidence. The debt-assets ratio negatively impacts financial performance, decreasing overall performance by 0.65 points for every point increase in this ratio. This suggests that as companies take on more debt, their profitability is likely to decline. Conversely, the debt-equity ratio positively influences the ROA by 0.084 points, ceteris paribus. The age of the company, defined as the number of years listed on the Frankfurt Stock Exchange, is statistically significant at both the 5% and 10% levels. Its impact on ROA is negative, indicating that for each additional year in operation, the expected return on assets is likely to decrease by 0.019 points, ceteris paribus. There might be several reasons to this. Older firms might be less adaptive to changes in technology, markets, processes and models which might lead to higher operational costs. Also, the markets in which they operate might be saturated. New entrance pressures a lot older companies. All these burdens may negatively affect the ROA of these companies.

5. DISCUSSION AND CONCLUSION

In this paper, we constructed a panel model to identify the factors affecting the financial performance of 22 software companies listed on the Frankfurt Stock Exchange over a 10-year period from 2012 to 2023. Based on our analysis of existing literature, we utilized return on assets (ROA) as the dependent variable, with assets, debt-equity ratio, debt-assets ratio, and age as independent variables. Our findings demonstrate that the model is statistically significant overall, with an explanatory power of 33%. Notably, all variables considered are significant in assessing the financial performance of the software companies at the 10% significance level. Specifically, assets and the debt-equity ratio have a significant positive impact on ROA, while age and the debt-assets ratio negatively affect it.

The study's findings indicate that software companies prioritize establishing a positive and significant relationship between their performance and capital choices to maximize market value. It is crucial for managers to not focus solely on capital structure but to consider other factors that can enhance overall performance. Decisions regarding capital structure should be based on rational analysis rather than assumptions. Companies should apply critical thinking and carefully weigh the benefits and drawbacks of each potential source of capital when determining how to allocate resources.

Future research should incorporate a variety of performance metrics to gain a deeper understanding of how capital structure and financing choices influence the financial performance of companies listed on the Frankfurt Stock Exchange. Additionally, identifying other variables may provide a more accurate description of the variance in return on equity.

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APPENDIX

A: *Stationarity*

Panel Unit Root Test

Method: Levin & Lin Chu

Variable	Prob.	Conclusion
DEBT-EQUITY	0.0000	Stationary
DEBT-ASSETS	0.0000	Stationary
LOG(ASSETS)	0.0000	Stationary
AGE	0.0000	Stationary

B: *Hausman Test*

Correlated Random Effects, Hausman Test,

Test cross-section random effects,

Test Summary	Chi-SqStatistics	Chi-Sq. d.f.	Prob
Cross-section random	34.857214	4	0.0000

C: *Heteroskedasticity Test*

Panel Cross-section Heteroskedasticity

Null Hypothesis: residuals are homoscedastic,

	Value	d.f.	Prob.
Likelihood ratio	715.5085	22	0.1200

D: Correlations

Variable	DEBT-EQUITY	DEBT-ASSETS	LOG(ASSETS)	AGE
DEBT-EQUITY	1.0000			
DEBT-ASSETS	0.7771	1.0000		
LOG (ASSETS)	0.2786	0.4626	1.0000	
AGE	0.0213	0.1074	0.5039	1.0000