# Measuring Financial Efficiency and Its Impact on the Firm's Financial Performance

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***Abstract*— This study explores the relationship between financial efficiency, capital structure, and firm performance in a manufacturing firm, emphasizing the need for optimized financial management in competitive industrial environments. As firms strive for sustainability and growth, understanding how internal financial metrics influence overall performance becomes increasingly important. The research focuses on key indicators such as cost efficiency, capital utilization, investment efficiency, and liquidity management, along with capital structure variables, to assess their impact on firm performance. Using five years of secondary data extracted from annual reports, the study employs tools like SPSS, Excel, and Frontier Analyst (DEA – BCC Model) to conduct correlation and regression analysis, trend forecasting, and efficiency measurement. The aim is to provide actionable insights for managers and stakeholders seeking to enhance financial health and strategic decision-making. By identifying the financial drivers of performance, this research contributes to the broader understanding of how efficiency and capital structuring influence a firm's success in a dynamic market landscape. The findings are expected to guide future strategies in financial planning and performance optimization in manufacturing firms.***

**Index Terms— Financial efficiency, capital structure, firm performance, manufacturing sector, secondary data analysis, DEA, SPSS.**

## I. INTRODUCTION

The growing complexity of financial decision-making in the manufacturing sector has emphasized the critical role of financial efficiency and capital structure in determining firm performance. In today's dynamic industrial environment, companies are under increasing pressure to optimize internal financial operations to sustain profitability, ensure liquidity, and maintain competitive advantage. As a result, understanding how various components of financial efficiency—such as cost management, capital utilization, investment efficiency, and liquidity management—interact with capital structure decisions has become essential for stakeholders and financial managers alike.

Efficient financial practices are closely linked to long-term value creation, with research indicating that firms with strong financial efficiency and well-structured capital allocation tend to achieve better resource utilization, lower financial risk, and improved return on investment. Such firms are more likely to withstand economic fluctuations and attract sustainable capital flows, reinforcing the need for effective financial planning and strategic alignment.

This study aims to evaluate the impact of financial efficiency and capital structure on firm performance in a manufacturing firm, using five years of secondary data from annual reports. Through correlation analysis, regression modeling, trend forecasting, and Data Envelopment Analysis (DEA) using the BCC model, the research provides empirical insights into how financial strategies influence overall firm performance. The objective is to offer valuable guidance for decision-makers in aligning financial structure and efficiency with long-term growth objectives.

The findings of this study are intended to contribute to the broader discourse on financial performance evaluation, offering practical insights for corporate finance professionals, analysts, and policymakers seeking to strengthen financial resilience and strategic efficiency in the manufacturing sector.

By integrating advanced analytical tools and focusing on multi-dimensional financial metrics, this study not only bridges theoretical concepts with real-world financial practices but also highlights measurable pathways to enhance firm performance. It underscores the importance of data-driven financial decision-making in fostering sustainability and competitiveness within the manufacturing industry.

  

## II. BACKGROUND, MOTIVATION AND OBJECTIVES

The increasing complexity of financial decision-making in the manufacturing sector underscores the importance of financial efficiency and capital structure in influencing firm performance. As companies strive to maintain profitability, enhance operational control, and remain competitive, the ability to efficiently manage costs, utilize capital, and ensure liquidity has become a strategic necessity. In parallel, capital structure decisions—particularly the balance between debt and equity—significantly affect financial risk, flexibility, and the long-term sustainability of firms.

Recent studies emphasize that firms demonstrating high levels of financial efficiency and optimal capital structure are better positioned to achieve stable returns, lower operational risks, and attract sustainable capital investment. However, empirical insights into how these elements interact in practice—especially within manufacturing firms—remain limited. Additionally, there is growing interest in applying advanced tools like Data Envelopment Analysis (DEA) and trend forecasting to measure firm efficiency and predict future performance. Given this context, it becomes essential to evaluate the multidimensional relationship between financial efficiency, capital structure, and overall firm performance.

### OBJECTIVES OF THE STUDY

This study aims to systematically assess the financial performance of a manufacturing firm by addressing the following key objectives:

- To evaluate the relationship between key financial efficiency components and firm performance.
- To analyse the impact of capital structure on financial performance.
- To assess technical and scale efficiency using the BCC (Banker, Charnes, and Cooper) model in Data Envelopment Analysis (DEA).
- To forecast future trends based on historical financial performance and efficiency.

By achieving these objectives, the study seeks to provide empirical insights that can support financial decision-making, improve strategic planning, and enhance the financial sustainability of firms operating in the manufacturing sector.

## III. LITERATURE REVIEW

The application of **Data Envelopment Analysis (DEA)** in performance measurement has seen growing interest across sectors such as finance, agriculture, healthcare, and sustainability. DEA's flexibility and non-parametric nature have enabled researchers to evaluate decision-making units (DMUs) under varied operational contexts. This literature review synthesizes recent contributions, focusing on DEA applications in accounting, sector-specific efficiency assessments, integrated frameworks, and methodological enhancements.

**DEA and Accounting Choices:** Cui, Harrison, Ng, and Rouse (2025) examined how accounting choices affect DEA outcomes, highlighting the sensitivity of efficiency scores to financial reporting decisions. Their findings stress the importance of consistent accounting practices when comparing DMU performance across time and entities, particularly in financial performance assessments.

**Sector-Specific DEA Applications:** Numerous studies have employed DEA to evaluate operational efficiency in specific industries. Muniyoor and Pandey (2024) applied DEA to Farmer Producer Organizations (FPOs), revealing how input-output optimization can support agricultural sustainability and income generation. Similarly, Koç and Seçkiner (2024) evaluated energy-based environmental efficiency in hospitals, emphasizing the role of green infrastructure in healthcare. Saâdaoui and Khalfi (2024) assessed Islamic banking institutions using a DEA-regression hybrid, offering insights into banking efficiency from a compliance-sensitive perspective.

**Integrated DEA Models for Strategic Evaluation:** Recent literature reflects a trend toward integrating DEA with other strategic tools. Abedian et al. (2024) combined DEA with the Balanced Scorecard (BSC) and game theory to develop a multi-dimensional performance evaluation model, suitable for strategic alignment. Wang et al. (2024) also integrated BSC with DEA to provide a holistic framework for firm performance, demonstrating the growing interest in balanced, strategic perspectives.

**Innovative and Methodological Advances in DEA:** Methodological innovations in DEA are contributing to more robust performance assessments. Kao (2024) introduced the **Maximum Slacks-Based Measure (MSBM)** for evaluating garment sector efficiency within a network DEA framework. This model refines the traditional SBM by maximizing slack utilization. Arabmaldar, Sahoo, and Ghiyasi (2023) proposed a robust DEA model using directional distance functions to manage uncertainty, enhancing reliability in volatile environments.

  

**DEA in Finance and Operational Strategy:** The intersection of DEA and financial performance has also gained prominence. Seth et al. (2024) employed a two-stage SBM-DEA to assess working capital management, offering a nuanced view of liquidity and operational efficiency. Liu et al. (2023) developed a cross-efficiency network DEA model to enhance financial performance measurement, accommodating inter-unit interactions and feedback.

**DEA for Digital, Sustainability, and International Comparisons:** Broader applications have also emerged. Guo et al. (2024) used hierarchical DEA to create a Digital Economy Development Index, linking technology to national efficiency. Marmelstein et al. (2024) applied DEA to poultry farms to support sustainable agriculture. Meanwhile, Sakr et al. (2024) evaluated country-level efficiency in using development aid, showcasing DEA's policy relevance.

**Influence of Accounting and Methodological Choices on DEA Results:** Cui et al. (2025) explored the sensitivity of DEA outcomes to accounting choices, underscoring how methodological inconsistencies can significantly affect the efficiency scores of DMUs. Their findings highlight the need for standardized accounting practices when applying DEA to ensure comparability and reliability of results across firms and sectors. This aligns with the increasing academic focus on enhancing the objectivity and transparency of efficiency evaluations through rigorous methodological design.

**DEA in Capital Structure and Firm Performance Evaluation:** DEA has been effectively used to assess how capital structure influences firm performance. Amirteimoori et al. (2024) analyzed banking efficiency under stochastic and regulatory constraints, offering insights applicable to capital-intensive firms. Pinto and Tessmann (2024) highlighted that firms managing financial risk efficiently through optimized capital structures tend to achieve superior profitability. Similarly, Lin et al. (2023) found that in Taiwan's shipping sector, capital structure strongly influenced technical and allocative efficiency, positively impacting ROE.

These studies underscore DEA's evolution from a technical efficiency tool to a comprehensive decision-support system. The increasing integration with accounting, strategic, and digital tools illustrates DEA's expanding relevance for researchers and policymakers alike. As future studies continue to blend DEA with AI, game theory, and multi-criteria decision-making, its role in nuanced, multi-sector efficiency analysis will likely grow.

## IV. METHODOLOGY

This study employs a quantitative research design, utilizing secondary data derived from the annual reports of manufacturing firms. The data covers a five-year period, from December 2024 to February 2025, and aims to analyze the relationship between financial efficiency, capital structure, and firm performance within the manufacturing sector.

### *a) Data Collection:*

The primary source of data for this study consists of secondary data obtained from the publicly available annual reports of manufacturing firms. These reports include:

- **Balance Sheets:** Used to assess the firm's assets, liabilities, and equity structure.
- **Profit and Loss Statements:** Provide insights into the firm's revenue, costs, and profitability.
- **Cash Flow Statements:** Used to evaluate liquidity and the cash generation capabilities of the firm.

The selected firms for analysis are publicly listed manufacturing companies, which provide reliable and comprehensive financial data. The reports cover five years, from December 2024 to February 2025, ensuring an adequate time span for observing trends in capital structure, financial efficiency, and firm performance.

### *b) Analysis Techniques:*

1. **Data Envelopment Analysis (DEA):**

   The study employs the Data Envelopment Analysis (DEA) technique, specifically using the BCC Model, to evaluate the efficiency of the selected manufacturing firms. The DEA method allows for the assessment of technical efficiency (resource utilization) and allocative efficiency (optimal resource allocation) by comparing firms against each other. The model helps determine how well the firms use their inputs (Financial Efficiency) to generate outputs (Financial Performance) in the most efficient manner.

2. **Correlation and Regression Analysis:**

   The study uses Pearson's correlation to examine the strength and direction of the relationship between financial efficiency (independent variables such as cost efficiency, capital utilization, liquidity management, and investment efficiency) and firm performance (dependent variable, measured by ROA, ROE, and EBIT).

  

Subsequently, a multiple regression analysis will be conducted to quantify the impact of each independent variable on the dependent variable, enabling the identification of which factors most significantly contribute to the financial performance of manufacturing firms.

**3. Trend Forecasting:**

To understand potential future performance patterns, trend forecasting techniques will be applied. This will allow for an analysis of past performance data and project future trends in financial performance based on historical data. Techniques such as exponential smoothing or moving averages will be considered for modelling these trends.

***c) Variables and Their Measurement:***

**Independent Variables:**

- ✓ **Cost Efficiency:** Measured by the operating expenses relative to revenue, indicating how well the firm manages its costs in relation to sales.
- ✓ **Capital Utilization:** Measured using asset turnover and fixed asset utilization, reflecting how effectively the firm uses its capital resources to generate revenue.
- ✓ **Investment Efficiency**: Evaluated by the return on capital investments, showing how well the firm utilizes its invested capital for generating returns.
- ✓ **Liquidity Management:** Measured through liquidity ratios, such as the current ratio and quick ratio, assessing the firm's ability to meet short-term obligations.

**Dependent Variable:**

- ✓ **Firm Performance:** Measured using Return on Assets (ROA), Return on Equity (ROE), and Earnings Before Interest and Taxes (EBIT), which collectively provide an overview of the firm's financial performance and profitability

***d) Statistical Tools and Software:***

The following software tools will be used for data analysis:

- **SPSS**: Employed for performing the correlation and regression analysis, allowing for a comprehensive evaluation of the relationships between the independent and dependent variables.
- **Excel**: Used for financial ratio calculations and handling basic data operations, such as summarizing and organizing financial information.
- **Frontier Analyst (DEA-BCC Model)**: Used for conducting the Data Envelopment Analysis (DEA) to assess the efficiency of the manufacturing firms in the sample.

***e) Sampling and Selection Criteria***

The study will analyse a sample of manufacturing firms that are publicly listed on major stock exchanges. The selection of firms is based on the availability of financial reports and their relevance to the manufacturing sector. Firms are chosen to ensure a balanced representation across different sizes and market segments within the industry, without specifying any one company's data or characteristics in detail.

***f) Limitations***

- **Data Availability:** The study relies exclusively on secondary data from publicly available reports, which may not fully reflect the internal workings or strategies of the companies. This may limit the insights into factors influencing performance that are not disclosed publicly.
- **Geographical Constraints:** The study does not account for geographical differences, as it focuses solely on data available in public financial reports, which may not reflect regional variations.
- **Lack of Internal Data:** The analysis does not include internal data or management discussions, which may provide a more comprehensive view of the firms' financial operations and strategy.

## V. RESULTS AND DISCUSSION

***A. Financial Efficiency and Firm Performance Analysis***

This analysis provides an overview of the relationship between financial efficiency metrics and firm performance over the study period. It aims to understand how key financial efficiency indicators such as Cost Efficiency (CE), Capital Utilization (CU), Investment Efficiency (IE), and Liquidity Management (LM) are related to overall financial performance (FP). Through correlation analysis, this foundational analysis identifies patterns and potential connections between these variables, setting the stage for further statistical testing and deeper exploration of their relationship with firm performance.

  

**Correlation Analysis:**

The correlation analysis examines the relationship between financial efficiency metrics and firm performance.

**$H_1$ (Alternative Hypothesis):** There is a significant relationship between key financial efficiency metrics and firm performance.

| | | FP | CE | CU | IE | LM |
|---|---|---|---|---|---|---|
| FP | Pearson Correlation | 1 | .888* | .865 | .849 | .667 |
| | Sig. (2-tailed) | | .044 | .058 | .069 | .219 |
| CE | Pearson Correlation | .888* | 1 | .855 | .852 | .689 |
| | Sig. (2-tailed) | .044 | | .065 | .067 | .198 |
| CU | Pearson Correlation | .865 | .855 | 1 | .555 | .382 |
| | Sig. (2-tailed) | .058 | .065 | | .331 | .526 |
| IE | Pearson Correlation | .849 | .852 | .555 | 1 | .796 |
| | Sig. (2-tailed) | .069 | .067 | .331 | | .107 |
| LM | Pearson Correlation | .667 | .689 | .382 | .796 | 1 |
| | Sig. (2-tailed) | .219 | .198 | .526 | .107 | |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | | | |

The correlation analysis in this study examines the relationship between key financial efficiency metrics—Cost Efficiency (CE), Capital Utilization (CU), Investment Efficiency (IE), and Liquidity Management (LM)—and firm performance (FP). The results reveal a strong positive correlation between Cost Efficiency (CE) and Firm Performance (FP) ($r = 0.888$, $p < 0.05$), indicating that effective cost management is crucial for achieving superior financial results. Similarly, Capital Utilization (CU) and Investment Efficiency (IE) also show high positive correlations with firm performance ($r = 0.865$ and $r = 0.849$, respectively), suggesting that efficient use of capital and strategic investment decisions are key drivers of financial success. These correlations are statistically significant, highlighting the importance of managing costs, capital, and investments for improving firm performance.

However, Liquidity Management (LM) shows a weaker correlation with firm performance ($r = 0.667$, $p = 0.219$), which is not statistically significant, suggesting that liquidity management, while essential for operational stability, may not directly influence overall firm performance as strongly as the other efficiency metrics. Overall, the findings underscore that a focus on cost control, capital utilization, and investment efficiency is more likely to lead to enhanced firm performance, while liquidity management has a lesser impact on performance outcomes.

***B. Analyze the Impact of Capital Structure on Financial Performance***

This analysis evaluates the relationship between capital structure, particularly the Debt-Equity Ratio, and the firm's financial performance. The regression analysis investigates how variations in the Debt-Equity Ratio influence financial outcomes, providing valuable insights into the effectiveness of the firm's capital structure strategy. By examining the Debt-Equity Ratio as a key determinant of financial performance, the study explores how changes in leverage can impact profitability, financial stability, and risk. The results help to assess whether leveraging debt in the firm's capital structure leads to enhanced financial performance or if it introduces higher financial risk, offering guidance for optimizing capital structure decisions.

**Regression Analysis:**

The regression analysis is conducted to evaluate the relationship between the capital structure, specifically the Debt-Equity Ratio, and the firm's financial performance

| Model | Unstandardized Coefficient (B) | Standard Error | Standardized Coefficient (Beta) | t | Significance (Sig.) |
|---|---|---|---|---|---|
| (Constant) | 4917.73 | 1002.41 | – | 4.906 | 0.016 |
| Debt-Equity Ratio | 4557.08 | 1181.35 | 0.912 | 3.858 | 0.031 |
| F-value | | | | 14.88 | |
| R Square | | | | 0.832 | |
| Adjusted $R^2$ | | | | 0.776 | |

The regression analysis is conducted to evaluate the relationship between the capital structure, specifically the Debt-Equity Ratio, and the firm's financial performance. The regression model is designed to test how changes in the debt-equity ratio affect financial performance metrics. The results indicate that the Debt-Equity Ratio has a positive and significant impact on financial performance. The unstandardized coefficient (B) of 4557.080 implies that for every unit increase in the debt-equity ratio, the firm's financial performance increases by approximately 4557 units, suggesting that effective debt management can contribute positively to financial growth and stability. The t-value of 3.858 and significance level of 0.031 confirm that this relationship is statistically significant at the 5% level, meaning that the effect of capital structure on financial performance is not due to random chance. Furthermore, the F-value of 14.880 demonstrates that the overall regression model is a good fit, indicating that the model significantly explains variations in financial performance. The R Square value of 0.832 suggests that 83.2% of the variation in financial performance is explained by the capital structure, and the Adjusted R Square of 0.776 confirms the robustness of the model.

  

Therefore, the regression equation can be framed as: Y = 4917.730 + 4557.080(Debt-Equity Ratio)

Since the regression model is statistically significant, the null hypothesis ($H_0$) is rejected, which implies that the capital structure has a substantial and measurable impact on financial performance. This emphasizes the importance of managing the debt-equity ratio strategically to optimize organizational profitability and long-term financial stability.

### *C. DEA Efficiency Analysis*

To assess the firm's operational and scale efficiency over time, a Data Envelopment Analysis (DEA) was performed using the BCC (Variable Returns to Scale) model. The analysis adopted an input-oriented and output-oriented approach. Financial Performance (FP) was selected as the output variable, while Cost Efficiency (CE), Capital Utilization (CU), Investment Efficiency (IE), and Liquidity Management (LM) served as input variables.

#### 1. Input-Oriented DEA – Technical and Scale Efficiency

The input-oriented BCC model evaluates the extent to which the firm could minimize its input usage while maintaining its current level of financial output. Efficiency scores were calculated for the five-year period from 2020–2024.

| Unit name | Score | Efficient | Condition |
|---|---|---|---|
| 2020 | 100% | True | Green |
| 2021 | 86% | False | Red |
| 2022 | 100% | True | Green |
| 2023 | 100% | True | Green |
| 2024 | 100% | True | Green |

**2019-2020, 2021-2022, 2022-2023, 2023-2024 (100% Efficiency, Green Condition):** The firm was fully efficient in these years, indicating that it optimized its resource use and operated at the best possible scale. There were no significant inefficiencies in operations, and the firm effectively utilized its assets, capital, and resources. 2020-2021 (86.4% Efficiency, Red Condition): In this year, the firm experienced a drop in efficiency, scoring 86.4%. This indicates that the firm was not operating at its optimal level, with a 13.6% inefficiency gap. This could be due to operational or managerial inefficiencies, or the firm may have been operating at a suboptimal scale, leading to reduced performance.

- **Recovery Post 2020-2021:** After the drop in 2020-2021, the firm regained full efficiency in the following years (2021-2024), suggesting that corrective measures were implemented to address inefficiencies.

#### 2. Output-Oriented DEA – Technical and Scale Efficiency

The output-oriented DEA evaluates the firm's ability to maximize financial output given a fixed set of inputs. The results show strong efficiency trends across the analysis period.

| Unit name | Score | Efficient | Condition |
|---|---|---|---|
| 2020 | 100.0% | True | Green |
| 2021 | 97.2% | False | Amber |
| 2022 | 100.0% | True | Green |
| 2023 | 100.0% | True | Green |
| 2024 | 100.0% | True | Green |

For the output-oriented BCC model, the firm demonstrated strong operational efficiency across most years. It achieved 100% efficiency in 2019–2020, 2021–2022, 2022–2023, and 2023–2024, indicating effective output maximization relative to inputs.

This reflects well-managed processes and optimal resource utilization. In 2020–2021, the efficiency score dipped slightly to 97.2%, marked Amber, suggesting a minor shortfall in output generation. This small inefficiency may have resulted from temporary operational or resource allocation issues. However, the firm's swift recovery to full efficiency in the following years implies that corrective actions were taken effectively.

Overall, the analysis confirms that the firm has largely maintained high efficiency levels, showcasing its ability to consistently convert inputs into outputs and maintain performance stability over time.

### *D. FORECASTING FOR FUTURE FINANCIAL EFFICIENCY VARIABLES (2025–2030)*

The forecasting of five major financial efficiency indicators – Capital Utilization, Investment Efficiency, Liquidity Management, Cost Efficiency, and Profitability – is done using the Compound Annual Growth Rate (CAGR) based on the actual values from 2020 to 2024.

  

The following formula is used for forecasting: Forecast = Previous Year × (1 + CAGR). The CAGR applied for each variable is:

- Capital Utilization – 7%
- Investment Efficiency – 6.5%
- Liquidity Management – 5.5%
- Cost Efficiency – 6%
- Profitability – 7.5%

| Year | Capital Utilization | Investment Efficiency | Liquidity Management | Cost Efficiency | Financial Performance |
|---|---|---|---|---|---|
| 2020 | 2714.76 | 1651.32 | 1890.48 | 1749.57 | 1373.14 |
| 2021 | 3237.11 | 1864.41 | 1981.51 | 1892.62 | 1450.96 |
| 2022 | 3750.76 | 2053.12 | 2055.34 | 2054.19 | 1531.18 |
| 2023 | 4090.21 | 2241.32 | 2121.59 | 2177.06 | 1615.99 |
| 2024 | 3619.37 | 2435.25 | 2204.49 | 2361.51 | 1704.61 |
| 2025 | 3889.18 | 2593.54 | 2325.74 | 2503.20 | 1800.72 |
| 2026 | 4179.22 | 2762.93 | 2453.62 | 2653.39 | 1902.85 |
| 2027 | 4491.76 | 2943.91 | 2588.52 | 2812.59 | 2011.88 |
| 2028 | 4826.18 | 3137.76 | 2730.88 | 2981.34 | 2127.28 |
| 2029 | 5184.01 | 3345.72 | 2881.06 | 3160.22 | 2250.49 |
| 2030 | 5570.89 | 3569.14 | 3039.52 | 3350.63 | 2382.10 |

The analysis of the forecasted data highlights a consistent positive trend in Financial Performance over the next decade, driven by improvements across all key financial efficiency metrics:

1. Capital Utilization shows a steady increase from 2020 to 2030, indicating that the company is utilizing its capital more efficiently each year. This upward trend suggests that higher capital utilization directly contributes to better financial performance.

2. Investment Efficiency also exhibits strong growth over the forecast period, reinforcing the idea that strategic investments are a major contributor to the firm's financial success. As investment efficiency improves, financial performance is expected to grow significantly.

3. Liquidity Management shows a moderate but steady increase, indicating that while liquidity is improving, its effect on financial performance is less pronounced compared to capital utilization and investment efficiency. However, liquidity management remains crucial for ensuring operational stability.

4. Cost Efficiency demonstrates the most significant improvement, with a continuous upward trajectory. This reflects a focused effort on cost control, which plays a critical role in enhancing profitability and overall financial outcomes.

Overall, the forecast suggests that improvements in Capital Utilization, Investment Efficiency, and Cost Efficiency are likely to drive strong growth in Financial Performance. Liquidity Management, while still important, has a relatively lesser impact on financial performance in comparison to the other metrics.

**Implications**

The results of this analysis provide valuable insights into the factors influencing firm performance, with a particular focus on financial efficiency, capital structure, operational efficiency, and future projections. The following implications can be drawn from the study:

✓ **Emphasizing Financial Efficiency for Superior Firm Performance**

The positive correlations observed between Cost Efficiency (CE), Capital Utilization (CU), and Investment Efficiency (IE) with Firm Performance (FP) indicate that companies with effective cost control, optimized capital utilization, and efficient investments tend to achieve superior financial results.

**Implication:** Companies should prioritize enhancing their financial efficiency metrics, focusing on cost management, strategic capital deployment, and investment decisions to boost overall performance and competitiveness in the market.

✓ **Optimizing Capital Structure for Enhanced Financial Stability**

The regression analysis demonstrates a significant positive relationship between the Debt-Equity Ratio and financial performance, indicating that leveraging debt in a strategic manner can contribute to financial growth.

**Implication:** Firms should consider optimizing their capital structure, maintaining a balanced debt-equity ratio to enhance profitability while minimizing financial risk. Effective debt management can lead to better financial outcomes and improved stability.

✓ **Ensuring Operational Efficiency Through DEA Insights**

The DEA analysis indicates that the firm has largely maintained high operational efficiency, but the drop in efficiency during 2020-2021 suggests room for improvement. The firm's ability to recover swiftly demonstrates effective corrective measures.

  

**Implication:** Firms should continually monitor and evaluate their operational efficiency, using tools like DEA to identify inefficiencies and implement corrective actions. By focusing on optimizing resource utilization and improving operational processes, firms can maintain consistent performance and scale efficiently over time.

- ✓ **Forecasting Financial Efficiency for Long-Term Growth**

The forecast for financial efficiency metrics over the next decade reveals positive trends in Capital Utilization, Investment Efficiency, Liquidity Management, and Cost Efficiency, with a particularly strong emphasis on cost control and capital efficiency.

**Implication:** Companies should proactively plan for long-term financial growth by focusing on key financial efficiency drivers. Forecasting tools can help firms identify future trends and allocate resources effectively to ensure sustainable profitability and financial health.

- ✓ **Leveraging Financial Efficiency Metrics for Strategic Decision-Making**

The findings highlight the importance of financial efficiency metrics as key drivers of firm performance. The strong correlation between these metrics and financial performance suggests that they should be central to decision-making processes.

**Implication:** Organizations should integrate financial efficiency metrics into their strategic decision-making frameworks, using data-driven insights to guide long-term planning and investment decisions. By improving financial efficiency, firms can strengthen their market position and drive sustainable growth.

## VI. CONCLUSION

This study provides a comprehensive analysis of the relationship between financial efficiency, capital structure, and firm performance in a manufacturing context. The findings underscore the critical role that financial efficiency metrics—such as Cost Efficiency (CE), Capital Utilization (CU), and Investment Efficiency (IE)—play in driving firm performance. A strong positive correlation between these variables and financial performance demonstrates that effective management of costs, capital, and investments significantly enhances financial outcomes.

The analysis also highlights the importance of capital structure, with the Debt-Equity Ratio showing a substantial impact on financial performance. The regression results suggest that leveraging debt, when managed effectively, can contribute positively to firm profitability and stability, though it also calls for careful consideration of financial risk.

Furthermore, the Data Envelopment Analysis (DEA) results reveal that while the firm has generally maintained high operational efficiency, periods of inefficiency, such as in 2020-2021, provide valuable insights into areas for improvement. These inefficiencies were promptly addressed, illustrating the firm's capacity to recover and maintain efficiency. Lastly, the forecasted trends indicate that improvements in financial efficiency, particularly in Capital Utilization, Investment Efficiency, and Cost Efficiency, are expected to drive continued growth in financial performance over the next decade. While liquidity management remains important, its influence on financial outcomes is comparatively lower than the other metrics.

Overall, this study emphasizes the significance of optimizing financial efficiency, maintaining a balanced capital structure, and focusing on operational excellence to achieve sustainable growth and enhance financial performance. The results provide a roadmap for firms looking to strengthen their financial position and make informed, strategic decisions for long-term success.

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