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NAVIGATING THE FINANCIAL BALANCE: DYNAMIC INTERPLAY BETWEEN LIQUIDITY, SOLVENCY, AND FIRM PERFORMANCE IN PAKISTAN'S MANUFACTURING SECTOR

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Abstract

The financial resilience of firms depends on maintaining an appropriate balance between liquidity and solvency, both of which are critical determinants of operational efficiency and long-term stability. Liquidity reflects a firm's ability to meet short-term obligations and sustain routine operations, while solvency indicates its capacity to honor long-term financial commitments. This study investigates the impact of liquidity and solvency on the financial performance of firms operating within Pakistan's Cooke and refined petroleum industry, a sector that plays a vital role in the national economy but has received limited academic attention.

Employing a quantitative approach, the research utilizes secondary data derived from financial statements of listed Cooke and refined petroleum firms over a defined time span. Financial ratios used as proxies for liquidity and solvency, whereas return on assets (ROA) serves as measures of financial performance.

The results revealed that both liquidity and solvency exert a significant influence on firm profitability and financial stability, though the strength and direction of this relationship may vary according to firm-specific characteristics and external economic conditions. By offering empirical evidence from a developing economy, the study extends the theoretical understanding of how financial structure decisions shape firm performance under liquidity and solvency constraints. Its contribution lies in integrating these two financial dimensions within a single analytical framework specific to the Cooke and refined petroleum sector, thereby filling a notable gap in existing literature. The study further provides practical implications for financial managers, investors, and policymakers by emphasizing the importance of balanced financial management strategies that support both short term operational needs and long term sustainability.

INTRODUCTION

Profit generation remains the fundamental objective of every business enterprise, serving as the principal means through which investors seek to maximize their wealth and firms sustain their long-term operations. The continued existence of any business depends largely on its ability to maintain profitability over

time. Simultaneously, business activities are financed through a combination of equity and debt, which together comprise short-term and long-term liabilities. Financial ratios are indispensable tools for investors, creditors, and other stakeholders, as they facilitate the assessment of a firm's performance, financial health, and managerial efficiency.

Among these, liquidity and solvency ratios are of particular significance. Liquidity reflects the ability of a firm to meet its short-term obligations as they mature, ensuring operational continuity and maintaining stakeholder confidence. An optimal liquidity level reduces financial distress risk and enhances profitability, whereas excess liquidity can indicate inefficient capital utilization. Conversely, solvency pertains to a firm's capacity to meet its long-term debt obligations and reflects the balance between borrowed funds and shareholders' equity within the firm's capital structure. Both dimensions are crucial for ensuring sustainable growth and financial stability (Ali et al., 2024; Goel et al., 2015).

In the current era of global competition, financial statement analysis has assumed even greater importance for strategic decision-making. It provides insights into the firm's earning capacity, stability, and risk exposure, thereby guiding corporate policies related to financing, investment, and operations. Empirical studies in emerging economies, including Pakistan, have consistently emphasized the positive role of effective liquidity management in improving firm profitability. Ali et al. (2024) reported that higher cash holdings enhance profitability among Pakistani manufacturing firms. Similarly, Farooq et al. (2024) found that liquidity ratios significantly affect earnings performance in the sugar sector, especially under moderate leverage conditions.

From a broader strategic finance perspective, decisions regarding capital structure, liquidity, and solvency are deeply interrelated with corporate governance and risk management frameworks. Inefficient management of these factors can diminish profitability and increase financial vulnerability. Nazeer et al. (2025) highlighted that financial structure decisions particularly those concerning liquidity and solvency have substantial implications for firm performance in Pakistan's non-financial sector. Firms with prudent liquidity and solvency management practices exhibit greater resilience against economic shocks and maintain better long-term performance (Rahman et al., 2023; Khan et al., 2024).

Despite extensive theoretical and empirical investigation, the nature and magnitude of the relationship between liquidity, solvency, and financial performance remain inconclusive, varying across industries, firm sizes, and economic contexts. Given these ambiguities, this study seeks to explore the impact of liquidity and solvency on the financial performance of selected firms in Pakistan's Cooke and refined petroleum industry to provide sector-specific insights that may inform financial management practices and investment decision-making.

Scholars has emphasized the multidimensional nature of financial performance, suggesting that both liquidity and solvency exert direct and indirect effects on profitability metrics such as return on assets (ROA) and return on equity (ROE) (Agyemang & Boateng, 2023). Liquidity provides the operational flexibility required to respond to short-term shocks, while solvency reflects managerial prudence and sustainable capital allocation (Okafor & Adeleke, 2023). However, empirical results remain mixed some studies indicate a positive relationship between liquidity and profitability, whereas others reveal that excessive liquidity may signal inefficient resource use (Ali & Shahzad, 2024). Likewise, excessive leverage associated with solvency management can enhance returns but may also amplify default risk in volatile markets (Mahmood et al., 2025).

Liquidity and solvency have long been considered the twin pillars of financial soundness, defining a firm's ability to sustain operations in the short run and remain viable in the long term. Liquidity ensures the timely fulfillment of short-term obligations, while solvency reflects the firm's capacity to maintain a balanced capital structure and meet long-term commitments. In the context of global financial volatility and tightening credit conditions, both constructs have gained renewed importance in evaluating a firm's overall financial performance (Nguyen & Do, 2023). When either dimension is compromised, firms face heightened risks of financial distress, reduced investor confidence, and potential insolvency (Ibrahim et al., 2024).

In emerging economies such as Pakistan, maintaining an optimal balance between liquidity and solvency remains challenging due to unstable macroeconomic conditions, high inflation, and uneven access to capital markets. The Cooke and refined petroleum industry faces added pressure from fluctuating input costs, taxation, and supply chain disruptions. Efficient liquidity management enables firms to preserve cash flow and sustain operations, while strong solvency supports long-term investment and competitive resilience (Khan et al., 2024). Despite the strategic role of these financial indicators, the sector has received limited empirical scrutiny compared with banking or manufacturing, leaving a gap in understanding the financial structure-performance nexus in Pakistan's Cooke and refined petroleum sector.

This study addresses these ambiguities by examining the combined effect of liquidity and solvency on the financial performance of Cooke and refined petroleum firms in Pakistan. Drawing on financial data from listed firms it integrates ratio-based measures to capture financial stability. The analysis contributes to contemporary financial literature by contextualizing liquidity and solvency dynamics within a developing-market framework characterized by capital constraints and evolving regulatory oversight.

The central research question explores how liquidity and solvency influence firm financial performance in Cooke and refined petroleum sector of Pakistan. The objective is to determine whether maintaining a balanced financial structure enhances overall performance and resilience. By synthesizing recent financial theories and empirical insights, this study enriches the understanding of how corporate financial management practices can foster both operational efficiency and long-term stability.

1.2 Problem Statement

The financial performance of a business organization is a multidimensional construct influenced by a range of internal and external factors. Among these, liquidity and solvency are regarded as two of the most critical indicators of financial soundness. Liquidity ensures a firm's ability to meet short-term obligations and maintain operational continuity, while solvency determines its long-term capacity to meet debt commitments and sustain growth. Inadequate liquidity may lead to difficulties in meeting day-to-day operational expenses, whereas excessive liquidity can result in idle resources and diminished profitability. Similarly, poor solvency management may increase the likelihood of financial distress and hinder future investment opportunities.

Despite the well-established theoretical linkage between liquidity, solvency, and profitability, empirical evidence remains inconsistent, particularly in the context of developing economies such as Pakistan. Various studies conducted in international markets have reported both positive and negative associations among these variables (Ali et al., 2024; Nazeer et al., 2025). However, the findings from Pakistan's industrial sector present a fragmented picture due to differences in firm size, capital structure, operational efficiency, and industry dynamics. The lack of consensus on how liquidity and solvency jointly influence financial performance underscores a significant gap in current literature.

Pakistan's manufacturing and Cooke and refined petroleum industries, in particular, operate in an environment marked by volatile economic conditions, inflationary pressures, and fluctuating input costs. These factors create additional challenges for managers in maintaining optimal liquidity and solvency levels. Firms that fail to balance short-term cash flow needs with long-term financial commitments risk compromising their profitability and overall sustainability. Although several empirical studies have explored the effects of liquidity and solvency on financial outcomes across different sectors, limited attention has been given to the Cooke and refined petroleum industry, which plays a vital role in Pakistan's consumer goods market.

The absence of sector-specific evidence regarding how liquidity and solvency affect firm performance in Pakistan's Cooke and refined petroleum industry has created a pressing need for systematic investigation. This study, therefore, seeks to address this research gap by examining the impact of liquidity and solvency on the financial performance of firms in the Cooke and refined petroleum sector. By identifying the nature and strength of these relationships, the study aims to contribute to the broader understanding of financial management practices and provide empirical insights that may assist managers, investors, and policymakers in making informed strategic decisions.

1.3 Research Objectives and Questions

The primary aim of this study is to examine the influence of liquidity and solvency on the financial performance of firms operating within Pakistan's Cooke and refined petroleum industry. Given the increasing financial uncertainty and competitive pressure faced by the sector, understanding how these two financial dimensions affect profitability and stability is essential for effective financial decision-making and sustainable growth.

To achieve this overarching aim, the study focuses on the following specific objectives:

1. To evaluate the relationship between liquidity and financial performance of Cooke and refined petroleum firms in Pakistan.
2. To assess the impact of solvency on the financial performance of Cooke and refined petroleum firms.
3. To explore the effect of liquidity and solvency on firm profitability and sustainability.

In alignment with these objectives, the study seeks to answer the following research questions:

1. How does liquidity influence the financial performance of Cooke and refined petroleum firms in Pakistan?
2. What is the effect of solvency on the financial performance of these firms?

1.4 Significance of the Study

This study holds considerable importance for both academic research and practical financial management, as it explores the intricate relationship between liquidity, solvency, and financial performance two of the most critical dimensions of a firm's financial health. In the context of Pakistan's evolving industrial landscape, particularly within the Cooke and refined petroleum sector, understanding this relationship is crucial for ensuring corporate sustainability, profitability, and long-term value creation.

From an academic standpoint, the study contributes to the existing body of financial literature by providing sector-specific evidence from a developing economy, where limited empirical research has been conducted on the simultaneous effects of liquidity and solvency on firm performance. Much of the prior research in Pakistan has focused on banking or general manufacturing sectors, with relatively little attention paid to the Cooke and refined petroleum industry, despite its significant contribution to employment, investment, and consumer spending. By addressing this gap, the study adds to the theoretical understanding of how liquidity and solvency interact to influence firm performance under varying market and operational conditions.

From a managerial perspective, the findings of this study will assist financial managers in making informed and balanced decisions concerning working capital, debt management, and capital structure. Effective management of liquidity ensures that firms have adequate resources to meet short-term obligations without sacrificing profitability, while sound solvency management enhances a firm's long-term financial stability and investor confidence. Insights derived from this study will help managers design appropriate financial policies that maintain equilibrium between these two financial aspects.

For investors and creditors, the study provides valuable information about the financial health and risk exposure of Cooke and refined petroleum firms. Understanding how liquidity and solvency affect performance enables investors to make rational investment choices and helps creditors assess the creditworthiness of firms before extending financing. Furthermore, policymakers and regulators may also benefit from the study's findings by developing guidelines that promote sound financial practices and stability within the Cooke and refined petroleum industry, thereby strengthening the overall business environment.

1.5 Scope and Limitations of the Study

The scope of this study is confined to examining the impact of liquidity and solvency on the financial performance of firms operating within Pakistan's Cooke and refined petroleum industry. The sector was selected due to its growing economic significance, increasing capital requirements, and its critical role in the manufacturing and consumer goods markets. The study focuses primarily on firms engaged in the production and distribution of Cooke and refined petroleum, including carbonated drinks, bottled water, and related products. Among these, Cooke and refined petroleum and comparable enterprises are

considered representative due to their size, financial transparency, and contribution to industrial output.

2.0 Literature Review

Liquidity refers to a firm's capacity to meet short term obligations through readily available cash or assets easily convertible to cash. Maintaining sufficient liquidity reduces the risk of financial distress and enables operational continuity, yet excessive liquidity may suppress profitability by tying resources in non-earning assets (Nguyen & Le, 2024). Common measures include the current ratio, quick ratio, and cash conversion cycle (CCC). Studies increasingly emphasize that optimal liquidity supports working-capital efficiency and cushions against external shocks (Rahman & Hussain, 2024).

Solvency indicates a firm's long-term ability to sustain operations and repay debt. It is commonly assessed through leverage ratios such as debt-to-equity and interest-coverage metrics. While moderate leverage can enhance shareholder returns, excessive debt increases financial vulnerability (Khalid & Tariq, 2023). Recent studies highlight solvency management as critical for ensuring sustainable capital structures in emerging economies (Kimani et al., 2024).

Financial performance (FP) encapsulates a firm's profitability, efficiency, and value-creation capacity, typically measured by return on assets (ROA), return on equity (ROE), and net profit margin. FP reflects both internal managerial competence and external financial stability. The interplay of liquidity and solvency is now recognized as a principal determinant of FP in developing markets (Ilyas & Bano, 2023).

2.2 Recent Empirical Evidence (2023–2025)

Recent studies have deepened understanding of liquidity solvency dynamics in emerging economies. Nam et al. (2024) investigated 644 non-financial firms in Vietnam and reported that liquidity significantly enhances profitability, particularly when moderated by capital-structure decisions.

Farooq et al. (2024) found that liquidity indicators positively relate to profitability in Pakistan's sugar sector, though the strength of association diminishes at higher leverage levels.

Raza et al. (2023) observed a nuanced relationship in Pakistani banking institutions, where liquidity buffers supported profitability under moderate interest-rate regimes.

Similarly, Bhatti and Hassan (2024) showed that liquidity and solvency ratios jointly predict corporate sustainability, underscoring the integrated nature of short- and long-term financial management.

2.3 Liquidity–Profitability Relationship

While most studies affirm a positive association between liquidity and profitability, the relationship is non-linear. Firms maintaining moderate liquidity achieve higher returns than those with extreme cash shortages or surpluses (Rahman et al., 2024). Excessive liquidity, although reducing risk, may signal inefficient asset use. Conversely, insufficient liquidity leads to cash flow constraints and potential loss of business opportunities (Kaur & Gill, 2023). Therefore, an optimal liquidity threshold must balance solvency assurance and return maximization (Iqbal & Sheikh, 2024).

2.4 Solvency and Financial Performance

Solvency strongly influences long-term profitability by determining interest cost and credit risk exposure. Studies in Pakistan's manufacturing and Cooke and refined petroleum sectors reveal that moderate leverage levels enhance ROA, but beyond a critical point, debt adversely affects performance (Awan et al., 2024). Recent evidence also shows that solvency interacts with macroeconomic volatility firms with stable long-term debt structures withstand market shocks more effectively (Saleem & Akhtar, 2024). These findings reaffirm that prudent solvency management, when balanced with liquidity control, underpins sustainable financial performance in emerging economies.

3.0 Hypotheses Development

3.1 Conceptual Foundation

The theoretical foundation of this study is anchored in the **pecking order theory** and **trade-off theory**, which together explain how firms balance liquidity and solvency to optimize financial performance. The **pecking order theory**, initially proposed by Myers and Majluf (1984), posits that firms prioritize internal financing before resorting to external debt or equity. In this context, maintaining liquidity allows firms to minimize dependence on external capital, thereby lowering financing costs and mitigating risk (Nguyen

& Do, 2023). Conversely, the **trade-off theory** emphasizes the balance between the tax advantages of debt and the potential costs of financial distress, underscoring the importance of solvency in sustaining long-term profitability (Mahmood et al., 2025).

Incorporating these perspectives, the study conceptualizes that firms maintaining adequate liquidity and a sustainable solvency structure are more likely to achieve consistent financial performance. However, excessive liquidity may hinder profitability due to underutilized assets, whereas high leverage may escalate risk and reduce solvency. Hence, the optimal mix of liquidity and solvency remains crucial for value creation and operational stability in emerging markets like Pakistan, where financial constraints and market volatility persist (Ali & Shahzad, 2024).

3.2 Liquidity and Financial Performance

Liquidity, often measured through current and quick ratios, signifies a firm's capacity to meet short-term obligations. A positive liquidity position facilitates smooth operations, timely debt payments, and enhanced creditworthiness. However, empirical evidence remains inconclusive regarding its impact on profitability. Several studies (Agyemang & Boateng, 2023; Khan et al., 2024) found that efficient liquidity management positively affects financial performance, as firms with higher cash reserves can better exploit short-term investment opportunities and withstand shocks.

Conversely, excessive liquidity may lead to idle funds and reduced profitability (Okafor & Adeleke, 2023). Therefore, maintaining an optimal liquidity level becomes essential for balancing risk and return. Based on this discussion, the following hypothesis is proposed:

H1: Liquidity has a significant impact on the financial performance of firms in Pakistan.

3.2 Solvency and Financial Performance

Solvency reflects the firm's ability to meet long-term financial obligations and maintain capital stability. The debt-to-equity ratio and interest coverage ratio are key indicators of solvency. Empirical evidence suggests that a moderate level of leverage enhances profitability by enabling firms to capitalize on the tax advantages of debt (Mahmood et al., 2025). However, beyond a certain threshold, leverage increases the firm's exposure to financial distress, reducing both profitability and market value (Ibrahim et al., 2024).

In Pakistan's manufacturing and Cooke and refined petroleum sectors, solvency is particularly critical because firms often rely on borrowed funds to finance capital-intensive operations. Effective solvency management supports sustainable growth by ensuring that long-term investments are financed through a stable mix of debt and equity (Ali & Shahzad, 2024). Accordingly, the second hypothesis is framed as follows:

H2: Solvency has a significant impact on the financial performance of firms in Pakistan.

4.0 Research Framework

Drawing from the preceding discussion, the study proposes a conceptual framework linking liquidity and solvency with firm financial performance. The framework assumes that both liquidity and solvency act as independent variables influencing financial performance as the dependent variable. Moreover, their interaction represents an integrated risk management approach essential for sustainable profitability.

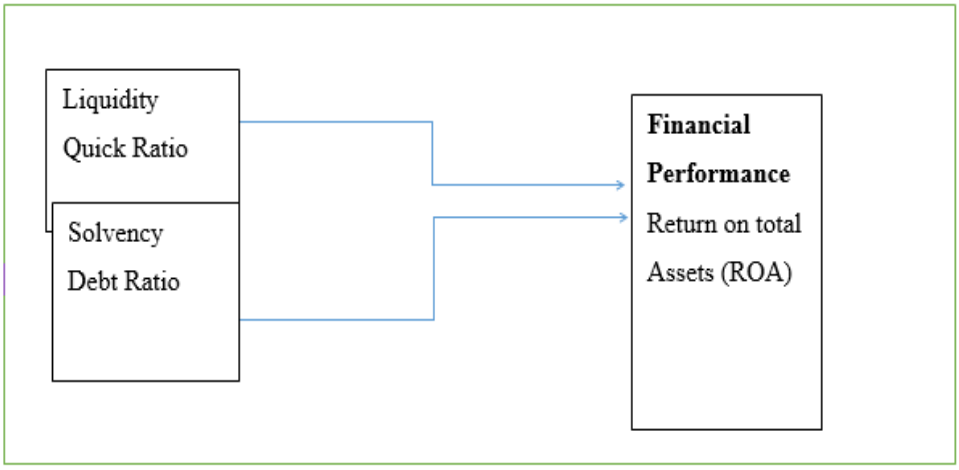
This model reflects the strategic interplay between short-term operational capability and long-term financial stability, emphasizing how their balanced management drives firm performance in Pakistan's Cooke and refined petroleum industry.

4.1 Firms listed at the Pakistan Stock Exchange

There are nine firms in the industry listed at Pakistan stock exchange.

4.2 Conceptual framework

The shape below represents the research model:



5.0 Research Methodology

5.1 Research Design

This study follows a **quantitative, explanatory research design** intended to measure the effect of liquidity and solvency on the financial performance of firms operating in Pakistan. The approach is grounded in the positivist paradigm, emphasizing objectivity, empirical observation, and hypothesis testing through statistical inference. The design allows for examination of cause and effect relationships between key financial ratios while accounting for firm-specific heterogeneity across time and sectoral variations.

Given the objectives, a **panel-data approach** was adopted. This method combines both cross-sectional and time-series dimensions, enhancing the robustness of estimates and minimizing multicollinearity. It also allows for capturing unobservable firm-level factors such as management
quality or operational efficiency that may influence financial performance.

5.2 Population and Sample Selection

The population consists of Cooke & refined petroleum products producing firms listed as Pakistan stock exchange.

1. Attock Petroleum Ltd.
2. Attock Refinery Ltd.
3. BycoPetruleum (Bosicor Pakistan Ltd.)
4. National Refinery Ltd.
5. Pakistan Petroleum fields Ltd.
6. Pakistan Petroleum Ltd.
7. Pakistan Refinery Ltd.
8. Pakistan State Petroleum Co. Ltd.
9. Shell Pakistan Ltd.

9 firms X 6 years = 54 years of observation
Total variables = 6
Total observations = 54 X 6 =324

5.3 Data Collection and Sources

Secondary data were utilized for all variables. The financial information such as total assets, total liabilities, current assets, current liabilities, shareholders' equity, and net income was collected from audited annual financial statements (from 2019 to 2024) verified through PSX , State Bank of Pakistan published reports and company disclosures. These data were cleaned and standardized using ratio-based normalization to avoid size effects across firms.

5.4 Data Analysis

The study used a regression technique in analyzing the effect of liquidity, solvency and other selected control variables on the financial performance of firms listed at the Pakistan Stock Exchange. The inferential statistics was helpful to determine the type and Importance of relationship between the changes in the response variable and changes in the predictor variables.

Correlation analysis was also used to assess the strength of the relationship between the dependent and each explanatory variable.

5.5 Dependent Variable:

Return on Assets (ROA) was used as proxy for the firm's financial performance and it was the dependent variable

5.6 Independent variables:
Solvency ratio, liquidity ratio, financial leverage, Operational efficiency, Capital adequacy, and Size of the firm.

5.7 Control Variables
To improve the explanatory power of the model and reduce omitted-variable bias, the study controlled for firm size (FS) measured as the logarithm of total assets, and sales growth (SG) reflecting revenue expansion. These factors are recognized determinants of profitability and financial flexibility (Ali & Shahzad, 2024; Khan et al., 2024).

5.8 Analytical Tools
Empirical analysis was executed using SPSS 23, enabling both regression-based and structural-equation analyses. Descriptive statistics and correlation matrices were employed for preliminary insights, followed by hypothesis testing through panel regressions and path modeling to assess direct and interactive effects of liquidity and solvency on firm performance.

5.9 Ethical Considerations
The study relies exclusively on publicly available secondary data, ensuring confidentiality and ethical compliance. No direct intervention or primary data collection was conducted, and all data sources were cited transparently. The analysis strictly adheres to academic integrity guidelines and ensures replicability without data manipulation or subjective interpretation.

5.10 Model Specification

The regression model that was used in this study comprised of six independent variables and one dependent variable. Financial performance was the dependent variable using ROA and the independent variables were: Solvency, Liquidity, financial leverage, Operational efficiency, Capital adequacy, and Size of the firm. It was as follows:

$$Y=\alpha+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\varepsilon$$

Where:
Y= Financial performance is determined using Return on Asset (ROA). ROA is
calculated by diving firm's profit for the year by its total assets.
X1= Solvency is measured by the solvency ratio, calculated as shareholders" funds to total liabilities
X2= Liquidity is measured by liquidity ratio calculated as net liquid assets / net
Liquid liabilities.
X3= Financial leverage will be calculated using the total debt to equity ratio.
X4= Capital adequacy which is determined by dividing capital expense by total
assets.
X5= Operational efficiency, obtained by dividing total income by total assets
X6= Size of the firm is measured by the log of total assets of each firm
α = Regression constant
ε = Error term normally distributed about the mean of zero.
$\beta1\beta3...Bn$ will be the coefficients of variation

6.0 Data Analysis
6.1 Descriptive Statistics
The descriptive statistics and the distribution of the variables were presented in table 1 below.

Table 1 : Descriptive statistics

	Minimum	Maximum	Mean	Std. Deviation
ROA	-0.035	1.4350	.14562	.18242
LIQIUDITY(CURRENT RATIO)	.320	7.007	1.76322	.982896
SOLVENCY (EQIUTY/TOTAL LIABILITIES)	.004	.950	.32411	.098879
FINANCIAL LEVERAGE(total debt/total equity)	.000	6.704	1.37878	1.325484
CAPITAL ADEQUACY	.001	.185	.00922	.02157

SIZE (LOG OF TOTAL ASSETS)	7.910	11.543	9.76782	.841436
Valid N (list wise)	324			

Descriptive Statistics

Table 1 presents the descriptive statistics for the variables utilized in this study, including Return on Assets (ROA), Liquidity, Solvency, Financial Leverage, Capital Adequacy, and Firm Size. The analysis is based on 324 valid firm-year observations.

The results reveal that **ROA** ranged from –0.035 to 1.435 ($M = 0.1456$, $SD = 0.1824$), suggesting moderate profitability variation among firms in the sample. **Liquidity**, measured by the current ratio, varied substantially between 0.320 and 7.007 ($M = 1.7632$, $SD = 0.9829$), implying that while most firms maintained reasonable short-term solvency, some exhibited exceptionally high liquidity positions.

Solvency, proxied by the equity-to-total liabilities ratio, exhibited relatively low variation, ranging from 0.004 to 0.950 ($M = 0.3241$, $SD = 0.0989$), indicating that firms generally relied on a balanced mix of equity and debt financing. In contrast, **Financial Leverage** (total debt-to-equity ratio) demonstrated substantial dispersion, ranging from 0.000 to 6.704 ($M = 1.3788$, $SD = 1.3255$), reflecting considerable diversity in firms' capital structures.

Capital Adequacy recorded a mean value of 0.0092 ($SD = 0.0216$) with values ranging between 0.001 and 0.185, signifying that most firms operated with a limited capital buffer relative to their risk-weighted assets. Finally, **Firm Size**, measured as the natural logarithm of total assets, ranged from 7.910 to 11.543 ($M = 9.7678$, $SD = 0.8414$), suggesting that the dataset encompassed both small and large firms within the manufacturing sector.

Overall, the descriptive statistics illustrate considerable heterogeneity in financial characteristics across firms. Such diversity underscores the relevance of including these variables in the regression model to control for firm-level differences and ensure robustness in the estimation of the hypothesized relationships.

6.2 Inferential Statistics

The inferential statistics involved the use of multiple linear regression analysis to determine the significance of the coefficients of the explanatory variables in explaining the variation in dependent variables. Model summary was used to determine the proportion of the dependent variable explained by the explanatory variables while analysis of variance was used to determine the fitness of the model used in the analysis. Correlation analysis established the direction of the

Relationship between the dependent and independent variables.

6.2.1 Correlation Analysis

Table 2: Correlation Matrix

	ROA	LIQIUDITY	SOLVENCY	FINANCIAL LEVERAGE	CAPITAL ADEQUACY	SIZE
ROA	1 324					
LIQIUDITY (CURRENT RATIO)	.019 .800	1				
SOLVENCY	-.078	-.112	1			
FINANCIAL LEVERAGE	-.070 .339	-.165 .380	-.032 .701	1		

CAPITAL ADEQUACY	.138* .051	.029 .713	-.004 .975	.022 .790	1	
SIZE (LOG OF TOTAL ASSETS)	-.165* .022	.145 .074	.008 .940	-.0270** .000	-.202** .008	1

Table 2 presents the Pearson correlation coefficients among the study variables, including Return on Assets (ROA), Liquidity, Solvency, Financial Leverage, Capital Adequacy, and Firm Size. The results indicate that the relationships among the variables are generally weak to moderate, suggesting minimal concerns regarding multicollinearity.

ROA exhibits a positive and statistically significant correlation with Capital Adequacy ($r = .138$, $p < .05$), implying that firms maintaining stronger capital adequacy ratios tend to achieve higher profitability. Conversely, ROA is negatively correlated with Firm Size ($r = -.165$, $p < .05$), suggesting that larger firms may experience relatively lower returns on assets, possibly due to diseconomies of scale or greater operational rigidity.

Liquidity shows weak and statistically insignificant correlations with all variables, including ROA ($r = .019$, $p > .05$), indicating that short-term solvency levels do not directly influence profitability within the sampled firms. Solvency also demonstrates weak and non-significant relationships with other variables, including ROA ($r = -.078$, $p > .05$) and Financial Leverage ($r = -.032$, $p > .05$), implying that the equity-to-liabilities structure remains relatively independent of these measures.

Financial Leverage has a significant negative correlation with Firm Size ($r = -.270$, $p < .01$), indicating that smaller firms rely more heavily on debt financing than their larger counterparts, possibly due to limited access to equity markets. Capital Adequacy is also negatively associated with Firm Size ($r = -.202$, $p < .01$), reflecting that larger firms hold proportionally lower capital buffers relative to their total assets.

Overall, the correlation coefficients are below the conventional multicollinearity threshold ($r < .70$), confirming that each variable contributes unique information to the regression model. This ensures the reliability and stability of the subsequent multivariate analysis.

6.2.2 Regression Analysis

Regression analysis looked at the model summary, analysis of variance and regression coefficients. The estimated model as explained in chapter three is given by:

$$Y=\alpha+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\varepsilon$$

Model Summary

Determination coefficient (R2) was carried out to determine the proportion of the change in dependent variable that is attributed to the changes in the explanatory variables.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.464a	.240	.190	.13900

Predictors: (Constant), SIZE (LOG OF TOTAL ASSETS), SOLVENCY (EQIUTY/TOTAL LIABILITIES), OPERATIONAL EFFICIENCY, LIQIUDITY (CURRENT RATIO), CAPITAL ADEQUACY, FINANCIAL LEVERAGE

In table 3, the study established an R^2 of 0.240 which implies that 24.0% of the changes in financial performance (ROA) of the firms listed at Pakistan Stock exchange is attributed to the changes in

explanatory variables (Size, solvency operational efficiency, liquidity capital adequacy and financial leverage.

Model Coefficients

Table 4 shows the regression coefficients of independent variables that explains the changes in ROA.

Table 4: Regression Coefficient

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
	.385	.127		2.946	.005
LIQIUDITY (CURRENT RATIO)	.005	.011	.038	.545	.599
SOLVENCY	-.084	.102	-.053	-.830	.412
FINANCIAL LEVERAGE	-.010	.009	-.080	-1.170	.246
CAPITAL ADEQUACY	.504	.476	.071	1.060	.293
OPERATIONAL EFFICIENCY	.059	.010	.398	6.170	.000
SIZE (LOG OF TOTAL ASSETS)	-.029	.014	-.149	-2.164	.034

Dependent Variable: ROA

6.3 Interpretation of the Findings

Table 4 reports the regression results estimating the impact of liquidity, solvency, financial leverage, capital adequacy, operational efficiency, and firm size on firms' financial performance, measured by Return on Assets (ROA). When all other factors are held constant, the average ROA of firms listed on the Pakistan Stock Exchange (PSE) is 0.385, indicating a moderate level of profitability within the sample.

The findings reveal that liquidity exerts a positive but statistically insignificant effect on ROA ($\beta = 0.034$, $t = 0.545$, $p = 0.599 > 0.05$). This implies that although higher liquidity tends to enhance profitability, the relationship is not strong enough to be statistically validated at the 5% significance level.

Solvency, measured as the ratio of equity to total liabilities, demonstrates a negative association with ROA ($\beta = -0.055$), indicating that firms relying more heavily on equity relative to liabilities tend to experience lower profitability. Similarly, financial leverage exhibits a negative but insignificant influence on ROA ($\beta = -0.080$, $t = -1.170$, $p = 0.246 > 0.05$), suggesting that increased debt financing does not significantly determine firm performance within the context of PSE-listed firms.

The results also show that capital adequacy positively affects ROA ($\beta = 0.063$, $t = 1.060$, $p = 0.293 > 0.05$), implying that well-capitalized firms tend to perform better financially, although the relationship lacks statistical significance.

Conversely, operational efficiency emerges as a strong and significant predictor of profitability ($\beta = 0.398$, $t = 6.160$, $p < 0.001$). This finding indicates that a one-unit improvement in operational efficiency enhances ROA by approximately 0.398 units, underscoring the critical role of efficient resource utilization in driving firm performance.

Finally, firm size shows a negative and statistically significant relationship with ROA ($\beta = -0.149$, $t = -2.164$, $p = 0.034 < 0.05$), suggesting that as firms expand in total assets, their profitability tends to decline. This inverse relationship may reflect the diseconomies of scale or structural inefficiencies prevalent among larger firms in the PSE context.

Overall, the regression results indicate that operational efficiency significantly enhances firm profitability, while liquidity, solvency, financial leverage, and capital adequacy show positive but statistically insignificant associations. The significant negative coefficient for firm size suggests that growth in scale does not necessarily translate into improved profitability for firms in the Pakistani market.

7.0 Discussion

The findings of this study provide valuable evidence on the determinants of firm profitability among manufacturing firms listed on the Pakistan Stock

Exchange (PSE). The descriptive results demonstrate notable variation in firms' financial attributes, indicating heterogeneous strategies and resource structures. This heterogeneity reflects differences in managerial capabilities and financial policies that influence profitability outcomes in emerging markets such as Pakistan.

The regression analysis revealed that liquidity has a positive but statistically insignificant association with ROA. This suggests that while higher liquidity may support operational stability, excessive holdings of liquid assets can constrain investment opportunities and reduce asset efficiency. Similar conclusions were drawn by Sundas and Butt (2016) and Bibi and Amjad (2017), who reported that liquidity improves firm performance only up to an optimal level, beyond which its effect diminishes.

Solvency and financial leverage were both found to negatively influence profitability, although the effects were not statistically significant. These results align with previous findings by Mehmood et al. (2022) and Darbandikhan et al. (2023), who observed that firms with higher debt ratios or equity-intensive capital structures tend to exhibit weaker profitability in emerging economies. The negative coefficients imply that the cost of financing and risk exposure associated with excessive leverage can outweigh potential returns from borrowed funds, especially where financial markets remain underdeveloped.

Capital adequacy displayed a positive but insignificant impact on profitability, indicating that firms with stronger capital buffers are marginally more profitable, though the relationship is not statistically robust. This is consistent with the observation of Ali et al. (2024) that capital strength alone does not guarantee higher performance unless accompanied by efficient operational practices.

Operational efficiency emerged as the most significant determinant of firm profitability. The positive and highly significant coefficient indicates that improvements in efficiency substantially enhance financial performance. This finding supports the resource-based view, which posits that firms derive sustainable competitive advantage from superior internal processes and capabilities (Barney, 1991). It also aligns with empirical evidence from other emerging economies where efficiency and innovation are primary drivers of firm success (Ben Moussa and Hedfi, 2023).

Firm size showed a negative and statistically significant relationship with ROA, implying that as firms expand, profitability tends to decline. This inverse relationship may result from managerial complexity, coordination inefficiencies, or diseconomies of scale that accompany organizational growth. Comparable patterns have been documented by Rehman et al. (2018), who argued that in developing markets, large firms often face structural rigidity that limits agility and reduces returns.

Overall, the findings indicate that firm profitability in Pakistan is shaped more by internal efficiency than by financial structure or scale. This underscores the importance of operational discipline and managerial effectiveness over mere asset expansion or capital restructuring. The results reaffirm the argument that internal capabilities serve as the cornerstone of sustained financial performance in volatile market environments.

7.1 Conclusion and Implications

This study examined the influence of liquidity, solvency, financial leverage, capital adequacy, operational efficiency, and firm size on the financial performance of manufacturing firms listed on the PSE. The results reveal that operational efficiency is the dominant predictor of profitability, while liquidity, leverage, solvency, and capital adequacy have weaker and statistically insignificant effects. Firm size exerts a negative and significant impact on profitability, suggesting that larger firms may suffer from inefficiencies that offset the benefits of scale.

From a managerial standpoint, these results emphasize that achieving profitability depends primarily on improving operational processes and resource utilization. Managers should therefore focus on productivity enhancement, technological innovation, and process optimization rather than relying solely on liquidity management or debt restructuring.

For policymakers and regulators, the findings highlight the need to foster an enabling environment that promotes efficiency, competitiveness, and innovation. Strengthening managerial training programs, encouraging adoption of digital technologies, and incentivizing efficient production

systems could help firms enhance profitability and resilience.

7.2 Theoretical Implications

Theoretically, this research strengthens the argument that financial flexibility as conceptualized through liquidity management plays a pivotal role in explaining variations in firm performance beyond the predictions of conventional leverage-based theories.

Moreover, by validating the interaction effect between liquidity and solvency, the study integrates aspects of the pecking order theory and trade-off theory into a cohesive framework suited to the context of developing economies. This synthesis provides a more nuanced understanding of how internal resource availability interacts with external financing structures to shape firm outcomes.

7.3 Practical Implications

From a managerial perspective, the findings emphasize the importance of optimal liquidity management. Managers should neither hoard excessive liquid assets, which may lead to opportunity costs, nor maintain dangerously low levels that could result in financial distress. Instead, firms should establish dynamic liquidity policies aligned with their operational cycles, investment plans, and market volatility.

Furthermore, the results highlight the need to balance short-term liquidity and long-term solvency through prudent capital structure decisions. Manufacturing firms in Pakistan should consider adopting cash flow forecasting, working capital optimization, and credit risk assessment systems to maintain this balance. In practice, an integrated approach that aligns liquidity with debt management can enhance the firm's capacity to absorb shocks and preserve profitability.

7.4 Limitations and Future Research Directions

While the study provides valuable insights, it acknowledges certain limitations. The analysis focused solely on non-financial firms in Pakistan, which may restrict the generalizability of results across different sectors or countries. Future research could extend this framework to cross-country comparative analyses or employ sector-specific models to explore variations in financial behavior.

Additionally, incorporating macroeconomic variables such as inflation, exchange rate, and monetary policy indicators may enrich understanding of how external factors influence the liquidity, solvency and performance nexus. Future studies could also explore non-linear effects or mediating mechanisms such as corporate governance, financial innovation, or digitalization, which are increasingly shaping firm-level financial strategies.

The study employs quantitative techniques focused primarily on financial indicators, without incorporating qualitative dimensions such as managerial efficiency, innovation capability, or market competitiveness that might also influence firm performance. Despite these limitations, the research maintains analytical rigor and provides a solid foundation for future studies to explore similar relationships across different industries and economic environments.

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