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Shivani Chhabra
Research Scholar, Department of Commerce, School of Commerce, IIS (Deemed to be University), Jaipur, Rajasthan, India

Shweta Gupta
Professor, Department of Accounting & Taxation, School of Commerce, IIS (Deemed to be University), Jaipur, Rajasthan, India

Correspondence Author:
Shivani Chhabra
Research Scholar, Department of Commerce, School of Commerce, IIS (Deemed to be University), Jaipur, Rajasthan, India

Impact of liquidity on firm's profitability: A panel analysis of the NSE listed Indian pharmaceutical companies

Shivani Chhabra and Shweta Gupta

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Abstract
This study examines the relationship between liquidity and profitability in the Indian pharmaceutical industry, focusing on the top five NSE-listed firms by market capitalization from 2015 to 2024. Using secondary data from the Prowess database, it applies panel regression and correlation analyses. Liquidity is measured by the current ratio (CR) and quick ratio (QR), while profitability is assessed using return on assets (ROA) and return on equity (ROE), with firm size as a control variable. Findings show that QR positively and significantly influences both ROA and ROE. In contrast, CR does not significantly impact ROA and is negatively related to ROE. Firm size also negatively affects profitability. The study emphasizes the need for effective liquidity management to ensure long-term profitability.

Keyword: Liquidity, profitability, firm size, panel regression, pharmaceutical

Introduction
The pharmaceutical industry in India stands as one of the largest and fastest-growing sectors, making an undeniable impact on global healthcare. India is firmly positioned as the world's third-largest producer of pharmaceuticals by volume and a dominant exporter of generic medicines. This industry boasts strong manufacturing capabilities, cost-effective production, and a significant presence in domestic and international markets. Affordable healthcare solutions are delivered worldwide, especially in emerging markets, through its vital contribution. Moreover, India's pharmaceutical sector is poised for continued growth, fuelled by surging demand for healthcare, groundbreaking drug development, and expanding export opportunities. The pharmaceutical field is essential to the Indian economy, contributing to GDP, creating jobs, and boosting exports. As a key industry, it is significant to analyze its financial status.

To analyze the financial status profitability plays a key role (Barakat, 2014). By focusing on profitability, pharmaceutical companies can reinvest in R&D, maintain competitiveness, and ensure long-term financial health while meeting the growing global demand for healthcare solutions. Liquidity has also been an essential part of financial performance. In the pharmaceutical sector, characterized by high research and development costs, long product development timelines, and stringent regulatory requirements, managing liquidity effectively is crucial for balancing immediate financial obligations with investments in innovation and growth. Liquidity, which refers to a company's ability to fulfill its short-term debts, and profitability, which signifies its capacity to generate earnings over time, are essential for ensuring long-term success and sustainability. Understanding the relationship between liquidity and profitability in pharmaceutical companies is significant for effective financial management and growth. A balance between these two elements is critical for addressing the high costs of research and development (R&D), regulatory challenges, and industry competition. This analysis offers valuable insights into optimizing cash flow and improving financial decision-making. Ultimately, mastering this relationship enables companies to manage risks and maximize shareholder value in the pharmaceutical sector. Wang (2002) examined the relationship between performance and liquidity.

Liquidity and Profitability

Liquidity analysis serves as an essential tool for evaluating a company's short-term financial position, offering insights into its cash availability to meet debt obligations without resorting to external financing. For creditors, banks, and investors, understanding liquidity ratios is vital as they reveal critical information regarding the company's financial stability and creditworthiness.

In contrast, profitability analysis assesses a company's ability to generate income relative to its expenses, shedding light on its profit margins. It is imperative for shareholders to examine net profits to gauge the company's performance, while management should leverage this analysis to identify cost-saving measures and enhance operational efficiency. An in-depth understanding of the factors influencing profitability is crucial for all stakeholders, particularly those invested in the company's future.

Liquidity levels directly affect a business's financial health; a decrease in liquidity may indicate potential risks such as business failure or economic distress, often signaling underlying issues with cash flow and the threat of insolvency. Profitability is equally essential, as it plays a significant role in securing external investments. As a result, owners, creditors, and managers consistently strive to maximize profits to maintain a competitive advantage. Furthermore, robust short-term liquidity is critical for fulfilling immediate financial obligations and reducing the risk of defaulting on loans.

Achieving a balance between liquidity and profitability is fundamental for effective financial management, enabling companies to honor their financial commitments while also cultivating strong profit margins. This study aims to analyze the interplay between liquidity and profitability within the Indian pharmaceutical industry, providing valuable insights into the financial dynamics of these companies and informing future investment decisions.

This research investigates the complex effects of liquidity on financial performance and clarifies the processes by which these effects occur, using a balanced panel dataset that covers five pharmaceutical companies over the ten years from 2014 to 2023.

This study adopts a comprehensive empirical framework to explore the relationship between liquidity management and financial performance. By utilizing established indicators, such as the Current Ratio (CR) and Quick Ratio (QR) for evaluating liquidity, and Return on Assets (ROA) and Return on Equity (ROE) for assessing profitability, the research seeks to uncover valuable insights. The objective is to deepen our understanding of the complex interplay between liquidity and profitability through panel regression analysis. By including control variables like firm size, the analytical precision of the study is improved, as it considers potential ambiguous factors that might affect the relationships being observed.

The significance of this study lies in its ability to uncover valuable insights into the financial dynamics of pharmaceutical companies, with a particular focus on the relationship between liquidity and profitability. Understanding this relationship is vital for pharmaceutical firms that aim to develop effective financial strategies, ensuring they maintain sufficient liquidity to meet short-term obligations while achieving sustained profitability for long-term growth.

The findings of this research can provide management with essential guidance in making informed decisions regarding resource allocation, cost control, and investment in innovation. Additionally, this study can assist investors and stakeholders in evaluating the financial health and potential risks associated with pharmaceutical companies, ultimately contributing to more effective decision-making within the industry.

Review of Literature

The literature provides valuable insights into liquidity and profitability, highlighting their significance in business operations. A company's cash flow is fundamental for its short-term viability, enabling it to meet immediate obligations. Simultaneously, profitability plays a critical role in fostering sustained growth and ensuring long-term success. By understanding that liquidity supports survival in the short term while profitability drives enduring stability, businesses can strategically balance both aspects. Emphasizing these factors is essential for any organization aiming for continued success and resilience in a competitive marketplace.

A. Ajanthan (2013) [1] examined the relationship between profitability (ROA, ROE) and liquidity (CR, QR, LR) in selected 08 profit-oriented trading companies from 2008 to 2012 with secondary data. The analysis, which includes descriptive statistics, correlation, and regression, unequivocally reveals a significant relationship between liquidity and profitability.

B Singh, M Singh (2016) [10] studied the impact of capital structure on a firm's profitability of selected 10 cement companies with secondary data for 5 years. It showed a negative relation between a firm's debt and profitability i.e. higher debt tends to have lower profitability.

HI Diana, MM Maria (2020) [16] conducted an insightful investigation into the role of profitability indicators in evaluating financial performance. Their empirical study, which focused on the pharmaceutical industry, utilized financial statement data from 2009 to 2018 to calculate return rates. The findings underscore the value of profitability indicators in reflecting the economic efficiency of various business activities. By focusing on key metrics such as return on assets (ROA), return on equity (ROE), and return on sales (ROS), stakeholders can gain a clearer understanding of financial performance. This approach empowers them to make well-informed decisions that can drive better outcomes for their organizations.

Q Saleem, RU Rehman (2011) [7] studied the relationship between liquidity (CR, QR, LR) and profitability (ROA, ROE, ROI). The findings highlight that the liquid ratio plays a significant role in influencing Return on Assets (ROA), whereas its impact on Return on Equity (ROE) and Return on Investment (ROI) is minimal. Interestingly, ROE does not appear to be significantly affected by the current ratio, quick ratio, or liquid ratio. In contrast, ROI shows a strong correlation with all three ratios—current, quick, and liquid. This study emphasizes the importance of understanding how each financial ratio impacts the overall economic health of enterprises, with liquidity ratios emerging as particularly influential. These insights can help organizations better manage their economic strategies for improved

performance.

A Bhunia, IU Khan (2011) [3] studies the association between liquidity management and profitability of 230 Indian private sector steel companies from 2002 to 2010. It states efficient liquidity management and satisfactory solvency position of the companies but a petite association is found between the liquidity management and profitability.

P Sharma, N Sarin (2024) [9] conducted a comprehensive investigation using secondary data to assess the impact of liquidity on the financial performance of the top 50 textile companies listed on the Bombay Stock Exchange (BSE) over a decade, from 2012 to 2022. They focused on two independent variables: the Current Ratio (CR) and the Cash Adequacy Ratio (CAR). The study aimed to understand how these liquidity measures influence two key dependent variables, Return on Assets (ROA) and Return on Equity (ROE). To enhance the analysis control variables such as firm size, firm growth, and leverage were included. They employed panel regression analysis and the Hausman test to evaluate their model effectively. Remarkably, the findings revealed that liquidity plays a highly significant role in enhancing ROA, while its impact on ROE is relatively less pronounced. Furthermore, it was noted that leverage has a detrimental effect on ROA, whereas both firm size and firm growth exhibit positive relationships with financial performance. This study provides valuable insights into how liquidity and other factors can be optimally managed to improve the financial outcomes of textile companies. Maintaining a balance between effective liquidity management and profitability is vital for the textile industry's success and survival. The results correspond with those of Nimer *et al.* (2013) [17], who discovered that liquidity in Jordanian banks significantly affects profitability via ROA. Ongore and Kusa (2013) [18], in contrast, noted a positive yet significantly weak correlation between ROE and liquidity management.

YJ Wang (2002) [13] studied the connection between liquidity management (cash conversion cycle (CCC)) and operating performance (ROA, ROE), as well as liquidity management and corporate value (Tobin's q ratio) for firms in Japan and Taiwan over a span of 11 years. The results show that aggressive liquidity management improves operating performance and is generally linked to higher corporate values in both countries, despite differences in structural characteristics or financial systems of the firms.

VC Lartey, S Antwi, EK Boadi (2013) [14] studied the relationship between liquidity and profitability of banks listed on the Ghana Stock Exchange for the period 2005-2010. Secondary data served as the basis for this research. For the purpose of analysis, the researcher relied on panel data methodology. A decreasing trend in liquidity and profitability was observed among the listed banks during the period of study. A weak positive correlation existed between the liquidity and profitability of the listed banks.

AH Samo, H Murad (2019) [8] used a sample of 40 publicly traded textile firms in Pakistan and data spanning from 2006 to 2016, to assesses the relationship between liquidity, financial leverage, and profitability. The findings showed a positive correlation between liquidity and profitability, as well as a negative correlation between financial leverage and profitability.

M Yameen, NHS Farhan, MI Tabash (2019) [11] examining the relationship between liquidity and profitability among pharmaceutical companies listed on the Bombay Stock Exchange (BSE). The data, obtained from the ProwessIQ database, covered 82 pharmaceutical firms over ten years, from 2008 to 2017. Employing a balanced panel data approach, the analysis demonstrated that liquidity indicators—specifically, the current ratio and quick ratio—positively and significantly influenced profitability, as measured by return on assets. In contrast, control variables such as financial leverage, company size, and firm age were found to exert a negative effect on profitability.

SI Ejike, NC Agha (2018) [12] explores how the management of operating liquidity, through receivables and payables, influences the profitability of Nigerian pharmaceutical firms. A sample of five firms was analyzed using correlation techniques within an ex-post facto research framework. A decade of data (2002-2011) was analyzed using the Ordinary Least Squares (OLS) multiple regression technique. According to the study, the profitability analysis is significantly influenced by operating liquidity (collection of account receivables and management of accounts payables). The management of account receivables has a statistically significant negative effect on profitability, while the management of account payables positively affects profitability.

Aulová, R., Pánková, L., & Rumánková, L. (2019) [15] explored how various profitability indicators—through DuPont analysis—reflected performance in Czech agricultural businesses from 2011 to 2015. By focusing on asset turnover, net profit margin, and equity multiplier, the analysis assessed their impact on ROE and ROA across different firm sizes and legal forms. Using longitudinal data and correlation analysis, the findings highlighted considerable differences in how these financial metrics influenced profitability depending on the firm's size and structure.

AMA Eljelly (2004) [4] analyzed how profitability relates to liquidity, using current ratio and cash conversion cycle as primary indicators. Results showed a notable negative relationship between profitability and liquidity at the firm level, especially among companies with high current ratios and lengthy cash conversion cycles.

When assessing liquidity at the industry level, the cash conversion cycle was identified as a more important determinant of profitability than the current ratio. The study also noted that firm size significantly affected profitability outcomes at the industry level.

Research Methodology

Research methodology denotes the organized strategy or collection of methods employed to gather, scrutinize, and make sense of data to address particular research inquiries or evaluate hypotheses. It encompasses the methods and approaches for choosing research participants, collecting data, and analyzing findings using various tools or statistical techniques.

Objective of the study

The main objectives of the paper are:

- To study the relationship between liquidity and profitability;
- To examine the impact of liquidity on the profitability of selected pharmaceutical companies.

Hypothesis

H_{01}: There is no significant impact of liquidity on the ROA of Selected Pharmaceutical Companies.

$H_{01.1}$: There is no significant impact of the Current Ratio on the ROA of Selected Pharmaceutical Companies.

$H_{01.2}$: There is no significant impact of the Quick Ratio on the ROA of Selected Pharmaceutical Companies.

H_{02}: There is no significant impact of liquidity on the ROE of selected Pharmaceutical Companies.

$H_{02.1}$: There is no significant impact of the Current Ratio on the ROE of Selected Pharmaceutical Companies.

$H_{02.2}$: There is no significant impact of the Quick Ratio on the ROE of Selected Pharmaceutical Companies.

Sample, Data, and Methodology

The analysis was carried out using secondary data that was taken from the ProwessQ1 database for the years 2015-2024. Based on their market capitalization, the top 5 NSE listed firms have been taken for the study. The researcher has chosen to use the longitudinal time dimensional analysis, or more specifically, the panel data analysis for the investigation. To analyze the data, Eviews and SPSS software are utilized. The three primary factors in the research framework are the following: the independent variable, liquidity, as determined by CR and QR; the dependent variable, profitability, as determined by ROA and ROE; and the control variable, which is represented by the firm size.

Tools & Technique

Descriptive statistics were thoroughly analyzed, employing the arithmetic mean and standard deviation to provide an overview of the data.

To examine relationships between variables, both a correlation matrix and variance inflation factor (VIF) was utilized, ensuring robust insights. The impact of these variables was rigorously assessed using panel data regression, specifically through the pooled ordinary least squares (OLS) model, which enhances the reliability of our findings. For residual diagnostics, we implemented the Durbin-Watson test to identify autocorrelation, conducted the Breusch-Pagan test to evaluate heteroscedasticity, and applied the Shapiro-Wilk test to confirm normality. This comprehensive analysis was executed using SPSS and E-Views software.

Details of Variables

Independent Variables

Current Ratio

A ratio between a corporation's current assets and liabilities, i.e., how much a company can use its current assets to pay off its debt or other payables.

Current ratio = Current Assets/Current Liabilities

Quick Ratio

The quick ratio, or acid-test ratio, is an indicator of a company's ability to cover its short-term debts using its most liquid assets (assets that can be quickly converted into cash without significant loss of value).

Quick ratio = Current assets-Stock or Liquid Assets/Current Liabilities

Dependent Variables

Return on Assets

The Return on Assets (ROA) ratio measures how efficiently a company utilizes its assets to generate profits over time. This financial metric is valuable for both management and investors, as the primary purpose of a company's assets is to generate revenue and profits. It helps assess how effectively the business converts its asset investments into earnings.

Return on Assets = Net Income/Total Assets

Return on Equity

Before investing, investors often examine return rates, with Return on Equity (ROE) being a key indicator. ROE reveals how effectively a company uses shareholder investments to generate profits for them.

Return on Equity = Net income/Shareholder's equity

Control Variable

Firm Size

Control variables are used to account for their influence, allowing for a more accurate assessment of the relationship between the primary variables. Incorporating firm size as a control variable helps to ensure that the observed relationships between the independent variables and profitability are not influenced by discrepancies in firm size, thus improving the accuracy and validity of the findings.

Firm Size = Log of Total Assets

Research Model

The approach chosen for model estimate involves panel data analysis, a reliable method used to examine how liquidity affects a company's profitability.

$$ROA_{it} = \beta_{0i} + \beta_1 CR_{it} + \beta_2 QR_{it} + \beta_3 FS_{it} + \mu_{it}$$
$$ROE_{it} = \beta_{0i} + \beta_1 CR_{it} + \beta_2 QR_{it} + \beta_3 FS_{it} + \mu_{it}$$

Where,

ROA_{it} = Return on assets of the company i at time t;
ROE_{it} = Return on equity of company i at time t;
CR_{it} = Current ratio of company i at time t;
QR_{it} = Quick ratio of company i at time t;
FS_{it} = Size of company i at time t;
β_0 = Intercept;
μ_{it}= Error term

Results and Discussion

Descriptive Statistics

Table 1 presents the descriptive statistics for the top 10 pharmaceutical companies with the highest market capitalization from 2014 to 2024. The table includes all variables used in the analysis, along with their respective mean, standard deviation, minimum, and maximum values based on 47 observations.

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
ROA	47	-0.726572	22.746146	9.81725374	4.915600938
ROE	47	-1.210604	28.150945	14.28971447	6.420537695
CR	47	0.515385	20.572243	3.05225385	3.050131259
QR	47	0.285257	5.296766	1.85842913	1.224247701
FS	47	10.83	13.05	12.0749	0.57179

The data shows a wide range of values for each variable. The profitability of firms varies, as seen in the ROA (Return on Assets) and ROE (Return on Equity), which range from-0.72 to 22.74 and-1.21 to 28.15, respectively. On average, ROA is 9.81 and ROE is 14.28, indicating positive profitability. There is also notable variation in liquidity, with the Current Ratio (CR) ranging from 0.51 to 20.57 and the Quick Ratio (QR) ranging from 0.28 to 5.29. However, the average CR of 3.05 and QR of 1.85 suggest that most companies can meet their short-term obligations. Firm Size (FS) shows minor variation, with values ranging from 10.83 to 13.05 and an average of 12.07. This suggests that the companies are relatively similar in size.

The standard deviation value indicates that ROE (6.42) has the highest variability, suggesting a wider spread of data around the mean of 14.29. ROA (4.92) also shows considerable variability, while FS (0.57) has the least variability, indicating that firm size values are more consistent.

Correlation Matrix

The correlation matrix is essentially used to quantify how closely dependent and independent variables are related. The direction and intensity of a linear relationship between two variables are also determined. It is essential to verify the Pearson correlation matrix prior to developing the panel data model.

Table 2: Correlation Matrix

Variable	ROA	ROE	CR	QR	FS
ROA	1				

ROE	0.833	1			
	0.000	---			
CR	0.473	0.095	1		
	0.001	0.527	---		
QR	0.618	0.264	0.821	1	
	0.000	0.073	0.000	---	
FS	-0.563	-0.642	-0.352	-0.354	1
	0.000	0.000	0.015	0.015	---

Table 2 shows ROA and CR (Current Ratio) have a moderate positive correlation of 0.473, suggesting that more profitable firms are better at managing their current assets, though the relationship is not very strong. A similar but stronger positive relationship exists between ROA and QR (Quick Ratio), with a correlation of 0.618, meaning profitable firms tend to have better liquidity excluding inventory. The correlation between ROE and CR (0.095) and QR (0.264) is weakly positive, indicating that profitability has little effect on liquidity.ROA and ROE have moderately strong negative correlations with Firm Size (FS), with coefficients of-0.563 and-0.642, respectively, implying that smaller firms are generally more profitable.

Multicollinearity Test

A regression model is considered multicollinear if a strong correlation exists between two or more independent variables. Because of this, it is challenging to ascertain how each variable affects the dependent variable independently.

Table 3: Multi-Collinearity Test Results

Variable	Collinearity Statistics	
	Tolerance	VIF
CR	0.322	3.102
QR	0.322	3.108
FS	0.863	1.158

In general, multicollinearity is problematic when the VIF value is more than 10, while VIF values between 1 and 5 are generally acceptable, In this instance, the VIF values for Current Ratio (CR) (3.102), Quick Ratio (QR) (3.108), and Firm Size (FS) (1.158) are all less than 10, suggesting that multicollinearity is not a key problem in this model. These numbers imply that the independent variables do not have a strong correlation, which makes the regression analysis's coefficient estimations and findings more trustworthy. Therefore, the multicollinearity issue is not present in the model. The controlled variable, firm size has a VIF value of 1.158 which does not exhibit multicollinearity with the other variables in the model.

Model Selection Test

Redundant Fixed Effects Tests

H_0: The coefficients are not different across the groups (pooled regression model)

H_1: The coefficients are different across the groups (fixed effects model or random effects model)

Table 4: Panel Diagnostic Test

Redundant Fixed Effects Tests (ROA)		
Effects Test	**Statistics**	**Prob.**
Cross-Section F	1.642	0.1831
Cross-Section Chi-Square	7.316	0.1201
Redundant Fixed Effects Tests (ROE)		
Effects Test	**Statistics**	**Prob.**
Cross-Section F	0.713	0.5874
Cross-Section Chi-Square	3.321	0.5055

The Redundant Fixed Effects Tests for both ROA and ROE indicate that fixed effects are not required in the panel data model. For ROA, the Cross-Section Chi-Square statistic is 7.316 with a p-value of 0.1201, and for ROE, it is 3.321 with a p-value of 0.5055. As both p-values are greater than 0.05, the null hypothesis that fixed effects are redundant is not rejected. This suggests that intercepts do not significantly vary across firms. Hence, a pooled regression model is appropriate for analyzing the impact of explanatory variables on profitability.

Random Effect test-

H_0: There are no significant random effects (the Pooled OLS model is adequate)

H_1: There are significant random effects (the Pooled OLS model is not adequate)

Test	Statistics	Prob.
Breusch-Pagan LM (ROA)	10.40156	0.4060
Breusch-Pagan LM (ROE)	14.4024	0.1553

The Breusch-Pagan Lagrange Multiplier (LM) test results for both models show p-values greater than 0.05 (0.4060 and 0.1553), indicating no significant random effects. Hence, the null hypothesis is not rejected in either case. This confirms that the Pooled OLS model is appropriate, and random effects are not required for the analysis. Therefore, the variation across entities is not enough to justify the use of a random effects model, supporting the use of a common intercept for all cross-sectional units.

Panel Data Regression Analysis-

H_{01}: There is no significant impact of liquidity on the ROA of Selected Pharmaceutical Companies.

$H_{01.1}$: There is no significant impact of the Current Ratio on the ROA of Selected Pharmaceutical Companies.

$H_{01.2}$: There is no significant impact of the Quick Ratio on the ROA of Selected Pharmaceutical Companies.

Table 5: Empirical Results of Pooled OLS for ROA

Dependent Variable: ROA Method: Panel Least Squares Sample: 2015 2024 Periods included: 10 Cross-Sections included: 5 Total panel (unbalanced) observations: 47				
Variable	**Coefficient**	**SE**	**t-Statistic**	**Prob.**
C	48.15840	12.02606	4.004503	0.0002
CR	-0.289584	0.297487	-0.973434	0.3358
QR	2.500117	0.741862	3.370055	0.0016
LFS	-3.486744	0.970247	-3.593668	0.0008
Effects Specification				
R^2	0.527664	Mean Dependent Var.		9.817254
Adjusted R^2	0.494711	SD Dependent Var.		4.915601
SE of Regression	3.494191	Akaike Info Criterion		5.421346
Sum Squared Resid.	525.0029	Schwarz Criterion		5.578805
Log Likelihood	-123.4016	Hannan-Quinn Criterion		5.480599
F-Statistic	16.01232			
Prob. (F-Statistic)	0.000000			

The coefficient for Current Assets (CA) is-0.28, indicating that a one-unit increase in current assets leads to a 0.28 unit decrease in ROA, showing a negative relationship. However, this relationship is not statistically significant (p-value = 0.3358). The Quick Assets (QA) coefficient stands at 2.50, which reveals a positive and statistically significant association with Return on Assets (ROA), supported by a p-value of 0.0016. In contrast, the controlled variable Firm Size (LFS) coefficient is-3.49, indicating a negative effect on ROA (p-value = 0.0008) but has a significant relationship.

The model explains 52.77% of the variance in ROA, with an R-squared value and an Adjusted R-squared of 0.495, suggesting that the influence of current ratio, quick ratio, and firm size on ROA accounts for 49.50%, while other factors explain the remaining 50.50%.The F-statistic is 16.01, confirming statistical significance.

H_{02}: There is no significant impact of liquidity on the ROE of selected Pharmaceutical Companies.

$H_{02.1}$: There is no significant impact of the Current Ratio on the ROE of Selected Pharmaceutical Companies.

$H_{02.2}$: There is no significant impact of the Quick Ratio on the ROE of Selected Pharmaceutical Companies.

Table 5a: Empirical Results of Pooled OLS for ROE

Dependent Variable: ROE Method: Panel Least Squares Sample: 2015 2024 Periods included: 10 Cross-Sections included: 5 Total panel (unbalanced) observations: 47				
Variable	**Coefficient**	**SE**	**t-Statistic**	**Prob.**
C	102.9920	16.27489	6.328274	0.0000
CR	-1.044900	0.402590	-2.595445	0.0129
QR	2.293945	1.003964	2.284888	0.0273
LFS	-7.434678	1.313037	-5.662201	0.0000
Effects Specification				
R^2	0.492950	Mean Dependent Var.		14.28971
Adjusted R^2	0.457575	SD Dependent Var.		6.420538
SE of Regression	4.728696	Akaike Info Criterion		6.026441
Sum Squared Resid.	961.5042	Schwarz Criterion		6.183901
Log Likelihood	-137.6214	Hannan-Quinn Criterion		6.085694
F-Statistic	13.93477			
Prob. (F-Statistic)	0.000002			

The coefficient for Current Assets (CA) is-1.04, indicating that a one-unit increase in current assets leads to a-1.04 unit decrease in ROE. This relationship is statistically significant (p-value = 0.0129). The Quick Assets (QA) coefficient stands at 2.29, which reveals a positive and statistically significant association with Return on Equity (ROE), supported by a p-value of 0.0273. The controlled variable Firm Size (LFS) coefficient is-7.43, indicating a negative effect on ROE with a significant relationship (p-value = 0.0000). The model explains 49.29% of the variance in ROE, with an R-squared value and an Adjusted R-squared of 0.4575, suggesting that the influence of current ratio, quick ratio, and firm size on ROE accounts for 45.75%, while other factors explain the remaining 54.25%. The F-statistic is 13.93, confirming statistical significance.

Hypothesis Test Results

Table 6: Hypothesis Result

Variable		Coefficient Value	p-value	Decision Rule	Result	Findings
ROA	CR	-0.289	0.3358	$p<0.05$	$H_{01.1}$ Accepted	Negative and Not Significant
	QR	2.500	0.0016	$p<0.05$	$H_{01.2}$ Rejected	Positive and Significant
ROE	CR	-1.044	0.0129	$p<0.05$	$H_{02.1}$ Rejected	Negative and Significant
	QR	2.293	0.0273	$p<0.05$	$H_{02.2}$ Rejected	Positive and Significant

Estimation Model

$ROA_{it} = 48.15+(-0.28)\ CR_{it} + 2.5QR_{it}+(-3.48)\ FS_{it} + \mu_{it}$

$ROE_{it} = 102.99+(-1.04)\ CR_{it} +2.29\ QR_{it}+(-7.43)\ FS_{it} + \mu_{it}$

Residuals Diagnostics

In statistical modeling and regression analysis, residual diagnostics are employed to evaluate how well a model fits the data. It is used to assess the suitability of the model and its compliance with the fundamental assumptions of regression analysis by examining these residuals. The researcher has examined the regression residuals to verify that their variances are not time-dependent and that the residuals are free from autocorrelation and heteroscedasticity, as well as normally distributed.

1) Autocorrelation Test

When a variable's value in one time period is connected to its value in another, this is known as autocorrelation. Simply, it occurs when residuals from the past affect the present. Autocorrelation is commonly evaluated using the Durbin-Watson test.

H_0: There is no autocorrelation (i.e., the residuals are not correlated).

H_1: There is autocorrelation (i.e., the residuals are correlated).

Table 7: Summary of the Durbin-Watson Test

Variable	Durbin-Watson Value	Results
ROA	1.794	No Autocorrelation
ROE	1.810	No Autocorrelation

The Durbin-Watson values for ROA (1.794) and ROE (1.810) imply that the model residuals show no autocorrelation. Given that both values are around the Acceptable Range of 1.5 to 2.5 which indicates no serious autocorrelation. These findings typically imply that the residuals are independent and not substantially associated with time, despite a minor hint of positive autocorrelation. As a result, there are no significant autocorrelation problems in the models. Since the result indicates "No Autocorrelation," we fail to reject the null hypothesis.

2) Heteroscedasticity Test

When the variance of the residuals (errors) in a regression analysis is not constant across all levels of the independent variables, this is known as heteroscedasticity. Breusch-Pagan Test is performed to determine the absence of heteroskedasticity in the model.

H_0: The residuals have constant variance (no heteroscedasticity).

H_1: The residuals have non-constant variance (exhibit heteroscedasticity)

Table 8: Heteroskedasticity Test (ROA)

F-Statistic	1.741815	Prob.	0.1727
Obs * R2	5.092663	Prob. Chi-Square	0.1651
Scaled Explained SS	6.498755	Prob. Chi-Square	0.0897

The p-values for all three tests (F-Statistic, Obs * R^2, and Scaled Explained SS) are much greater than 0.05, leading to the failure to reject the null hypothesis. This suggests the absence of significant heteroscedasticity in the ROA regression model.

Table 8a: Heteroskedasticity Test (ROE)

F-Statistic	0.692011	Prob.	0.5619
Obs * R2	2.164644	Prob. Chi-Square	0.5389
Scaled Explained SS	2.178783	Prob. Chi-Square	0.5361

The p-values for the F-Statistic, Obs * R^2, and Scaled Explained SS tests are all much greater than 0.05, meaning the null hypothesis is not rejected. This suggests no significant heteroscedasticity in the ROE regression model.

3) Normality Test

To determine whether or not the data utilized in this study follows a normal distribution, a normality test is used to assess the distribution of the data. Here, the Shapiro-Wilk Test is used to check the normality of residuals.

H_0: The residuals are normally distributed.

H_1: The residuals are not normally distributed.

Table 9: Shapiro-Wilk

	Statistic	df	Sig.
ROA	0.963	47	0.139
ROE	0.980	47	0.603

For ROA, the Shapiro-Wilk statistic is 0.963, with a p-value of 0.139. Since the p-value exceeds 0.05, we fail to reject the null hypothesis, indicating that the ROA data follows a normal distribution.

For ROE, the Shapiro-Wilk statistic is 0.980, with a p-value of 0.603. As the p-value is greater than 0.05, we fail to reject the null hypothesis, suggesting that the ROE data also follows a normal distribution.

Conclusion, limitations, suggestions

Conclusion and Findings

This study seeks to investigate the relationship between liquidity and profitability of the top 5 pharmaceutical companies listed on the NSE, ranked by market capitalization. The study covers a decade, from 2014 to 2023. CR and QR served as proxies for assessing companies' liquidity, while ROA and ROE were used for evaluating companies' profitability. The size of the firm is treated as a controlled variable.

Before proceeding with the empirical analysis, a thorough verification of the variables' appropriateness through multicollinearity testing was conducted. This analysis evaluates the degree of correlation among the explanatory variables. The results, as indicated by the VIF values, demonstrate no significant correlation among the explanatory variables, confirming their suitability for further research.

The empirical results demonstrate that the quick ratio (QR) has a statistically significant positive effect on both Return on Assets (ROA) and Return on Equity (ROE). This indicates that companies that excel in liquidity management are likely to achieve higher profitability. On the other hand, the current ratio (CR) does not have a significant impact on ROA, suggesting that simply managing short-term assets may not be as essential for profitability. The relationship between Return on Equity (ROE) and Current Assets (CA) in this analysis is negative and statistically significant. It suggests that while current assets are necessary for day-to-day operations, an overextension in current assets might harm profitability, potentially reflecting operational inefficiencies or a lack of effective capital utilization. Moreover, the analysis reveals a consistent negative relationship between firm size (FS) and ROA and ROE. This indicates that smaller pharmaceutical companies tend to be more profitable than their larger counterparts, likely due to their increased agility and operational efficiency.

The regression models applied in this study explain a substantial portion of the variation in profitability, with R-squared values reflecting that liquidity and size factors play a significant role in the variance of both ROA and ROE. Additionally, diagnostic tests for autocorrelation, heteroscedasticity, and normality confirm the robustness of these models, with no significant issues regarding model specification identified. Overall, these findings underscore the critical role of liquidity and firm size in influencing profitability in the pharmaceutical sector. By recognizing that smaller, more liquid companies often outperform larger

ones, pharmaceutical firms can strategically focus on optimizing these factors to enhance their profitability in a competitive marketplace. Such insights can serve as a valuable foundation for informed decision-making.

Limitations

The analysis is based on a sample of the top five pharmaceutical companies from 2014 to 2023, which may not fully represent the entire pharmaceutical industry. This study might not capture the varying trends exhibited by smaller firm. Additionally, the ten-year period under examination may be insufficient for a comprehensive analysis. Since the study relies on secondary data, it could face limitations regarding accuracy, which might impact its results. While liquidity and firm size are considered, there may be other significant variables influencing profitability that are not included in this study. For instance, It fails to take into consideration the variations in ownership structures across different companies. Examining the effects of ownership structures on profitability, as well as including nonlinear relationships among variables, could enhance the analysis of profitability. The study is limited to Pharma companies, and future research could broaden its scope to explore factors that affect profitability across various sectors. Nevertheless, this period encompasses considerable economic uncertainties, including demonetization, the Covid-19 pandemic, and recession. As a result, liquidity levels and adjustments could differ from the norm during these extraordinary circumstances.

Suggestions

Pharmaceutical companies should prioritize optimizing their Quick Ratio by improving cash flow and receivables management, as it has a significant positive impact on profitability. They should also be cautious with their Current Ratio, avoiding excessive liquidity that may lead to inefficiency. Additionally, firms should streamline current asset management and consider the operational flexibility of smaller firms to improve profitability, especially for larger companies. By strategically managing liquidity and adopting efficient operational practices, pharmaceutical firms can enhance both short-term stability and long-term profitability.

Future research could benefit from including a broader and more diverse range of pharmaceutical companies, such as smaller firms, multinational corporations, and companies in emerging markets. This approach would offer a more comprehensive perspective on the industry. Additionally, incorporating various financial metrics—such as R&D spending, marketing investments, ownership structure, and debt-to-equity ratio—could provide a more nuanced understanding of the factors that influence profitability in the pharmaceutical sector.

A longitudinal study that spans an extended period and accounts for changes in industry dynamics, such as regulatory shifts, technological advancements, and market competition, would yield expanded insights into the long-term trends impacting profitability. Given that the pharmaceutical industry is significantly affected by factors like patent laws, government regulations, and global health crises, future studies should also consider including these sector-specific variables to better understand their effects on firm profitability.

Significance

This research significantly enhances the pharmaceutical industry's comprehension of how liquidity management relates to profitability. The study provides beneficial perspectives for strategic decision-making by offering practical advice on optimizing liquidity ratios and managing current assets. It also fills a void in the current literature and acts as a valuable resource for stakeholders such as investors and policymakers. Ultimately, the results can assist pharmaceutical companies in enhancing their operational efficiency, financial strategies, and overall profitability.

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