



An Econometric Analysis of Profitability Determinants in the Indian Pharmaceutical Sector

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Abstract: Background: The pharmaceutical industry occupies a strategic position in the Indian economy due to its significant contribution to healthcare delivery, exports, and technological advancement. Evaluating financial performance is crucial for understanding the operational efficiency and long-term sustainability of firms within this highly regulated sector. Objectives: To evaluate and compare the financial performance of selected leading pharmaceutical companies in India and analyse the impact of key liquidity, efficiency, and leverage ratios on profitability (Return on Equity). Methodology: This study adopts a descriptive and analytical research design utilizing secondary data over a five-year period (2020–21 to 2024–25) for five chosen companies: Sun Pharmaceutical Industries Ltd, Dr. Reddy's Laboratories Ltd, Cipla Ltd, Aurobindo Pharma Ltd, and Glenmark Pharmaceuticals Ltd. Financial ratio analysis, multiple regression, ANOVA, and coefficient interpretations were conducted using 25 firm-year observations. Results: The multiple regression model demonstrated a moderately strong relationship (), proving that liquidity, efficiency, and capital structure jointly explain 44.5% of the variations in ROE. The Inventory Turnover Ratio has a statistically significant negative impact on ROE (), whereas liquidity and leverage indicators were statistically insignificant. Conclusion: Maintaining optimal working capital levels, steady operational asset efficiency, and controlled leverage profiles remain vital pillars for expanding shareholder wealth and sustaining long-term industrial competitiveness.

Keywords: Financial Performance, Pharmaceutical Industry, Ratio Analysis, Liquidity, Capital Structure, Return on Equity (ROE).

1. INTRODUCTION

The pharmaceutical industry plays a vital role in the socio-economic development of a country by ensuring the availability of safe, effective, and affordable medicines. In India, the pharmaceutical sector is one of the fastest-growing industries and has gained global recognition due to its strong manufacturing capabilities, skilled workforce, and cost-effective production processes. India ranks among the largest producers of generic medicines globally, exporting critical pharmaceutical formulations to more than 200 countries, thereby contributing significantly to foreign exchange earnings and national healthcare delivery frameworks.

Despite its vast growth potential, the pharmaceutical industry operates within a highly complex environment characterized by intense domestic and international competition, steep research and development (R&D) costs, strict regulatory guidelines, price control mechanisms, and fluctuating market demand conditions. These distinct environmental challenges make sound, structured financial management an absolute prerequisite for companies hoping to sustain profitability, preserve market shares, and protect stakeholder capital. Financial performance analysis helps in evaluating how effectively companies utilize their resources, manage asset risks, and generate continuous, dependable returns for their stakeholders.



This empirical study focuses on analysing the financial performance of selected pharmaceutical companies in India by examining core financial ratios over a five-year period (2020–21 to 2024–25). Return on Equity (ROE) is utilized as the primary dependent indicator of profitability, while the independent framework comprises short-term liquidity measures (Current Ratio and Quick Ratio), operational efficiency measures (Inventory Turnover Ratio), and capital structure elements (Debt-to-Equity and Debt-to-Assets ratios). Beyond basic trend reviews, the study deploys multiple regression analysis to quantitatively isolate the explanatory power of liquidity, operational velocity, and capital risk variables on the creation of shareholder value.

2. LITERATURE REVIEW

- **Vinod Parghi (2025)** studied the financial performance of selected Indian pharmaceutical companies using profitability, liquidity, leverage, and efficiency ratios to assess inter-firm differences in financial strength. The study's results revealed wide variation in ROA and ROE among firms, observing that companies with diversified product portfolios showed better profitability. Efficient working capital management improved liquidity positions, and firms with strong export orientation demonstrated stable earnings, while high R&D expenditure supported long-term growth. Conversely, excessive operating costs reduced net profit margins, and capital structure decisions significantly influenced financial stability. The study concluded that operational efficiency is a key driver of financial performance.
- **Kalimuthu M. (2025)** examined operational efficiency and financial performance in Indian pharmaceutical firms with a focus on production levels, cost structures, and profitability. The results indicated that optimal capacity utilization improves contribution margins, whereas firms with high fixed costs faced margin pressure during low demand periods. Managerial inefficiency negatively affected profitability, and marketing and administrative costs significantly influenced operating expenses. Better governance practices enhanced financial outcomes, while liquidity management played a supporting role, and firms with controlled leverage showed stability. The study emphasized cost efficiency for sustainable financial performance.
- **Mahalakshmi & Ganesan (2025)** analyzed the financial performance of National Stock Exchange (NSE)-listed pharmaceutical companies using liquidity, solvency, and profitability ratios. The study found that liquidity ratios positively influenced profitability and that firms with moderate debt levels performed better financially, while excess leverage increased financial risk. Asset utilization efficiency impacted ROA significantly, profit margins fluctuated due to regulatory costs, and trend analysis showed inconsistent growth patterns. Strong internal controls improved financial outcomes, leading to the conclusion that a balanced capital structure enhances performance.
- **Ramesh et al. (2025)** conducted a ratio and trend analysis of selected pharmaceutical companies by evaluating liquidity, efficiency, and profitability indicators. Results showed rising operational costs reduced net margins, whereas the inventory turnover ratio significantly influenced corporate profitability. Receivables management directly affected cash flow stability, firms with efficient operations showed higher ROA, and solvency positions varied across firms. High marketing expenses impacted operating profits, highlighting the critical importance of cost control. It was concluded that efficiency-driven strategies improve financial performance.
- **Sharma & Patel (2025)** analysed the financial stability of pharmaceutical firms using solvency and profitability ratios, identifying leverage as a major financial risk factor. Firms with low debt-equity ratios were more stable, and liquidity ratios supported short-term financial health, while profit volatility was higher among leveraged firms. Asset turnover influenced earnings efficiency, and cost management improved operating margins. The study highlighted prudent financing policies, noting that strong liquidity enhanced resilience and concluding that financial discipline ensures long-term stability.
- **Mahalakshmi & Venkatesh (2024)** evaluated the financial performance of selected Indian pharmaceutical companies through ratio analysis assessing liquidity, efficiency, and profitability. Operational velocity positively impacted profit levels, and firms with higher asset turnover achieved better ROA. Liquidity management ensured smooth operations, fixed cost absorption improved margins, and firm size influenced financial outcomes. Significant inter-firm variations were noted, and efficient firms maintained stable earnings, confirming the relevance of ratio analysis in performance evaluation.
- **Yadav & Abhinav (2024)** examined the impact of research and development (R&D) expenditure on financial performance across selected Indian pharmaceutical companies. Higher R&D spending improved long-term

profitability, though short-term margins were affected by immediate research costs. Firm size moderated profitability outcomes, innovation enhanced competitive advantage, and efficient cost control supported earnings, while liquidity helped fund ongoing R&D activities. Financial performance differed across firms, leading to the conclusion that an innovation-driven strategy improves sustainability.

- **Gautam et al. (2024)** focused on the operational efficiency and profitability of Indian pharma firms using activity ratios as key indicators. Inventory turnover positively influenced ROA, and receivables efficiency improved overall corporate cash flows. Liquidity supported operational continuity, and firms with faster operating cycles earned higher margins, while poor working capital management reduced profitability. Asset utilization efficiency varied across firms, confirming an efficiency–profitability linkage, leading to recommendations to strengthen corporate working capital policies.
- **Kumar & Singh (2024)** analyzed the relationship between liquidity and profitability by examining current and quick ratios in pharmaceutical organizations. Results showed a positive impact of liquidity on ROE, though excess liquidity conversely reduced profitability, while optimal liquidity levels enhanced overall efficiency. Working capital management was critical, firms differed in liquidity strategies, and profit margins were influenced by cash management. Financial stability improved with balanced liquidity, concluding that liquidity optimization is essential.

3. METHODOLOGY

Research Design

The present study adopts a descriptive and analytical research design to systematically examine the financial performance of selected pharmaceutical companies in India. It relies on a rigorous combination of trend analysis and econometric modeling via financial ratio analysis and multiple regression techniques to evaluate corporate relationships.

Need of the Study

Operating within a high-risk landscape marked by massive R&D outlays, unpredictable price regulatory mechanisms, and intense generic market saturation requires strict financial evaluation. This study is necessary to assess the operational thresholds of Indian pharma firms, help investors make rational allocation decisions, evaluate how capital structure shapes profitability, and highlight inter-firm variances.

Objectives of the Study

1. To compare and contrast the financial performance indicators of select pharmaceutical companies in India.
2. To analyze and quantify the empirical impact of selected financial ratios on firm profitability (ROE).

Data Collection Methods

This study relies entirely on secondary data extracted from published annual reports of the selected entities. Supplementary data verification was completed through established online financial databases including Moneycontrol, Investing.com, and academic journals.

Sample and Period of the Study

A purposive (judgmental) sampling technique was implemented based on company size, market presence, and data availability. The five selected pharmaceutical companies are:

1. Sun Pharmaceutical Industries Ltd
2. Dr. Reddy's Laboratories Ltd
3. Cipla Ltd
4. Aurobindo Pharma Ltd
5. Glenmark Pharmaceuticals Ltd

The temporal scope of the study covers a five-year period from the financial years 2020–21 to 2024–25, yielding a balanced panel of 25 unique firm-year observations ().

Statistical and Financial Tools Used

- **Financial Ratio Analysis:** Applied to assess liquidity (Current Ratio, Quick Ratio), efficiency (Inventory Turnover Ratio), and leverage (Debt-to-Equity, Debt-to-Assets).
- **Multiple Regression Analysis:** Used to estimate changes in the dependent variable (ROE) based on the independent ratios.
- **ANOVA (F-test):** Executed to verify the combined statistical significance of the explanatory variable matrix.

DATA ANALYSIS

SECTION I: Company-Wise Trend Analysis and Interpretations

1. Sun Pharmaceutical Industries Limited

The financial performance structure of Sun Pharmaceutical Industries Ltd is mapped across key variables from 2021 to 2025.

Table 4.1: Financial Ratios of Sun Pharmaceuticals Ltd

Year	Current Ratio (X1)	Quick Ratio (X2)	Inventory Turnover (X3)	Debt-to-Equity (X4)	Debt-to-Asset (X5)	ROE (%)
2020-21	1.89	1.31	2.20	0.08	0.06	6.33
2021-22	2.03	1.49	2.36	0.03	0.02	6.93
2022-23	2.00	1.45	2.35	0.12	0.08	16.29
2023-24	2.56	1.95	2.24	0.05	0.04	16.01
2024-25	2.89	2.30	2.26	0.03	0.03	16.09

Interpretation

Sun Pharma shows a clear upward trend in short-term solvency, with its Current Ratio climbing from 1.89 to 2.89 and Quick Ratio rising from 1.31 to 2.30. This indicates strong liquid buffer generation and effective working capital accumulation. Inventory turnover exhibits minimal variance, hovering narrowly between 2.20 and 2.36, demonstrating highly stable demand matching and stock consistency. On leverage, the firm highlights a near debt-free stance, with its debt-to-equity closing at an ultra-conservative 0.03 in 2025. Notably, ROE improved from a baseline of 6.33% to an optimized plateau of roughly 16% from 2022-23 onwards. This concurrent growth in ROE alongside contracting debt reflects superior internal operational margins rather than capital leverage expansion.

2. Dr. Reddy's Laboratories Limited

The financial parameters of Dr. Reddy's Laboratories Ltd reveal distinct movements, especially within its profitability matrix.

Table 4.2: Financial Ratios of Dr. Reddy's Laboratories Ltd

Year	Current Ratio (X1)	Quick Ratio (X2)	Inventory Turnover (X3)	Debt-to-Equity (X4)	Debt-to-Asset (X5)	ROE (%)
2020-21	1.75	1.15	2.93	0.44	0.23	11.66
2021-22	1.77	1.19	3.09	0.49	0.24	-1.83
2022-23	1.85	1.30	3.07	0.16	0.09	-21.93

2023-24	1.28	0.81	2.92	0.28	0.15	12.54
2024-25	1.56	1.01	2.83	0.13	0.06	11.20

Interpretation

Dr. Reddy's shows-controlled liquidity, with its current ratio fluctuating between 1.28 and 1.85. It maintains functional short-term solvency, though excluding inventory exposes thin liquid assets in years like 2023-24 (). Operational throughput is strong, keeping a high inventory turnover between 2.83 and 3.09 times per year, signaling rapid cash conversion cycles. Capital gearing dropped drastically over the observation window, with debt-to-equity falling from 0.49 to 0.13, indicating deep deleveraging. Profitability was highly volatile, swinging from double-digit positives into deep stress in 2021-22 () and 2022-23 (), driven by external market adjustments or write-offs, before recovering to a stable 11.20% by 2025.

3. Cipla Limited

The financial performance profiles for Cipla Ltd reflect a highly liquid and conservative positioning across the study period.

Table 4.3: Financial Ratios of Cipla Ltd

Year	Current Ratio (X1)	Quick Ratio (X2)	Inventory Turnover (X3)	Debt-to-Equity (X4)	Debt-to-Asset (X5)	ROE (%)
2020-21	2.87	1.82	2.76	0.11	0.08	14.11
2021-22	2.99	1.87	2.80	0.05	0.04	12.85
2022-23	3.34	2.27	2.69	0.03	0.03	12.66
2023-24	3.70	2.66	2.92	0.02	0.02	16.45
2024-25	4.24	3.17	2.95	0.01	0.01	18.21

Interpretation

Cipla exhibits exceptional short-term credit strength. Its current ratio advanced from 2.87 to a high of 4.24, well clear of the traditional 2:1 standard. Similarly, its quick ratio climbed to 3.17, highlighting a vast cash-and-equivalent cushion completely detached from stock values. Inventory turnover improved to 2.95 by 2025, demonstrating steady alignment with market demand. Gearing ratios reached absolute zero thresholds (for both measures), outlining an equity-funded corporate base. Despite the potential drag of holding idle capital, efficient asset performance allowed ROE to rebound from a brief dip up to a strong peak of 18.21% in 2024–25.

4. Aurobindo Pharma Limited

Aurobindo Pharma Ltd presents a balanced interplay of operational acceleration and capital allocation.

Table 4.4: Financial Ratios of Aurobindo Pharma Ltd

Year	Current Ratio (X1)	Quick Ratio (X2)	Inventory Turnover (X3)	Debt-to-Equity (X4)	Debt-to-Asset (X5)	ROE (%)
2020-21	1.78	1.23	2.32	0.18	0.11	10.51
2021-22	1.93	1.39	2.22	0.18	0.12	12.96
2022-23	2.41	1.84	2.27	0.06	0.04	21.38
2023-24	2.58	1.92	2.20	0.07	0.05	21.77
2024-25	1.92	1.37	2.15	0.14	0.09	18.42

Interpretation

Aurobindo's short-term solvency rose continuously to peak in 2023-24 (current, quick) before dropping back down to 1.92 and 1.37 in 2024-25. This contraction matches proactive changes in working capital utilization rather than systemic duress. Inventory turnover rates slowed down marginally from 2.32 to 2.15, revealing extended holding intervals potentially tied to supply chain setups. Leverage stayed safe across all periods, dropping to a low in 2022-23 before rising slightly back to 0.14 by 2025. The company's equity return (ROE) expanded from 10.51% up to a high of 21.77% before settling at a healthy 18.42% in the final year.

5. Glenmark Pharmaceuticals Limited

The operational and structural indicators of Glenmark Pharmaceuticals Ltd point to different strategic trade-offs compared to its industry peers.

Table 4.5: Financial Ratios of Glenmark Pharmaceuticals Ltd

Year	Current Ratio (X1)	Quick Ratio (X2)	Inventory Turnover (X3)	Debt-to-Equity (X4)	Debt-to-Asset (X5)	ROE (%)
2020-21	1.86	1.01	2.00	0.24	0.16	27.54
2021-22	2.22	1.30	1.98	0.13	0.10	11.39
2022-23	1.87	1.13	2.21	0.20	0.13	7.50
2023-24	1.95	1.14	2.25	0.22	0.15	11.20
2024-25	1.85	1.13	2.16	0.25	0.17	11.16

Interpretation

Glenmark maintains a tighter liquidity profile, with its current ratio stabilizing near 1.85 and its quick ratio scraping close to unity (in 2025). This indicates that the company depends heavily on continuous stock liquidation to clear its immediate short-term debts. Its inventory turnover ratio grew slightly from 2.00 to 2.25 before sliding back to 2.16. Unlike its peers, Glenmark's leverage ratios increased during the later years, with debt-to-equity reaching 0.25 and debt-to-assets hitting 0.17 to sustain expansion or R&D pipelines. Consequently, its ROE proved highly volatile, plunging from an exceptional 27.54% down to 7.50% before flattening out at around 11.16%.

Section II: Macro-Level Econometric Modelling and Statistical Insights

To model the collective impact of liquidity (), efficiency (), and leverage () across the five pharmaceutical companies, a multiple linear regression analysis was executed using the pooled sample data of 25 observations.

Table 4.6: Model Fit and Regression Statistics

Regression Statistics	Value
Multiple R	0.667
R-Squared ()	0.445
Adjusted R-Squared	0.299
Standard Error	10.94
No. of Observations	25

Interpretation

The **Multiple R** value of 0.667 proves that a moderately strong collective relationship links corporate profitability (ROE) to the combined variations of the liquidity, efficiency, and leverage ratios. The **R-Squared** value () shows that 44.5% of the total cross-sectional and temporal variance in shareholder returns is directly explained by the model's independent variables. The **Adjusted R-Squared** () confirms that after modifying for degrees of freedom,

roughly 30% of variance is captured by the model. This is considered typical and acceptable for financial modelling across diverse firms, where external factors like product mix, compliance overheads, and price controls also play a major role. The **Standard Error** of 10.94 represents the average deviation of actual values from the model's predictions.

Table 4.7: Analysis of Variance (ANOVA)

Source	df	SS	MS	F	Prob(F)
Regression	5	1820.9	364.18	3.043	0.0349
Residual	19	2273.8	119.67		
Total	24	4094.7	170.61		

Interpretation

The ANOVA framework tests the global significance of the regression model. The calculated **F-Statistic** stands at 3.043. The corresponding **Prob(F)** value is 0.0349, which is strictly below the standard 5% significance threshold ($\alpha = 0.05$). Therefore, we reject the null hypothesis that all regression coefficients are equal to zero ($H_0: \beta_1 = \beta_2 = \dots = \beta_5 = 0$). This statistical check confirms that the independent variables jointly exert a meaningful, statistically validated effect on Return on Equity.

Table 4.8: Coefficient Matrix and Significance Analysis

Variable	Coefficient	Standard Error	t-value	p-value	Result
Constant	53.70	20.62	2.604	0.017	Significant
Current Ratio (X_1)	18.70	12.76	1.466	0.159	Insignificant
Quick Ratio (X_2)	-12.82	15.86	-0.808	0.429	Insignificant
Inventory Turnover (X_3)	-25.11	8.67	-2.896	0.009	Significant
Debt-to-Equity (X_4)	185.37	130.90	1.416	0.173	Insignificant
Debt-to-Asset (X_5)	-318.04	246.74	-1.289	0.213	Insignificant

SECTION III: Empirical Regression Equation Formulation

Using the calculated coefficient values from Table 4.8, the empirical model is constructed as follows:

$$\text{ROE} = 53.70 + 18.70(X_1) - 12.82(X_2) - 25.11(X_3) + 185.37(X_4) - 318.04(X_5)$$

Where:

- X_1 = Current Ratio
- X_2 = Quick Ratio
- X_3 = Inventory Turnover Ratio
- X_4 = Debt-to-Equity Ratio
- X_5 = Debt-to-Assets Ratio

Key Variable Insights

- **Constant (53.70):** Reflects a strong base level of profitability inherent to the companies when the specified financial ratios are zero ($p = 0.017 < 0.05$).

- **Current Ratio (+18.70):** Indicates a positive directional pull, suggesting that holding adequate working capital levels helps support smoother operations and improves overall profitability. However, this relationship is not statistically significant ($p = 0.159$).
- **Quick Ratio (-12.82):** Displays a negative coefficient, which suggests that holding excessive cash buffers can result in idle capital drag and pull down asset returns ($p = 0.429$, statistically insignificant).
- **Inventory Turnover Ratio (-25.11):** Shows a negative and statistically significant impact on ROE ($p = 0.009 < 0.01$). This indicates that aggressive, high-velocity product movement may be linked to competitive price reductions or discounting, which compresses operational margins within the sector.
- **Leverage Ratios (X_4, X_5):** Reveal a mixed directional impact. While debt-to-equity pulled positively (+185.37), expanding asset gearing via debt pulled negatively (-318.04). Both metrics were statistically insignificant due to the conservative capital structures across the sector.

4. Conclusion

This empirical study evaluates the internal drivers of financial performance across five leading Indian pharmaceutical firms over a five-year period. The results highlight clear differences in performance between the sampled companies. Well-established players like Cipla and Sun Pharma consistently display excellent short-term liquidity profiles and conservative capital gearing, which translates into highly stable shareholder returns. Conversely, companies carrying elevated leverage or navigating less liquid cash cycles, such as Glenmark, face increased earnings volatility and higher risk exposure.

The macro regression model confirms that liquidity, operational efficiency, and capital decisions collectively explain 44.5% of the variance in Return on Equity. Interestingly, the significant negative impact of the inventory turnover ratio reveals that speed alone does not guarantee higher returns. High-velocity sales must be balanced with strict cost controls to ensure they do not compress operational profit margins. Ultimately, a balanced financial strategy combining optimized cash cycles, disciplined cost management, and a conservative approach to debt financing forms the foundation for long-term growth and resilience in the pharmaceutical sector.

Implications of the Study

1. **Strategic Corporate Management:** Executives should avoid chasing high inventory turnover at the expense of product pricing margins, focusing instead on optimizing cost structures and maintaining moderate liquidity buffers.
2. **Investment Strategy:** Financial analysts and equity investors should focus on underlying operational efficiency metrics and capital structure balance rather than superficial liquidity indicators when assessing risk in the pharmaceutical market.
3. **Credit Risk Mitigation:** Leveraged companies should implement structured debt reduction plans to control volatility and stabilize net income margins during periods of regulatory change or pricing pressure.

Scope for Further Research

Future research can expand upon this study by broadening the sample size to cover a wider range of mid-cap and small-cap listed pharmaceutical firms. Extending the time horizon beyond five years would also capture a wider variety of macroeconomic cycles and long-term trends. Additionally, adding non-ratio metrics such as R&D investment percentages, patent counts, or international regulatory filings would create a more comprehensive framework for predicting long-term profitability. Finally, applying advanced econometric techniques, such as panel data regression with fixed or random effects, could control for unobserved firm-specific variations across the industry.

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