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Liquidity Optimization Through Inventory And Receivables Control: An Empirical Study Of Selected Indian Pharma Companies

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This study investigates the impact of inventory and receivables management on the liquidity performance of Indian pharmaceutical firms, focusing on Torrent Pharmaceuticals Ltd. and Zydus Lifesciences Ltd. Using panel data spanning 15 years (2010–2024), the research applies fixed and random effects regression models in STATA 18 to assess how Inventory Turnover Ratio (ITR), Days Inventory Outstanding (DIO), Receivables Turnover Ratio (RTR), and Days Sales Outstanding (DSO) influence key liquidity indicators: Current Ratio, Quick Ratio, and Cash Ratio. The analysis reveals that receivables management—particularly RTR and DSO—has a statistically significant and positive impact on both Current and Quick Ratios, highlighting the critical role of efficient credit and collection policies in maintaining liquidity. Conversely, inventory-related metrics exhibit no significant influence on any liquidity measure, reflecting the unique operational and regulatory dynamics of the pharmaceutical sector where high inventory levels are often unavoidable. The Cash Ratio is unaffected by either set of variables, indicating that broader treasury policies drive cash holdings. This study fills a crucial gap in the literature by offering firm-level, sector-specific evidence on how working capital components affect liquidity in pharma firms. It contributes actionable insights for financial managers, policymakers, and industry stakeholders, urging a strategic focus on receivables control for enhancing short-term solvency in a capital-intensive industry.

Keywords: Working Capital Management, Liquidity, Receivables Turnover, Inventory Efficiency, Pharmaceutical Sector, Panel Regression.

1. Introduction

Liquidity is the lifeblood of operational sustainability for firms across industries, but nowhere is this more evident than in the pharmaceutical sector. As a capital-intensive and regulation-driven industry, pharmaceutical companies are often required to maintain extensive inventory, offer extended credit terms, and operate under significant cost constraints. In such an environment, the management of short-term assets—namely inventory and trade receivables—becomes crucial for ensuring that a firm retains the ability to meet its immediate financial obligations while maintaining profitability and solvency (Adu, 2013).

Inventory, typically comprising raw materials, work-in-progress, and finished goods, constitutes a substantial portion of the current assets in pharmaceutical companies. Mismanagement or excessive accumulation of inventory can lead to obsolescence, increased holding costs, and diminished returns. On the other hand, receivables management deals with the efficiency of credit sales and the firm's ability to collect payments in a timely manner. Delays in receivables conversion not only reduce operational liquidity but also hinder reinvestment opportunities and increase the risk of bad debts (Onyimba, Ugwu & Bassey, 2020).

In pharmaceutical operations, working capital cycles are uniquely elongated due to the nature of R&D, production processes, and long regulatory approval timelines. The challenge of balancing liquidity with operational needs and financial efficiency requires managers to develop robust strategies for controlling inventory and accelerating receivable turnover (Zaheer & Siddique, 2023). Research in working capital management (WCM) thus highlights the direct and indirect ways in which inventory and receivables influence liquidity outcomes, including Current Ratio, Quick Ratio, and Cash Ratio.

While the pharmaceutical sector in India has grown to become the third-largest in the world by volume, many domestic firms face persistent liquidity challenges that affect both their competitiveness and creditworthiness (Panigrahi & Raul, 2018). The surge in demand for pharmaceuticals during the COVID-19 pandemic further accentuated the importance of agile inventory handling and efficient receivables collection in ensuring seamless supply and capital flow. In this context, understanding the interlinkages between inventory and receivables control and liquidity optimization has emerged as a pressing concern for stakeholders across the industry.

Over the years, several studies have sought to explore the role of working capital management in enhancing firm performance, but few have explicitly isolated and empirically examined the joint impact of inventory and receivables on liquidity in the pharmaceutical context. For example, Ejike and Agha (2018) evaluated operating liquidity and its influence on profitability in Nigerian pharmaceutical firms, identifying receivables as a core driver of cash flow. However, the study did not explore how inventory levels mediate this relationship.

Similarly, Ofoegbu and Onodugo (2016) found that poor receivables management practices adversely affect both liquidity and profitability, using a dataset from publicly listed pharmaceutical companies in Nigeria. However, their study was limited by its geographic scope and its lack of integration with inventory turnover metrics. Other scholars, such as Putri (2024), have examined receivables and inventory control in the context of multi-finance companies, revealing a significant relationship with liquidity indicators, but these findings are not directly transferable to pharmaceutical firms given the unique nature of production and supply chain challenges in this industry.

Omari (2020) investigated liquidity and solvency in Jordanian pharmaceutical firms, highlighting the critical role of current asset management in sustaining profitability. Nevertheless, the absence of a disaggregated analysis of inventory and receivables leaves a gap in identifying the precise levers for liquidity enhancement. Similarly, ADEBOWALE and

DADA (2022) emphasized the importance of account receivables control, but did not incorporate inventory turnover in their analysis.

In the Indian context, Panigrahi and Raul (2018) explored the trade-off between liquidity and profitability, but their focus remained broad, without a micro-level exploration of how specific working capital components like DSO (Days Sales Outstanding) or DIO (Days Inventory Outstanding) relate to liquidity metrics. The same limitation is echoed in studies such as that of Zaheer and Siddique (2023), which primarily examined inventory management's role in financial performance without linking it directly to liquidity outcomes.

Taken together, these studies underscore the need for an empirical examination that isolates the effects of inventory and receivables on liquidity, especially in the Indian pharmaceutical sector where long working capital cycles are prevalent. This study addresses this research gap by using panel data analysis to evaluate how Inventory Turnover Ratio (ITR), Days Inventory Outstanding (DIO), Receivables Turnover Ratio (RTR), and Days Sales Outstanding (DSO) affect key liquidity metrics like Current Ratio, Quick Ratio, and Cash Ratio over a fifteen-year period.

Despite the critical role of working capital management in financial sustainability, many Indian pharmaceutical firms continue to experience liquidity stress that compromises their operational stability and strategic agility. While aggregate working capital metrics have been studied extensively, there remains a lack of clarity on how the two pivotal components—inventory and receivables—specifically impact liquidity. Do firms that turn over inventory faster enjoy stronger liquidity? Does the efficiency of receivables collection translate into higher short-term solvency? These questions are particularly significant in a sector characterized by prolonged credit cycles, complex distribution channels, and high product differentiation. Moreover, with Indian pharma companies increasingly operating in international markets, managing liquidity has become even more complex due to currency risks and diversified receivable portfolios.

The existing empirical literature provides fragmented insights into the relationship between inventory, receivables, and liquidity, often conflating their impact with profitability or using sector-agnostic data. There is thus a pressing need for a focused, empirical study that not only quantifies the effect of inventory and receivables management on liquidity but also contextualizes it within the operational realities of Indian pharmaceutical firms.

The primary aim of this study is to examine the impact of inventory and receivables management on the liquidity performance of selected Indian pharmaceutical companies. Specifically, the paper seeks to:

1. Analyze trends and variability in Inventory Turnover Ratio (ITR), Days Inventory Outstanding (DIO), Receivables Turnover Ratio (RTR), and Days Sales Outstanding (DSO) over a 15-year period.

2. Evaluate the relationship between these working capital metrics and three key liquidity indicators: Current Ratio (CR), Quick Ratio (QR), and Cash Ratio (CashR).

3. Use panel regression techniques (Fixed and Random Effects models) to identify statistically significant predictors of liquidity.
4. Provide actionable insights for financial managers and policymakers in the pharmaceutical sector to improve liquidity management through operational controls on receivables and inventory.

The study contributes both methodologically and practically by leveraging firm-level panel data over a significant time span and by integrating both inventory and receivables metrics in the analysis of liquidity—something rarely done in current pharmaceutical research.

This research is significant for several reasons. First, it contributes to the academic literature on working capital management by isolating the effects of inventory and receivables on liquidity, rather than conflating them with broader financial performance metrics. Second, the study uses real-time data from two of India's top pharmaceutical firms over a comprehensive 15-year period, thereby enhancing the empirical robustness and temporal validity of the results. Third, the insights derived from this study are highly relevant to industry practitioners. In the wake of increasing price competition, supply chain disruptions, and global compliance burdens, pharmaceutical companies must look inward to improve efficiency. Managing short-term assets like inventory and receivables effectively can lead to faster cash cycles, reduced financial risk, and improved investor confidence. Finally, the paper adds value for policymakers and regulatory bodies by identifying liquidity levers that are operationally controllable. In an industry where the stability of supply chains is linked to national healthcare outcomes, ensuring that firms remain liquid is not just a financial goal, but a strategic imperative.

2. Literature Review

This section organizes and critically analyzes prior studies on the impact of inventory and receivables management on liquidity, structured thematically to align with our research objectives: (1) examining trends in ITR, DIO, RTR, and DSO; (2) evaluating their relationship with liquidity ratios like CR, QR, and Cash Ratio; and (3) identifying operational factors affecting financial solvency in pharmaceutical and related industries.

Theme 1: Inventory Management and Liquidity Outcomes

The relationship between inventory management and liquidity has been widely explored, particularly through metrics like Inventory Turnover Ratio (ITR) and Days Inventory Outstanding (DIO). Sarpingah (2020) studied firms listed on the Indonesia Stock Exchange and concluded that inventory turnover significantly influences liquidity levels. The study employed multiple regression analysis and found a positive correlation between ITR and the Current Ratio, asserting that faster turnover allows firms to maintain better cash flows and meet short-term obligations (Sarpingah, 2020).

Similarly, Amanda (2019) explored the effect of inventory and cash turnover on profitability and liquidity in Indonesian firms. Using panel data regression, the study confirmed that

effective inventory management leads to improved liquidity performance, especially in firms with high inventory-to-sales volatility (Amanda, 2019).

In the pharmaceutical context, Adu (2013) conducted an in-depth analysis of trading and manufacturing firms in Ghana, focusing on how inventory levels affect firm liquidity. The study reported that inventory mismanagement often leads to liquidity bottlenecks, especially when turnover cycles are prolonged due to overstocking or misaligned supply chains. The findings emphasized the importance of synchronizing procurement with demand forecasting to optimize liquidity (Adu, 2013).

Theme 2: Receivables Management and Cash Flow Efficiency

Receivables management, particularly through Receivables Turnover Ratio (RTR) and Days Sales Outstanding (DSO), has been widely recognized as a determinant of liquidity. Yusup and Hariani (2023) conducted a quantitative study on Indonesian manufacturing firms and reported that improved receivables turnover is linked with a higher quick ratio, indicating that timely collection of payments helps free up cash to cover liabilities (Yusup & Hariani, 2023).

In a similar vein, Nasution and Sembiring (2022) found a negative relationship between DSO and liquidity in consumer goods companies. They concluded that an increase in DSO significantly reduces cash reserves and liquidity coverage, highlighting the risks associated with extended credit terms (Nasution & Sembiring, 2022).

Putri (2024) explored receivables and inventory management in multi-finance companies and found that shortening DSO and improving RTR had a dual benefit: they not only enhanced liquidity but also minimized bad debt risks. The study used structural equation modeling (SEM) to establish significant predictive links between receivables management and liquidity outcomes (Putri, 2024).

Theme 3: Integrated Impact of Inventory and Receivables on Liquidity

Some researchers have adopted a holistic view, analyzing the combined effect of inventory and receivables management on liquidity. Salam, Abdurrohman, and Alfarizi (2022), for instance, assessed companies in the chemical subsector and found that both ITR and RTR jointly impact liquidity ratios. The study used time-series analysis and emphasized the need for synchronizing receivables collection with inventory sales to achieve liquidity balance (Salam et al., 2022).

Eryatna and Eltivia (2021) extended the investigation to consumer goods firms, observing that inventory and receivables turnover collectively accounted for over 65% of the variation in cash ratio and quick ratio. The findings, derived from regression diagnostics, confirmed that improving both metrics simultaneously yields stronger liquidity gains compared to optimizing either in isolation (Eryatna & Eltivia, 2021).

Andini (2023) conducted a sectoral study in the tobacco industry and found that efficient management of inventory and receivables led to a 20–30% improvement in current and quick ratios. The study highlighted how firms with synchronized WCM practices had better debt servicing capacities and creditworthiness (Andini, 2023).

Gorondutse et al. (2016) focused on SMEs and revealed that while inventory turnover improved profitability, its effect on liquidity was amplified when combined with fast receivables collection. The study used multivariate analysis and stressed the synergistic value of dual-component optimization (Gorondutse et al., 2016).

Despite the substantial literature on working capital and liquidity, there is a noticeable gap in empirical research that concurrently and comprehensively investigates the effects of inventory and receivables management on liquidity outcomes—especially within the context of Indian pharmaceutical firms. Most existing studies have either focused on a single component (inventory or receivables) or generalized across industries without acknowledging the unique cash cycles and regulatory dynamics of pharma firms.

This paper fills that gap by using panel regression analysis on data spanning 15 years from top Indian pharmaceutical companies—Torrent and Zydus—to assess how Inventory Turnover Ratio, DIO, Receivables Turnover Ratio, and DSO impact Current Ratio, Quick Ratio, and Cash Ratio. It contributes to the strategic financial literature by identifying operational levers that managers can control to enhance liquidity, especially in capital-intensive sectors.

The findings of this research are not only academically valuable but also offer practical insights for CFOs, credit analysts, and supply chain professionals operating in the pharmaceutical space. By revealing the dynamic interplay between inventory and receivables, and their direct effect on liquidity, this study informs smarter financial planning, stronger credit policies, and improved cash flow predictability for the sector.

3. Research Methodology

3.1 Research Design

This study adopted a quantitative, analytical research design, leveraging panel data econometrics to empirically examine the effect of inventory and receivables management on liquidity in the Indian pharmaceutical sector. The scope of the study was narrowed to two leading firms—Torrent Pharmaceuticals Ltd. and Zydus Lifesciences Ltd., selected based on their continuous listing on Indian stock exchanges and their consistent presence in the top ten pharmaceutical companies in India by market capitalization.

A longitudinal panel data approach was used to account for firm-level and temporal variations in liquidity performance, covering a 15-year period (2010–2024). The panel dataset allowed for deeper insights into intra-firm variability and time-dependent behavior in inventory and receivables efficiency.

The analytical model utilized STATA 18 for statistical computations, with fixed effects (FE) and random effects (RE) regressions applied. Hausman specification tests were used to determine the most appropriate estimation strategy between FE and RE models.

3.2 Data Source and Coverage

The study relied exclusively on secondary data, extracted from audited annual financial reports of Torrent Pharmaceuticals and Zydus Lifesciences. These reports were sourced from official company websites and validated databases such as the Bombay Stock Exchange (BSE), National Stock Exchange (NSE), and Moneycontrol.

All financial metrics were manually compiled and cross-verified for accuracy and consistency. The dataset included balance sheet and income statement figures necessary for calculating inventory and receivables management indicators, as well as liquidity ratios.

Table 3.1: Data Source Details

Component	Detail
Companies Analyzed	Torrent Pharmaceuticals Ltd., Zydus Lifesciences Ltd.
Sector	Indian Pharmaceutical Sector
Time Frame	2010–2024 (15 years)
Data Type	Panel (cross-sectional over time)
Data Nature	Secondary (archival financial data)
Data Sources	Company Annual Reports (Torrent, Zydus), BSE, NSE, Moneycontrol
Variables Used	ITR, DIO, RTR, DSO, Current Ratio, Quick Ratio, Cash Ratio
Data Collection Format	Microsoft Excel (structured firm-year format)
Data Verification	Cross-checked across multiple databases and disclosures
Software Used	STATA 18
Analytical Tools	Descriptive Statistics, Panel Regression (FE, RE), Hausman Test
Estimation Techniques	Fixed Effects and Random Effects models
Statistical Threshold	5% significance level ($p < 0.05$)

3.3 Variables and Measurement

Independent Variables

The two main sets of working capital metrics used as predictors were:

Inventory Management Metrics:

- **Inventory Turnover Ratio (ITR)** = Cost of Materials Consumed / Inventories
- **Days Inventory Outstanding (DIO)** = (Inventories / Cost of Materials Consumed) × 365
- **Inventory to Sales Ratio** = Inventories / Revenue from Operations

Receivables Management Metrics:

- **Receivables Turnover Ratio (RTR)** = Revenue / Trade Receivables
- **Days Sales Outstanding (DSO)** = (Trade Receivables / Revenue) × 365

Dependent Variables (Liquidity Indicators):

- **Current Ratio (CR)** = Current Assets / Current Liabilities
- **Quick Ratio (QR)** = (Current Assets – Inventories) / Current Liabilities
- **Cash Ratio (CashR)** = Cash and Bank Balances / Current Liabilities

All financial figures were calculated in INR crores and standardized for inflation where appropriate, using the GDP deflator method for comparability.

3.4 Model Specification

The following panel regression equation was estimated for each dependent variable (CR, QR, and CashR):

$$\text{Liquidity}_{it} = \beta 0 + \beta 1(\text{ITR})_{it} + \beta 2(\text{DIO})_{it} + \beta 3(\text{RTR})_{it} + \beta 4(\text{DSO})_{it} + \mu i + \varepsilon it$$

Where:

- $i = \text{firm index (Torrent or Zydus)}$
- $t = \text{time (year, from 2010 to 2024)}$
- $\mu i = \text{firm} - \text{specific unobserved effect}$
- $\varepsilon it = \text{random error term}$

Both Fixed Effects (FE) and Random Effects (RE) models were estimated, and the Hausman Test was applied to determine the superior specification for each dependent variable model.

3.5 Scope and Limitations

This research was limited to:

- Two Indian pharmaceutical companies (Torrent and Zydus)
- Financial variables directly associated with inventory, receivables, and liquidity
- Secondary data availability and accuracy from audited public sources

The study does not include non-financial determinants of liquidity such as supply chain disruptions, payment cycles influenced by public healthcare systems, or macroeconomic shocks. These remain areas for future inquiry.

4. Results and Analysis

Table 1: Descriptive Statistics for Liquidity Indicators (Company-wise)

Company	Current Ratio (±SD)	Quick Ratio (±SD)	Cash Ratio (±SD)
Torrent	1.72 ± 0.53	1.16 ± 0.44	0.16 ± 0.19
Zydus	1.58 ± 0.60	1.11 ± 0.50	0.07 ± 0.04
Total	1.65 ± 0.56	1.13 ± 0.46	0.12 ± 0.14

Interpretation and Discussion:

This table summarizes the average liquidity metrics of Torrent and Zydus over the 15-year period. Torrent Pharmaceuticals consistently outperforms Zydus in all three liquidity indicators. The Current Ratio of Torrent (1.72) indicates that it maintains a stronger pool of current assets relative to current liabilities, providing a better cushion against short-term obligations. Similarly, the Quick Ratio, which excludes inventory, stands at 1.16 for Torrent versus 1.11 for Zydus, showing that Torrent also holds more liquid assets that are quickly convertible to cash. The most notable difference lies in the Cash Ratio, where Torrent (0.16) significantly surpasses Zydus (0.07), highlighting its more conservative approach in cash reserves. However, Torrent's higher standard deviation (0.19) in cash ratio suggests volatility in cash management practices. Overall, these findings suggest that Torrent pursues a more liquidity-focused financial strategy compared to Zydus, possibly sacrificing some operational efficiency for solvency.

Table 2: Descriptive Statistics for Inventory Management Indicators (Company-wise)

Company	Inventory Turnover Ratio	Days Inventory Outstanding (DIO)	Inventory to Sales Ratio
Torrent	1.14 ± 0.35	344.38 ± 90.80	0.231 ± 0.044
Zydus	1.51 ± 0.31	250.83 ± 51.65	0.212 ± 0.047
Total	1.33 ± 0.37	297.60 ± 86.78	0.222 ± 0.046

Interpretation and Discussion:

Zydus Lifesciences demonstrates better inventory efficiency with a higher Inventory Turnover Ratio (1.51 vs. Torrent’s 1.14) and lower Days Inventory Outstanding (DIO) (251 vs. 344 days). These results indicate that Zydus is more effective in converting inventory into sales and managing stock levels, potentially lowering storage costs and risk of obsolescence.

Torrent's higher Inventory to Sales Ratio (0.231) suggests that a greater portion of its revenue is tied up in unsold inventory, which can adversely affect liquidity. These insights reveal that Zydus maintains a leaner inventory approach, likely supported by robust demand forecasting and supply chain integration. For Torrent, the slower inventory movement could be due to higher production lead times or broader product portfolios. Overall, inventory management practices appear to significantly diverge between the two firms, with Zydus favoring operational agility.

Table 3: Descriptive Statistics for Receivables Management Indicators (Company-wise)

Company	Receivables Turnover Ratio	Days Sales Outstanding (DSO)
Torrent	4.56 ± 0.99	84.36 ± 21.85
Zydus	4.46 ± 1.31	89.69 ± 29.33
Total	4.51 ± 1.14	87.03 ± 25.56

Interpretation and Discussion:

Both firms exhibit similar **Receivables Turnover Ratios** (around 4.5), implying consistent credit collection cycles, though Torrent slightly outperforms. The **DSO** values indicate that it takes Torrent around 84 days to collect payment post-sale, while Zydus takes approximately 90 days. Although the difference may appear small, this can have significant implications for liquidity management, especially in high-capital sectors like pharmaceuticals. Torrent's marginally faster collections could contribute to its better liquidity metrics observed earlier. The higher standard deviation for Zydus in DSO suggests more variability in collection times, indicating fluctuating customer payment behavior or inconsistent credit policies. Efficient receivables management, as reflected here, can free up cash for reinvestment and reduce reliance on external borrowing, reinforcing its importance in working capital strategy.

Table 4: Year-Wise Liquidity Indicators – Torrent Pharmaceuticals

Year	Current Ratio	Quick Ratio	Cash Ratio
2010	1.94	1.49	0.68
2011	1.60	1.14	0.35
2012	1.72	1.24	0.44
2013	1.86	1.23	0.25
2014	2.29	1.69	0.19
2015	2.06	1.47	0.05
2016	2.09	1.44	0.05

2017	3.07	2.18	0.07
2018	1.22	0.78	0.02
2019	1.21	0.77	0.08
2020	1.13	0.68	0.12
2021	1.60	0.86	0.03
2022	1.68	0.93	0.03
2023	1.15	0.68	0.04
2024	1.25	0.73	0.04

Interpretation and Discussion:

Torrent's liquidity profile has seen significant fluctuations over the years. Between 2010 and 2017, all three ratios remained healthy, with the Current Ratio peaking at 3.07 and Quick Ratio at 2.18 in 2017—highlighting a period of strong short-term solvency. However, a steep decline is observed post-2017, especially in Cash Ratio, which dropped to just 0.02 in 2018. This may reflect increased investment activity, reduced cash flow, or changing credit strategies. Despite moderate recovery in subsequent years, liquidity metrics never fully returned to their pre-2018 highs. The steady fall in Cash Ratio suggests a shift in working capital structure or liquidity policy. These variations provide context to later regression analyses by linking temporal shifts in liquidity to changes in operational variables like inventory and receivables.

Table 5: Year-Wise Inventory Management – Torrent Pharmaceuticals (2010–2024)

Year	Inventory Turnover Ratio	DIO (Days)	Inventory to Sales Ratio
2010	1.96	185.81	0.159
2011	1.68	217.33	0.204
2012	1.50	243.13	0.198
2013	1.14	319.07	0.266
2014	1.26	289.35	0.216
2015	1.24	294.48	0.229
2016	1.07	340.16	0.183
2017	1.14	320.29	0.231
2018	0.77	476.54	0.314

2019	0.89	410.77	0.244
2020	0.90	406.76	0.250
2021	0.74	491.11	0.302
2022	0.85	429.12	0.270
2023	0.92	395.83	0.212
2024	1.06	345.93	0.187

Interpretation and Discussion:

Torrent's inventory management has shown signs of inefficiency, especially from 2013 onwards. The Inventory Turnover Ratio dropped below 1.0 by 2018, with DIO spiking to 476 days, indicating slower inventory clearance and rising holding costs. The Inventory to Sales Ratio also peaked during this time, suggesting excessive stock accumulation relative to sales. This inefficiency likely contributed to the deterioration in liquidity observed during the same years. However, post-2021, a gradual recovery is visible as ITR improves and DIO declines, pointing toward efforts to optimize inventory processes. This trajectory underscores the operational-financial link and supports the hypothesis that inventory mismanagement adversely impacts liquidity, a relationship tested further in regression models.

Table 6: Year-Wise Receivables Management – Torrent Pharmaceuticals (2010–2024)

Year	Receivables Turnover Ratio	DSO (Days Sales Outstanding)
2010	5.65	64.60
2011	5.33	68.54
2012	5.40	67.61
2013	3.49	104.70
2014	2.58	141.41
2015	3.17	115.26
2016	6.29	58.04
2017	4.80	75.99
2018	4.13	88.29
2019	4.53	80.55
2020	4.24	85.98

2021	4.25	85.81
2022	4.51	80.99
2023	4.50	81.17
2024	5.49	66.53

Interpretation and Discussion:

Torrent Pharmaceuticals exhibits a mixed trend in receivables efficiency over the 15-year span. The early years (2010–2012) show strong Receivables Turnover Ratios above 5 and DSO values below 70, indicating swift payment collections and stringent credit policies. However, a substantial decline occurs between 2013 and 2015—RTR drops as low as 2.58 and DSO peaks at 141.41 days in 2014—suggesting relaxed credit terms, increased sales on credit, or inefficiencies in collections. This period likely strained liquidity, contributing to the weakening liquidity ratios observed in Table 4. Interestingly, 2016 marks a sharp turnaround with RTR reaching 6.29 and DSO falling to 58 days, followed by a relatively stable phase. The recovery could be attributed to stricter credit control or improved customer profile. By 2024, Torrent nearly regains early-period efficiency, reinforcing the importance of strong receivables control in working capital strategy and liquidity management.

Table 7: Year-Wise Liquidity Indicators – Zydus Lifesciences (2010–2024)

Year	Current Ratio	Quick Ratio	Cash Ratio
2010	1.883	1.271	0.045
2011	1.779	1.140	0.058
2012	1.183	0.793	0.092
2013	1.089	0.735	0.055
2014	1.326	0.903	0.057
2015	1.348	0.946	0.065
2016	1.521	1.179	0.085
2017	0.710	0.400	0.006
2018	1.275	0.801	0.066
2019	1.519	0.994	0.040
2020	1.389	0.985	0.112
2021	1.251	0.882	0.032

2022	1.698	1.219	0.075
2023	2.566	1.927	0.089
2024	3.123	2.459	0.163

Interpretation and Discussion:

Zydus Lifesciences presents a liquidity trend that oscillates, with key improvements in recent years. From 2010–2016, liquidity indicators remain within a moderate range, suggesting stable short-term financial health. A sharp decline occurs in 2017—Current Ratio drops to 0.710, Quick Ratio to 0.400, and Cash Ratio to a dangerously low 0.006—signifying a liquidity crunch, possibly due to capital investment, unexpected liabilities, or cash flow mismatch. However, the company swiftly rebounds, with liquidity metrics improving consistently post-2018. By 2024, Zydus achieves its best liquidity standing, with a Current Ratio of 3.123 and a Quick Ratio of 2.459, suggesting enhanced working capital management, improved inventory and receivables strategies, or strengthened revenue streams. This dramatic recovery positions Zydus favorably and mirrors the importance of dynamic liquidity planning. The Cash Ratio, while still modest (0.163), shows the firm maintains just enough cash for contingencies without locking too much idle capital.

Table 8. Year-Wise Inventory Management – Zydus Lifesciences (2010–2024)

Year	Inventory Turnover	DIO (Days)	Inventory to Sales Ratio
2010	2.08	175.74	0.202
2011	1.46	250.54	0.213
2012	1.58	231.30	0.208
2013	1.61	227.02	0.201
2014	1.61	226.74	0.188
2015	1.60	228.26	0.172
2016	2.10	173.98	0.102
2017	0.99	367.44	0.305
2018	1.18	308.22	0.237
2019	1.19	306.11	0.256
2020	1.32	276.92	0.234
2021	1.32	276.89	0.239

2022	1.36	267.44	0.254
2023	1.52	240.64	0.212
2024	1.78	205.19	0.164

Interpretation and Discussion

The inventory efficiency of Zydus Lifesciences follows a fluctuating pattern across the years. While the firm began with strong ITR in 2010 (2.08), the sharp decline in 2017 to 0.99—coupled with the highest DIO (367.44 days)—indicates sluggish inventory movement and potential overstocking. This also aligns with a high inventory-to-sales ratio of 0.305. However, from 2018 onward, DIO gradually improves and reaches 205 days by 2024, showing better inventory control. The ITR also shows a steady rise post-2017, culminating at 1.78 in 2024. These positive trends suggest the implementation of stronger supply chain and production alignment strategies. Such recovery is crucial for liquidity optimization as excessive inventory ties up working capital.

Table 10. Year-Wise Receivables Management – Zydus Lifesciences (2010–2024)

Year	Receivables Turnover	DSO (Days)
2010	6.05	60.35
2011	6.27	58.22
2012	5.83	62.58
2013	5.46	66.86
2014	6.03	60.57
2015	5.18	70.48
2016	4.22	86.47
2017	4.11	88.91
2018	4.79	76.13
2019	3.12	116.86
2020	2.93	124.60
2021	4.13	88.30
2022	3.58	101.87

2023	2.65	137.87
2024	2.51	145.35

Interpretation and Discussion

Zydus Lifesciences exhibited disciplined receivables management from 2010 to 2015, with turnover ratios above 5 and DSO below 70. However, the trend reversed after 2016. DSO peaked at 145.35 in 2024, and turnover dropped to 2.51, signaling collection inefficiencies or extended credit policies. This has serious liquidity implications—delayed collections can restrict operational cash flows and increase dependency on external funding. The regression analysis further validates that deteriorating receivables performance negatively impacts liquidity, making it a critical area for strategic intervention.

Table 11. Panel Regression Results – Current Ratio

Variable	Fixed Effects Coeff.	p-value	Random Effects Coeff.	p-value
Inventory Turnover Ratio	0.347	0.638	0.462	0.568
DIO	-0.0007	0.838	0.0015	0.666
Receivables Turnover	0.714	0.034	0.810	0.021
DSO	0.0417	0.007	0.0448	0.004
Constant	-5.450	0.141	-6.971	0.076

Interpretation and Discussion

Current Ratio, a broad indicator of liquidity, is significantly affected by Receivables Turnover and DSO. The fixed effects model (validated by Hausman test) shows both variables positively impact the Current Ratio. Inventory Turnover and DIO do not show significant influence. The positive relationship of DSO may indicate extended credit policies in financially strong firms. This underlines that receivables management, rather than inventory turnover, plays a stronger role in influencing overall liquidity.

Table 12. Panel Regression Results – Quick Ratio

Variable	Fixed Effects Coeff.	p-value	Random Effects Coeff.	p-value

Inventory Turnover Ratio	0.321	0.561	0.414	0.502
DIO	-0.0012	0.626	0.0006	0.830
Receivables Turnover	0.509	0.042	0.588	0.028
DSO	0.0317	0.006	0.0342	0.004
Constant	-3.983	0.150	-5.220	0.081

Interpretation and Discussion

Quick Ratio also reflects significant relationships with receivables variables. Receivables Turnover and DSO both improve Quick Ratio significantly. Inventory metrics again fail to make an impact, reinforcing the inference that short-term liquidity in pharma companies is more sensitive to cash inflows from receivables than inventory handling. The results suggest managerial focus should be directed more on debtor management than stock optimization to strengthen liquid asset backing.

Table 13. Panel Regression Results – Cash Ratio

Variable	Fixed Effects Coeff.	p-value	Random Effects Coeff.	p-value
Inventory Turnover Ratio	0.110	0.536	0.163	0.507
DIO	-0.0010	0.212	-0.000009	0.994
Receivables Turnover	-0.058	0.457	-0.014	0.898
DSO	-0.0022	0.525	-0.0008	0.870
Constant	0.726	0.408	0.031	0.979

Interpretation and Discussion

No independent variable significantly affects the Cash Ratio, suggesting that neither inventory turnover nor receivables collection directly influence the firm's cash holdings. This reflects the reality of complex treasury operations, where cash levels are driven by broader strategies beyond operating cycles. These include debt restructuring, investment outflows, and financing decisions. Therefore, Cash Ratio may be better explained by cash flow statements than working capital metrics.

Table 14. Summary of Hypothesis 3 Findings

Liquidity Measure	Significant Variables	Interpretation Summary
Current Ratio	Receivables Turnover, DSO	Receivables efficiency improves liquidity
Quick Ratio	Receivables Turnover, DSO	Reinforces receivables' importance
Cash Ratio	None	Unaffected by receivables/inventory

Interpretation and Discussion

The hypothesis that inventory and receivables management impact liquidity is only partially accepted. The empirical findings strongly support that receivables-related metrics (RTR, DSO) are key drivers of both Current and Quick Ratios, confirming their importance in maintaining liquidity. However, inventory-related metrics show no significant influence, and the Cash Ratio remains independent of either. These outcomes validate the prioritization of receivables control in financial strategy formulation, particularly in industries like pharma with long operating cycles and credit exposure.

5. Discussion & Conclusion

5.1 Interpretation of Empirical Results in Light of Existing Literature

The results presented in Section 4 offer critical insights into the interplay between working capital components—namely inventory and receivables—and the liquidity performance of Indian pharmaceutical companies. In doing so, this study advances the theoretical and empirical discourse outlined in the literature review.

The most consistent and statistically significant finding from the panel regression analysis is the influence of receivables management on liquidity, as demonstrated by the positive relationship between Receivables Turnover Ratio (RTR) and Days Sales Outstanding (DSO) with both Current and Quick Ratios. This confirms the findings of previous studies such as Yusup and Hariani (2023) and Nasution and Sembiring (2022), who emphasized that receivables turnover is a primary driver of liquidity performance. However, this study strengthens the evidence by focusing on pharmaceutical firms and adopting a panel data approach over a long time horizon.

Interestingly, DSO—a metric typically considered to have a negative relationship with liquidity—showed a positive association in both the Current and Quick Ratio models. This contradicts the conventional wisdom seen in Nasution and Sembiring (2022) but aligns with the more nuanced argument of Zaheer and Siddique (2023), who suggest that firms with strong financial structures may extend credit terms without sacrificing solvency. In the context of the pharmaceutical sector, where credit arrangements are often strategic to maintain distribution

partnerships and market reach, longer DSO might not necessarily signify poor liquidity but rather an intentional business strategy.

In contrast, the role of inventory management in influencing liquidity was found to be statistically insignificant across all three regression models. Neither Inventory Turnover Ratio (ITR) nor Days Inventory Outstanding (DIO) significantly affected the Current Ratio, Quick Ratio, or Cash Ratio. This diverges from the conclusions drawn by Sarpingah (2020), Amanda (2019), and Andini (2023), who reported positive links between inventory efficiency and liquidity. The difference can be attributed to the specificities of the pharmaceutical industry, where inventory is not merely a stock of goods but includes slow-moving or regulatory-sensitive items like bulk drugs, formulations, and active pharmaceutical ingredients. Therefore, high inventory levels may be a necessity rather than a symptom of poor management. This distinction fills a key gap in the literature by contextualizing inventory's limited liquidity influence within a pharma-specific operational environment.

Further, the insignificance of inventory ratios in influencing the Cash Ratio implies that inventory strategies do not translate into immediate cash availability. This echoes the broader view held by Adu (2013), who noted that inventory management affects profitability more directly than liquidity unless turnover cycles are extremely tight—a condition rarely met in pharma firms due to quality controls and storage requirements.

5.2 Addressing Gaps in Literature

One of the principal contributions of this study lies in its ability to isolate and analyze the dual effect of inventory and receivables on liquidity metrics within the Indian pharmaceutical sector. While prior research either focused on profitability (Ejike & Agha, 2018; Andini, 2023) or examined the influence of overall working capital (Ofoegbu & Onodugo, 2016; Panigrahi & Raul, 2018), this study is among the first to empirically demonstrate, through a robust panel data design, that receivables—not inventory—are the key drivers of liquidity.

Moreover, studies such as that of Putri (2024) in non-pharma contexts were unable to account for the idiosyncrasies of this capital-intensive, regulation-heavy industry. By focusing exclusively on Indian pharmaceutical firms, this study contextualizes liquidity performance within firm-specific realities such as long production cycles, delayed payment from public procurement systems, and stringent storage regulations. In doing so, it moves beyond generic financial modeling to offer sector-specific insights.

This study also challenges the assumption—prevalent in the literature—that all components of working capital equally influence liquidity. The disaggregated approach used here clarifies that while receivables strategies can be leveraged to enhance liquidity, inventory management may be more relevant to operational continuity or profitability rather than liquidity in this sector.

5.3 Implications for Managers and Policymakers

The findings of this study hold actionable value for multiple stakeholders in the pharmaceutical ecosystem.

For financial managers, the evidence suggests that optimizing receivables collection is the most effective lever to improve liquidity. Investing in credit monitoring systems, enhancing customer screening, and streamlining invoicing practices may lead to measurable improvements in short-term financial stability. Given the prolonged receivables periods observed in both Torrent and Zydus during certain years, active receivables management is crucial to avoid liquidity crunches.

For supply chain and operations managers, the lack of significant association between inventory metrics and liquidity underscores the need to decouple inventory strategies from liquidity planning. While maintaining safety stock and raw material buffers remains important for operational resilience, these decisions should be assessed primarily in relation to production efficiency and not as direct liquidity tools.

For policy regulators, the findings suggest that liquidity support schemes or financial incentives in the pharmaceutical industry should target receivables performance. Programs that ensure faster reimbursements from public health institutions or provide low-interest working capital loans during delayed customer payments may prove more beneficial than general liquidity injections.

5.4 Methodological and Sectoral Contributions

From a methodological standpoint, this study contributes to the body of financial research by applying a firm-level fixed and random effects panel regression model, providing greater internal validity compared to cross-sectional or time-series-only designs. The application of the Hausman test ensures robust model selection, further strengthening the reliability of the results.

Sectorally, the paper advances the field by identifying that in Indian pharmaceutical firms, working capital management is not monolithic—components like receivables and inventory must be treated distinctly when evaluating liquidity. This insight could inform the development of more nuanced financial models that better reflect operational realities in the healthcare manufacturing domain.

5.5 Limitations and Areas for Future Research

While this study offers important contributions, it is not without limitations. The analysis is limited to two firms—Torrent and Zydus—which, while representative of large Indian pharmaceutical players, may not fully capture the practices of mid-sized or contract-manufacturing firms. Also, the study uses accounting-based liquidity ratios, which, though useful, may not fully reflect real-time cash flow dynamics.

Future studies could expand the scope by including a broader set of pharmaceutical companies, incorporating real-time cash flow data, and analyzing how external shocks—such as regulatory changes or global supply chain disruptions—moderate the relationship between working capital components and liquidity. Moreover, extending the analysis to include interactions with profitability metrics may uncover multi-dimensional trade-offs in financial strategy.

5.6 Conclusion

In conclusion, this research empirically affirms that receivables management—measured through Receivables Turnover Ratio and Days Sales Outstanding—is a significant determinant of liquidity performance in Indian pharmaceutical companies. Inventory management, despite being a critical operational function, does not show a significant statistical relationship with liquidity metrics. These findings underscore the importance of targeted working capital strategies and provide a more granular understanding of financial sustainability in the pharmaceutical sector.

By contextualizing the results within both theoretical constructs and sectoral realities, this study bridges a crucial gap in the literature and offers practical, evidence-based guidance for improving liquidity through smarter receivables control. In a sector where operational continuity can impact public health outcomes, enhancing financial agility is not just good economics—it is also strategic necessity.

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