An Empirical Study on the Relationship between Profitability and Liquidity Performance of Listed Sugar Companies in India

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Abstract

The relationship between liquidity management and the profitability performance of listed sugar companies in India between 2011-12 and 2020-21 is empirically examined in this study. Using panel data from 27 BSE listed companies, the study examines whether liquidity and profitability performance of particular companies are related. Return on Assets, Return on Equity, and Net Profit Margin are used to measure profitability, while Current Ratio, Quick Ratio, and Cash Ratio are used to measure liquidity. Average Collection Period, Inventory Conversion Period, Average Payment Period, and Cash Conversion Cycle are among the working capital management elements that are also examined. The study finds strong positive correlations between liquidity ratios and profitability metrics using panel regression models and Pearson correlation analysis. The results imply that, when effectively managed, liquidity and profitability can be complimentary rather than competing goals in the context of India's sugar sector, which is marked by cyclical production patterns and significant working capital intensity. These findings enlighten investors about financial health indicators, give financial managers useful information about the best way to allocate working capital, and help legislators comprehend industry-specific issues.

Keywords: Profitability Performance, Liquidity Position, Sugar Industry, Listed Companies.

Introduction

As the world's second-largest producer of sugar after Brazil and a significant consumer and exporter, the Indian sugar sector plays a crucial role in the country's agricultural economy. Millions of sugarcane farmers in major producing states like Uttar Pradesh, Maharashtra, and Karnataka are directly impacted by the industry, which employs a significant number of people in rural areas and has about 500 sugar mills that are divided into public, private, and cooperative sector factories. The sector's importance goes beyond economic indicators to include social welfare aspects through rural development and farmer livelihoods. However, because of its cyclical production patterns, seasonal working capital requirements, government regulatory actions, and volatile commodity prices, the business faces particular financial management issues. In sugar enterprises, financial management entails managing the basic conflict between optimizing profitability through effective resource deployment and preserving sufficient liquidity for operational continuity. Conventional financial theory, however, suggests that there is a trade-off between profitability and liquidity, with increased liquidity lowering profitability due to opportunity costs associated with idle funds. Conflicting results are seen in empirical data across industries, especially in those with seasonal operations and high levels of working capital.

Working capital dynamics are unique due to the seasonal nature of sugarcane crushing, which usually takes place between October and March. During the crushing season, businesses must manage lengthy cash conversion cycles, handle government procurement agency receivables, and balance payables to suppliers and sugarcane growers. Important considerations

concerning ideal liquidity levels and their connection to profitability in this situation are brought up by these operational realities. The manufacturing, FMCG, pharmaceutical, and IT sectors have been the main focus of earlier research on liquidity-profitability linkages, leaving a sizable void with regard to agro-processing industries. Although there are studies on the financial success of Indian sugar firms, there is still a dearth of thorough empirical research employing reliable panel data methodology across long time periods. This study addresses these gaps by empirically examining the nature and magnitude of the relationship between liquidity position and profitability performance of 27 BSE-listed sugar companies over the period from 2011-12 to 2020-21.

Literature Review
Deloof (2003), analysed 1,009 Belgian firms and found that reducing cash conversion cycle enhances profitability, and Shin and Soenen (1998), who reported negative correlation between net trade cycle and profitability in American firms. Bagchi and Chakrabarti (2014) revealed powerful adverse correlation between liquidity management and performance in Indian FMCG companies, though firm size showed beneficial connection to profitability. Sandhar, Janglani and Acropolis (2013) found that Current Ratio and Liquid Ratio had negative relationships with ROA and ROI in Indian context, supporting the trade-off hypothesis. However, contrasting evidence suggests positive relationships in certain contexts. Ismail (2016) demonstrated that current liquidity and cash conversion indices have significant positive influence on Pakistani firms' financial performance, with high current ratio and longer cash conversion cycle leading to better performance. Bibi and Amjad (2017) found current ratio has favourable and substantial connection with profitability of Pakistani companies, while Chukwunweike (2014) indicated positive and substantial impact of current ratio on profitability in Nigerian firms. Du, Wu and Liang (2016) suggested firm's sufficient liquidity can increase market value based on Chinese evidence.

Research specifically examining working capital components reveals nuanced relationships. Most studies report negative relationships between Average Collection Period and profitability, as longer collection periods tie up resources and increase financing costs (Deloof, 2003). Inventory Conversion Period typically shows negative association with profitability in manufacturing sectors due to carrying costs, storage expenses, and obsolescence risks, though agricultural commodity processing may present different dynamics. Average Payment Period findings are mixed, with some studies suggesting extended payables provide free financing while others indicate potential damage to supplier relationships.

Sharma and Patel (2018) examined profitability trends revealing positive trajectory with increased operational efficiency and favourable market conditions as key factors. Reddy and Kumar (2019) focused on relationships between government policies and profitability, emphasizing need for adaptive strategies in dynamic regulatory environments. Gupta and Singh (2020) studied financial leverage influence on profitability, suggesting balanced capital structure importance. Al-Homaidi et al. (2020) examined 2,154 Indian firms across sectors, identifying significant associations between internal factors and liquidity management.

Research Gap
The review of literature identifies a number of important gaps. First, despite the economic importance of the Indian sugar business, there is still a dearth of empirical research that

particularly examines the liquidity-profitability dynamics of this sector. Second, the majority of research on the sugar sector uses restricted analytical approaches. Third, insufficient attention has been paid to industry-specific characteristics including seasonal patterns, regulatory constraints, and working capital intensity. These gaps require thorough empirical investigation using rigorous methods in order to improve knowledge of the linkages between liquidity and profitability in this unique industry.

Objectives of the study
(1) To examine the relationship between liquidity measures and profitability indicators of listed Sugar Companies.
(2) To analyse the impact of liquidity position on the profitability performance of listed Sugar Companies.
(3) To find out how working capital management components affects profitability performance of firm.

Research Methodology
a)   Research Design: This study adopts positivist research philosophy emphasizing on quantitative analysis of relationships between liquidity and profitability variables. The research design is quantitative, and explanatory in nature, employing longitudinal analysis.
b)   Period of the study:
The study covers a period of 10 year from 2011-12 to 2020-21.
c)   Sample of the data:
The population comprises all sugar manufacturing companies listed on Bombay Stock Exchange (BSE), India. The study uses purposive sampling based on criteria including-continuous listing throughout the study period, primary business classification as sugar manufacturing and availability of complete audited financial data. The final sample comprises 27 BSE-listed sugar companies. This yields a panel dataset of 297 company-year observations representing significant proportion of organized sugar sector market capitalization and production capacity.

d)   Data collection:
The study relies exclusively on secondary data collected from various annual reports of companies from company websites and BSE portal.

e)   Variables of the study:
Profitability measures include
1.   Net Profit Margin (Net Profit/Net Sales × 100)
2.   Return on Assets (Net Income/Total Assets × 100)
3.   Return on Equity (Net Income/Shareholders' Equity × 100)
Liquidity measures comprise:
1.   Current Ratio (Current Assets/Current Liabilities)
2.   Quick Ratio ((Current Assets - Inventory)/Current Liabilities)
3.   Cash Ratio (Cash and Cash Equivalents/Current Liabilities)

Working capital management variables include:
1.   Average Collection Period (Trade Receivables/Net Sales) × 365 days
2.   Inventory Conversion Period ((Inventory/Cost of Goods Sold) × 365 days
3.   Average Payment Period (Trade Payables/Purchases) × 365 days

4.   Cash Conversion Cycle (ACP + ICP - APP)

f)   Data analysis:
The study employs descriptive statistics which summarizes sample characteristics and provides initial insights. Pearson correlation analysis measures linear relationship and direction between the variables, with statistical significance tested at $\alpha = 0.05$ level. Panel regression analysis employs Ordinary Least Squares with robust standard errors to address heteroscedasticity. Multiple regression models are also estimated as:
1.   Model 1 examines the impact of liquidity ratios on profitability performance.
(PROFITit = β0 + β1 (CR)it + β2 (QR)it + εit)

2.   Model 2 analyses the effect of working capital components on profitability measures.
(NPMit = β0 + β1(ACP)it + β2(ICP)it + β3(APP)it + β4(CCC)it + εit)

Results And Discussion
Table 1: Descriptive analysis

Variable	N	Mean	Median	S.D	Min	Max
A. Profitability Measures (%)						
NPM	277	-119.6	0.630	1351.38	-15933.3	23.03
ROE	233	-4.884	5.667	74.88	-608.2	355.46
ROA	273	-0.065	0.489	8.750	-57.9	51.54
B. Liquidity Ratios						
CR	275	0.936	0.987	0.436	0.068	3.30
QR	275	0.214	0.169	0.185	0.004	1.53
Cash Ratio	275	0.053	0.018	0.089	0.001	0.52
C. Working Capital Components (Days)						
ACP	269	29.86	25.71	37.97	1.76	287.65
ICP	254	237.95	201.83	164.18	30.00	757.60
APP	271	112.45	98.33	78.62	8.00	559.85
CCC	271	108.45	119.47	98.33	179.0	735.88

Source: Compiled by the author

Analysis of profitability measures indicates that Net Profit Margin averaged -119.6% during period with extremely high standard deviation of 1351.3%, reflecting severe financial distress among several companies. Return on Equity showed mean of -4.88% over the period of study while Return on Assets showed mean of -0.065% over the periods. These figures indicate that while some companies achieved reasonable profitability, the sector faced persistent challenges with several companies experiencing losses throughout the study period.
Liquidity position analysis reveals that Current Ratio increased from 0.87 in the year 2011-12 to 1.01 in 2020-21, with average current ratio of 0.93 and standard deviation of 0.68 during the period of study. Quick Ratio improved from 0.19 to 0.24 over the same periods with

mean 0.21 and standard deviation 0.004, though remaining well below the conventional benchmark of 1.0, indicating potential liquidity constraints across the industry.

Working capital management metrics show Average Collection Period of 32.52 days in early period, declining to 27.21 days subsequently with Average Collection Period averaged at 29.86 days, suggesting improved receivables management. Cash Conversion Cycle dramatically improved from 131.58 days (in 2011-12) to 95.67 days (in 2020-21), with average Cash Conversion Cycle of 108.45 days and standard deviation of 98.33 days, indicating better working capital efficiency.

Correlation analysis

Pearson correlation analysis reveals significant relationships between liquidity measures and profitability indicators, as presented in Table 2.

Table 2: Correlation between Profitability and Liquidity measures

VARIABLES	NPM	ROE	ROA	CR	QR	Cash Ratio
NPM	1.0000					
ROE	0.3216*	1.0000				
ROA	0.1917*	0.5769*	1.0000			
CR	0.1607*	0.3284*	0.5214*	1.0000		
QR	0.0968	0.0814	0.2372*	0.6844*	1.0000	
Cash Ratio	0.0467	0.0831	0.1195*	0.4734*	0.6222*	1.0000

Note- * indicates significance at $p<0.05$ level.

The table represents the correlation between Net Profit Margin and Current Ratio is positive and statistically significant ($r = 0.1607$, $p = 0.0076$), suggesting that companies maintaining higher liquidity tend to exhibit better profit margins. This relationship strengthens considerably for Return on Assets, with Current Ratio showing strong positive correlation ($r = 0.5214$, $p < 0.0001$). Similarly, Return on Equity demonstrates significant positive correlation with Current Ratio ($r = 0.3284$, $p < 0.0001$). These findings challenge the traditional trade-off hypothesis, suggesting that in the sugar industry context, liquidity and profitability may be complementary rather than competing objectives.

Further, it can be also observed from the table that Quick Ratio shows weaker correlations with profitability measures, with only the QR-ROA relationship reaching statistical significance ($r = 0.2372$, $p = 0.0001$), while correlations with NPM ($r = 0.0968$, $p = 0.1091$) and ROE ($r = 0.0814$, $p = 0.2180$) remain non-significant. Cash Ratio exhibits the weakest associations with profitability, with only the Cash Ratio-ROA relationship achieving marginal significance ($r = 0.1195$, $p = 0.0494$). These differential correlation patterns suggest that Current Ratio, which includes all current assets provides more informative indications about profitability potential than other liquidity measures.

Table 3: Correlation between Profitability indicators and working capital management

INDICATORS	NPM	ROE	ROA	CR	ACP	ICP	APP	CCC
NPM	1.0000							
ROE	0.632	1.0000						
ROA	0.923	0.636	1.0000					
CR	0.584	0.366	0.568	1.0000				

ACP	-0.1352	-0.2453	-0.0912	0.073	1.0000			
ICP	0.1814	0.1769	0.0892	0.213	0.140	1.0000		
APP	-0.5276	-0.2873	-0.4442	-0.391	-0.019	0.044	1.0000	
CCC	0.4814	0.3029	0.3587	0.437	0.019	0.728	-0.644	1.0000

Note- * indicates significance at p<0.05 level.

Table 3 reveals the comprehensive correlation analysis by incorporating working capital management variables. The Average Collection Period shows negative correlations with profitability measures (NPM: r = -0.1352; ROE: r = -0.2453; ROA: r = -0.0912). Inventory Conversion Period exhibits positive correlations (NPM: r = 0.1814; ROE: r = 0.1769; ROA: r = 0.0892), which may be a reflection of the particular seasonal dynamics of the sugar industry. The average payment period shows a strong negative correlation with profitability (NPM: r = -0.5276; ROE: r = -0.2873; ROA: r = -0.4442). This suggests that businesses with shorter payment periods are more successful, which could be a sign of better supplier relationships or stronger bargaining positions. Cash Conversion Cycle shows positive correlations with profitability (NPM: r = 0.4814; ROE: r = 0.3029; ROA: r = 0.3587)

Empirical findings
Regression Analysis and Hypothesis Testing
Panel regression analysis provides rigorous testing of hypothesized relationships while controlling for potential confounding factors. Table 4 presents regression results for testing hypotheses.

Table 4: Hypotheses testing

Hypothesis	Dependent variable	Independent variables	Coefficient	S.E	t-stat	p-value	R^2	Decision
H_1	NPM	ACP	-0.3589	0.0656	-5.47	0.001	0.3681	**Reject H_0**
H_2	NPM	ICP	0.0453	0.0154	2.94	0.004	0.0409	**Reject H_0**
H_3	NPM	APP	-0.0905	0.00064	-14,067	0.001	0.9998	**Reject H_0**
H_4	NPM	CCC	0.0908	0.00076	11,952	0.001	0.9997	**Reject H_0**
H_5	NPM	CR + QR	CR: 553.34 QR: -182.09	361.86 201.89	1.53 -0.90	0.127 0.368	0.0262	**Accept H_0**

Hypothesis 1: **There is significant relationship between Average Collection Period and profitability.**

The model specification NPMit = $\beta0$ + $\beta1$(ACP)it + ϵit yields highly significant results with coefficient estimate $\beta1$ = -0.3589 (SE = 0.0656, t = -5.47, p < 0.001). The model explains 36.81% of variance in Net Profit Margin (R^2 = 0.3681), indicating that Average Collection Period is a substantive predictor of profitability. The negative coefficient implies that for every one-day increase in collection period, profitability declines by approximately 0.36 percentage points. The result suggests rejection of null hypothesis (H_0: there is no significant relationship between NPM and ACP). The findings confirm that efficient receivables management critically impacts profitability. The economic interpretation also suggests that companies achieving faster collections unlock tied-up capital fast which reduces financing costs and improve cash flows and thereby enhancing overall profitability.

Hypothesis 2: There is significant relationship between Inventory Conversion Period and Profitability.
The positive coefficient $\beta2$ = 0.0453 (SE = 0.0154, t = 2.94, p = 0.004) indicates that longer inventory holding periods are associated with higher profitability, contrary to conventional theory predicting negative relationships. While the model's explanatory power is modest (R^2 = 0.0409), the significance of relationship between inventory conversion period and profitability demands thoughtful consideration. This counter-intuitive finding can be rationalized through industry's distinctive characteristics i.e. seasonal production. Seasonal production concentrated in 5-6 month crushing periods necessitates substantial inventory accumulation for year-round sales. Companies maintaining strategic inventory levels can capitalize on price improvements during lean supply periods to avoid distress selling during peak production, and ensure consistent market presence. Additionally, inventory aging may enhance product quality in certain applications. The findings of the study suggest for maintaining optimal inventory levels over the year.

Hypothesis 3: There is significant relationship between Average Payment Period and Profitability.
The coefficient estimate for Average Payment Period is β_3 = -0.0905 with extraordinarily small standard error of 0.00064, producing extremely high t-statistic of 14,067 (p < 0.001). This negative coefficient is highly statistically significant. The model achieves remarkably high explanatory power with R-squared of 0.9998, indicating that Average Payment Period explains virtually all variance in Net Profit Margin within the sample.

Hypothesis 4: There is significant relationship between Cash Conversion Cycle and Profitability.
The coefficient estimate for Cash Conversion Cycle is β_4 = 0.0908 with remarkably small standard error of 0.00076, producing extremely high t-statistic of 11,952 (p < 0.001). This positive coefficient is highly statistically significant at all levels. The model achieves explanatory power with R-squared of 0.9997, indicating that Cash Conversion Cycle explains virtually all profitability variance. The result shows extremely high statistical significance, providing evidence for rejection of null hypothesis.

Hypothesis 5: There is significant relationship between liquidity ratios (Current Ratio and Quick Ratio) and profitability measures (Net Profit Margin).
The Model Specification NPMit = $\beta0$ + $\beta1$(CR)it + $\beta2$(QR)it + ϵit indicates non-significant result with low explanatory power (R^2 = 0.0262). Individual coefficient estimates (CR: β = 553.34, SE = 361.86, t = 1.53, p = 0.127; QR: β = -182.09, SE = 201.89, t = -0.90, p = 0.368)

fail to achieve statistical significance. Consequently, the null hypothesis (There is no significant relationship between liquidity ratios and profitability measures) is accepted. This finding suggests that when Current Ratio and Quick Ratio are jointly considered as predictors of Net Profit Margin, their combined explanatory power diminishes, and thereby they influence profitability.

Conclusion

The empirical investigation of liquidity-profitability relationships in listed sugar companies in India over a period of study yields several important conclusions. First, the study finds evidence supporting complementarity rather than trade-off between liquidity and profitability in this industry with Current Ratio demonstrating strong positive correlation with Return on Assets. Secondly, receivables management emerges as the most critical profitability determinant. Third, inventory management exhibits counterintuitive positive relationship with profitability, reflecting industry's unique seasonal production and strategic inventory positioning requirements. Fourth, Cash Conversion Cycle demonstrates highly significant relationship with profitability, emphasizing importance of comprehensive working capital optimization.

The study makes significant theoretical and practical contributions. Theoretically, it demonstrates that universal working capital theories require industry-specific adjustment with complementarity vs. trade-off perspectives. Practically, the findings offer financial managers specific guidance on receivables targets, liquidity benchmarks, and integrated working capital frameworks. Investors gain evidence-based tools for evaluating sugar company financial health, while policymakers receive insights into industry challenges requiring regulatory attention, particularly payment delays and seasonal financing needs.

This study highlights the nuanced relationship between liquidity management and profitability performance in listed Sugar industry in India. The findings reveal that well-managed liquidity can complement profitability objectives when embedded within sophisticated working capital management strategies. The sugar industry's distinctive characteristics i.e. seasonal production, government intervention, working capital intensity and commodity exposure, necessitate customized financial management approaches. For practitioners, optimal performance requires integrated working capital management recognizing industry-specific dynamics rather than mechanically applying generic benchmarks. As India's sugar industry navigates sustainability pressures, evolving regulations and global competition, sound financial management grounded in empirical evidence becomes increasingly critical for resilience and competitiveness.

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