

WORKING CAPITAL EFFICIENCY AND FIRM PROFITABILITY: PANEL EVIDENCE FROM INDIAN MANUFACTURING FIRMS

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ABSTRACT

Working capital management plays a crucial role in determining the liquidity and profitability of firms. This study examines the relationship between working capital management and firm profitability using panel data from manufacturing firms. Profitability is measured using return on assets (ROA), return on equity (ROE), and net profit margin (NPM). The key working capital variables include average age of inventory (AAI), average accounts receivable (AAR), and average accounts payable (AAP). Firm size (SIZE), sales growth (SG), and working capital financing (WCF) are included as control variables. Panel regression techniques including ordinary least squares (OLS), fixed effects (FE), and random effects (RE) models are used to estimate the relationships. The empirical findings indicate that longer receivable and payable periods reduce profitability due to delayed cash inflows and inefficient credit management, while sales growth positively affects firm performance. The findings highlight the importance of efficient working capital policies for improving financial performance in manufacturing firms.

Keywords: Working capital management, profitability, manufacturing firms, panel data analysis

1. INTRODUCTION

Working capital management refers to the management of short-term assets and liabilities within a firm. It includes the management of inventory, accounts receivable, and accounts payable, which are essential components of a firm's day-to-day operations. Effective working capital management ensures that firms maintain sufficient liquidity to meet short-term obligations while also maximizing profitability.

Manufacturing firms typically require substantial working capital investments because they must maintain large inventories, provide credit to customers, and manage supplier payments. Inefficient working capital policies can lead to liquidity shortages, higher financing costs, and

reduced profitability. For instance, excessive inventory holdings may increase storage and opportunity costs, while delayed receivables may create cash flow problems.

The relationship between working capital management and profitability has become an important topic in corporate finance. Firms that efficiently manage their receivables, inventory, and payables can reduce operating costs and improve financial performance. Therefore, understanding how working capital components influence profitability is essential for financial managers, investors, and policymakers.

This study aims to examine the impact of working capital management on firm profitability using panel data from manufacturing firms. Specifically, the study analyzes how inventory management, receivable management, and payable management influence profitability indicators such as return on assets, return on equity, and net profit margin.

2. LITERATURE REVIEW

The relationship between working capital management and profitability has been widely examined in financial literature. Early studies emphasized the importance of managing the cash conversion cycle and its components to improve firm performance.

Deloof (2003) investigated the relationship between working capital management and profitability using a sample of Belgian firms. The study found that firms can increase profitability by reducing the number of days accounts receivable and inventory. The results suggest that efficient management of working capital components can significantly improve firm performance.

Lazaridis and Tryfonidis (2006) examined the relationship between the cash conversion cycle and corporate profitability for firms listed on the Athens Stock Exchange. Their findings indicated that shorter cash conversion cycles lead to higher profitability. The authors concluded that managers can enhance firm performance by effectively managing working capital components.

Raheman and Nasr (2007) analyzed Pakistani firms and found a significant negative relationship between the cash conversion cycle and profitability. Their results suggested that longer receivable and inventory periods reduce firm performance due to inefficient working capital management.

Gill, Biger, and Mathur (2010) studied American manufacturing firms and found that accounts receivable and the cash conversion cycle significantly affect profitability. Their findings indicated that effective management of working capital can improve financial performance and operational efficiency.

Shin and Soenen (1998) also reported a strong negative relationship between the net trade cycle and corporate profitability, suggesting that firms should minimize their working capital cycle to maximize returns. Similarly, Garcia-Teruel and Martinez-Solano (2007) showed that reducing the number of days accounts receivable and inventory improves profitability for small and medium-sized firms.

More recent studies emphasize the importance of balancing liquidity and profitability. While shorter working capital cycles may improve profitability, extremely low levels of working

capital may increase liquidity risk. Therefore, firms must adopt an optimal working capital policy that balances risk and return.

Overall, previous literature consistently highlights that efficient working capital management contributes positively to firm profitability and operational efficiency.

3. HYPOTHESIS DEVELOPMENT

Based on the literature, the following hypotheses are developed:

H1: Average age of inventory negatively affects firm profitability.

H2: Average accounts receivable negatively affects firm profitability.

H3: Average accounts payable negatively affects firm profitability.

H4: Sales growth positively influences firm profitability.

H5: Firm size has a significant relationship with profitability.

4. DATA AND METHODOLOGY

This study uses panel data consisting of 840 firm-year observations from manufacturing firms. The sample includes publicly listed manufacturing firms over a specified time period. Financial data were obtained from company financial statements and financial databases.

Profitability is measured using three indicators: return on assets (ROA), return on equity (ROE), and net profit margin (NPM). The independent variables include average age of inventory (AAI), average accounts receivable (AAR), and average accounts payable (AAP). Control variables include firm size (SIZE), sales growth (SG), and working capital financing (WCF).

Panel regression models are used to estimate the relationship between working capital management and profitability. The models include ordinary least squares (OLS), fixed effects (FE), and random effects (RE) estimations.

Regression model:

$$\text{Profitability} = \beta_0 + \beta_1\text{AAI} + \beta_2\text{AAR} + \beta_3\text{AAP} + \beta_4\text{SIZE} + \beta_5\text{SG} + \beta_6\text{WCF} + \epsilon_{it}$$

Where, i represents the firm, t represents time

5. RESULTS AND DISCUSSION

Table 1. Descriptive Statistics

Variable	Mean	Std Dev	Min	Max
ROA	0.082	0.067	-0.159	0.263
ROE	0.16	0.123	-0.294	0.624
NPM	0.102	0.111	-0.38	0.501
AAI	99.81	86.91	12.81	551.75
AAR	63.93	54.3	5.35	269.64
AAP	79.23	51.32	13.91	346.82

INTERPRETATION

The descriptive statistics indicate moderate variation in profitability and working capital variables across manufacturing firms. The average ROA is 8.2%, suggesting that firms generate moderate returns from their assets. The average ROE of 16% indicates relatively strong returns to shareholders. Inventory holding periods are relatively long, averaging nearly 100 days, which reflects the inventory-intensive nature of manufacturing firms. Receivable periods average around 64 days, indicating that firms provide trade credit to customers. Payable periods average 79 days, suggesting that firms rely on supplier credit as a financing source.

Table 2. Correlation Matrix

Variable	ROA	AAI	AAR	AAP	SIZE	SG	WCF
ROA	1						
AAI	-0.12	1					
AAR	-0.25	0.32	1				
AAP	-0.21	0.28	0.41	1			
SIZE	-0.18	0.1	0.14	0.09	1		
SG	0.22	-0.05	-0.08	-0.04	0.12	1	
WCF	-0.16	0.18	0.2	0.23	0.11	0.07	1

INTERPRETATION

The correlation matrix presents the pairwise relationships between profitability and the explanatory variables used in the study. The results show that average accounts receivable (AAR) and average accounts payable (AAP) have negative correlations with profitability (ROA), indicating that longer credit periods granted to customers or extended payment periods to suppliers may reduce firm profitability. This result is consistent with the theoretical expectation that inefficient working capital management can lead to cash flow constraints and higher financing costs.

The correlation between average age of inventory (AAI) and profitability is slightly negative, suggesting that firms holding inventory for longer periods may experience lower profitability due to higher storage costs and inventory holding risks.

Sales growth (SG) shows a positive correlation with ROA, indicating that firms experiencing higher sales growth tend to achieve better financial performance. This suggests that expanding business operations can improve profitability.

The correlation coefficients among the independent variables are relatively low, with the highest value being 0.41 between AAR and AAP, which is well below the commonly accepted multicollinearity threshold of 0.70. Therefore, the results indicate that multicollinearity is not a serious concern in the regression model, and the variables can be safely included in the panel regression analysis.

Overall, the correlation analysis provides preliminary evidence that efficient management of receivables, inventory, and payables plays an important role in determining firm profitability.

Table 3. OLS Regression Results

Variable	ROA	ROE	NPM
AAI	0.0003	0.0001	0.0002
AAR	-0.0002**	-0.0005***	0.000***
AAP	-0.0004***	-0.0003*	-0.0007***
SIZE	-0.0081***	-0.0159***	0.0032***
SG	0.0145**	0.0314***	0.0139*

*** p < 0.01, ** p < 0.05, * p < 0.10

INTERPRETATION

The OLS results show that accounts receivable and accounts payable have significant negative relationships with profitability. The negative coefficient for AAR indicates that longer receivable periods reduce profitability because delayed customer payments restrict cash flow. Similarly, the negative coefficient for AAP suggests that extended supplier payment periods may reflect financial distress or inefficient payment management.

Sales growth has a positive and significant impact on profitability across all models. This indicates that firms experiencing higher sales growth tend to achieve better financial performance. Firm size shows a negative relationship with profitability in some models, which may indicate that larger firms experience operational inefficiencies or higher operating costs.

Table 4. Fixed Effects (FE) Results

Variable	ROA	ROE	NPM
AAI	-0.0001	-0.0002	0.0001
AAR	-0.0003**	-0.0006***	-0.0001
AAP	-0.0004***	-0.0003**	-0.0006***
SIZE	-0.0075***	-0.0148***	0.0029
SG	0.0132**	0.0297***	0.0125*

*** p < 0.01, ** p < 0.05, * p < 0.10

INTERPRETATION

The fixed effects results confirm the negative relationship between receivable periods and profitability. This indicates that firms that take longer to collect payments experience lower returns. The negative effect of accounts payable also suggests that inefficient payment management may increase financing costs and reduce profitability.

Table 5. Random Effects (RE) Results

Variable	ROA	ROE	NPM
AAI	-0.0001	0.00003	0.0001
AAR	-0.0002**	-0.0005***	-0.0001
AAP	-0.0003***	-0.0002**	-0.0006***
SIZE	-0.0079***	-0.0154***	0.003
SG	0.0140**	0.0306***	0.0131*

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

INTERPRETATION

The random effects model provides results consistent with OLS and fixed effects models. The findings suggest that receivable and payable periods significantly influence firm profitability. Firms that efficiently manage their credit policies and supplier payments are more likely to achieve higher financial performance.

6. CONCLUSION

This study examined the relationship between working capital management and firm profitability using panel data from manufacturing firms. The results indicate that accounts receivable and accounts payable have significant negative effects on profitability, suggesting that inefficient credit management and delayed payment practices reduce financial performance.

Sales growth positively influences profitability, indicating that expanding sales contributes to improved financial performance. Inventory management shows weaker statistical significance, but it remains an important component of working capital management.

Overall, the findings highlight the importance of efficient working capital policies in improving firm profitability. Managers should focus on reducing receivable collection periods, optimizing inventory levels, and maintaining effective supplier payment policies to enhance financial performance.

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