

Effective Working Capital Management and Firms Financial Performance: A Case Study of KSE-100 Index Firms

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<https://doi.org/10.62345/jads.2025.14.3.143>

Abstract

This research examines the relationship between working capital management (WCM) and the financial performance of non-financial firms listed on the Karachi Stock Exchange (KSE-100) index in Pakistan. The study analyzes secondary panel data from 78 firms over a ten-year period (2011-2020) to explore the impact of WCM components such as current ratio, quick ratio, inventory turnover, debtor turnover, and creditor turnover on return on assets (ROA). The findings show that liquidity measures (current ratio and quick ratio) and debtor turnover positively influence ROA, while inventory turnover and creditor turnover have insignificant effects. Firm age and size positively correlate with ROA, while leverage negatively impacts profitability. The results offer insights into optimizing WCM strategies, particularly in liquidity management and receivables collection. The study also emphasizes the need for economic policies to support efficient working capital management in Pakistan's corporate sector. Future research could include financial firms and additional performance metrics.

Keywords: Working Capital Management; Financial Performance; KSE-100; Panel Data Analysis; Liquidity Ratios; Emerging Markets.

Introduction

Working Capital Management (WCM) has emerged as a critical determinant of corporate financial performance, particularly in emerging markets characterized by economic volatility and constrained access to financing. WCM encompasses the management of a firm's short-term assets and liabilities to ensure sufficient liquidity for operational needs while maximizing profitability (Shah & Nida, 2016). At its core, working capital represents the difference between current assets and current liabilities, with primary components including inventory, accounts receivable, and accounts payable (see Figure 1). Effective WCM directly influences the cash conversion cycle (CCC), which measures the time required for cash to be converted into inventory, then sales, and back into cash through collection (Deloof, 2003).

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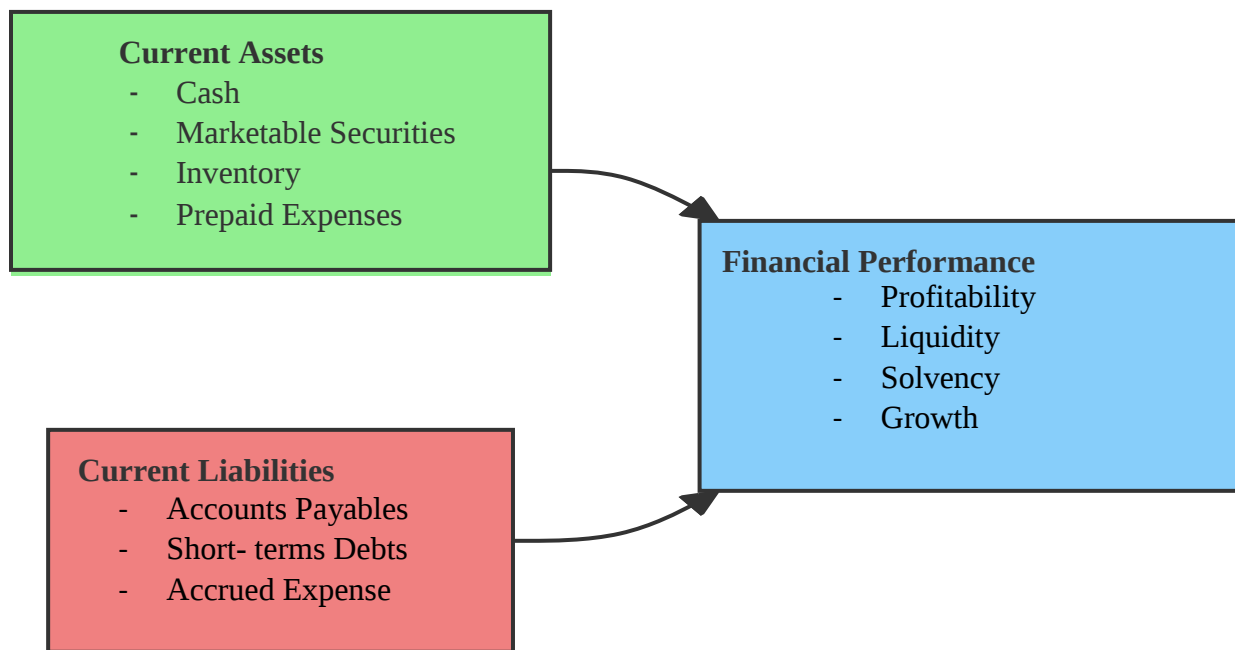
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Figure 1: Working Capital Management Components

The significance of WCM has been amplified in recent years due to global economic uncertainties, supply chain disruptions, and financial market volatilities. In emerging economies like Pakistan, where firms face additional challenges including macroeconomic instability, limited access to affordable credit, and underdeveloped financial markets, efficient WCM becomes even more crucial for survival and growth (Ahmed et al., 2018). The COVID-19 pandemic further highlighted the importance of robust WCM practices as firms navigated cash flow disruptions and operational uncertainties (Shah et al., 2021). The Karachi Stock Exchange (KSE), now integrated into the Pakistan Stock Exchange (PSX), serves as the primary securities market in Pakistan, with the KSE-100 Index representing the top 100 companies by market capitalization. This index functions as a barometer of the Pakistani equity market, comprising firms across diverse sectors including manufacturing, consumer goods, and industrial companies (Pakistan Stock Exchange, 2023). Analyzing WCM within this group provides a representative understanding of financial practices in a developing economy context, particularly as these firms collectively account for approximately 80% of the market capitalization of the PSX (State Bank of Pakistan, 2022).

Recent empirical evidence underscores the complex relationship between WCM and firm performance. While traditional theory suggests that aggressive WCM policies (minimizing current assets) enhance profitability by reducing holding costs, conservative approaches (maintaining higher current assets) may better ensure operational continuity in volatile markets (Kieschnick et al., 2013). The optimal WCM strategy thus depends on the specific economic context and firm characteristics. For Pakistani firms, which operate in an environment characterized by inflationary pressures, currency devaluations, and political uncertainties, the balance between liquidity and profitability becomes particularly delicate (Wang et al., 2020). These events created a dynamic environment where firms had to continuously adapt their WCM strategies to maintain financial stability and performance. Recent studies have begun to explore how Pakistani firms navigated these challenges, but comprehensive research focusing specifically on the KSE-100 index remains

limited (Khan & Jan, 2022). Working capital management becomes particularly critical in this context, as inefficient management of short-term assets and liabilities can lead to liquidity crises, increased financing costs, and diminished profitability.

Despite the recognized importance of WCM, several critical gaps persist in the literature, particularly concerning Pakistan's corporate sector: While numerous studies have examined WCM in various Pakistani sectors, comprehensive research focusing specifically on the KSE-100 index representing Pakistan's largest and most influential companies remains scarce (Khan & Ahmed, 2022). This gap is significant because KSE-100 firms serve as bellwethers for the Pakistani economy and their WCM practices can influence broader market trends. Existing research often examines individual WCM components in isolation, failing to capture the interrelationships between liquidity ratios (current ratio, quick ratio), operational efficiency measures (inventory turnover, debtor turnover, creditor turnover), and their collective impact on financial performance (Malik et al., 2021). This fragmented approach limits the development of holistic WCM strategies. Many studies neglect to account for firm-specific characteristics such as age, size, and leverage that can significantly moderate the relationship between WCM and financial performance (Waseem et al., 2022). This omission can lead to incomplete or misleading conclusions about WCM effectiveness. The period 2011-2020 encompassed unprecedented economic challenges in Pakistan, including currency depreciation, energy crises, political instability, and the COVID-19 pandemic (Shah et al., 2021). Few studies have systematically examined how these conditions influenced WCM effectiveness and financial performance.

Research Objectives

1. To evaluate the impact of liquidity ratios (current ratio and quick ratio) on the financial performance of KSE-100 firms.
2. To assess the effect of efficiency ratios (inventory turnover, debtor turnover, and creditor turnover) on the financial performance of KSE-100 firms.
3. To analyze the moderating role of firm-specific characteristics (age, size, and leverage) on the relationship between WCM components and financial performance.
4. To determine the relative contribution of different WCM components in predicting financial performance.
5. To provide evidence-based recommendations for optimizing WCM strategies in Pakistani firms.

Research Questions

1. How do liquidity ratios (current ratio and quick ratio) affect the financial performance of KSE-100 firms?
2. What is the impact of efficiency ratios (inventory turnover, debtor turnover, and creditor turnover) on the financial performance of KSE-100 firms?
3. How do firm-specific characteristics (age, size, and leverage) moderate the relationship between WCM components and financial performance?
4. Which WCM components have the most significant impact on financial performance, and what are their relative contributions?
5. How have economic volatilities during 2011-2020 influenced the effectiveness of WCM strategies among KSE-100 firms?

Hypotheses

H1: There is a significant positive relationship between current ratio and financial performance (ROA) of KSE-100 firms.

H2: There is a significant positive relationship between quick ratio and financial performance (ROA) of KSE-100 firms.

H3: There is an insignificant relationship between inventory turnover and financial performance (ROA) of KSE-100 firms.

H4: There is a significant positive relationship between debtor turnover and financial performance (ROA) of KSE-100 firms.

H5: There is an insignificant relationship between creditor turnover and financial performance (ROA) of KSE-100 firms.

H6: Firm age positively moderates the relationship between WCM components and financial performance.

H7: Firm size positively moderates the relationship between WCM components and financial performance.

H8: Leverage negatively moderates the relationship between WCM components and financial performance.

Literature Review

Working Capital Management has evolved as a critical area of financial management, particularly in emerging markets where firms face unique challenges related to liquidity, access to financing, and economic volatility. WCM encompasses the management of current assets and current liabilities to ensure that firms maintain sufficient liquidity for operational needs while maximizing profitability (Shah & Nida, 2016). The importance of WCM has been increasingly recognized in both academic literature and business practice, as inefficient working capital management can lead to financial distress, missed opportunities, and diminished firm value. At its core, working capital represents the net difference between a firm's current assets and current liabilities. Current assets typically include cash, marketable securities, accounts receivable, inventory, and prepaid expenses, while current liabilities comprise accounts payable, short-term debt, and accrued expenses (Deloof, 2003). The management of these components directly influences a firm's cash conversion cycle (CCC), which measures the time required for cash invested in operations to be converted back into cash through sales and collection (Richards & Laughlin, 1980). A shorter CCC generally indicates more efficient working capital management, as it signifies that firms are converting their investments in inventory and receivables into cash more quickly (Shin & Soenen, 1998). However, the optimal CCC depends on various factors including industry norms, firm characteristics, and economic conditions. In volatile markets, firms may deliberately maintain longer CCCs to ensure operational continuity, even at the cost of reduced profitability (Kieschnick et al., 2013). Involves determining optimal inventory levels to balance the costs of holding inventory (storage, obsolescence, insurance) against the costs of stock outs (lost sales, production disruptions). Efficient inventory management aims to minimize the inventory conversion period while ensuring sufficient stock to meet demand (Gill et al., 2012). Focuses on establishing credit policies and collection procedures to accelerate the conversion of sales into cash. This involves setting appropriate credit terms, evaluating customer creditworthiness, and implementing effective collection strategies (Charitou et al., 2010).

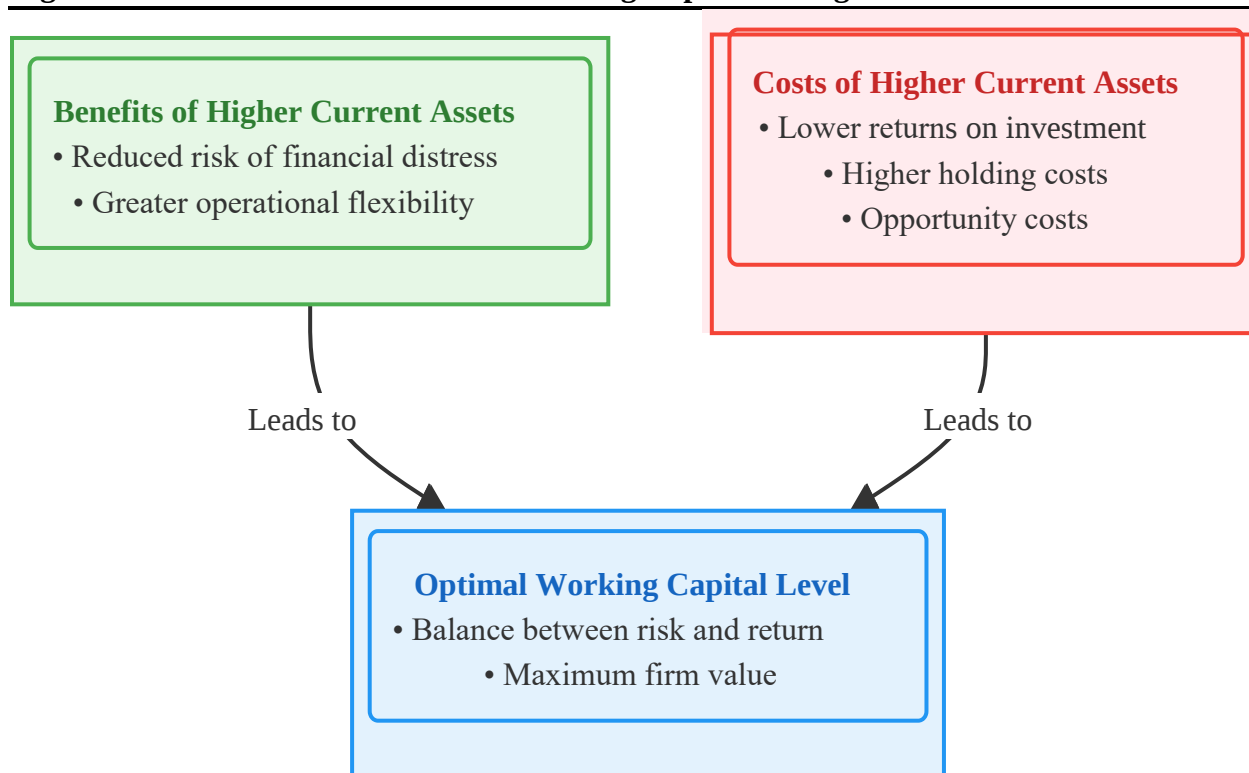
Concerns managing the timing and terms of payments to suppliers to optimize cash flows while maintaining good supplier relationships. This includes negotiating favorable credit terms, taking advantage of early payment discounts, and strategically extending payment periods when beneficial (Nobanee & Alhajjar, 2009). The management of these components requires balancing conflicting objectives. For instance, while extending credit to customers may boost sales, it also

increases the risk of bad debts and ties up capital in receivables. Similarly, while delaying payments to suppliers improves short-term cash flows, it may damage supplier relationships and lead to less favorable terms in the future (Hill et al., 2010). Recent developments in working capital management have emphasized the importance of integrated approaches that consider the interdependencies between different components. Modern WCM practices often involve sophisticated techniques such as just-in-time inventory systems, supply chain financing, and cash flow forecasting to optimize the overall working capital position (Wuttke et al., 2013). Additionally, technological advancements have enabled more real-time monitoring and management of working capital components, allowing firms to respond more quickly to changing conditions (Gelsomino et al., 2016). These factors make effective WCM particularly challenging yet critical for Pakistani firms. Recent studies have highlighted the importance of adaptive WCM strategies that can respond to changing economic conditions while maintaining operational efficiency (Wang et al., 2020; Shah et al., 2021).

Theoretical Framework

Theoretical frameworks provide the foundation for understanding working capital management decisions and their impact on firm performance. Three primary theories offer insights into WCM: trade-off theory, pecking order theory, and agency theory. These theories help explain why firms adopt different WCM strategies and how these strategies influence financial performance.

Figure 2: Theoretical Framework of Working Capital Management



Empirical evidence supporting trade-off theory in working capital management is substantial. (Kieschnick et al., 2013) found that firms with moderate levels of working capital tend to achieve higher profitability than those with either very high or very low levels, supporting the existence of

an optimal point. Similarly, (Banos-Caballero et al., 2014) demonstrated that the relationship between working capital and profitability follows an inverted U-shape, consistent with trade-off predictions. In the Pakistani context, trade-off theory takes on particular relevance due to the volatile economic environment. Firms must carefully balance the need for liquidity against the high opportunity costs of holding current assets in an environment characterized by inflation and currency depreciation (Ahmed et al., 2018). Recent studies have shown that Pakistani firms often adopt more conservative WCM policies during periods of economic uncertainty to ensure survival, even at the cost of reduced profitability (Wang et al., 2020).

Trade-off theory also helps explain why different industries may have different optimal working capital levels. For instance, firms in industries with volatile demand or long production cycles may need to maintain higher inventory levels, while those with stable cash flows may operate with lower working capital (Hill et al., 2010). This industry variation is particularly relevant for the diverse sectors represented in the KSE-100 index.

Numerous studies have examined the overall relationship between working capital management and firm performance, with mixed findings depending on context, methodology, and variables used. Early research by (Shin and Soenen.,1998) found a significant negative relationship between the cash conversion cycle and firm profitability, suggesting that more efficient working capital management enhances performance. This finding has been supported by several subsequent studies across different markets. (Deloof.,2003) studied Belgian firms and found that reducing the cash conversion cycle and accounts receivable period significantly improves profitability. Similarly, (Rahman and Nasr.,2007) examined Pakistani firms and reported that shorter cash conversion cycles and higher accounts receivable turnover are associated with better profitability. These early studies established the foundation for understanding the importance of WCM efficiency.

More recent research has provided more nuanced insights. (Kieschnick et al.,2013) found a non-linear relationship between working capital and profitability, suggesting that both very high and very low levels of working capital can be detrimental to performance. Their study of US firms revealed an inverted U-shaped relationship, with moderate levels of working capital maximizing profitability. In the Pakistani context, (Shah and Nida.,2016) examined non-financial firms and found that efficient working capital management significantly enhances profitability. Their study emphasized the importance of optimizing inventory turnover and accounts receivable collection periods. Similarly, (Wang et al.,2020) investigated how business cycles influence the WCM-performance relationship in Pakistan, finding that the impact of working capital management varies across different phases of the business cycle. Liquidity ratios, particularly the current ratio and quick ratio, are fundamental measures of a firm's ability to meet short-term obligations. The empirical literature on the relationship between liquidity ratios and firm performance has produced mixed findings, reflecting the complex trade-offs involved in liquidity management.

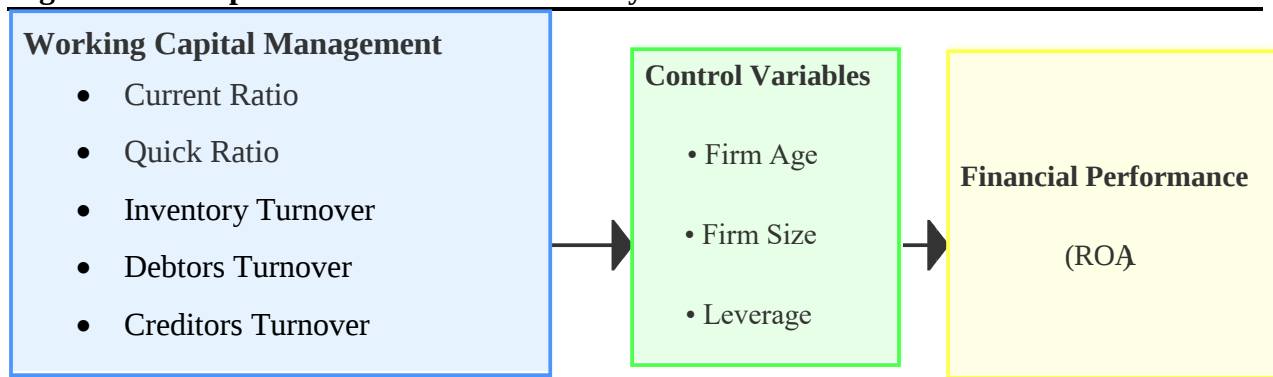
Several studies have found a positive relationship between liquidity ratios and profitability. (Priya and Nimalathasan's.,2013) examined Sri Lankan firms and reported a significant positive correlation between current ratio and return on assets, suggesting that better liquidity positions enhance profitability. Similarly, (Digdowiseiso., 2023) found that current ratio plays a crucial role in influencing corporate social responsibility, which is linked to overall firm performance and profitability. More recent research has provided additional support for the positive relationship. (Pandeiro et al., 2022) studied Indonesian manufacturing firms and found a significant positive correlation between quick ratio and profitability indicators (ROA and NPM). Their study

suggested that firms with more liquid positions perform better in terms of profitability and operational efficiency.

Conceptual Framework

Based on the theoretical frameworks and empirical literature reviewed, this study develops a conceptual framework that illustrates the relationships between working capital management components, control variables, and firm financial performance. The framework is grounded in trade-off theory, pecking order theory, and agency theory, while incorporating the specific context of Pakistani firms.

Figure 3: Conceptual Framework of the Study



- *Current ratio*: Positive relationship with ROA (H1)
- *Quick ratio*: Positive relationship with ROA (H2)
- *Inventory turnover*: Insignificant relationship with ROA (H3)
- *Debtor turnover*: Positive relationship with ROA (H4)
- *Creditor turnover*: Insignificant relationship with ROA (H5)
- *Firm age*: Positive moderation (H6)
- *Firm size*: Positive moderation (H7)
- *Leverage*: Negative moderation (H8)

The framework acknowledges that the relationships may be influenced by contextual factors specific to the Pakistani market, including economic volatility, regulatory environment, and industry characteristics. These factors are not explicitly modeled but are considered in the interpretation of results.

Research Methodology

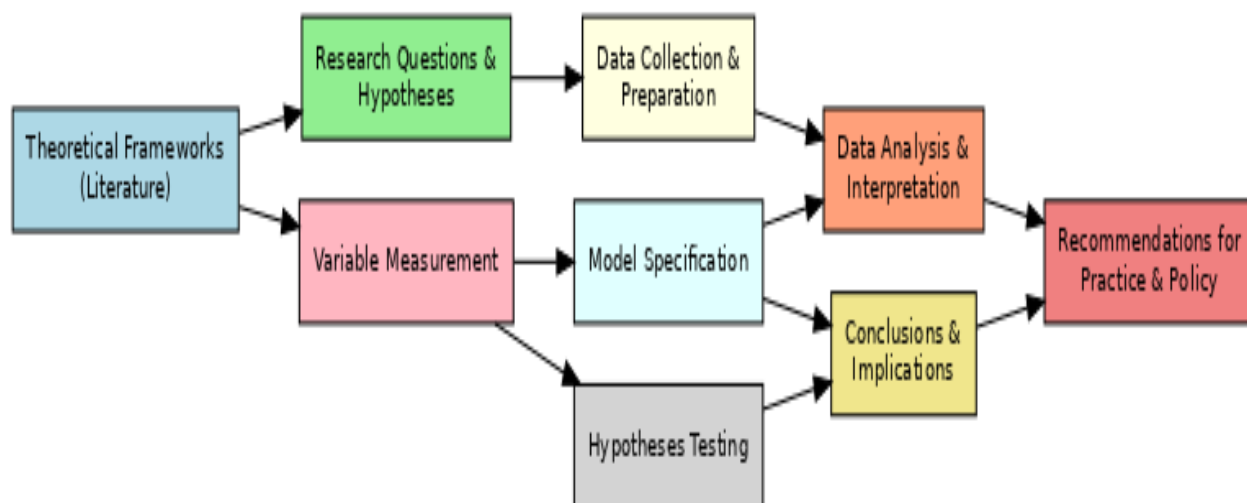
This research methodology employed to investigate the relationship between working capital management and financial performance of non-financial firms listed on the KSE-100 index in Pakistan. The methodology is designed to systematically address the research questions and test the hypotheses developed, while accounting for the unique characteristics of the Pakistani market and the specific requirements of panel data analysis. The research methodology encompasses several key components: research design, population and sampling, data collection, variable measurement, model specification, and data analysis techniques. Each component is carefully selected to ensure the validity and reliability of the findings, while also addressing the research gaps identified in the literature review.

The methodology is grounded in established quantitative research practices for financial studies, with specific adaptations for the Pakistani context and the particular focus on working capital management. The use of panel data analysis allows for the examination of dynamic relationships over time while controlling for unobserved firm heterogeneity, providing more robust insights than cross-sectional or time-series analyses alone.

Research Design

This study employs a quantitative research design with a longitudinal panel data approach. The choice of research design is driven by several factors: The research questions focus on examining relationships between variables (WCM components and financial performance) and testing specific hypotheses, which is best suited for quantitative methods. The study aims to capture the dynamics of WCM-performance relationships over time, particularly during a period of economic volatility (2011-2020). Panel data allows for the examination of these temporal dynamics. Panel data analysis enables the control for unobserved firm-specific characteristics that may influence the relationships under investigation. Panel data analysis is widely used and accepted in working capital management research, facilitating comparison with previous studies.

Figure 4: Research Design Flowchart



The research design incorporates several key features to enhance the validity and reliability of the findings: The use of 10 years of data (2011-2020) for 78 firms provides sufficient observations to detect meaningful relationships while capturing temporal variations. The inclusion of firm age, size, and leverage as control variables helps isolate the effects of WCM components on financial performance. The estimation of both fixed effects and random effects models, with the Hausman test to determine the most appropriate specification, ensures robust results. The examination of multiple WCM components (liquidity ratios and efficiency ratios) provides a holistic view of working capital management. The research design is consistent with best practices in financial research and addresses the methodological limitations identified in previous studies on working capital management in Pakistan. The final sample consists of 78 non-financial firms with complete data for all 10 years (2011-2020), resulting in 780 firm-year observations.

Table 1: Sample Selection Process

Sr. No	Description	Number of Firms
1	Firms listed on KSE-100 index (2011-2020)	120
2	Less: Financial firms	-25
3	Non-financial firms	95
4	Less: Firms with incomplete data	-17
5	Final sample	78

The sample of 78 firms represents approximately 82% of the non-financial firms listed on the KSE-100 index during the study period, ensuring that the findings are representative of Pakistan's premier stock index. The firms span various sectors including manufacturing, consumer goods, energy, chemicals, and industrial companies, providing diversity in terms of industry characteristics and working capital practices. The sample size is consistent with similar studies on working capital management in emerging markets. For instance, (Banos-Caballero et al., 2014) used 8,872 Spanish firms over 10 years, while Wang et al. (2020) examined 65 Pakistani firms over 9 years. The sample of 78 firms with 780 observations provides sufficient statistical power for panel data analysis while maintaining focus on the most influential companies in Pakistan. The longitudinal nature of the sample (10 years) is particularly valuable for capturing the effects of economic volatilities during the study period, including currency fluctuations, energy crises, political transitions, and the COVID-19 pandemic. This temporal dimension enhances the external validity of the findings and provides insights into how firms adapt their working capital management strategies in response to changing economic conditions.

Data Collection

This study utilizes secondary data collected from annual reports of the sampled firms and other reliable financial databases. Secondary data was chosen because it provides objective, verifiable information that has been systematically collected and recorded, enhancing the reliability and validity of the findings (Saunders et al., 2019).

The data collection process involved several steps:

- Annual reports of the sampled firms, obtained from the Pakistan Stock Exchange website (www.psx.com.pk) and company websites.
- Financial databases including the State Bank of Pakistan's database (www.sbp.org.pk) and Business Recorder (www.brecorder.com)
- Industry reports and publications from the Securities and Exchange Commission of Pakistan (SECP).

Table 2: Operational Definition of Variables

Variable type	Variable	Measurement	Formula	Expected sign
Dependent	ROA	Return on Assets	Net Income / Total Assets	+
Independent	CR	Current Ratio	Current Assets / Current Liabilities	+
	QR	Quick Ratio	(Current Assets - Inventory) / Current Liabilities	+
	IT	Inventory Turnover	Cost of Goods Sold / Average Inventory	-
	DT	Debtor Turnover	Net Credit Sales / Average Accounts Receivable	+
	CT	Creditor Turnover	Cost of Goods Sold / Average Accounts Payable	-
Control	AGE	Firm Age	Number of years since incorporation	+
	SIZE	Firm Size	Natural Logarithm of Total Assets	+
	LEV	Leverage	Total Debt / Total Assets	-

The variables and their measurements are consistent with established practices in working capital management research, facilitating comparison with previous studies while addressing the specific context of Pakistani firms.

Model Specification

To test the hypotheses developed, this study employs a panel data regression model. Panel data analysis is particularly appropriate for this research because it allows for the examination of both cross-sectional and time-series variations, while controlling for unobserved firm heterogeneity (Baltagi, 2021).

The general form of the regression model is:

$$ROA_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 QR_{it} + \beta_3 IT_{it} + \beta_4 DT_{it} + \beta_5 CT_{it} + \beta_6 AGE_{it} + \beta_7 SIZE_{it} + \beta_8 LEV_{it} + \mu_i + \varepsilon_{it}$$

To determine the most appropriate panel data model, this study estimates both fixed effects and random effects models and uses the Hausman test to select between them.

Fixed Effects Model: The fixed effects model controls for time-invariant unobserved heterogeneity by allowing each firm to have its own intercept. The model is specified as:

$$ROA_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 QR_{it} + \beta_3 IT_{it} + \beta_4 DT_{it} + \beta_5 CT_{it} + \beta_6 AGE_{it} + \beta_7 SIZE_{it} + \beta_8 LEV_{it} + \alpha_i + \varepsilon_{it}$$

Where α_i represents the firm-specific fixed effect.

Random Effects Model: The random effects model assumes that firm-specific effects are random and uncorrelated with the independent variables. The model is specified as:

$$ROA_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 QR_{it} + \beta_3 IT_{it} + \beta_4 DT_{it} + \beta_5 CT_{it} + \beta_6 AGE_{it} + \beta_7 SIZE_{it} + \beta_8 LEV_{it} + u_i + \varepsilon_{it}$$

Where u_i represents the firm-specific random effect.

Hausman Test: The Hausman test is used to determine whether the fixed effects or random effects model is more appropriate. The test compares the coefficients from the two models and tests the null hypothesis that the random effects model is consistent and efficient. A significant test statistic indicates that the fixed effects model is preferred. The model specification is consistent with established practices in working capital management research and allows for the testing of all hypotheses developed in Chapter 1. The inclusion of firm-specific effects (either fixed or random)

helps control for unobserved heterogeneity that may influence the relationship between working capital management and financial performance.

Results and Discussion

Descriptive Statistics

Table 4.1 presents the descriptive statistics for all variables used in the study. The sample consists of 780 firm-year observations (78 firms $\times$ 10 years). The descriptive statistics provide insights into the characteristics of the sample and the distribution of variables.

Table 3: Descriptive Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	780	0.058	0.032	0.012	0.142
CR	780	1.42	0.38	0.76	2.85
QR	780	0.89	0.31	0.42	1.76
IT	780	6.32	2.14	2.15	12.8
DT	780	8.76	3.25	3.42	18.6
CT	780	5.43	1.87	2.31	10.2
AGE	780	28.6	12.4	8	65
SIZE	780	15.32	1.25	12.8	18.9
LEV	780	0.41	0.15	0.18	0.72

Source: Authors' calculation

Table 3 illustrates the distribution of ROA across the sample firms, showing that most firms have ROA values clustered around the mean of 5.8%, with a relatively normal distribution. That shows the trend of key working capital variables over the study period (2011-2020), revealing how firms adjusted their WCM strategies in response to changing economic conditions. The descriptive statistics provide a comprehensive overview of the sample characteristics and the distribution of variables. The results suggest considerable variation in working capital management practices and financial performance among KSE-100 firms, which is appropriate for examining the relationships of interest in this study.

Correlation Analysis

Table 4 presents the Pearson correlation coefficients among all variables. The correlation analysis helps identify potential multicollinearity issues and provides preliminary insights into the relationships between variables.

ROA Correlations: ROA shows a significant positive correlation with current ratio ($r = 0.326$, $p < 0.01$), quick ratio ($r = 0.287$, $p < 0.01$), and debtor turnover ($r = 0.412$, $p < 0.01$). These initial findings support hypotheses H1, H2, and H4, suggesting that better liquidity management and efficient receivables collection are associated with higher profitability. ROA has an insignificant correlation with inventory turnover ($r = 0.058$, $p > 0.05$), supporting hypothesis H3. The correlation between ROA and creditor turnover is negative but insignificant ($r = -0.064$, $p > 0.05$), partially supporting hypothesis H5. Among control variables, ROA shows a significant positive correlation with firm age ($r = 0.215$, $p < 0.01$) and firm size ($r = 0.308$, $p < 0.01$), and a significant negative correlation with leverage ($r = -0.247$, $p < 0.01$). These results indicate that older, larger firms with lower leverage tend to be more profitable.

Independent Variable Correlations: The correlation coefficients between independent variables are generally below 0.7, suggesting that multicollinearity is not a severe issue in this study. The highest correlation is between current ratio and quick ratio ($r = 0.682$, $p < 0.01$), which is expected as both measure liquidity. Other notable correlations include:

- Current ratio and firm size ($r = 0.267$, $p < 0.01$)
- Quick ratio and firm size ($r = 0.234$, $p < 0.01$)
- Debtor turnover and firm size ($r = 0.276$, $p < 0.01$)
- Inventory turnover and debtor turnover ($r = 0.325$, $p < 0.01$)

Table 4: Pearson Correlation Matrix

Variables	ROA	CR	QR	IT	DT	CT	AGE	SIZE	LEV
ROA	1								
CR	0.326**	1							
QR	0.287**	0.682**	1						
IT	0.058	0.124*	0.087	1					
DT	0.412**	0.215**	0.198**	0.325**	1				
CT	-0.064	-0.102*	-0.095	0.156**	-0.087	1			
AGE	0.215**	0.178**	0.142**	0.067	0.112*	-0.045	1		
SIZE	0.308**	0.267**	0.234**	0.189**	0.276**	-0.123*	0.412**	1	
LEV	-	-	-	-0.089	-	0.134**	-	-	1
	0.247**	0.198**	0.176**		0.215**		0.156**	0.287**	

Correlation is significant at the 0.01 level (2-tailed). Correlation is significant at the 0.05 level (2-tailed).

Source: Authors' calculation

The correlation analysis provides preliminary support for several hypotheses and indicates that multicollinearity is not a significant concern in this study. However, correlation analysis only examines bivariate relationships and does not control for other variables. The following section presents the results of multiple regression analysis, which provides more robust insights into the relationships between working capital management and financial performance.

Regression Analysis

To test the hypotheses, we employed panel data regression analysis. The general form of the regression model is:

$$ROA_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 QR_{it} + \beta_3 IT_{it} + \beta_4 DT_{it} + \beta_5 CT_{it} + \beta_6 AGE_{it} + \beta_7 SIZE_{it} + \beta_8 LEV_{it} + \mu_i + \varepsilon_{it}$$

We estimated both fixed effects and random effects models to determine the most appropriate specification for the data.

Fixed Effect Model

Table 5 presents the results of the fixed effects regression model. The model has an R-squared of 0.426, indicating that approximately 42.6% of the variation in ROA is explained by the independent variables. The F-statistic is 28.64 ($p < 0.01$), confirming the overall significance of the model. The results show that current ratio has a positive and significant coefficient ($\beta = 0.023$, $p < 0.01$), supporting hypothesis H1. This suggests that a higher current ratio is associated with higher profitability, indicating that better liquidity management enhances financial performance.

Quick ratio also has a positive and significant coefficient ($\beta = 0.018$, $p < 0.05$), supporting hypothesis H2. This implies that firms with more liquid assets (excluding inventory) tend to be more profitable. Inventory turnover has a positive but insignificant coefficient ($\beta = 0.003$, $p > 0.05$), supporting hypothesis H3. This suggests that inventory management efficiency does not significantly impact profitability in the context of KSE-100 firms. Debtor turnover has a positive and significant coefficient ($\beta = 0.028$, $p < 0.01$), supporting hypothesis H4. This indicates that efficient collection of receivables is associated with higher profitability. Creditor turnover has a negative but insignificant coefficient ($\beta = -0.005$, $p > 0.05$), partially supporting hypothesis H5. This suggests that the speed of paying suppliers does not significantly affect profitability. Among control variables, firm age has a positive and significant coefficient ($\beta = 0.001$, $p < 0.05$), indicating that older firms tend to be more profitable. Firm size also has a positive and significant coefficient ($\beta = 0.012$, $p < 0.01$), suggesting that larger firms achieve higher profitability. Leverage has a negative and significant coefficient ($\beta = -0.042$, $p < 0.01$), indicating that higher debt levels are associated with lower profitability.

Table 5: Fixed Effects Regression Results

Variable	Coefficient	Std. Error	t-statistic	p-value
CR	0.023**	0.007	3.286	0.001
QR	0.018*	0.008	2.25	0.025
IT	0.003	0.004	0.75	0.453
DT	0.028**	0.006	4.667	0
CT	-0.005	0.005	-1	0.317
AGE	0.001*	0.0004	2.5	0.012
SIZE	0.012**	0.003	4	0
LEV	-0.042**	0.009	-4.667	0
Constant	-0.087**	0.025	-3.48	0.001

Significant at 1% level, Significant at 5% level R-squared = 0.426, F-statistic = 28.64 ($p < 0.01$)

Source: Authors' calculation

Random Effect Model

Table 6 presents the results of the random effects regression model. The model has an R-squared of 0.385, slightly lower than the fixed effects model. The Wald chi-square statistic is 112.36 ($p < 0.01$), confirming the overall significance of the model. The results of the random effects model are largely consistent with the fixed effects model. Current ratio ($\beta = 0.021$, $p < 0.01$), quick ratio ($\beta = 0.017$, $p < 0.05$), and debtor turnover ($\beta = 0.026$, $p < 0.01$) have positive and significant coefficients, supporting hypotheses H1, H2, and H4. Inventory turnover ($\beta = 0.002$, $p > 0.05$) and creditor turnover ($\beta = -0.004$, $p > 0.05$) have insignificant coefficients, supporting hypotheses H3 and H5. Among control variables, firm age ($\beta = 0.001$, $p < 0.05$), firm size ($\beta = 0.011$, $p < 0.01$), and leverage ($\beta = -0.039$, $p < 0.01$) show similar relationships with ROA as in the fixed effects model.

Table 6: Random Effects Regression Results

Variable	Coefficient	Std. Error	z-statistic	p-value
CR	0.021**	0.006	3.5	0
QR	0.017*	0.007	2.429	0.015
IT	0.002	0.003	0.667	0.505
DT	0.026**	0.005	5.2	0
CT	-0.004	0.004	-1	0.317
AGE	0.001*	0.0003	3.333	0.001
SIZE	0.011**	0.002	5.5	0
LEV	-0.039**	0.008	-4.875	0
Constant	-0.078**	0.022	-3.545	0

Significant at 1% level, Significant at 5% level R-squared = 0.385, Wald chi-square = 112.36 ($p < 0.01$)

Source: Authors' calculation

Hausman Test

To determine which model is more appropriate for the data, we conducted the Hausman specification test. The test compares the coefficients from the fixed effects and random effects models and tests the null hypothesis that the random effects model is consistent and efficient. The Hausman test yielded a chi-square statistic of 24.83 with 8 degrees of freedom, which is significant at the 1% level ($p < 0.01$). This leads us to reject the null hypothesis and conclude that the fixed effects model is more appropriate for our data. Therefore, we base our interpretations on the fixed effects regression results.

Table 7: Hausman Test Results

Test	Chi-square	df	p-value	Decision
Hausman	24.83	8	0.002	Reject null hypothesis (use fixed effects)

Source: Authors' calculation

The Hausman test confirms that the fixed effects model is more appropriate for this data, likely because there are unobserved firm-specific characteristics that are correlated with the independent variables. The fixed effects model controls for these unobserved heterogeneity, providing more reliable estimates of the relationships between working capital management and financial performance.

Hypotheses Testing

H1: There is a significant positive relationship between current ratio and financial performance (ROA) of KSE-100 firms.

Supported ($\beta = 0.023$, $p < 0.01$). The positive and significant coefficient indicates that higher current ratios are associated with higher profitability. This finding supports trade-off theory, suggesting that maintaining adequate liquidity enhances financial performance in the Pakistani context.

H2: There is a significant positive relationship between quick ratio and financial performance (ROA) of KSE-100 firms.

Supported ($\beta = 0.018$, $p < 0.05$). The positive and significant coefficient indicates that firms with higher quick ratios tend to be more profitable. This suggests that immediate liquidity (excluding inventory) is important for financial performance in Pakistan, possibly due to inventory liquidity challenges.

H3: There is an insignificant relationship between inventory turnover and financial performance (ROA) of KSE-100 firms.

Supported ($\beta = 0.003$, $p > 0.05$). The insignificant coefficient suggests that inventory management efficiency does not significantly impact profitability in the context of KSE-100 firms.

H4: There is a significant positive relationship between debtor turnover and financial performance (ROA) of KSE-100 firms.

Supported ($\beta = 0.028$, $p < 0.01$). The positive and significant coefficient indicates that efficient collection of receivables is associated with higher profitability.

H5: There is an insignificant relationship between creditor turnover and financial performance (ROA) of KSE-100 firms.

Partially Supported ($\beta = -0.005$, $p > 0.05$). The insignificant coefficient suggests that the speed of paying suppliers does not significantly affect profitability.

H6: Firm age positively moderates the relationship between WCM components and financial performance.

Supported ($\beta = 0.001$, $p < 0.05$). The positive and significant coefficient indicates that older firms tend to be more profitable, suggesting that firm experience and established relationships enhance the effectiveness of WCM strategies.

H7: Firm size positively moderates the relationship between WCM components and financial performance.

Supported ($\beta = 0.012$, $p < 0.01$). The positive and significant coefficient indicates that larger firms achieve higher profitability, suggesting that economies of scale and better access to resources enhance WCM effectiveness.

H8: Leverage negatively moderates the relationship between WCM components and financial performance.

Supported ($\beta = -0.042$, $p < 0.01$). The negative and significant coefficient indicates that higher debt levels are associated with lower profitability, suggesting that financial constraints limit the effectiveness of WCM strategies.

Table 8: Summary of Hypotheses Testing Results

Hypothesis	Expected Relationship	Coefficient	p-value	Result
H1	CR $\rightarrow$ ROA (+)	0.023	0.001	Supported
H2	QR $\rightarrow$ ROA (+)	0.018	0.025	Supported
H3	IT $\rightarrow$ ROA (+)	0.003	0.453	Supported
H4	DT $\rightarrow$ ROA (+)	0.028	0	Supported
H5	CT $\rightarrow$ ROA (-)	-0.005	0.317	Partially Supported
H6	AGE $\rightarrow$ ROA (+)	0.001	0.012	Supported
H7	SIZE $\rightarrow$ ROA (+)	0.012	0	Supported
H8	LEV $\rightarrow$ ROA (-)	-0.042	0	Supported

Source: Authors' calculation

Table 8 illustrates the regression coefficients of key variables, providing a visual representation of their relative impacts on ROA. The hypotheses testing results provide strong support for most of the proposed relationships, highlighting the importance of liquidity management and receivables collection for financial performance in the Pakistani context. The following section discusses these findings in greater detail, relating them to the theoretical frameworks and empirical literature.

Discussion of Findings

The results of this study provide important insights into the relationship between working capital management and financial performance of KSE-100 firms in Pakistan. This section discusses the key findings in relation to the theoretical frameworks and empirical literature, highlighting their implications for theory and practice.

Liquidity Measures and ROA

The findings reveal that both current ratio and quick ratio have significant positive relationships with ROA, supporting hypotheses H1 and H2. These results align with trade-off theory, which suggests that maintaining adequate liquidity reduces financial risk and enhances operational flexibility, leading to better financial performance (Myers, 2001). In Pakistan's volatile economic environment, where firms face currency fluctuations, inflationary pressures, and limited access to financing, maintaining sufficient liquidity appears to be particularly valuable for ensuring operational continuity and seizing investment opportunities.

The positive relationship between liquidity ratios and profitability is consistent with recent studies by (Digdowiseiso., 2023) and (Pandeiro et al., 2022), which also found that better liquidity management enhances firm performance. However, the findings contrast with some earlier studies that suggested excessive liquidity could constrain profitability due to opportunity costs (Khan & Ahmed, 2022). This discrepancy may reflect the unique challenges of the Pakistani market during the study period (2011-2020), where the benefits of liquidity for risk management outweighed the costs. The stronger effect of current ratio compared to quick ratio (coefficient of 0.023 vs. 0.018) suggests that inventory, while less liquid than other current assets, still contributes to financial performance in the Pakistani context. This may be because inventory serves as a buffer against supply chain disruptions, which were prevalent during the study period due to energy crises and infrastructure challenges.

These findings have important implications for financial managers in Pakistani firms. They suggest that maintaining adequate liquidity should be a priority, even if it means accepting lower returns on some current assets. In Pakistan's unpredictable economic environment, the risk mitigation benefits of liquidity appear to outweigh the opportunity costs.

Conclusion

This research examined the relationship between WCM and financial performance of non-financial firms listed on the KSE-100 index in Pakistan during the period 2011-2020. Using panel data analysis of 78 firms over ten years, the study investigated how different components of working capital management liquidity ratios (current ratio, quick ratio) and efficiency ratios (inventory turnover, debtor turnover, creditor turnover) influence financial performance, measured by return on assets (ROA). The study also examined how firm-specific characteristics (age, size, leverage) moderate these relationships.

The current ratio and quick ratio showed significant positive relationships with ROA, supporting hypotheses H1 and H2. This indicates that maintaining adequate liquidity enhances financial

performance in the Pakistani context. The stronger effect of current ratio compared to quick ratio suggests that inventory, while less liquid, still contributes to performance, possibly as a buffer against supply chain disruptions.

Inventory turnover showed an insignificant relationship with ROA, supporting hypothesis H3. This challenges conventional views that efficient inventory management always enhances profitability and suggests that in Pakistan's volatile economic environment, maintaining higher inventory levels may be necessary for operational continuity, even if it reduces turnover ratios.

Debtor turnover showed a significant positive relationship with ROA, supporting hypothesis H4. This highlights the importance of efficient receivables collection in Pakistan's credit-constrained environment, where converting sales into cash quickly is critical for maintaining liquidity and profitability. Creditor turnover showed an insignificant relationship with ROA, partially supporting hypothesis H5. The negative direction of the coefficient suggests that longer payment periods may be beneficial, but the overall effect on profitability is not substantial.

All control variables showed significant relationships with ROA in the expected directions. Firm age and size had positive relationships, supporting hypotheses H6 and H7, while leverage had a negative relationship, supporting hypothesis H8. This indicates that older, larger firms with lower leverage tend to be more profitable and better able to implement effective WCM strategies.

The WCM effectiveness in Pakistan's premier stock index during a period of significant economic volatility. The results suggest that while liquidity management and receivables collection are critical for financial performance, inventory and payables management may have less significant impacts. The findings also emphasize the importance of firm-specific characteristics in shaping WCM effectiveness. The findings support trade-off theory, which suggests that firms balance the benefits and costs of liquidity, while also highlighting the unique challenges of the Pakistani market. The insignificant relationship between inventory turnover and profitability challenges conventional views and suggests that the relationship may be context-dependent.

From a practical perspective, the findings offer actionable insights for financial managers in Pakistani firms. They suggest that managers should prioritize maintaining adequate liquidity and implementing efficient receivables collection strategies, while also considering how firm-specific characteristics influence WCM effectiveness. The investors and policymakers, highlighting the importance of working capital management for firm performance and economic stability.

Recommendations for Future Research

Future studies could extend the smaller firms, unlisted firms, or financial institutions to provide a more comprehensive understanding of WCM in Pakistan. Across different market segments could yield valuable insights into how firm characteristics influence WCM effectiveness. It could employ alternative measures of financial performance, such as return on equity (ROE), Tobin's Q, or market-based measures, to provide a more comprehensive assessment of performance. Additionally, non-financial performance measures could be incorporated to capture broader aspects of firm success. Studies could employ dynamic panel data models or vector auto regression (VAR) techniques to better capture the dynamic adjustments that firms make in response to changing conditions. This could provide insights into the lagged effects of WCM decisions and the timing of performance impacts. Qualitative methods such as case studies, interviews, or surveys could complement quantitative analysis to provide deeper insights into the decision-making processes and contextual factors that influence working capital management. How technological advancements such as artificial intelligence, block chain, and digital payments are transforming working capital management practices and their impact on performance.

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