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Working Capital Management and Firm Performance: Evidence from Kazakhstan

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Abstract: The literature on working capital management (WCM) provides mixed evidence on the effect of working capital on firm profitability and performance. Using firms from the Kazakhstan Stock Exchange (KASE), we examine the relationship between WCM and firms' performance. Particularly, we look at how working capital components relate to firms' performance while controlling for firm-specific and macroeconomic factors. Our findings show that the cash conversion cycle (CCC) is inversely related to firm performance—a shorter cash conversion cycle is associated with higher firm performance measured by ROA. We find that receivables and inventory management significantly impact firm performance. We also find that the efficiency of working capital management is influenced by company-specific variables such as firm size, growth, and leverage, as well as uncontrollable macroeconomic variables such as economic growth and inflation. Finally, we find that both the Energy and Telecommunication sectors perform significantly better than the benchmark Consumer non-cyclical sector.

Keywords: Working capital management, cash conversion cycle, firm performance, developing markets.

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1. INTRODUCTION

A successful business operation requires continuous cash generation, which is closely related to how a firm manages its working capital. In addition to the long-term investment decisions, a company must remain solvent in its daily operations. Working capital management involves managing a firm's payables, receivables, and inventories. A company's liquidity management is becoming increasingly difficult with the rise of digital transformation, ever-changing market conditions, globalization, and geopolitical uncertainty. Companies use cash as a means of risk mitigation in the supply chain.

Our paper investigates the impact of working capital management on firm performance using a sample of firms listed on the Kazakhstan Stock Exchange (KASE). We use return on assets (ROA) as the performance measure. Previous empirical studies provide mixed results, with each working capital component showing varying influence over a firm's performance (Deloof, 2003; Kiymaz, 2022). The mixed results are partially due to most previous works being country-specific or industry-specific. Our research provides a developing market example from Kazakhstan. Along with each component of the cash conversion cycle, we also incorporate both firm-specific factors (firm size, growth, and financial leverage) and macroeconomic variables (inflation, the gross domestic product (GDP) growth rate, and interest rates) to explain the performance of Kazakh firms.

Our research contributes to the existing literature in the following ways. First, we provide evidence from one of Central Asia's most commodity-rich and fast-developing countries. Second, in addition to working capital management variables, our study examines the impact of firm-specific variables, including size, growth, and leverage, on firms' performance. Third, we argue

the macroeconomic environment may impact firms' performance and working capital decisions. Hence, our analysis includes country-specific macroeconomic variables, including interest rates, gross domestic product, and inflation. Finally, we provide evidence from the most active industries: consumer non-cyclical, energy, material, telecommunications, and utilities.

We find statistically significant differences among our sample's cash conversion cycle components and firm performance. For example, DSO (receivables) is inversely related to firm performance—the longer the collection period, the poorer the firm performance. Similarly, we find that the longer the inventory holdings of a firm, the worse the firm performance measured by ROA. The DPO (payables) does not appear to influence firm performance in our models. Our control variables also impact firm performance. For example, firm-specific variables (growth, size, and leverage) significantly affect performance. Specifically, larger firms with higher growth patterns and low leverage perform better than others. Finally, macroeconomic conditions also influence firm performance. Specifically, firms experience higher returns when economic growth and lower inflation are present. Furthermore, we find statistically significant differences between various sectors and the consumer non-cyclical sector.

We organize the remainder of the research as follows. Section 2 provides a brief review of the related literature. In Section 3, we describe the data and methodology. Section 4 presents the empirical results, and the last section summarizes and concludes the paper.

2. LITERATURE REVIEW

Managing a company's working capital is instrumental in improving a firm's financial performance. A substantial body of empirical research can be found on the impact of working capital management on global corporate performance. Smith (1980) finds an inverse relationship

between liquidity and profitability among the earlier studies, supported by many subsequent research papers. In many studies, the cash conversion cycle (CCC) is the most widely used measurement of working capital management. CCC depicts a firm's overall management of receivables, inventories, and payment policy. For example, using a large sample of U.S. firms between 1975 and 1994, Shin and Soenen (1998) use CCC as a proxy to investigate the connection between working capital management and firms' profitability. Deloof (2003) examines Belgian non-financial firms from 1992 to 1996 in a related study. The study suggests that reducing the accounts receivable and inventory turnover period would maximize value for their shareholders. García-Teruel and Martínez-Solano (2007) and Afrifa, Tauringana, and Tingbani (2014) analyze the relationship between WCM and the profitability of SMEs. They report a concave relationship, supporting an optimal level of working capital where such a relationship increases profitability.

In a more recent study on US firms, Kieschnick, LaPlante, and Moussawi (2013) show that the value of additional dollar investment is influenced by anticipated sales, access to external capital, bankruptcy risk, and the firm's practice of using debts.

Some of the most recent works on developed and developing economies expand on the relationship between WCM and firms' performance by incorporating other firm-specific factors. For example, Kiymaz, Haque, and Choudhury (2022) examine the impact of the firm's leverage, growth, and size when investigating the relationship between working capital measures and firm performance for a group of developed countries. WCM measured by the CCC has an inverse relationship with firm profitability and performance, aligning with almost all studies examined. Concerning CCC's components, inventories appear to be a significant driver of WCM's impact on firm performance by exerting a positive influence. Receivables have a consistently significant

adverse effect on firm performance, indicating the importance of a strict credit policy on firm performance and value. Payables are important for firm performance, potentially indicating firms' reliance on trade credit in their operations developing markets. Among firm-specific variables, the size variable is positive, showing that larger firms perform better than smaller firms, regardless of the model or dependent variable used. Using U.S.-listed firms, Kayani, De Silva, and Gan (2019a) raise the importance of Corporate Governance and working capital management to maximize firms' performance using the generalized method of moments (GMM). They conclude that when WCM can be a good short-term performance indicator, the corporate policy.

Among the studies on European firms, Enqvist, Graham, and Nikkinen (2014) demonstrate the significance of working capital management policies for Finnish companies during an economic downturn. In a related study, Baños-Caballero, García-Teruel, and Martínez-Solano (2014) find an inverted U-shaped relationship between working capital investment and firm performance for a sample of non-financial firms in the UK. This supports the optimal level of working capital that improves the firm's value. Madhou, Moosa, and Ramiah (2015) further examine the relationship between WCM, profitability, and firms' characteristics using economic value added (EVA) as a proxy for corporate profitability and find a significant influence of accounts receivable and accounts payable along with firm size and growth on corporate profitability.

A good number of scholarly works on the strategic role of working capital management have come from developing countries such as – China, India, Turkiye, Indonesia, Malaysia, and Pakistan. For Instance, the negative association between WCM and profitability is substantiated further by Coskun and Kök (2011), Abdioglu (2016), and Yilmaz-Turkmen and Soylemez (2019)

for Turkish firms. Çakir and Küçükkaplan (2012), in contrast, find no significant influence of WCM on firms' profitability. Laghari and Chengang (2019) and Ren, Liu, Yang, Ziao, and Hu (2019) support a negative association between WCM and firm performance among Chinese firms. Furthermore, Ren, Liu, Yang, Ziao, and Hu (2019) demonstrate that ownership structure and legal system remarkably influence the negative relation between CCC and corporate profitability.

Multiple studies focus on WCM and firm performance in the Indian market. Arunkumar and Ramanan (2011), Singhania, Sharma, and Rohit (2014), and Kaushik and Chauhan (2019) suggest that a shorter CCC improves the profitability of a company. Their findings acknowledge that decreasing the number of days of receivables and increasing the number of days payable to a firm can benefit the companies. Setianto and Pratiwi (2019) reveal the optimal level of working capital among Indonesian firms. In a follow-up study, Nastiti, Atahau, and Supramono (2019) add that when WCM does not directly influence sustainable growth, it has an indirect influence.

Among the studies on Malaysian firms, Sim and Azlan (2020) provide extensive evidence of a relationship between WCM and firm performance. Additionally, Haron and Nomran (2016), using panel regression of 57 firms, report a stable negative relationship between WCM and corporate profitability before, during, and after the financial crisis of 2007-2008. Another actively investigated market in Asia is Pakistan. Nazir and Afza (2009) prove that conservative working capital management policies maximize firm value. Muhammad, Jan, and Ullah (2012), focusing on firms in the textile industry, conclude that increasing cash, inventory, and credit sales also increase profit. This paper provides evidence on the relationship between firm performance and working capital measures for a sample of Kazakh firms.

3. DATA AND METHODOLOGY

3.1 Data and Sample

The net sample comprises 25 firms listed on the Kazakhstan Stock Exchange across five industries — Consumer Non-cyclical, Energy, Materials, Telecommunications, and Utilities between 2010 and 2022. Data used includes the following categories: (1) firm profitability and performance, (2) WCM measures, (3) firm-specific variables, and (d) macroeconomic variables. The FactSet database is a data source for profitability, WCM measures, and firm-specific variables, whereas macroeconomic variables come from the International Monetary Fund (IMF) and World Bank. The sample excludes firm-year observations with null and error values. The final firm-year observations for the entire sample are 226. Panel A of Table 1 reports the sample selection. We start with 84 firms listed on the Kazakhstan Stock Exchange. We eliminated financials (20 firms) and firms with missing data (41 firms). The net sample consisted of 25 firms with panel data ranging from 2010 to 2022. Panel B of Table 1 shows the industry distribution of our sample. Return on assets (ROA) serves as a proxy performance measure because it isolates the impact of financing decisions and changes in tax law on profitability (Jose *et al*., 1996). The components of the CCC —DSO, DIO, and DPO — are used to test WCM′s impact on corporate profitability (Jose *et al*., 1996; Gill *et al*., 2010; Christian and Raisa, 2017). Polarized views exist about WCM′s effect on profitability. Some scholars view a longer CCC as pivotal to sales increase and protection against stockouts. Yet, others find a positive association between a lower CCC and profitability. This way, the manager can put unproductive assets to better use. This study examines how the CCC′s different impact components affect firm performance.

Among firm-specific variables, the study uses firm size (measured by the natural logarithm of total assets), leverage (measured by debt ratio), and growth (measured by annual sales growth) as firm-specific control.

3.2 Methodology

We use panel data regression analysis to investigate WCM's impact. ROA is our dependent variable (performance measure) using the control variables illustrated below for the Kazakh sample. We use a panel regression model because it controls for the time-invariant unobserved firm features that may correlate with our model's explanatory variables. Furthermore, by pooling samples at different points in time, we can get more precise estimators and test statistics with more power. We also use fixed-effect and random-effect models with white cross-section standard errors and covariance to control for heteroskedasticity.

$$ROA_{it} = \beta_0 + \beta_1 CCC + \varepsilon \quad (1)$$

$$ROA_{it} = \beta_0 + \beta_1 DIO + \beta_2 DSO + \beta_3 DPO + \varepsilon \quad (2)$$

$$ROA_{it} = \beta_0 + \beta_1 DIO + \beta_2 DSO + \beta_3 DPO + \beta_4 SIZE + \beta_6 GRO + \beta_7 LEV + \varepsilon \quad (3)$$

$$ROA_{it} = \beta_0 + \beta_1 CCC + \beta_2 GRO + \beta_3 LEV + \beta_4 INTR + \beta_5 GDP + \beta_6 CPI + \varepsilon \quad (4)$$

$$ROA_{it} = \beta_0 + \beta_1 DIO + \beta_2 DSO + \beta_3 DPO + \beta_4 SIZE + \beta_5 GRO + \beta_6 LEV + \beta_7 INTR + \beta_8 GDP + \beta_9 CPI + \varepsilon \quad (5)$$

Where CCC = Cash conversion cycle; DIO = Days inventory on hand; DSO = Days sales outstanding; DPO = Days payables outstanding; SIZE = Company size measured as the natural logarithm of the total assets; GRO = Company′s growth rate of sales relative to the previous year; LEV = Debt ratio; INTR = Interest rate measured as short-term interest rate; GDP = GDP growth rate relative to the previous year; and CPI = Inflation measured as the change in the consumer price index (CPI). Table 2 provides variable descriptions in the following categories: (1) firm

profitability and performance, (2) WCM measures, (3) firm-specific variables, and (4) macroeconomic variables.

The next section discusses our empirical findings about WCM's impact on firm performance. Efficient WCM is essential for enhancing firm performance and shareholder returns. Although excessive use of current assets may hurt a firm's profitability, a low level of existing assets may lead to lower liquidity and stockouts, resulting in difficulties in maintaining smooth operations. A standard measure of WC is the CCC, and many studies examine how the CCC relates to firm performance or profitability.

4. EMPIRICAL RESULTS

4.1 Descriptive Statistics

Table 3 reports the summary statistics of variables for our sample. Among working capital variables, the average CCC is 72.8 days. For the components of CCC, the average DIO is 85.2 days, while the average DSO is 68.0 days. The average DPO, on the other hand, is 80.2 days. The large standard deviation of different variables, especially inventory turnover in days, average receivable period, average payment period, and CCC, is due to firms' different WC policies and practices. The sample has an average growth rate of 50 percent with 20.7 percent leverage for firm-specific control variables. The average GDP growth rate during the study period was 3.6 percent. The short-term borrowing rate is 10.2 percent, and the average annual inflation rate is 7.6 percent during the study period.

Table 4 reports the correlation coefficients for our sample. The results do not exhibit a high

correlation that could impede our interpretations. The only exception is the high correlation of 0.69 between DIO and CCC. We don′t use the DIO and CCC variables in the same model, which does not influence our findings' interpretation.

4.2. Panel regression results

We use a panel data regression analysis to investigate WCM's impact as it controls for the time-invariant unobserved firm features that may correlate with our model's explanatory variables. Furthermore, by pooling samples at different points in time, we can get more precise estimators and test statistics with more power. We report our findings in Table 5. We use five models described while controlling firm-specific and country-specific factors. The number of observations is 226.

The adjusted R^2 ranges from 0.014 to 0.770 from Model 1 (with one independent variable) to Model 5 (with nine independent variables). At the same time, the F-values are all statistically highly significant, indicating that independent variables collectively explain variation in our dependent variable. The first model (Column 1) reports the relationship between the cash conversion cycle and firm performance. The coefficient of CCC is -0.026 and statistically significant at a 10 percent level. This finding shows that firm performance is inversely related to CCC for Kazakh firms, and firms with longer cash conversion cycles perform poorly. These findings are in line with many studies from other countries. In Column 2, we use the components of the cash conversion cycle (DIO, DSO, and DPO) to explain firm performance while excluding CCC to avoid interpretation problems. We find a statistically significant relation between DIO, DSO, and firm performance. We note a negative coefficient of -0.063 for DSO that is statistically

significant at a 1 percent level, indicating that firms with longer collection periods of receivables experience poor performance.

Similarly, we find a negative coefficient of -0.053 for DIO that is statistically significant at the 5 percent level, indicating that the longer firms hold their inventories, the lower the firm performance is. This may be interpreted as a result of having more inventories, reflecting management's optimism about future sales. The remaining working capital measure (DPO--Days Payables Outstanding) has a positive coefficient but is statistically significant.

In Column 3, we add firm-specific factors to our analysis's cash conversion cycle components. In this specification, we find that a longer collection period (DSO) reduces the firm performance. The DSO variable has a coefficient of -0.070 and is statistically significant at a 1 percent level. The remaining two cash conversion cycle components (DIO and DPO) are not statistically significant. Among the firm-specific variables, we find that larger firms with high growth prospects experience better firm performance measured by ROA. For example, the size variable is positive with a coefficient of 0.056 and statically significant at a 1 percent level, indicating that larger firms, on average, experience better firm performance.

Similarly, the GRO variable has a coefficient of 0.004 and is statistically significant at a 10 percent level. We also find that firms with higher leverage perform worse than firms with lower leverage. For example, The LEV variable has a coefficient of -0.121 and is statistically significant at a 5 percent level. In sum, firm-specific variables appear to influence firm performance while employing the working capital measures.

In Column 4, we examine the impact of the components of the cash conversion cycle on firm performance while controlling for country-specific variables. Among them, DIO and DSO remain

inversely related to the firm performance. For example, DSO has a coefficient of -0.058 and is statistically highly significant at a 1 percent level. Similarly, DIO with a coefficient of -0.047 is statistically significant at a 5 percent level. These results support the view that while controlling macroeconomic variables, inventory holdings and receivable collection policies significantly impact firm performance. Among the macroeconomic variables, although all variables have the expected signs, only the inflation variable is statistically significant at the 10 percent level. The CPI variable has a coefficient of -1.204, indicating that inflation hurts firm performance, potentially through its impact on cost and pricing practices.

Finally, in Model 5 (Column 5), we include all components of working capital measures as well as firm-specific and macroeconomic control variables in our model. Among the components of cash conversion variables, DSO continues to be inversely associated with firm performance. DSO has a coefficient of -0.074 and is statistically significant at a 1 percent level. Among the firm-specific control variables, the size, growth, and leverage variables all have the expected signs and statistically significant coefficients. For example, the SIZE variable has a coefficient of 0.064 and is highly statistically significant. Similarly, the GRO variable has a positive coefficient of 0.04 and is statistically significant at a 5 percent level. The LEV variable continues to be inversely related to the firm performance with a coefficient of -0.124. These findings indicate that firm-specific control variables continue to impact firm performance.

Table 6 reports the findings related to including sectors in our analysis. The analysis provides sector dummy variables for the Energy, Materials, Telecommunications, and Utility sectors. The consumer non-cyclical sector is excluded from the regression model to avoid the dummy variable trap and used as the benchmark for interpreting our results. We run three models that include sector

analysis. The adjusted R^2 ranges from 0.077 to 0.179 from Model 1 (with one independent variable) to Model 3 (with ten independent variables). F-values are all statistically significant, indicating that independent variables collectively explain variation in our dependent variable. Column 1 shows the relationship between the cash conversion cycle and firm performance along with the sector dummy variables. The coefficient of CCC is -0.077 but not statistically significant. The second model includes the three components of the cash conversion cycle (DIO, DSO, and DPO) and sector dummy variables. Among these variables, DSO has a coefficient of -0.044 and is statistically significant at a 5 percent level. The remaining variables (DIO and DPO) are not statistically significant. Among the sector variables, we observe significant differences. For example, the Energy sector dummy variable has a coefficient of 0.140 and is statistically significant at a 5 percent level. This indicates that Energy sector firms perform significantly better than the Consumer Non-cyclical sector. Similar results are observed for the telecommunication sector dummy variable with a coefficient of 0.161 at a 5 percent significance level. We don′t see statistically significant results between the Materials and Utilities sectors and the benchmark Consumer Non-cyclical sector.

Finally, we divide the whole sample into sectors and repeat the analysis. We report our findings in Table 7. The five industries include Consumer Non-cyclical, Energy, Materials, Telecommunication, and Utilities. Our results show significant differences in the impact of working capital on firm performance. The adjusted R^2 ranges from 0.113 to 0.765 from the Utilities (Column 5) to Consumer Non-cyclical (Column 1) sector. Among the statistically significant findings, the days in inventory (DIO) is statistically significant at 5 percent for the Consumer Non-cyclical sector with a coefficient of 0.066, indicating longer inventory holdings are associated with

better firm performance. This would make sense for the retail industry, where higher sales expectations by management encourage firms to hold excess inventories. For the telecommunication industry, the DSO (Day Sales Outstanding) variable has a coefficient of -0.162, which is statistically significant at a 5 percent level. These results indicate that longer collection periods negatively influence firm performance in the telecommunication sector. Among the firm-specific control variables, we note that larger firms perform statistically significantly better in the Materials sector. Conversely, smaller firms tend to perform better in the Utility sector. Also, the Leverage variable is inversely related to firm performance in three sectors under consideration: Consumer Non-cyclical, Energy, and Telecommunication. Among the macroeconomic variables under consideration, only the inflation variable has a statistically significant negative impact on the firm's performance in the energy sector.

Overall, among the cash conversion components, DSO (Day Sales Outstanding) appears to be consistently related to the firm performance. Firms should monitor their credit and collection policies regularly to ensure they align with the goals set. A firm′s inability to collect its receivables efficiently causes a drain on the firm′s resources and hurts firm performance. Firms should also avoid excessive inventories in the two models under consideration; we find statistically significant negative relations between the inventory holding period and firm performance. We use firm-specific and country-specific control variables to find that larger and growing firms with lower leverage have better firm performance. Also, higher GDP growth and lower inflation translate to better firm performance. Finally, there are differences between various sectors concerning firm performance. We note that both the Energy and Telecommunication sectors perform significantly

better than the benchmark Consumer non-cyclical sector.

5. SUMMARY AND CONCLUSION

Our research examines the impact of working capital management on corporate performance for a sample of firms traded on the Kazakhstan Stock Exchange (KASE). Previous studies provide mixed results, with each working capital component showing varying influence over a firm's performance. We also integrate both firm-specific factors (firm size, growth, and financial leverage) and macroeconomic variables (inflation, the gross domestic product (GDP) growth rate, and interest rates) to explain the variability of firm performance.

We contribute to the literature in the following ways. First, we add to the growing literature on working capital management using firms in a fast-developing, commodity-rich country. Second, we examine the impact of firm-specific variables, including size, growth, and leverage, on firms' performance. Third, we argue the macroeconomic environment may impact firms' performance and working capital decisions. Hence, our analysis includes country-specific macroeconomic variables, including interest rates, gross domestic product, and inflation.

We find statistically significant differences among our sample's cash conversion cycle measures and firm performance. For example, DSO (receivables) appears to be the most important variable determining the firm performance, followed by DIO (inventories). The DPO (payables) does not appear to influence firm performance in our models. Our further analysis shows that firm-specific variables (growth, size, and leverage) significantly impact firm performance. Specifically, larger firms with higher growth patterns and low leverage perform better than others. Finally, macroeconomic conditions also influence firm performance. Specifically, firms experience higher

returns when economic growth and lower inflation are present. Furthermore, we find statistically significant differences between various sectors and the consumer non-cyclical sector. Specifically, the Energy and Telecommunication sectors perform significantly better than the benchmark Consumer non-cyclical sector.

The implications of our findings for management include the following: Working capital management is crucial for a company's financial health and operational efficiency. It involves managing a company's short-term assets and liabilities to ensure smooth day-to-day operations. Our findings support this view as an inverse relationship exists between the cash conversion cycle and the firm performance measured by ROA. Furthermore, using the components of the cash conversion cycle, our findings imply that a reduced holding period for inventory and a shorter collection period improve firm profitability and performance. Firms must have proper working capital policies, including optimizing operating capital in general and inventory management, accounts receivable, and accounts payable. Efficient management in these areas reduces the cash conversion cycle, enhancing overall efficiency. Furthermore, managing working capital contributes to higher profitability by minimizing excess inventory holding costs, while managing accounts receivable ensures timely cash inflows. Effective receivable management is often viewed positively by investors. It demonstrates a firm's ability to convert sales into cash and manage its financial resources efficiently.

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Table 1. Sample Selection
This table reports the sample selection and distribution by sectors
Panel A: Sample Selection
This table reports the sample selection

	Sample Selection	
Sample	# of Firms	% of Total
Initial sample: KASE Listed Firms	84	100
Less: Financial Firms	20	24
Less: Missing Data (including partial)	41	49
Net Sample	25	30%

Source: FactSet

Panel B: Distribution of firms by sectors
This table reports the sample distributions by sectors

	Sectors distribution	
Sectors	# of Firms	% of Total
Consumer Non-Cyclicals	3	12
Energy	11	44
Materials	6	24
Telecommunications	2	8
Utilities	3	12
Total	25	100.0%

Source: FactSet

Table 2. Variable descriptions

This table provides variable descriptions and the expected signs for independent variables. The dependent variable is ROA. Independent variables include fundamental working capital management variables, firms specific and country-specific control variables.

Variables	Description	Expected sign
ROA	Return on Asset	
Fundamental Working Capital Management Variables:		
CCC	Cash Conversion Cycle	-
DIO	Days Inventory on Hand	-
DSO	Days Sales Outstanding	-
DPO	Days Payable Outstanding	+
Firm-Specific Variables:		
SIZE	Size of the firm measured as Ln of total asset	+
GRO	Growth of the firm measured as 1-year growth rate	+
LEV	Leverage measured as a percentage of long-term debt	+
Country-Specific Variables:		
INTR	Market Interest Rate	+
GDP	Gross Domestic Product	+
CPI	Consumer Price Index	-

Table 3. Summary statistics

This table provides the summary statistics of variables used in the analysis for Kazakhstan. The net sample consisted of 226 firms/years during the 2010-2022 period.

Variables	N	Mean	Median	Std. Dev	Min	Max
ROA	226	0.083	0.071	0.509	-2.123	0.216
CCC	226	72.8	65.4	781.7	-867.6	169.9
DIO	226	85.2	57.0	808.6	4.4	104.7
DSO	226	68.0	43.5	841.6	3.2	99.8
DPO	226	80.5	47.7	1000.0	0.0	121.9
GRO	226	0.500	0.114	71.167	-0.677	4.741
LEV	226	0.207	0.117	1.279	0.000	0.250
SIZE	226	11.208	11.034	16.673	5.156	2.184
CPI	226	0.076	0.074	0.150	0.048	0.025
INTR	226	0.102	0.093	0.168	0.070	0.026
GDP	226	0.036	0.042	0.074	-0.025	0.027

Table 4. Correlation Matrix

This table summarizes the correlation coefficients of variables for the sample. The findings show that correlations are not high and do not influence our interpretations of our findings.

	ROA	CCC	DSO	DSI	DPO	SIZE	LEV	GRO	GDP	CPI	INTR
ROA	1.000										
CCC	-0.083	1.000									
DSO	-0.145	0.374	1.000								
DIO	-0.124	0.691	-0.003	1.000							
DPO	-0.205	0.104	0.641	0.241	1.000						
SIZE	0.204	-0.388	-0.095	-0.403	0.062	1.000					
LEV	-0.127	0.108	0.230	0.021	0.305	0.260	1.000				
GRO	-0.064	0.154	0.222	-0.184	0.057	-0.100	0.151	1.000			
GDP	0.134	-0.075	-0.198	-0.075	-0.272	-0.064	-0.037	0.026	1.000		
CPI	-0.243	-0.054	0.029	-0.013	0.112	0.018	-0.034	-0.022	-0.336	1.000	
INTR	-0.244	-0.033	0.071	-0.006	0.177	0.040	0.023	-0.005	-0.372	0.880	1.000

Table 5. Panel regression analysis

This table reports the impact of working capital management on firm performance using five different models. ROA is used as a dependent variable, while the independent variables include working capital management, firm-specific control, and macroeconomic control variables. We use the Hausman, Chow& Wald, and Breusch-Pagan-LM tests to determine the appropriate form of OLS, Fixed Effect, and Random Effect models to employ.

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
C	0.137*	0.438***	-0.215	0.471***	-0.325
	(1.79)	(3.94)	(-1.09)	(4.29)	(-1.34)
CCC	-0.026*	-	-	-	-
	(-1.75)	-	-	-	-
DIO	-	-0.053**	-0.021	-0.047**	-0.011
	-	(2.60)	(-0.92)	(-2.52)	(-0.427)
DSO	-	-0.062***	-0.070***	-0.058***	-0.074***
	-	(3.51)	(-3.84)	(-3.45)	(-4.03)
DPO	-	0.014	0.006	0.018	0.021
	-	(0.94)	(0.41)	(1.26)	(1.43)
SIZE	-	-	0.056***	-	0.064***
	-	-	(4.03)	-	(3.45)
GRO	-	-	0.004*	-	0.004**
	-	-	(1.97)	-	(2.22)
LEV	-	-	-0.121**	-	-0.124**
	-	-	(-2.64)	-	(-2.71)
INTR	-	-	-	-0.065	0.317
	-	-	-	(-0.11)	(0.53)
GDP	-	-	-	0.346	0.747**
	-	-	-	(1.10)	(2.34)
CPI	-	-	-	-1.204*	-1.34**
				(-1.94)	(2.20)
FE	No	No	No	No	Yes
RE	Yes	Yes	Yes	Yes	No
Adj. R^2	0.014	0.067	0.149	0.136	0.770
N	226	226	226	226	226
F-value	2.56**	5.25***	6.30***	5.68***	23.36***

***, **, * shows the statistical significance at 1%, 5%, and 10% levels respectively.

Table 6. Panel regression analysis with sector dummy variables

This table reports the impact of working capital management on firm performance using five different models. ROA is used as a dependent variable, while the independent variables include working capital management, firm-specific control, and macroeconomic control variables. We use the Hausman, Chow& Wald, and Breusch-Pagan-LM tests to determine the appropriate form of OLS, Fixed Effect, and Random Effect models to employ. The analysis includes the sector dummy variables for Energy, Materials, Telecommunications, and Utility. The consumer non-cyclical sector is excluded from the regression model to avoid the dummy variable trap and is used as the benchmark for interpreting our results.

Variables	Model (1)	Model (2)	Model (3)
C	0.103	0.200*	-0.328*
	(1.11)	(1.84)	(-1.76)
CCC	-0.007	-	-
	(-0.44)	-	-
DIO	-	0.013	0.061**
	-	(0.63)	(2.37)
DSO	-	-0.044**	-0.035*
	-	(-2.36)	(-1.80)
DPO	-	-0.025	-0.018
	-	(-1.61)	(-1.12)
SIZE	-	-	0.027***
	-	-	(3.32)
GRO	-	-	0.005
	-	-	(1.40)
LEV	-	-	-0.178***
	-	-	(-2.88)
ENERGY	0.062	0.140**	0.149**
	(1,27)	(2.53)	(2.62)
MATER	-0.097	-0.016	-1.049
	(-1.62)	(-0.27)	(-0.83)
TELEC	-0.032	0.161**	0.189**
	(-0.40)	(2.13)	(2.43)
UTILITY	0.007	0.065	0.141*
	(0.11)	(0.89)	(1.81)
FE	Yes	Yes	Yes
RE	No	No	No
Adj. R^2	0.077	0.128	0.179
N	226	226	226
F-value	1.84*	2.71**	3.20***

***, **, * shows the statistical significance at 1%, 5%, and 10% levels respectively.

Table 7. Sub-Sector Analysis

This table reports the impact of working capital management on firm performance using five different models. ROA is used as a dependent variable, while the independent variables include working capital management, firm-specific control, and macroeconomic control variables for each sector. The analysis includes the impact of working capital on firm performance for each sector, including Energy, Materials, Telecommunications, and Utility.

Variables	*Consumer Non-cyclical*	*Energy*	*Materials*	*Telecom*	*Utilities*
C	-0.498**	0.501**	-1.129	1.264*	0.462
	(-2.03)	(2.46)	(-1.51)	(1.749)	(1.50)
DIO	0.066**	-0.024	-0.197	-0.057	-0.082
	(2.57)	(-0.90)	(-1.22)	(-0.56)	(-1.69)
DSO	-0.030	-0.010	0.121	-0.162**	0.051
	(-1.57)	(-0.52)	(1.06)	(-2.78)	(1.69)
DPO	0.019	-0.023	-0.054	0.061	0.026
	(0.79)	(-1.51)	(-0.75)	(1.27)	(0.99)
SIZE	0.032	-0.005	0.210***	-0.037	-0.035**
	(1.29)	(-0.64)	(4.66)	(-0.89)	(2.02)
GRO	0.051	0.045	-0.007	0.175	0.016
	(1.50)	(1.16)	(-0.64)	(1.61)	(0.15)
LEV	-0.339***	-0.163**	-0.135	-0.370*	-0.254
	(-4.70)	(-2.55)	(-0.68)	(-1.98)	(-1.42)
INTR	-0.222	0.826	0.031	-1.655	0.877
	(-0.42)	(0.78)	(0.04)	(-1.09)	(0.81)
GDP	-0.089	0.460	0.087	-0.146	-0.412
	(-0.27)	(0.76)	(0.03)	(-0.19)	(-1.26)
CPI	0.258	-2.353**	-4.758	0.982	-1.412
	(0.45)	(2.13)	(-070)	(0.65)	(-1.26)
FE	No	No	No	No	No
RE	No	No	No	No	No
Adj. R^2	0.765	0.223	0.627	0.738	0.113
N	30	106	28	25	33
F-value	11.5***	4.35***	6.05***	8.49***	1.45

***, **, * shows the statistical significance at 1%, 5%, and 10% levels respectively.