

Effect of Exchange Rate Volatility and Working Capital Management Strategies on Profitability with Special Reference to LuSE Listed Manufacturing Firms (2010-2023)



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ABSTRACT: Manufacturing activity in Sub-Saharan African countries, including Zambia, remain insufficient to meet growth and development goals, particularly as the 2030 UN-SDGs milestone approaches. Investment in manufacturing is influenced by the sector's profitability, heavily impacted by firms' financial management. This study investigates the impact of working capital management (WCM) strategies on the profitability of manufacturing companies listed on the Lusaka Securities Exchange (LuSE), with a focus on the moderating effect of exchange rate volatility. The objectives of study were to establish the impact of working capital management strategies on the profitability of LuSE-listed manufacturing firms from 2010-2023, to explore how exchange rate volatility moderates this relationship, and to compare the effectiveness of different strategies in mitigating volatility's negative impact. The research employed a quantitative approach, utilizing multiple data sources for triangulation. Primary data was collected using questionnaires and feedback was received from 80 respondents in finance and management roles within LuSE-listed manufacturing firms, selected through quota sampling. Secondary data, covering the period 2010-2023 was sourced from annual reports for WCM and Return on Assets (ROA) data, while exchange rate volatility data were obtained from the Bank of Zambia. Data analysis involved descriptive statistics, correlation analysis, and panel regression models. The primary data analysis revealed that inventory management is perceived as the most effective WCM strategy for enhancing profitability despite its high vulnerability to exchange rate volatility. Receivables and payables management showed mixed impacts on profitability, indicating their effectiveness depends on external economic factors. Secondary data analysis using fixed effects and dynamic panel data models showed that exchange rate volatility significantly moderates the relationship between WCM components and profitability. Specifically, receivables management exhibited a negative impact on profitability in the presence of exchange rate fluctuations, while inventory management remained an effective strategy. The study's findings align with existing literature that has found a positive correlation between efficient WCM and profitability, as well as studies that have highlighted the significant moderating role of exchange rate volatility on firm performance in the context of effectiveness of WCM strategies. The research provides valuable insights for managers, suggesting that prioritizing inventory management and developing robust risk management strategies can mitigate the adverse effects of exchange rate volatility.

KEYWORDS: Working Capital Management, Exchange Rate Volatility, Lusaka Securities Exchange, Profitability, Manufacturing Firms

1. INTRODUCTION

Financial management decisions guide corporations toward stability and growth by effectively allocating resources, managing risks, and optimizing investments. These decisions impact a company's financial health, its ability to create jobs, contribute to economic development, and generate wealth for stakeholders (Chansa F. M.-2., pp. Mubanga, Mudenda & Ndulo, 2019). They also influence market confidence, investor trust, and overall economic stability, shaping the socioeconomic landscape of communities and nations (Mulungu K. & -2., pp. & Ng'ombe, 2017). Consequently, there is extensive research on how different financial management areas affect corporate performance. Working capital management strategies and their association with business profitability are of particular interest but often yield conflicting results (Enow S. T.-A.-1., pp. , 2022; Habib & Huang, 2018). From the Zambian context, this study is of paramount import in view of the fact that the country in its Vision 2030 envisions itself as a "strong and dynamic middle-income industrial nation that provides opportunities for improving the well-being of all, embodying values of socio-economic justice (Sichoongwe, Thompson, & Hapompwe, 2021), and industrialization is pivotal to Africa's long-term socio-

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economic development, and ... deepening the manufacturing sector will build more resilient economies which will automatically sustain the growing populations (Hapompwe, Banda, & Chalwe, 2024). Recent research has explored this relationship within the context of financial market volatilities, focusing on interest rates and exchange rates (Emre K. U.-3., pp. Emre & Derekoy, 2020; (Dhole S. M.-b.-B., pp. Mishra, & Pal, 2019); (Karim S. U.-3., pp. Umrie, Bakar, & Robiyanto, 2021)) This focus is important given the globalization of the business environment, which implies that all businesses may be affected by exchange rates, whether directly involved in imports/exports or not (Eun C. &, pp. & Resnick, 2014). In smaller economies that are typically import-dependent, exchange rate volatility exacerbates financial uncertainty and risk, leading to more profit fluctuations (Hussain S. A.-s., pp. et al., 2024); (Emre K. U.-3., pp. Derekoy, 2020). Studies suggest that exchange rate volatility can detrimentally affect firm profitability. Uncertainty surrounding future cash flows, exacerbated by fluctuating exchange rates, impedes efficient working capital management, leading to negative outcomes for firms. This challenge is especially pronounced for companies engaged in international operations or reliant on imported supplies, as they are more exposed to currency risk (Bolek M. (-F.-1., pp. .M, 2013). Consequently, effective working capital management strategies are imperative in mitigating the adverse effects of exchange rate volatility (Khan N. U., pp. , Alam, & Syed, 2021.) Firms adopting proactive measures to address these challenges may see profitability improvements compared to those that do not (Amponsah-Kwatiah K. &.-1., pp. & Asiamah, 2021) as entrepreneurship is generally affected by is affected by scarcity of resources such as land, labour, natural resources, and capital (Chivwindi, Hapompwe, & Banda, 2023). Research suggests that exchange rate volatility disproportionately affects specific working capital management elements ((Dhole S. M.-b.-B., pp. Mishra, & Pal, 2019). Fluctuations in exchange rates can disrupt inventory management by causing variations in the cost of imported raw materials and finished goods, making it challenging to maintain optimal inventory levels ((Ndonye P. K., pp. , 2021) Managing accounts receivable also becomes more complex with fluctuating currencies, complicating cash flow management ((Habib A. &.-3., pp. & Huang, 2018). These findings justify more empirical research to establish the relationship between working capital management and firm profitability in volatile exchange rate contexts. In Zambia, an import-dependent country, exchange rate volatility against major convertible currencies like the US Dollar has been notable for a long time ((Mulungu K. &.-2., pp. & Ng'ombe, 2017). Throughout the late 2010s and early 2020s, the Kwacha experienced persistent volatility. Fiscal challenges persisted as the government struggled to control spending and raise revenue ((Haabazoka L. &, pp. & Kaulu, 2023). Additionally, a global economic slowdown and the COVID-19 pandemic further exacerbated the Kwacha's depreciation. As of 2023, there has been limited improvement in the Kwacha's stability ((Brautigam D. (-1., pp. , 2022). Despite government efforts to address fiscal imbalances and implement economic reforms, challenges remain with significant fluctuations in the local currency. The Lusaka Securities Exchange (LuSE) was established by the Securities Act of 1993 (Act 38 of 1993), provides a legal framework for Zambia's securities industry (Haabazoka L. &, pp. & Kaulu, 2023). LuSE-listed manufacturing firms are of interest as major players in Zambia's economy, with their profitability being crucial to investors and managers. The sector faces challenges that have stifled its growth below potential (Almas L. K.-1., pp. & Obembab, 2014). Persistent volatility of the Zambian Kwacha against major currencies like the USD has significantly impacted businesses, particularly LuSE-listed manufacturing firms (Chansa F. M.-2., pp. Mubanga, Mudenda, & Ndulo, 2019). Exchange rate fluctuations introduce financial uncertainty and risk, hindering efficient management of working capital components such as inventory and receivables ((Enow S. T.-A.-1., p. 2022). Despite the importance of this issue, there remains a gap in understanding how exchange rate volatility moderates the relationship between working capital management strategies and profitability in Zambia.

1.1. Research Problem

Persistent volatility of the Zambian Kwacha against major currencies like the United States Dollar has been a defining feature from 2010 to 2023 (Haabazoka & Kaulu, 2023). This volatility, driven by factors such as fluctuating copper prices and widening budget deficits, has significantly impacted businesses, particularly LuSE-listed manufacturing firms (Chansa, Mubanga, Mudenda, & Ndulo, 2019). Although theoretical assertions link effective working capital management to enhanced profitability, empirical studies have presented mixed findings (Enow, 2022). Recent research suggests exchange rate volatility as a potential moderator in this relationship; however, there is a notable gap in empirical research specifically exploring this moderating effect (Sunday, 2018; Emre & Derekoy, 2020; Hussain, Hassan, Quddus, & Rafiq, 2021). Failure to address this issue could lead to severe consequences for the Zambian manufacturing sector, which is crucial for the country's industrialization goals (Chansa, Mubanga, Mudenda, & Ndulo, 2019). Exchange rate fluctuations introduce financial uncertainty and risk, hindering the efficient management of working capital components such as inventory and receivables (Enow, 2022). This research aims to fill a gap in understanding how exchange rate volatility influences working capital management strategies and profitability in Zambia's manufacturing sector.

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1.2. Objectives

- 1.2.1. To examine the individual effects of working capital management strategies on the profitability of LuSE-listed manufacturing firms for the period 2010-2023 measured by the ROA.
- 1.2.2. To investigate how exchange rate volatility moderates the relationship between working capital management strategies and profitability of LuSE-listed manufacturing firms for the period 2010-2023 measured by the ROA.
- 1.2.3. To compare the effectiveness of different working capital management strategies in mitigating the negative impact of exchange rate volatility on the profitability of LuSE-listed manufacturing firms for the period 2010-2023 measured by the ROA

1.3. Hypotheses

Hypothesis 1

H1a: Receivables management (e.g., stricter credit policies) has a negative impact on ROA.

H1b: Inventory management (e.g., just-in-time inventory practices) has a positive impact on ROA.

H1c: Payables management (e.g., negotiating longer payment terms) has a positive impact on ROA.

H1d: A shorter cash conversion cycle has a positive impact on ROA.

Hypothesis 2

H2a: Exchange rate volatility significantly strengthens the negative impact of receivables management on ROA.

H2b: Exchange rate volatility significantly weakens the positive impact of inventory management on ROA.

H2c: Exchange rate volatility significantly weakens the positive impact of payables management on ROA.

H2d: There is a statistically significant moderating effect of exchange rate volatility on the relationship between cash conversion cycle and ROA.

Hypothesis 3

H3: Inventory management is more effective than other working capital management strategies in mitigating the negative impact of exchange rate volatility on ROA.

2. LITERATURE REVIEW

The relationship between working capital management (WCM) and firm profitability has been extensively studied, particularly within emerging economies. Two significant theories provide a foundation for understanding this relationship: Trade-off Theory and the International Finance Theory. This review critically examines the findings from various studies, focusing on their similarities, differences, and implications within these theoretical frameworks. The Trade-off Theory suggests a balance between liquidity and profitability, proposing that firms must manage their working capital to maximize returns while maintaining sufficient liquidity. Efficient WCM involves optimizing the levels of receivables, inventory, and payables to enhance profitability without compromising liquidity. Conversely, the International Finance Theory posits that external factors, such as exchange rate volatility, significantly impact firm performance. This theory explains how firms adjust their WCM practices in response to currency fluctuations to sustain profitability. Several studies consistently indicate that efficient WCM positively impacts profitability. For instance, Chang (2022) found that shorter Days Sales Outstanding (DSO) and Days Inventory Outstanding (DIO) correlate with higher profitability, while longer Days Payable Outstanding (DPO) can harm financial performance due to potential strains on supplier relationships. Similarly, (Ukaegbu B. (-1., pp. ,2014) and (Amponsah-Kwatiah K. & -1., pp. & Frimpong ,2019) revealed a negative correlation between the Cash Conversion Cycle (CCC) and profitability, suggesting that quicker conversion of working capital into cash enhances liquidity and financial performance. However, (Bolek M. (-F-1., p. 2013) warns against a one-size-fits-all approach to WCM, suggesting that overly aggressive strategies might not suit all firms. This view is echoed by studies like those by (Gołaś Z. (-2., p. 2020) and (Alvarez, pp. Sensini and Vazquez ,2021) who emphasize that the impact of WCM on profitability varies significantly across different sectors and contexts. The moderating effect of exchange rate volatility on the relationship between WCM and profitability is another critical area of focus. Hussain et al. (2021) found that exchange rate volatility significantly moderates the link between CCC and firm performance. They showed that while short-term effects might be positive, long-term currency fluctuations can adversely impact profitability due to increased costs and pricing instability. This finding underscores the need for firms engaged in international transactions to adopt robust financial management strategies to mitigate the risks associated with exchange rate volatility. (Egbunike C. F-1., pp. & Okerekeoti ,2018) supported this view, demonstrating a significant negative relationship between exchange rate volatility and firm profitability in Nigerian manufacturing firms. Their findings indicated that high levels of exchange rate fluctuations lead to decreased profitability due to increased costs of imported raw materials and pricing instability. This suggests that effective hedging strategies and financial planning are crucial for firms operating in volatile exchange rate environments. The impact of WCM on profitability also varies significantly across different industries. (Gołaś Z. (-2., p. 2020) found

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that efficient management of working capital components positively impacts profitability in the manufacturing sector, especially for SMEs. This highlights the sector-specific nuances that influence the effectiveness of WCM strategies. Similarly, (Alvarez, pp. Sensini and Vazquez ,2021)examined manufacturing companies in Chile and found a significant positive correlation between all components of working capital and profitability. Their study suggests that efficient WCM enhances profitability, although the extent of this impact can vary based on industry-specific factors.Despite the extensive research, several gaps persist. Many studies focus on specific countries or sectors, limiting the generalizability of their findings. For instance, findings from Pakistani manufacturing firms may not directly apply to firms in other regions or industries. Additionally, while studies like those by Hussain et al. (2021) and Karim et al. (2021) provide insights into exchange rate volatility's impact on firm performance, their focus on regions outside Zambia leaves a gap in understanding how such volatility affects firms listed on the Lusaka Stock Exchange (LuSE).Moreover, while studies have considered various macroeconomic factors, there is limited research examining the efficacy of different WCM strategies in mitigating the adverse effects of exchange rate fluctuations on firm profitability. This gap points to the need for more targeted studies that explore how specific WCM practices can buffer firms against the risks posed by volatile exchange rates. The findings from these studies have several practical implications for managers and policymakers. First, managers should adopt tailored WCM strategies that consider their specific industry and market conditions. This includes balancing liquidity and profitability effectively to enhance financial performance. Second, firms engaged in international transactions should develop strategies to hedge against exchange rate risks. This could involve using financial instruments to stabilize costs and revenues amidst volatile exchange rates. Lastly, policymakers should create supportive environments that facilitate efficient WCM. This includes stable economic policies and regulatory frameworks that reduce uncertainty and allow firms to plan and manage their finances effectively.Therefore, the relationship between WCM and firm profitability is multifaceted, influenced by industry-specific factors, firm characteristics, and macroeconomic variables such as exchange rates. The International Finance Theory and Trade-off Theory provide valuable frameworks for understanding these dynamics. While efficient WCM generally enhances profitability, the impact of exchange rate volatility and other external factors varies across contexts. Future research should focus on addressing the identified gaps, particularly by exploring the manufacturing sector in under-researched regions like Zambia. Additionally, there is a need for more studies examining the interplay between various WCM strategies and macroeconomic variables, providing firms with actionable insights to navigate the complexities of global business environments.

3. METHODOLOGY

This study adopts a quantitative and correlational research approach to investigate the relationship between working capital management strategies, exchange rate volatility, and profitability of LuSE-listed manufacturing firms in Zambia (Lau, 2016). Rooted in the positivist philosophical perspective, the quantitative method allows for systematic examination and empirical analysis of these variables (Afrifa G. A.-5., pp. Tauringana, & Tingbani, 201). The research focuses on data from 2010 to 2023 to capture significant economic fluctuations and exchange rate movements in Zambia. Positivism asserts the existence of an objective reality that can be observed and measured, guiding the study towards neutrality and the identification of universal laws governing the phenomena (Azungah T. (-4., p. 2018)The sampling frame includes all LuSE-listed manufacturing firms in Zambia, chosen for their economic significance and regulatory environment (LuSE, 2024). This targeted approach enhances comparability and reduces confounding variables typical of cross-industry comparisons (Afrifa G. A.-5., pp. Tauringana, & Tingbani, 2014). Nine manufacturing firms listed on LuSE were studied, with a target sample size of 80, ensuring robust statistical power. Secondary data collection relied on annual reports and financial statements spanning 2010-2023, providing comprehensive insights into financial performance and management practices ((Emre K. U.-3., pp. & Derekoy, 2020). Exchange rate data, sourced from the Bank of Zambia, supplemented this analysis, crucial for understanding financial dynamics in a manufacturing sector reliant on exports ((Amponsah-Kwatiah K. &-1., pp. & Asiamah, 2021). Primary data was collected through semi-structured questionnaires from finance staff/managers at each firm. Quantitative techniques such as correlation analysis, multiple regression, and time series analysis were employed to explore relationships and test hypotheses (Lau, 2016). These methods allow for rigorous examination of how working capital management strategies and exchange rate volatility influence profitability in LuSE-listed manufacturing firms.

4. RESULTS

4.1. Secondary Data Presentation and Analysis

In Table 1 below, the variables that were used in this part of the study were the ROAs, Days Sales Outstanding, Days Payables Outstanding, Days Sales of Inventory, Cash Conversion Cycle (CCC) and exchange rate volatility. The summary statistics for the variables are presented in the table below. The mean ROA was 0.0569 with a standard deviation of 0.1325, indicating substantial

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variability. The DSO and DPO averaged 45.49 and 35.57 days, respectively. The DSI had a mean of 8.01 days, while the CCC averaged 48.60 days. FXVOL showed a mean of 0.017 with notable variability

Table 1: Descriptive Statistics for Variables in the Study

Variable	Obs.	Mean	Std. Dev.	Min	Max
ROA	112	0.0568901	0.132461	-0.40339	0.48039
DSO	112	45.49286	14.8886	25.9	75.1
DPO	112	35.57054	14.92618	10.5	64.1
DSI	112	8.010714	4.686234	2	36.2
CCC	112	48.60357	33.72384	2.5	117.7
FXVOL	112	0.0169558	0.0373552	0.0001675	0.1435716

Source: Field Data (2024)

Figure 1 below shows the plot for the dependent variable (i.e., ROA) across the firms over the period of interest. The results in Figure 2 below show that the firms have experienced highly unstable profitability over the period 2010-2023. This may reflect the influence of difficult operating conditions over the period and the results of different financial management practices including those relating to working capital management. The findings in this regard offered empirical justification for this study.

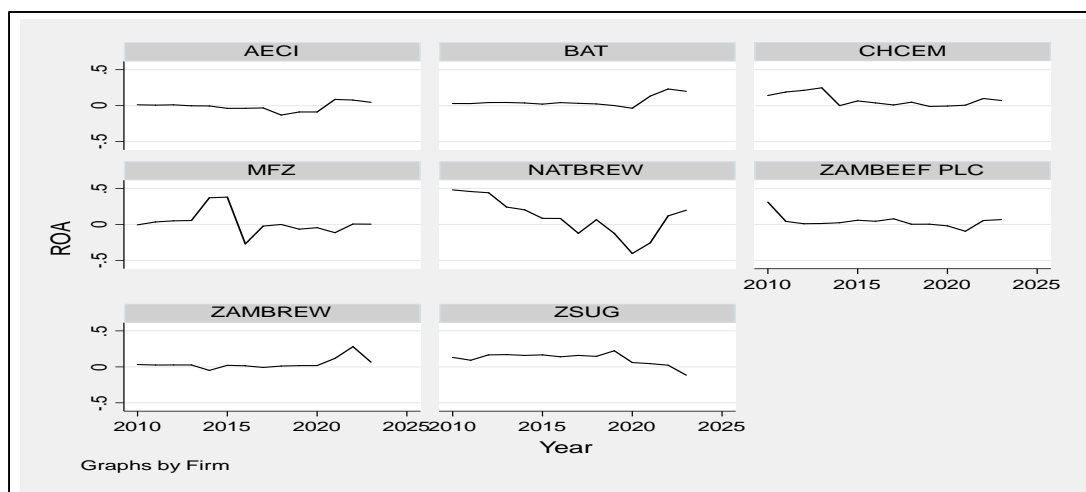


Figure 1 ROAs of Sampled LuSE listed Manufacturing Firms (2010-2023)

Source: Field Data (2024)

Figure 2 captures the data showing volatility of exchange rates over the period 2010 to 2023. The graph shows that there was relative stability in the rates from 2010 before significant swings after 2015.

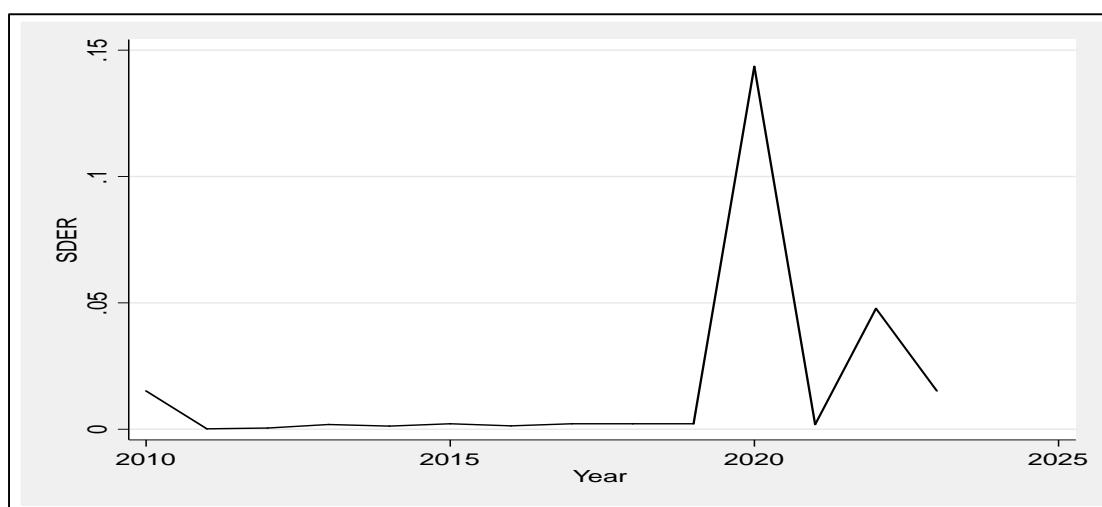


Figure 2: Exchange Rate Volatility (2010-2023)

Source: Field Data (2024)

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Figure 3 captures the data on the receivables management of the firms as indicated by their DSO ratios. The results suggest that all the firms adopted relatively stable policies as indicated by their DSOs.

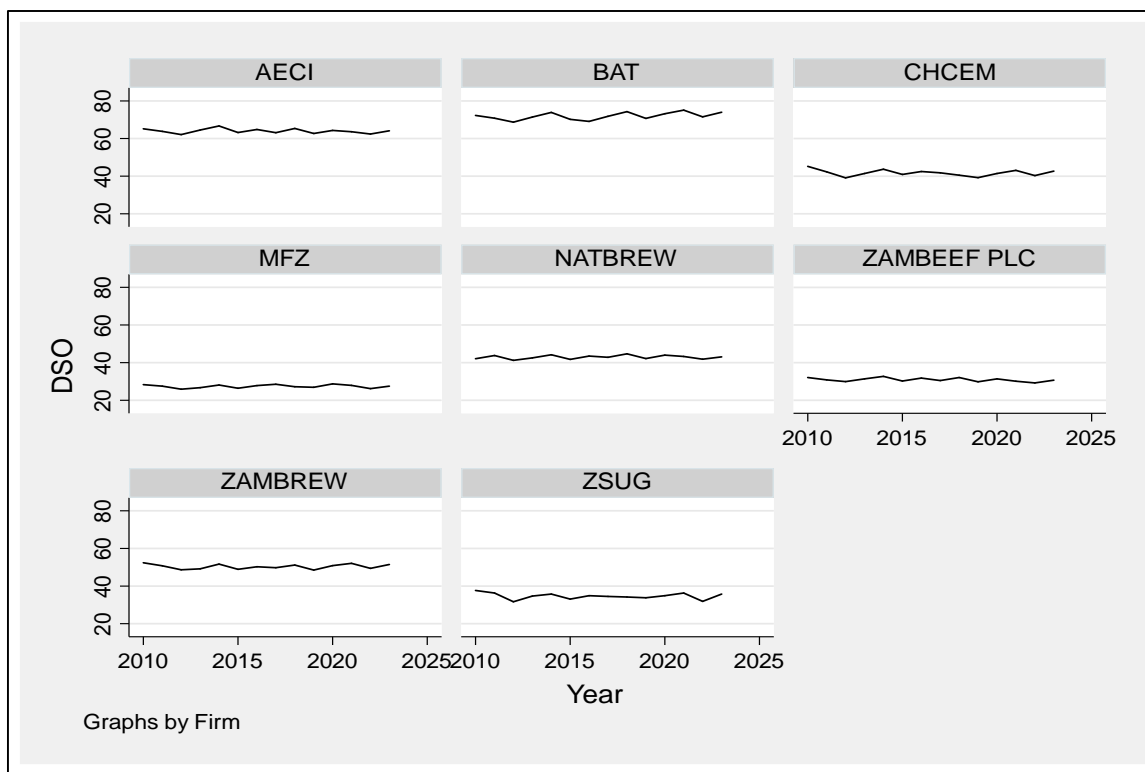


Figure 3: Receivables Policy (DSO) 2010-2023

Source: Field Data (2024)

Figure 4 shows the payables policies of the firms as represented by their DPOs. Similar to the DSOs, the firm level DPOs showed stability on the graph.

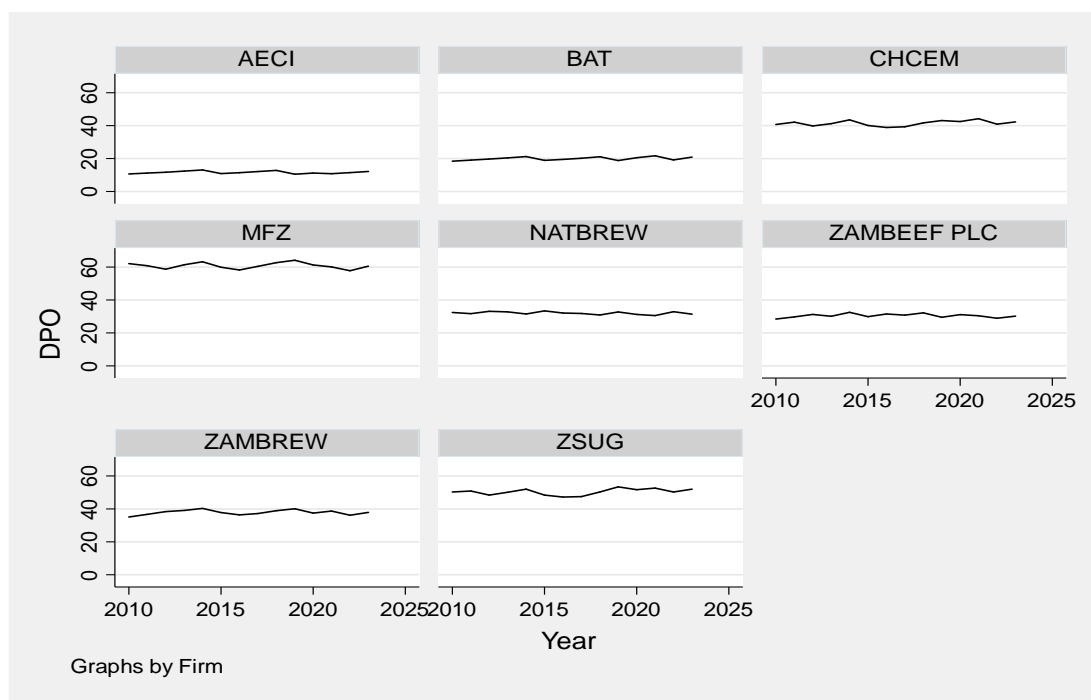


Figure 4: Payables Policy (DPO) 2010-2023

Source: Field Data (2024)

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Figure 5 shows the inventory management of the firms as captured by their DSIs. The results suggest stability in the policies although there was some notable difference in pattern for short timeframes amongst some of the firms.

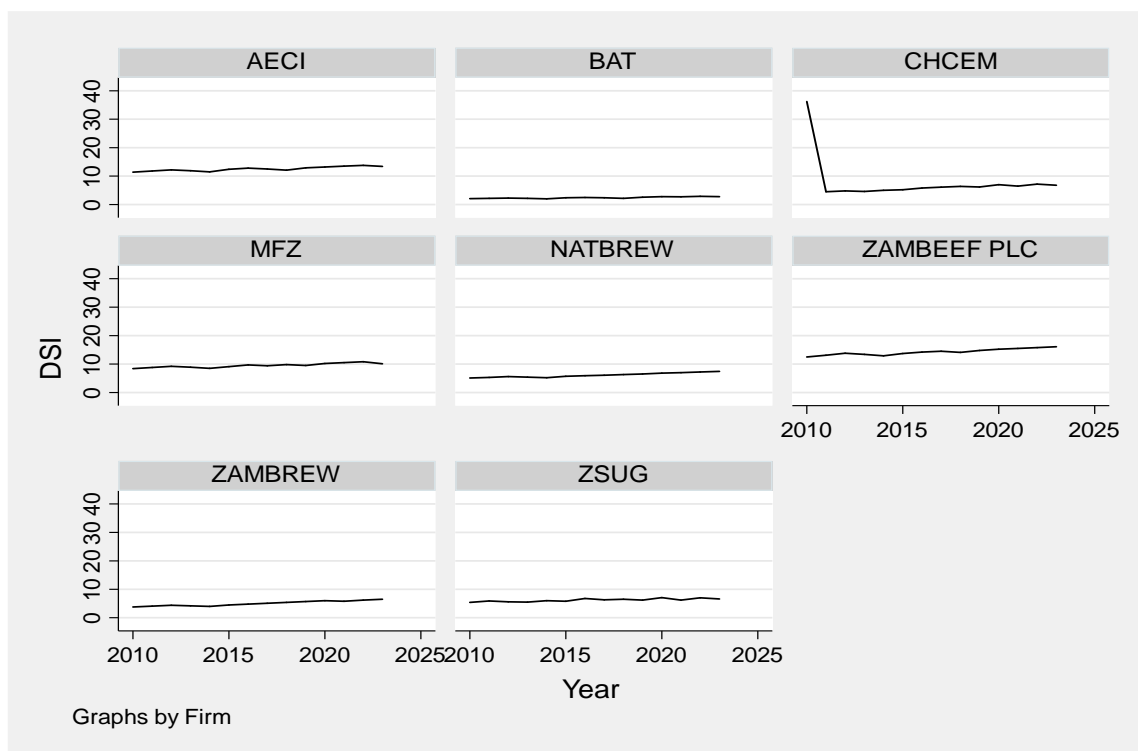


Figure 5: Inventory Management (DSI) 2010-2023

Source: Field Data (2024)

Figure 6 shows the data that was collected vis-à-vis the overall working capital management policies of the firms as indicated by the CCCs. The graphs also show relatively stable positions in the ratios.

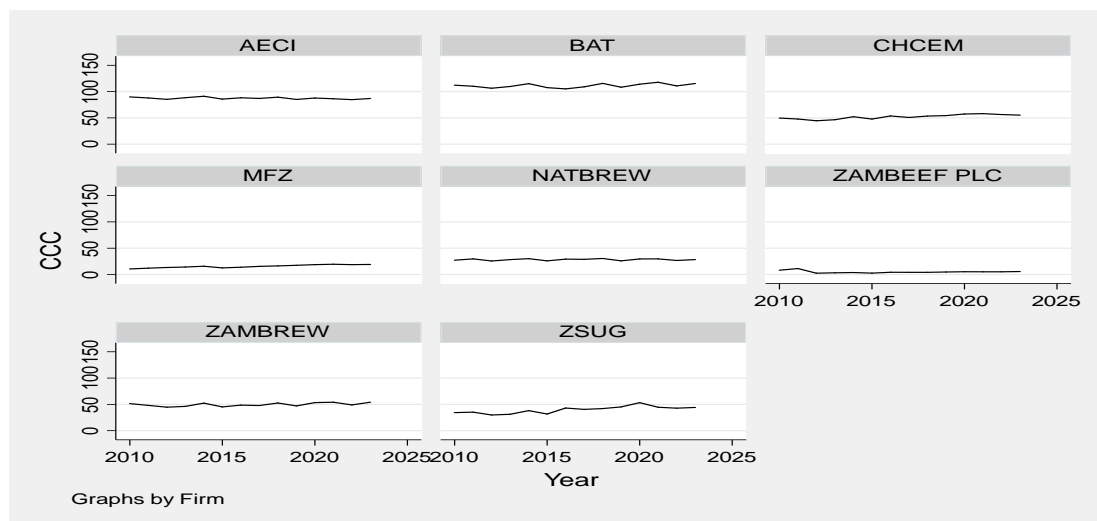


Figure 6: Overall Working Capital Management (CCCs) 2010-2023

Source: Field Data (2024)

Prior to panel empirical model estimations, the correlations amongst the study variables were tested based on pairwise correlations as presented in the matrix below in **Table 2**. The results show that there was significant negative correlation between the DSO and the DPO (p -value=0.0000 for the coefficient -0.7923). There was also negative correlation but of a lower magnitude between the DSO and the DSI (p -value=0.0013 for the coefficient of -0.2994). There was strong positive correlation between the

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DSO and the CCC (p-value= 0.000 for the correlation coefficient of 0.9452). Likewise, the CCC had statistically significant negative correlations with the DPO and the DSI.

Table 2: Correlations Amongst Variables

	roa	dso	dpo	dsi	ccc	sder	sig
roa	1.0000						
dso	-0.0941	1.0000					0.3239
dpo	0.1082	-0.7923	1.0000				0.2560
dsi	-0.1422	-0.2994	-0.0807	1.0000			0.1347
ccc	-0.0823	0.9452	-0.6373	-0.3518	1.0000		0.3884
sder	-0.1995	0.0065	-0.0002	0.0663	0.0347	1.0000	0.0349
		0.9457	0.9985	0.4873	0.7161		

Source: Field Data (2024)

Before estimating the empirical models that could be used to address research hypotheses, the data that was compiled was subjected to stationarity tests as well as tests for empirical model specifications. To test whether the data was stationary and therefore suitable for empirical model estimations in the form observed, the Levin-Lin-Chu (LLC) unit root test for panel data was used. Table 3 shows the results that were obtained. The results showed that all variables were stationary apart from the ROA and the inconclusive results for the DSI. Differencing the ROA and running the test yielded a LLC adjusted t-statistic of -3.6772 with p-value=0.0001 indicating that the procedure helped the series achieve stationarity. Results for the DSI remained the same after first differencing.

Table 3: Summary of LLC unit Root Test for Panel Data

Variable	Adjusted t	p-value	Conclusion
ROA	-0.4152	0.3390	Unit Root in Panels
DSO	-9.2797	0.0000	No Unit Root in Panels
DPO	-5.4067	0.0000	No Unit Root in Panels
DSI	6.9830	1.0000	Inconclusive
CCC	-4.4241	0.0000	No Unit Root in Panels
SDER	-1.8980	0.0288	No Unit Root in Panels

Source: Field Data (2024)

The empirical models were estimated using Regression with Panel Corrected Standard Errors. **Table 5** shows the empirical model that was estimated to predict ROA based on the individual working capital regressors i.e., DSO, DPO and DSI. The table show that the resulting model was a poor fit for the data given the R-squared value of 0.0433. Of the coefficient estimates, only the DSI had a negative and statistically significant factor of -0.0063 with p-value=0.033 i.e., statistically significant at the 5% level.

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Table 4: Empirical Model 1: ROA, DSO, DPO and DSI

```
. xtpcse roa dso dpo dsi
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Linear regression, correlated panels corrected standard errors (PCSEs)

```
Group variable:  FIRM                    Number of obs    =    112
Time variable:   year                    Number of groups =     8
Panels:          correlated (balanced)   Obs per group:
Autocorrelation: no autocorrelation               min =    14
                                                avg  =    14
                                                max  =    14
Estimated covariances    =    36           R-squared        =    0.0433
Estimated autocorrelations =    0           Wald chi2(3)     =    9.77
Estimated coefficients    =    4           Prob > chi2      =    0.0206
```

roa	Panel-corrected				
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
dso	-.0021238	.0017811	-1.19	0.233	-.0056148 .0013671
dpo	-.0008768	.0016746	-0.52	0.601	-.004159 .0024053
dsi	-.006266	.0029441	-2.13	0.033	-.0120363 -.0004956
_cons	.2348928	.1657651	1.42	0.156	-.0900008 .5597864

Source: Field Data (2024)

Individual models to assess the effects of each working capital management component were also estimated prior to exchange rate volatility potential moderator analysis. Table 5 shows the results of empirical model 2 that involved only the ROA and the DSO. The coefficient for the DSO was negative but statistically insignificant (p-value=0.322).

Table 5: Empirical Model 2: ROA and DSO Only

```
Linear regression, correlated panels corrected standard errors (PCSEs)
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```
Group variable:  FIRM                    Number of obs    =    112
Time variable:   year                    Number of groups =     8
Panels:          correlated (balanced)   Obs per group:
Autocorrelation: no autocorrelation               min =    14
                                                avg  =    14
                                                max  =    14
Estimated covariances    =    36           R-squared        =    0.0088
Estimated autocorrelations =    0           Wald chi2(1)     =    0.98
Estimated coefficients    =    2           Prob > chi2      =    0.3217
```

roa	Panel-corrected				
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
dso	-.0008368	.0008444	-0.99	0.322	-.0024919 .0008182
_cons	.0949598	.0463624	2.05	0.041	.0040912 .1858284

Source: Field Data (2024)

Table 6 shows the results of empirical model 3 estimation that involved only the DPO as the predictor for the ROA. The results show a positive coefficient for the DPO which was however not statistically significant given p-value=0.241.

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In **Table 8**, Empirical model 5, ROA is dependent only on CCC. The results however show a negative but statistically insignificant coefficient (p-value=0.379).

Table 8 Empirical Model 5: ROA and CCC

Linear regression, correlated panels corrected standard errors (PCSEs)						
Group variable:	FIRM		Number of obs	=	112	
Time variable:	year		Number of groups	=	8	
Panels:	correlated (balanced)		Obs per group:			
Autocorrelation:	no autocorrelation		min	=	14	
			avg	=	14	
			max	=	14	
Estimated covariances	=	36	R-squared	=	0.0068	
Estimated autocorrelations	=	0	Wald chi2(1)	=	0.78	
Estimated coefficients	=	2	Prob > chi2	=	0.3786	
roa	Panel-corrected					
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
ccc	-.0003232	.000367	-0.88	0.379	-.0010426	.0003962
_cons	.0725982	.0297231	2.44	0.015	.014342	.1308543

Source: Field Data (2024)

In **Table 9**, the empirical model predicting ROA based on DSO and the interaction between DSO and exchange rate volatility is estimated. The results show that both the regressors had negative coefficients. However, the interaction between DSO and exchange rate volatility had a statistically significant effect on ROAs of the LuSE listed manufacturing firms over the period. It suggested that higher values for DSO with greater volatility in exchange rates would significantly lower ROAs of the firms.

Table 9: Model 6: ROA, DSO and Exchange Rate Volatility

Linear regression, correlated panels corrected standard errors (PCSEs)						
Group variable:	FIRM		Number of obs	=	112	
Time variable:	year		Number of groups	=	8	
Panels:	correlated (balanced)		Obs per group:			
Autocorrelation:	no autocorrelation		min	=	14	
			avg	=	14	
			max	=	14	
Estimated covariances	=	36	R-squared	=	0.0389	
Estimated autocorrelations	=	0	Wald chi2(2)	=	3.96	
Estimated coefficients	=	3	Prob > chi2	=	0.1379	
roa	Panel-corrected					
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dso	-.0006085	.0008829	-0.69	0.491	-.002339	.001122
DSOFXVOL	-.0127457	.0072944	-1.75	0.081	-.0270424	.001551
_cons	.0944512	.0463393	2.04	0.042	.0036278	.1852746

Source: Field Data (2024)

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Table 10 shows similar analysis in relation to Model 7 which regressed ROAs of the firms against the DPO and the interaction term between DPO with the exchange rate volatility indicator. The DPO in the model had the expected sign i.e., positive as increasing DPO stretches the benefits of the interest free financing of working capital represented by payables. However, the coefficient for the DPO was statistically insignificant (p-value=0.140. The interaction term showed that greater volatility in exchange rates combined with longer DPOs would erode the ROAs of the firms. The negative coefficient for the interaction term was statistically significant at the 10% level (p-value=0.084). Table 12 offers similar analysis in relation to the DSI. The results in the table show negative coefficients for the DSI and the interaction term between the DSI and exchange rate volatility, suggesting that higher values for both lower the ROAs of the firm. However, both coefficients were statistically insignificant at the 10% level (p-values=0.113 and 0.133 respectively).

Table 10: Empirical Model 7: ROAs, DPO and Exchange Rate Volatility

Linear regression, correlated panels corrected standard errors (PCSEs)						
Group variable:	FIRM		Number of obs	=	112	
Time variable:	year		Number of groups	=	8	
Panels:	correlated (balanced)		Obs per group:			
Autocorrelation:	no autocorrelation		min	=	14	
			avg	=	14	
			max	=	14	
Estimated covariances	=	36	R-squared	=	0.0468	
Estimated autocorrelations	=	0	Wald chi2(2)	=	4.30	
Estimated coefficients	=	3	Prob > chi2	=	0.1167	

roa	Panel-corrected					
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dpo	.0012541	.0008493	1.48	0.140	-.0004106	.0029188
DPOFXVOL	-.0170938	.0098971	-1.73	0.084	-.0364917	.0023042
_cons	.0225892	.0323225	0.70	0.485	-.0407617	.0859401

Source: Field Data (2024)

Table 11 Empirical Model 8: ROA, DSI and Exchange Rate Volatility

Group variable:	FIRM		Number of obs	=	112	
Time variable:	year		Number of groups	=	8	
Panels:	correlated (balanced)		Obs per group:			
Autocorrelation:	no autocorrelation		min	=	14	
			avg	=	14	
			max	=	14	
Estimated covariances	=	36	R-squared	=	0.0438	
Estimated autocorrelations	=	0	Wald chi2(2)	=	7.80	
Estimated coefficients	=	3	Prob > chi2	=	0.0202	

roa	Panel-corrected					
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
dsi	-.0027864	.0017584	-1.58	0.113	-.0062327	.0006599
DSIFXVOL	-.0589445	.0392534	-1.50	0.133	-.1358797	.0179907
_cons	.0878957	.0199295	4.41	0.000	.0488346	.1269568

Source: Field Data (2024)

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Finally, **Table 12** provides the overall picture in relation to the CCC as an amalgamation of the working capital management policies of the firm, and their interaction with exchange rate volatility in terms of ROA effects. The results in the table also had the expected negative signs but the estimated coefficients were not statistically significant (p-values=0.614 and 0.131 respectively).

Table 12 Empirical Model 9: CCC, Exchange Rate Volatility and ROAs

Linear regression, correlated panels corrected standard errors (PCSEs)						
Group variable:	FIRM	Number of obs	=	112		
Time variable:	year	Number of groups	=	8		
Panels:	correlated (balanced)	Obs per group:				
Autocorrelation:	no autocorrelation	min	=	14		
		avg	=	14		
		max	=	14		
Estimated covariances	=	36	R-squared	=	0.0197	
Estimated autocorrelations	=	0	Wald chi2(2)	=	3.04	
Estimated coefficients	=	3	Prob > chi2	=	0.2185	
Panel-corrected						
roa	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
ccc	-.0002004	.0003976	-0.50	0.614	-.0009798	.0005789
CCCFXVOL	-.0065397	.00433	-1.51	0.131	-.0150262	.0019469
_cons	.0723052	.029653	2.44	0.015	.0141864	.1304239

Source: Field Data (2024)

Table 13 provides a summary of the hypothesis test results based on the analysis of secondary data. The empirical analysis reveals mixed support for the hypotheses regarding working capital management's impact on ROA. Receivables management shows no significant effect on ROA without considering exchange rate volatility but has a negative and significant interaction with it. Inventory management consistently shows a negative impact on ROA, contrary to expectations. Payables management displays a positive but insignificant impact, with exchange rate volatility weakening this effect. The cash conversion cycle's impact on ROA remains insignificant. Exchange rate volatility significantly moderates receivables and payables management's effects, but inventory management does not outperform other strategies in mitigating its negative impact on ROA.

Table 13: Summary of Hypotheses Test Results Based on Secondary Data Analysis

Hypothesis	Empirical Model(s)	Result	Conclusion
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H1a: Receivables management has a negative impact on ROA.	Model 1, Model 2, Model 6	Mixed results: Model 1 and 2 showed negative but statistically insignificant results; Model 6 showed a negative and statistically significant interaction term with exchange rate volatility.	Not supported without considering exchange rate volatility. Supported when considering exchange rate volatility.
H1b: Inventory management has a positive impact on ROA.	Model 1, Model 4	Model 1 showed negative but statistically significant results; Model 4 showed negative and statistically significant results.	Not supported.
H1c: Payables management has a positive impact on ROA.	Model 1, Model 3, Model 7	Mixed results: Model 1 and 3 showed positive but statistically insignificant results; Model 7 showed a positive but statistically insignificant result and a negative and statistically significant interaction term with exchange rate volatility.	Not supported without considering exchange rate volatility. Partially supported with exchange rate volatility.
H1d: A shorter cash conversion cycle has a positive impact on ROA.	Model 5, Model 9	Both models showed negative but statistically insignificant results.	Not supported.
H2a: Exchange rate volatility significantly strengthens the negative impact of receivables management on ROA.	Model 6	Negative and statistically significant interaction term.	Supported.
H2b: Exchange rate volatility significantly weakens the positive impact of inventory management on ROA.	Model 8	Negative but statistically insignificant interaction term.	Not supported.
H2c: Exchange rate volatility significantly weakens the positive impact of payables management on ROA.	Model 7	Negative and statistically significant interaction term at 10% level.	Partially supported.
H2d: There is a statistically significant moderating effect of exchange rate volatility on the relationship between cash conversion cycle and ROA.	Model 9	Negative but statistically insignificant interaction term.	Not supported.
H3: Inventory management is more effective than other working capital management strategies in mitigating the negative impact of exchange rate volatility on ROA.	Models 6, 7, 8, 9	Model 8 (inventory management) had negative but statistically insignificant interaction term. Other models also showed mixed results.	Not supported.

Source: Field Data (2024)

4.2 Primary Data Presentation and Analysis

Respondents were asked to provide information on working capital management practices of their firms. In the area of receivables management, **Figure 7** shows the patterns reported. There was near parity amongst the frequencies that were observed in relation to each of the 3 categories of response i.e., Strict credit policies (33.75%), Balanced Approach (33.75%) or Flexible Approach (32.50%). In other words, all the 3 policies were equally applied amongst the sampled firms based on the data in Figure 9.

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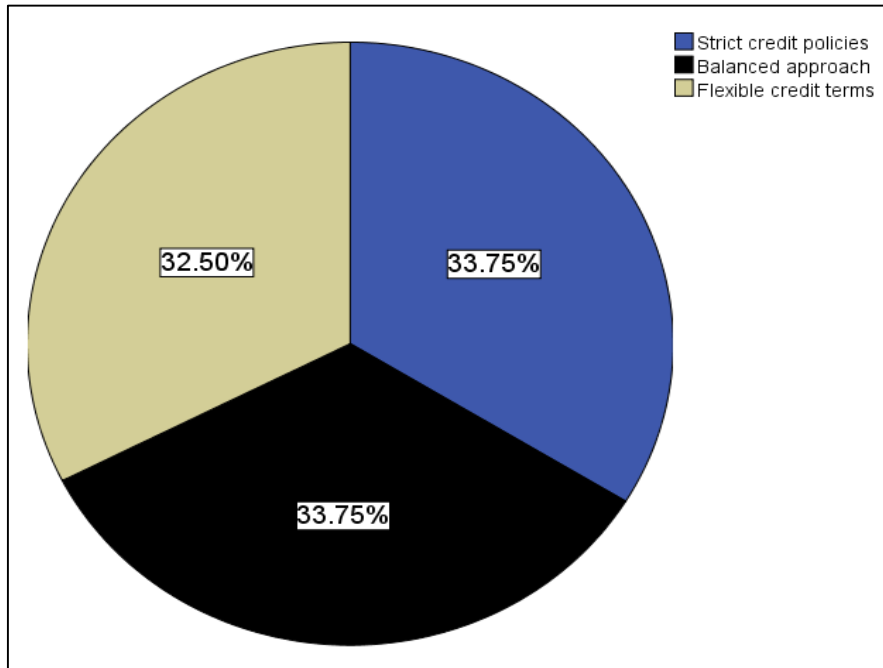


Figure 7: Receivables Management Policies

Source: Field Data (2024)

Figure 8 likewise shows data on the inventory management approaches that sampled LuSE listed firms were reported to use. Low inventory (JIT) had 23.75% frequency i.e., the least while the EOQ model had 43.75% (the highest) while other methods had 32.50% frequency.

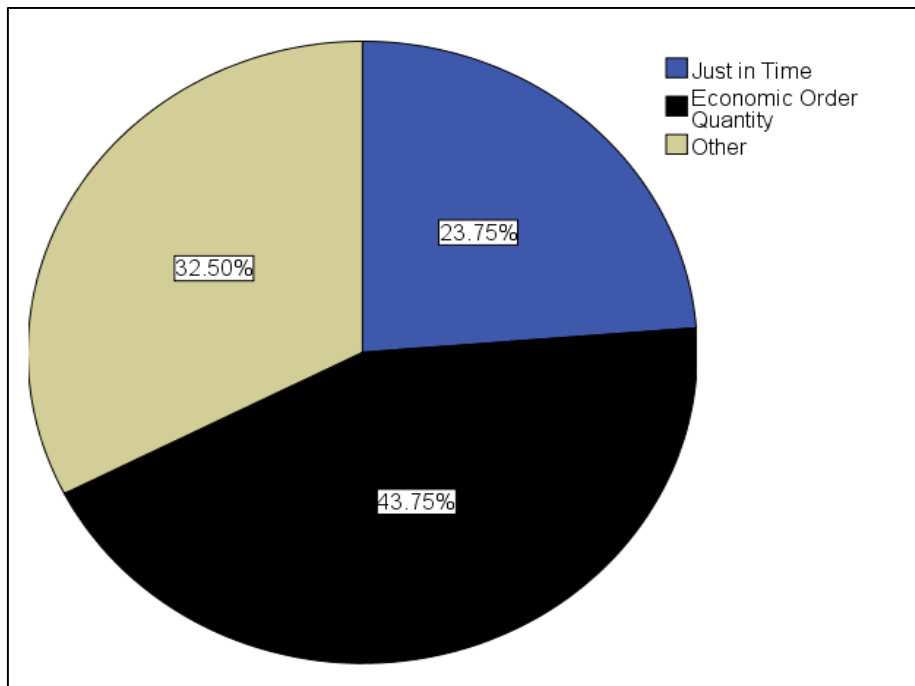


Figure 8 Inventory Management

Source: Field Data (2024)

Figure 9 shows the data that was collected vis-à-vis the payables management policies of the sampled LuSE listed firms. The figure shows that prompt payment (20.00%) was the least popular payables management practice. This was followed by long payment terms (35.00%) and the balanced policy (45.00%) in terms of popularity as a payables management strategy.

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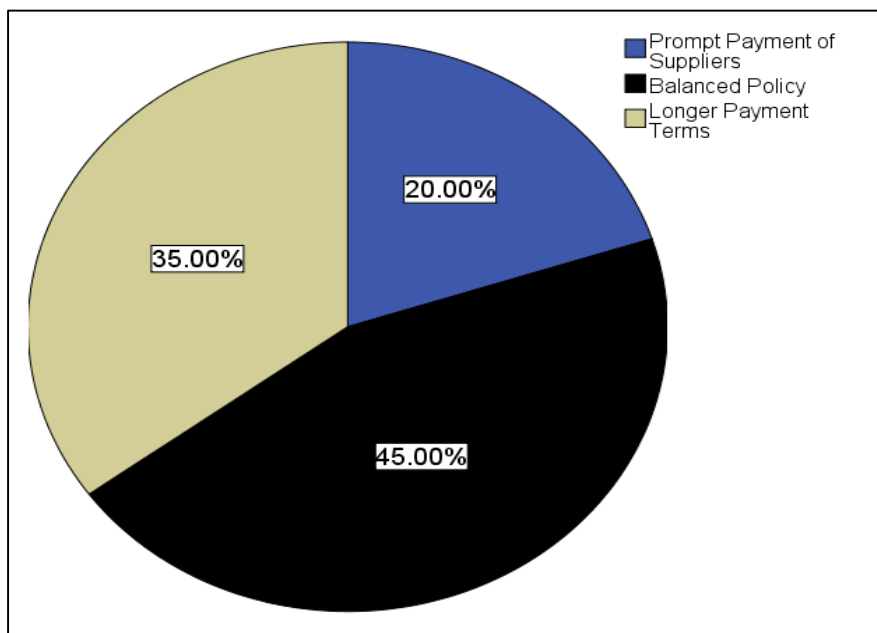


Figure 91 Payables Management Practices

Source: Field Data (2024)

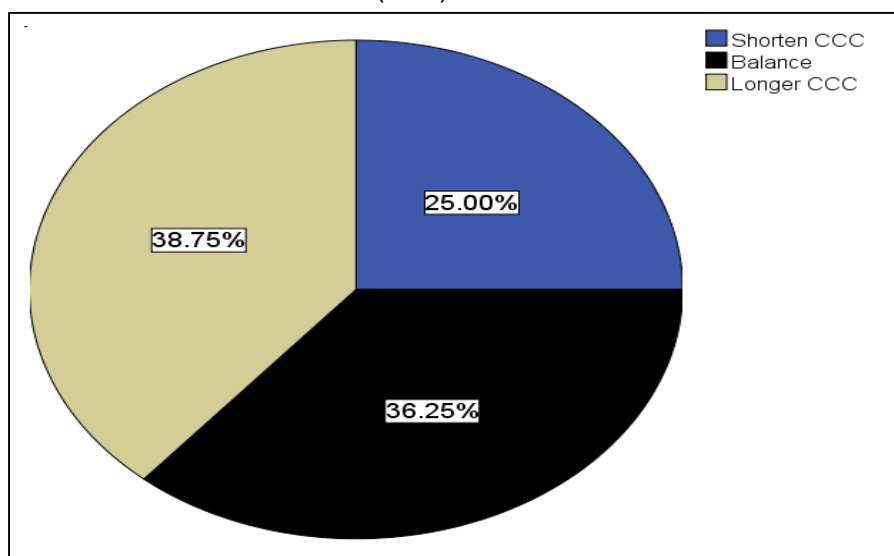


Figure 10 CCC Management

Source: Field Data (2024)

Figure 10 offers similar analysis in relation to the overall working capital management practices of the sampled LuSE listed firms as measured by the CCC. The objective of shortening the CCC was associated with 25.00% of respondents. On the other hand, a balanced CCC that would not be too short or too long was favoured by 36.25%. The objective of having longer CCCs was related to 38.75% of respondents.

Table 14 shows the responses that were obtained in relation to the question of the overall impact of exchange rate volatility on the performance of the sampled LuSE listed firms. The results show that 23.8% of respondents identified positive impacts, 26.2% reported no impact while 50% associated with the negative effects outcome.

Table 14 Overall Impact of Exchange Rate Volatility on Business Performance

FX_VOLATILITY_IMPACT					
		Frequency	Percent	Valid Percent	Cumulative %
Valid	Positively	19	23.8	23.8	23.8
	No Impact	21	26.2	26.2	50.0
	Negatively	40	50.0	50.0	100.0

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	Total	80	100.0	100.0	
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Source: Field Data (2024)

Table 15 shows the distribution of respondents according to the challenges they considered as having exchange rate volatility as the root cause. There were 33.8% of respondents who reported that increased cost of imported raw materials was their major concern or challenge. A further 32.5% noted uncertainty in cash flow forecasting as the challenge while 33.8% identified pricing challenges as the issue.

Table 15: Challenges arising from Exchange Rate Volatility

FX_VOL_CHALLENGES					
		Freq.	Percent	Valid %	Cumulative %
Valid	Increased cost -imported raw materials	27	33.8	33.8	33.8
	Uncertainty in Cash Flow Forecasting	26	32.5	32.5	66.2
	Difficulties in Pricing Products	27	33.8	33.8	100.0
	Total	80	100.0	100.0	

Source: Field Data (2024)

Respondents were asked to provide data on performance of the LuSE listed manufacturing companies over the past 10 years in terms of profit trends. Table 16 shows the findings in this regard. There were 33.8% of respondents who reported decline of profits, a further 33.8% reporting that profits had fluctuated while 32.5% reported that profits rose steadily over the period.

Table 16: Profit Trends over Past 10 Years

PROFIT_TRENDS					
		Frequency	Percent	Valid Percent	Cumulative %
Valid	Declined	27	33.8	33.8	33.8
	Fluctuated	27	33.8	33.8	67.5
	Increased Steadily	26	32.5	32.5	100.0
	Total	80	100.0	100.0	

Source: Field Data (2024)

Table 17 shows data that was collected in relation to exchange rate fluctuation and working capital strategy impacts on performance. The results show that 13.8% of respondents noted a very negative impact, 28.8% a somewhat negative impact, 20.0% neutral impact, 33.8% somewhat positive impact and 17.5% very positive impact. The proportions of respondents who identified positive impacts were cumulatively 51.3% (33.8% +17.5%). This proportion was higher than the proportion of respondents that identified negative effects (28.8% cumulative frequency).

Table 17: Effect of WCM on Profit

WCM_PROFIT					
		Freq.	Percent	Valid %	Cumulative %
Valid	Very Negative Impact	11	13.8	13.8	13.8
	Somewhat Negative Impact	12	15.0	15.0	28.8
	Neutral	16	20.0	20.0	48.8
	Somewhat Positive Impact	27	33.8	33.8	82.5
	Very Positive Impact	14	17.5	17.5	100.0
	Total	80	100.0	100.0	

Source: Field Data (2024)

Table 18 shows the data that was collected in relation to vulnerabilities of working capital elements to the effects of exchange rate volatility according to experience of respondents. The results show that 27.5% of respondents considered receivables management as the most vulnerable working capital management component to exchange rate volatility while the highest proportion of respondents (38.8%) reported inventory management as the most vulnerable component to exchange rate

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fluctuations. In terms of payables management, 33.7% of respondents identified this component as the most vulnerable of the 3 to exchange rate fluctuations.

Table 28: Most Vulnerable Elements of WCM to Exchange Rate Volatility

FX_VULN					
		Freq.	Percent	Valid %	Cumulative %
Valid	Receivables Management	22	27.5	27.5	27.5
	Inventory Management	31	38.8	38.8	66.3
	Payables Management	27	33.7	33.7	100.0
	Total	80	100.0	100.0	

Source: Field Data (2024)

Respondents were also asked to indicate which component of WCM they felt was most effective in enhancing the profitability of their organizations. Table 19 shows the results that were obtained. The highest proportion of respondents (36.2%) identified inventory management as the most effective strategy for enhancing profitability given exchange rate volatility. This was followed by receivables management (27.5%), CCC management (20.0%) and lastly payables management (16.2%).

Table 19: Most Effective WCM Component in Enhancing Profitability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Receivables Management	22	27.5	27.5	27.5
	Inventory Management	29	36.2	36.2	63.8
	Payables Management	13	16.2	16.2	80.0
	CCC Management	16	20.0	20.0	100.0
	Total	80	100.0	100.0	

4.3 Summary of Results Based on Primary Data and Triangulation

This section summarizes the results of the primary data analysis vis-à-vis the hypotheses that the study investigated. The section also offers the triangulated results of the study. Based on the primary data analyses, the following conclusions can be drawn regarding the hypotheses:

Hypothesis 1:

H1a (Receivables management has a negative impact on ROA): 27.5% of respondents identified receivables management as the most vulnerable to exchange rate volatility, while 27.5% also noted it as effective in enhancing profitability. This mixed response suggests a complex impact, aligning with earlier findings that receivables management may have both positive and negative influences depending on external factors like exchange rate volatility.

H1b (Inventory management has a positive impact on ROA): 36.2% of respondents identified inventory management as the most effective WCM component in enhancing profitability, despite it being seen as the most vulnerable to exchange rate volatility by 38.8%. This suggests that effective inventory management practices can still significantly enhance profitability even under volatile conditions.

H1c (Payables management has a positive impact on ROA): Only 16.2% of respondents identified payables management as the most effective, and 33.7% saw it as vulnerable to exchange rate fluctuations. This aligns with previous findings showing a positive but statistically insignificant impact on ROA, indicating limited effectiveness.

H1d (A shorter cash conversion cycle has a positive impact on ROA): 20% of respondents highlighted CCC management as effective in enhancing profitability, suggesting moderate support for this hypothesis. The overall impact may be context-dependent.

Hypothesis 2:

H2a (Exchange rate volatility strengthens the negative impact of receivables management on ROA): With 27.5% identifying receivables management as most vulnerable to exchange rate volatility, there is support for this hypothesis, consistent with findings of a significant negative interaction in the empirical models.

H2b (Exchange rate volatility weakens the positive impact of inventory management on ROA): 38.8% identified inventory management as vulnerable to exchange rate volatility, yet it is still considered effective. This partial support suggests that while inventory management is vulnerable, its overall effectiveness might counterbalance the negative impact.

H2c (Exchange rate volatility weakens the positive impact of payables management on ROA): 33.7% saw payables management as vulnerable, supporting this hypothesis, aligning with the previous significant negative interaction term findings.

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H2d (Exchange rate volatility moderates the relationship between CCC and ROA): The data does not provide strong evidence of this effect, with only 20% highlighting CCC management as effective.

Hypothesis 3:

H3 (Inventory management is more effective in mitigating the negative impact of exchange rate volatility on ROA): Inventory management was considered the most effective strategy by 36.2% of respondents, supporting this hypothesis despite its high vulnerability to exchange rate volatility. This indicates that while inventory management is challenged by exchange rate fluctuations, it still plays a crucial role in enhancing profitability.

Triangulating the results of primary and secondary data analyses provides a more comprehensive understanding of the impact of working capital management (WCM) strategies and exchange rate volatility on Return on Assets (ROA) for firms listed on the Lusaka Stock Exchange (LuSE). Primary data reveals varied perceptions regarding the impact of exchange rate volatility on business performance, with 50% of respondents noting negative effects. Challenges identified include increased costs of imported raw materials (33.8%), uncertainty in cash flow forecasting (32.5%), and pricing difficulties (33.8%). Financial performance data indicates that 33.8% of firms experienced profit declines, another 33.8% saw fluctuating profits, and 32.5% reported steady profit increases over the past decade.

When evaluating the impact of WCM strategies on profitability, 51.3% of respondents noted a positive impact, while 28.8% reported negative effects. The vulnerabilities of WCM elements to exchange rate volatility were highlighted, with inventory management being the most vulnerable (38.8%), followed by payables management (33.7%) and receivables management (27.5%). Despite this, inventory management was considered the most effective strategy in enhancing profitability under volatile exchange rates by 36.2% of respondents, suggesting its significant role in navigating exchange rate challenges. Secondary data provides a mixed but detailed view of the hypotheses. Receivables management showed no significant impact on ROA without considering exchange rate volatility, but had a negative and significant interaction with it, supporting the hypothesis that exchange rate volatility strengthens the negative impact of receivables management on ROA (H2a). Inventory management, contrary to expectations, consistently showed a negative impact on ROA, and did not outperform other strategies in mitigating exchange rate volatility's negative impact (H3). Payables management showed a positive but insignificant impact on ROA, with exchange rate volatility weakening this effect, partially supporting H1c and H2c. The cash conversion cycle (CCC) had an insignificant impact on ROA, and exchange rate volatility did not significantly moderate this relationship (H2d).

The primary data's mixed responses regarding receivables management align with secondary data, indicating its complex role influenced significantly by exchange rate volatility. This supports H1a only when exchange rate volatility is considered, aligning with the secondary finding of a significant negative interaction term. Inventory management's perceived effectiveness by primary data respondents (36.2%) contrasts with secondary data showing a consistent negative impact on ROA. This discrepancy suggests that while firms believe in the potential of inventory management, actual performance data does not support its effectiveness, failing to support H1b and H3. Payables management, perceived as the least effective by primary data (16.2%), aligns with secondary data showing an insignificant impact on ROA, but a negative and significant interaction with exchange rate volatility, partially supporting H1c and H2c. The CCC's moderate support from primary data (20%) as an effective strategy does not align with secondary data's insignificant findings, suggesting that its impact on ROA may be more context-dependent, failing to support H1d and H2d.

5. DISCUSSION OF RESULTS

The findings on the impact of working capital management (WCM) strategies on profitability reveal a complex relationship. Primary data indicates that inventory management is perceived as the most effective strategy for enhancing profitability, with 36.2% of respondents endorsing it. However, secondary data analysis contradicts this perception, indicating a negative impact of inventory management on Return on Assets (ROA). This inconsistency is consistent with (Bolek M. , 2013), who found no significant correlation between WCM strategies and profitability, suggesting that aggressive working capital strategies do not necessarily lead to higher profitability despite potentially carrying more risk.

Receivables management showed a complex impact. Primary data revealed mixed responses, with 27.5% identifying it as both vulnerable to exchange rate volatility and effective in enhancing profitability. Secondary data supported this complexity, showing a negative but statistically significant interaction between receivables management and exchange rate volatility. This aligns with (Gill A. B.-9., pp. Biger, & Mathur ,2010), who observed that efficient WCM, including receivables management, positively correlates with profitability, but this relationship can be influenced by external factors like exchange rate volatility. Payables management was perceived as the least effective WCM strategy in the primary data, with only 16.2% of respondents considering it the most effective. Secondary data supported this perception, showing a positive but statistically insignificant impact on ROA. This finding is consistent

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with (Knauer T. &.-8., p. & Wöhrmann (2013)), who noted that while efficient WCM can boost profitability, the impact is not always clear-cut, and aggressive payables management does not necessarily translate to higher profitability.

Exchange rate volatility significantly moderates the relationship between WCM strategies and profitability. Primary data indicated that exchange rate volatility negatively impacted business performance, with 50% of respondents noting negative effects. This aligns with (Egbunike C. F.-1., pp. & Okerekeoti ,2018), who found a significant negative relationship between exchange rate volatility and firm profitability in the Nigerian manufacturing sector. (Hussain S. H.-2., p. et al. 2021) also support the moderating role of exchange rate volatility, showing that it significantly influences the relationship between the cash conversion cycle (CCC) and firm performance. This aligns with the primary data finding that 20% of respondents highlighted CCC management as effective in enhancing profitability, but its impact may be context-dependent and influenced by exchange rate volatility.

The interaction between WCM strategies and exchange rate volatility reveals complex effects. Inventory management was considered the most vulnerable to exchange rate volatility by 38.8% of respondents, yet it was also seen as the most effective strategy for enhancing profitability. This dual perception indicates that while inventory management faces challenges from exchange rate fluctuations, effective practices can still significantly enhance profitability. This aligns with the theoretical framework of International Finance Theory, which posits that firms must manage their working capital efficiently to mitigate the adverse effects of exchange rate volatility.

Receivables management, identified as vulnerable by 27.5% of respondents, showed mixed effects on profitability. The negative interaction with exchange rate volatility found in secondary data supports the trade-off theory of WCM, which suggests that firms must balance the costs and benefits of holding receivables, particularly in volatile exchange rate environments. Payables management was seen as vulnerable by 33.7% of respondents, with secondary data showing a negative and statistically significant interaction with exchange rate volatility. This finding underscores the importance of managing payables efficiently to avoid adverse impacts on profitability, consistent with the trade-off theory (Afrifa G. A.-5., pp. Tauringana, & Tingbani, 2014)

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

This study concludes that working capital management (WCM) strategies significantly influence the profitability of LuSE-listed manufacturing firms, with inventory management emerging as the most effective strategy despite its high vulnerability to exchange rate volatility. Receivables and payables management exhibited mixed impacts on profitability, suggesting that their effectiveness is contingent on external factors such as economic fluctuations. The findings corroborate existing literature, highlighting the intricate balance firms must maintain in managing working capital to optimize financial performance under varying economic conditions.

6.2. Policy Recommendations

Managers of LuSE-listed manufacturing firms should prioritize efficient inventory management to enhance profitability, even amidst exchange rate volatility. Policies should be established to implement robust risk management strategies, including the use of financial instruments to hedge against exchange rate risks. Tailored receivables and payables management practices should be adopted to mitigate the impacts of economic fluctuations. Additionally, operational strategies should focus on leveraging technology to streamline inventory management, improving efficiency and reducing vulnerability to external shocks.

6.3. Future Research Directions

Future research should expand the scope beyond LuSE-listed manufacturing firms to include other sectors and geographic regions, enhancing the generalizability of the findings. Longitudinal studies could provide a deeper understanding of the long-term effects of exchange rate volatility on WCM and profitability. Furthermore, examining the impact of technological advancements in WCM practices and their role in mitigating exchange rate risks would offer valuable insights for firms operating in volatile economic environments.

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