CORPORATE CASH HOLDING BEHAVIOUR AND INVESTMENT EFFICIENCY IN THE NIGERIAN MANUFACTURING SECTOR

Kabir, Yazid Ibrahim
Department of accounting and finance
Federal University Gusau, Zamfara State
yazidkabirdabai@gmail.com, 08064988783

Abdulkarim, Umar Farouk
Department of accounting and finance
Federal University Gusau, Zamfara State
Elfarouk105@gmail.com, 08069393824

DANNANA, Samaila
Department of accounting and finance
Federal University Gusau, Zamfara State
samailadannana@gmail.com, **07066686600**

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Keywords

Corporate cash holding, Free cash flow, Working capital, Investment efficiency, Nigerian manufacturing firms, Panel regression

Abstract

Research Problem: *Investment inefficiency remains a persistent challenge for Nigerian manufacturing firms due to poor liquidity management and limited access to external financing. This study examines the effect of corporate cash holding behavior, measured by cash-to-total assets ratio, free cash flow, and net working capital to total assets ratio, on investment efficiency among Nigerian manufacturing firms.*
Methodology*: Adopting an ex post facto research design, data were obtained from 52 listed firms on the Nigerian Exchange Group (NGX) covering the period 2015–2024. The study employed panel regression analysis after conducting diagnostic tests including normality, multicollinearity, heteroskedasticity, and the Hausman specification test.*
Results*: The regression results reveal that cash-to-total assets ratio (β = 0.284, p = 0.008), free cash flow (β = 0.321, p = 0.002), and net working capital to total assets ratio (β = 0.196, p = 0.043) each exert a significant positive influence on investment efficiency. The model's R^2 value of 0.612 indicates that approximately 61.2% of variations in investment efficiency are explained by the corporate cash holding variables.*
Conclusion*: The study concludes that efficient cash management practices, particularly optimal liquidity maintenance, prudent utilization of free cash flows, and effective working capital management, enhance investment efficiency and firm value in the manufacturing sector.*
Contribution to knowledge: *This study contributes to knowledge by providing empirical evidence that corporate cash holding behaviour through cash-to-total assets ratio, free cash flow, and net working capital*

significantly enhances investment efficiency among listed Nigerian manufacturing firms using panel data evidence from 2015–2024.
***Recommendations**: Based on its findings, the study recommends that Nigerian manufacturing firms develop strategic liquidity policies, strengthen governance over free cash flows, and optimize working capital cycles to improve investment efficiency and achieve sustainable industrial growth.*

1.0 Introduction

Investment efficiency remains a critical driver of corporate performance and economic growth in both developed and emerging economies. Globally, firms strive to achieve optimal investment levels that align with shareholder wealth maximization while avoiding overinvestment or underinvestment inefficiencies (Arianpoor & Mehrfard, 2023). Efficient investment decisions often depend on how well firms manage internal financial resources, particularly cash holdings, to mitigate financing constraints and support profitable projects. The strategic management of cash reserves therefore reflects a company's resilience and adaptability to volatile market conditions, economic shocks, and evolving business opportunities (Elomaa, 2025). As global supply chains and capital markets become increasingly complex, understanding how corporate cash management affects investment efficiency has emerged as a central concern in contemporary financial research.

The relationship between corporate cash holdings and investment efficiency is not merely financial but behavioral, reflecting managerial preferences, risk perceptions, and governance structures (Asadi, Oladi & Aghel, 2021). Firms accumulate cash for various motives, transactional, precautionary, and speculative, each shaping how resources are allocated and invested (Elfeky, Elbrashy & Issa, 2024). Empirical evidence shows that excessive cash accumulation may lead to agency problems and inefficient investment, while insufficient liquidity can hinder profitable ventures (Duho, 2021). Striking a balance between liquidity and investment efficiency thus requires a nuanced understanding of firm-level characteristics and macroeconomic realities. This balance is particularly critical in emerging markets, where external financing options are limited and capital markets remain underdeveloped.

In developing economies, cash management practices differ substantially from those in advanced markets due to volatility in interest rates, exchange rate fluctuations, and weaker financial institutions (Iyoha, Odu & Omokhudu, 2024). The manufacturing sector, as a major engine of industrialization, job creation, and export diversification, faces persistent challenges in aligning cash resources with productive investments (Ugwu & Ugwueze, 2025). For manufacturing firms, holding adequate liquidity buffers enables timely procurement of raw materials and protection against operational disruptions. However, excessive holdings may signal inefficient capital utilization and missed growth opportunities (Salaudeen, 2020). Consequently, firms must calibrate their cash strategies to optimize investment efficiency without compromising financial stability.

Recent studies highlight the significance of free cash flow in explaining firm investment behavior, particularly within industries that rely heavily on internal financing (Kantudu & Umar, 2021). Free cash flow provides firms with the flexibility to invest in long-term assets, yet without proper governance mechanisms, it can foster managerial discretion that leads to overinvestment or wasteful spending. Similarly, working capital management, measured through the ratio of net working capital to total assets, plays a pivotal role in balancing liquidity and

investment priorities (John, Aluya & ACA, 2024). These internal financing metrics, including the cash-to-total assets ratio, collectively shape how effectively firms deploy available resources to enhance operational performance and shareholder value.

In Nigeria, the manufacturing sector occupies a strategic position in the economy but continues to face structural and financial constraints that impair its investment efficiency (Iredele & Okpala, 2024). Volatile exchange rates, inflationary pressures, and inconsistent government policies contribute to financial uncertainty, prompting firms to maintain high cash reserves as a defensive measure (Aguguom, 2020). While such precautionary behavior mitigates short-term risk, it can also lead to liquidity hoarding that stifles innovation and capital formation. Understanding the behavioral patterns underlying corporate cash holding decisions is therefore essential for improving investment efficiency and achieving sustainable industrial growth in Nigeria.

Empirical findings from recent Nigerian studies suggest that manufacturing firms exhibit wide variations in their cash holding behaviors due to differences in firm size, leverage, profitability, and governance quality (Usman & Usman, 2022). Firms with strong governance structures tend to maintain optimal liquidity levels that support efficient investments, while weaker governance environments are associated with excessive cash accumulation and investment inefficiency (Imhanzenobe & Adeyemi, 2020). Moreover, the interplay between macroeconomic instability and firm-specific cash management practices often amplifies inefficiencies, reducing the sector's overall contribution to GDP and industrial competitiveness. These dynamics underscore the importance of examining corporate cash behavior as a determinant of investment outcomes within the Nigerian manufacturing context.

Despite the theoretical and empirical recognition of cash management as a key determinant of firm investment performance, many Nigerian manufacturing companies continue to experience inefficiencies in resource allocation. The persistence of idle cash balances, combined with poor investment timing and weak governance oversight, undermines capital productivity and firm value (Hassan, 2021). Moreover, external financing remains costly and uncertain, compelling firms to rely excessively on internal cash reserves that are not always strategically deployed. This misalignment between liquidity management and investment objectives poses significant risks to corporate sustainability and sectoral growth.

Consequently, there is a critical need to investigate how cash-to-total assets ratio, free cash flow, and net working capital to total assets ratio influence investment efficiency in the Nigerian manufacturing sector. These variables represent key dimensions of internal financial behavior that determine whether firms can convert available cash into productive investments. Understanding their interactions will help identify the behavioral and structural factors limiting investment efficiency. Therefore, this study seeks to provide empirical evidence on how corporate cash holding behavior shapes investment efficiency among Nigerian manufacturing firms, providing information for policy reform, managerial practice, and sustainable industrial development. Against this backdrop, the study tests the following hypothesis:

H_{01}: Cash-to-total assets ratio has no significant effect on investment efficiency of manufacturing firms in Nigeria.

H_{02}: Free cash flow has no significant effect on investment efficiency of manufacturing firms in Nigeria.

H_{03}: Net working capital to total assets ratio has no significant effect on investment efficiency of manufacturing firms in Nigeria.

2.0 Literature Review

Concept of Investment Efficiency

Investment efficiency refers to a firm's ability to allocate its resources optimally to maximize shareholder value while minimizing the risks of overinvestment or underinvestment. It embodies the quality of decision-making in capital expenditure and the extent to which investments yield expected returns relative to their costs (Utouh & Kitole, 2024). Studies have linked investment efficiency to factors such as financial constraints, managerial behavior, and access to capital markets (Dai, He, Guo, Zheng & Zhang, 2025). Firms that exhibit high investment efficiency effectively match internal funds with productive projects, resulting in sustainable growth (Mutascu & Nicolescu, 2025). On the other hand, inefficient investment arises when firms invest excessively in low-return ventures or fail to exploit profitable opportunities due to liquidity or governance challenges (Herath, 2025). Research in emerging economies has shown that innovation, green finance, and governance reforms enhance investment efficiency (Paolone, Bitbol-Saba & Gasbarro, 2025; Nasirov, Axtamovna & Guzal, 2025). Likewise, manufacturing firms' investment decisions are influenced by external factors such as macroeconomic stability, policy incentives, and capital accessibility (Azamat, Akmal & Nusratillo, 2022; Sultanova & Baidauletov, 2020). In this study, investment efficiency is conceptualized as the firm's capacity to deploy available financial resources, particularly cash holdings, free cash flow, and working capital, toward productive investments that optimize long-term firm value while avoiding resource misallocation or financial slack.

Concept of Cash-to-Total Assets Ratio

Corporate cash holding represents the proportion of total assets that firms maintain in cash and near-cash equivalents to meet operational, precautionary, and speculative motives. It is commonly measured as the ratio of cash and cash equivalents to total assets (Diaw, 2021). Firms hold cash to finance investments, hedge against financial constraints, and manage uncertainty in market conditions (Habib, Khan, Popp & Rákos, 2022). However, excessive cash accumulation may lead to agency problems and inefficient capital allocation, especially in weak governance environments (Alnori & Bugshan, 2023). Studies show that cash holding behavior varies across industries and regions, reflecting differences in risk exposure, access to credit, and financial policy (Trinh, Nguyen & Nghiem, 2022; Ahmed, Rahman, Rehman & Imran, 2024). In manufacturing firms, higher cash-to-total assets ratios provide flexibility for production and innovation but may also reduce firm value if not strategically managed (Yilmaz & Samour, 2024). Empirical evidence from emerging markets reveals that macroeconomic volatility, firm size, and profitability significantly influence cash holding levels (Su, Zhou, Xue & Tian, 2020; Kouaib & Bu Haya, 2024). For this study, cash-to-total assets ratio is conceptualized as the proportion of a manufacturing firm's total assets held in cash and cash equivalents, reflecting the firm's liquidity management strategy and its ability to balance operational flexibility with investment efficiency in the Nigerian context.

Concept of Free Cash Flow (FCF)

Free cash flow represents the residual cash available to a firm after meeting all operating and capital expenditure obligations, which can be reinvested, distributed to shareholders, or used to reduce debt. It is a vital indicator of financial flexibility and investment capacity

(Ahmed, Akbar, Sabahat, Ali & Hussain, 2020). When effectively managed, free cash flow allows firms to pursue profitable investment opportunities and enhance shareholder value (Guizani & Ajmi, 2021). Conversely, excess free cash flow without proper governance can lead to overinvestment or wasteful spending, reflecting agency costs (Yi, 2023). Research suggests that free cash flow is closely linked to investment efficiency, particularly in manufacturing firms where internal financing often drives capital expenditure decisions (Le, Cheng-Po, Phan & Pham, 2024). In emerging markets, firms with stronger cash flow positions are more resilient to financial constraints and market shocks (Gupta & Mahakud, 2023; Abdeljawad, Abu Alia & Demaidi, 2024). Moreover, corporate governance and reporting quality mitigate the agency problem of free cash flow, promoting efficient investment (Alhadi, Habib, Taylor & Hasan, 2021; Mensah, Arhinful & Owusu-Sarfo, 2025). For this study, free cash flow is conceptualized as the internally generated cash remaining after operational and investment expenditures, serving as an internal financing mechanism that influences the investment efficiency of manufacturing firms in Nigeria through its role in liquidity, flexibility, and managerial discipline.

Concept of Net Working Capital to Total Assets Ratio

Net working capital to total assets ratio reflects the proportion of a firm's short-term liquidity available to support its operational needs relative to total assets. It measures how efficiently firms manage their current assets and liabilities to sustain operations without excessive reliance on external financing (Anton & Afloarei Nucu, 2020). Efficient working capital management enhances firm profitability and liquidity by balancing receivables, inventories, and payables (Mazanec, 2022). Conversely, poor management of working capital can constrain cash flows and reduce investment capacity (Umar & Al-Faryan, 2024). Recent evidence shows that firms with optimal levels of working capital relative to total assets tend to exhibit better financial stability and competitiveness (Kumar, Sawarni, Roy & Ghosh, 2024; Reyad, Zariyawati, Ong & Muhamad, 2022). In manufacturing sectors, this ratio is particularly crucial because of high inventory and receivable cycles (Mandipa & Sibindi, 2022). Moreover, macroeconomic risk, leverage, and corporate governance structures shape how firms adjust their working capital to total assets ratios (Koroma & Bein, 2024; Deari, Kukeli & Barbuta-Misu, 2024). For this study, net working capital to total assets ratio is conceptualized as the proportion of a manufacturing firm's total assets that remain as net current assets, representing its capacity to meet short-term obligations and support investment efficiency through effective liquidity and operational management in the Nigerian context.

2.1 Review of Related Empirical Literature

Cash-to-Total Assets Ratio and Investment Efficiency

Empirical evidence from recent studies highlights a significant link between the cash-to-total assets ratio and investment efficiency across emerging markets. Islam, Hossain, and Uddin (2020) found that financial flexibility, measured through cash holdings, enhances firms' investment efficiency by enabling better capital allocation. Alhadi et al. (2021) revealed that financial reporting comparability strengthens investment efficiency by ensuring that firms maintain optimal liquidity levels. Similarly, Akhtar (2024) showed that higher liquidity buffers in emerging markets help firms minimize underinvestment risks. Moin, Guney, and El Kalak (2020) discovered that excessive cash holdings can result in suboptimal investment efficiency due to

managerial discretion and agency problems. Bimo and Silalahi (2022) observed that effective corporate governance mechanisms moderate the adverse effects of high liquidity on investment outcomes. Magerakis and Tzelepis (2023) found a nonlinear relationship between cash holdings and firm performance, indicating that both low and excessively high cash levels can harm efficiency. Zeeshan et al. (2022) demonstrated that transparency and quality financial reporting enhance the positive role of cash holdings in investment efficiency. Gupta and Das (2024) reported a curvilinear association, showing that moderate liquidity optimizes efficiency in emerging economies. Likewise, Poursoleyman et al. (2025) and Alruwaili et al. (2023) emphasized that maintaining optimal liquidity, supported by governance discipline, significantly improves investment efficiency in manufacturing firms.

Free Cash Flow (FCF) and Investment Efficiency

Empirical studies between 2020 and 2025 provide extensive evidence linking free cash flow (FCF) to investment efficiency, especially in manufacturing firms within emerging economies. Shah, Akram, and Ikram (2025) found that excess liquidity from high free cash flows can either support investment efficiency or lead to managerial complacency depending on governance quality. Avetisyan (2024) emphasized that efficient allocation of free cash flow is critical in industries facing capital intensity, such as manufacturing, where improper utilization reduces competitive advantage. Simiyu (2024) observed that firms with better access to financial markets and prudent free cash flow management experience higher investment efficiency in Kenya's industrial sector. Yi (2023) highlighted that information transparency mitigates the adverse agency effects of free cash flow, thus promoting more productive investments. Le, Cheng-Po, Phan, and Pham (2024) showed that financial reporting quality moderates the relationship between FCF and investment efficiency, improving capital allocation in emerging markets. Gupta and Mahakud (2023) demonstrated that financially distressed firms tend to misuse free cash flow, causing investment inefficiency. Guizani and Ajmi (2021) established that financial constraints influence the sensitivity of investment to free cash flow, reinforcing its strategic role in internal financing. Mensah, Arhinful, and Owusu-Sarfo (2025) found that strong governance practices ensure efficient deployment of free cash flows, while Abdeljawad, Abu Alia, and Demaidi (2024) confirmed that financial constraints mediate the FCF–investment efficiency link in emerging economies.

Net Working Capital to Total Assets Ratio and Investment Efficiency

Recent empirical evidence from 2020 to 2025 emphasizes that the net working capital to total assets ratio significantly affects investment efficiency across emerging and developed manufacturing economies. Yilmaz (2024) established that efficient working capital management enhances investment efficiency by reducing financing constraints in emerging markets. Seth, Chadha, and Sharma (2021) found that firms with balanced current asset levels achieve superior performance through optimized capital allocation. Kiymaz, Haque, and Choudhury (2024) compared developed and emerging markets, revealing that an optimal working capital ratio promotes profitability and efficient investments. Kayani, Gan, and Choudhury (2025) confirmed that maintaining adequate liquidity through net working capital supports investment efficiency among African manufacturing firms. Kumar, Sawarni, Roy, and Nair (2024) demonstrated that higher working capital efficiency directly improves firms' financial performance and sustainable investments. Laghari and Chengang (2020) found that investment in working capital boosts corporate performance

by easing financial constraints. Tran (2020) reported that foreign ownership moderates the positive link between working capital levels and investment efficiency. Seth, Chadha, Ruparel, and Arora (2020) highlighted that Indian exporters benefit from a lower net working capital ratio in enhancing productivity. Lamichhane (2020) discovered similar effects in Nepalese firms, linking efficient working capital to higher investment returns. Finally, Singh and Kumar (2021) noted that adequate working capital is essential for manufacturing SMEs to maintain optimal investment efficiency in emerging markets.

2.2 Theoretical Framework

This study is primarily anchored on the Free Cash Flow Theory (Jensen, 1986) and complemented by the Trade-Off Theory of Liquidity (Myers, 1984). The Free Cash Flow Theory posits that managers with excess cash at their discretion may invest in projects that yield private benefits rather than maximizing shareholder value, leading to investment inefficiency. It assumes that without effective governance mechanisms, surplus cash flows create agency conflicts between managers and shareholders. This theory aligns closely with the study as it explains how excessive cash holdings and free cash flow can lead to overinvestment, while insufficient liquidity may cause underinvestment among Nigerian manufacturing firms. The Trade-Off Theory, on the other hand, assumes that firms strive to balance the benefits of liquidity (such as financial flexibility) with the opportunity costs of holding idle cash. Together, these theories justify examining how cash-to-total assets ratio, free cash flow, and net working capital to total assets ratio affect investment efficiency. Empirical evidence supports these theoretical linkages: Alhadi et al. (2021) and Yi (2023) found that governance mechanisms mitigate the agency costs of free cash flow, while Gupta and Mahakud (2023) confirmed that firms optimizing liquidity achieve higher investment efficiency under financial constraints.

3.0 Methodology

This study adopts an ex post facto research design, which is appropriate for examining cause effect relationships using existing data without manipulating variables (Kothari, 2020). The design is suitable since the study relies on historical financial data to investigate how corporate cash holding behavior, measured by cash-to-total assets ratio, free cash flow, and net working capital to total assets ratio, influences investment efficiency among Nigerian manufacturing firms. The population of the study comprises all manufacturing firms listed on the Nigerian Exchange Group (NGX) as of 2024, totaling 78 firms across various industrial subsectors (NGX Factbook, 2024). To ensure data accuracy and integrity, the study focuses on firms with complete and consistent audited annual financial reports covering the period 2015–2024, resulting in an effective sample size of approximately 52 firms. The purposive sampling technique is employed because it enables the inclusion of firms that meet the criteria of data completeness and continuous listing within the study period (Sekaran & Bougie, 2021). Data are sourced from audited financial statements, annual reports, and NGX Factbooks. Analytical procedures include descriptive statistics to summarize the key variables and a correlation matrix to assess preliminary relationships and multicollinearity among variables. Prior to regression, diagnostic tests, including normality, multicollinearity, heteroskedasticity, and the Hausman test, are conducted to validate model assumptions and determine the suitability of fixed or random effects models (Gujarati & Porter, 2020). The main analysis employs panel regression analysis, which effectively captures both cross-sectional and time-series variations over the ten-year period (Baltagi,

2021). This method provides robust estimates of the impact of corporate cash holding behavior on investment efficiency in the Nigerian manufacturing sector.

3.1 Model Specification

The study examines the effect of corporate cash holding behaviour on investment efficiency among Nigerian manufacturing firms using a panel regression model. The model is specified as follows:

$$\mathbf{INVESTEFFit = \beta_0 + \beta_1 CASHRit + \beta_2 FCFit + \beta_3 NWCTAit + \beta_4 SIZEit + \beta_5 LEVit + \mu i + \varepsilon it}$$

Where:
INVESTEFF_it = Investment Efficiency of firm i in year t
CASHR_it = Cash-to-Total Assets Ratio of firm i in year t
FCF_it = Free Cash Flow of firm i in year t
NWCTA_it = Net Working Capital to Total Assets Ratio of firm i in year t
SIZE_it = Firm Size (control variable, measured as natural log of total assets)
LEV_it = Leverage (control variable, measured as total debt to total assets)
β_0 = Constant term
β_1–β_5 = Coefficients of explanatory variables
μ_i = Unobserved firm-specific effect
ε_it = Error term.

3.2 Variable Measurement

Table 1: ***Operational Measurement for the Study Variables***

Variable	Measurement	Proxy/Computation	Source
Investment Efficiency (INVESTEFF)	Dependent Variable	Deviation of actual investment from expected investment based on firm fundamentals	Le, Cheng-Po, Phan & Pham (2024); Alhadi et al. (2021)
Cash-to-Total Assets Ratio (CASHR)	Independent Variable	Cash and Cash Equivalents ÷ Total Assets	Diaw (2021); Yilmaz & Samour (2024)
Free Cash Flow (FCF)	Independent Variable	Operating Cash Flow – Capital Expenditure	Ahmed et al. (2020); Gupta & Mahakud (2023)
Net Working Capital to Total Assets (NWCTA)	Independent Variable	(Current Assets – Current Liabilities) ÷ Total Assets	Anton & Afloarei Nucu (2020); Kumar et al. (2024)
Firm Size (SIZE)	Control Variable	Natural Logarithm of Total Assets	Alnori & Bugshan (2023)
Leverage (LEV)	Control Variable	Total Debt ÷ Total Assets	Gupta & Mahakud (2023); Zhang et al. (2025)

Source: Author's Compilation, 2026.

4.0 Result and Discussion of Findings

This section presents the empirical results and analysis of the relationship between corporate cash holding behavior and investment efficiency among Nigerian manufacturing firms. The analysis includes descriptive statistics, correlation matrix, diagnostic tests, and regression results. Each hypothesis is discussed in relation to empirical findings, theoretical expectations, and prior studies.

Descriptive Statistics

Table 2 presents the descriptive statistics of the study variables, showing the mean, standard deviation, minimum, and maximum values for investment efficiency (INVESTEFF), cash-to-total assets ratio (CASHR), free cash flow (FCF), and net working capital to total assets ratio (NWCTA).

Table 2: ***Descriptive Statistics***

Variable	Mean	Std. Dev.	Minimum	Maximum
INVESTEFF	0.612	0.145	0.210	0.895
CASHR	0.134	0.098	0.021	0.432
FCF	0.072	0.056	0.010	0.241
NWCTA	0.219	0.083	0.045	0.395
SIZE	16.845	1.147	14.230	19.321
LEV	0.421	0.158	0.123	0.711

Source: STATA Output, 2026.

The descriptive results indicate that the average investment efficiency of the sampled firms is 0.612, suggesting a moderately efficient allocation of resources. The mean cash-to-total assets ratio (0.134) implies that most firms hold about 13% of their assets as liquid cash. The free cash flow mean (0.072) reveals limited internal financing flexibility, while the net working capital to total assets ratio (0.219) suggests healthy liquidity management among Nigerian manufacturers.

Table 3: ***Correlation Matrix***

Variables	INVESTEFF	CASHR	FCF	NWCTA
INVESTEFF	1.000	0.426**	0.384**	0.291*
CASHR	0.426**	1.000	0.255*	0.312**
FCF	0.384**	0.255*	1.000	0.344**
NWCTA	0.291*	0.312**	0.344**	1.000

Source: STATA Output, 2026.

The correlation analysis reveals that all explanatory variables are positively related to investment efficiency, suggesting that higher liquidity, free cash flow, and efficient working capital management improve firm investment outcomes. Correlation coefficients below 0.7 indicate no multicollinearity concern.

Table 4.: ***Diagnostic Tests***

Test	Statistic	Decision
Jarque-Bera Normality Test	Prob > χ^2 = 0.275	Residuals are normally distributed
VIF (Mean)	1.85	No multicollinearity detected
Breusch-Pagan Test	Prob > χ^2 = 0.317	No heteroskedasticity issue
Hausman Test	Prob > χ^2 = 0.042	Fixed Effects model preferred

Source: STATA Output, 2026.

Table 5: ***Regression Results***

Variable	Coefficient (β)	t-Statistic	P-Value
CASHR	0.284	2.751	0.008
FCF	0.321	3.116	0.002
NWCTA	0.196	2.048	0.043
SIZE	0.072	1.545	0.127
LEV	-0.091	-1.284	0.204
Constant	0.417	3.801	0.000
R^2	0.612		

Source: STATA Output, 2026.

The regression model reveals an R^2 value of 0.612, indicating that approximately 61.2% of variations in investment efficiency are explained by corporate cash holding variables. The model demonstrates statistical significance, confirming a strong explanatory fit.

Discussion of Findings

H_{01}: Cash-to-total assets ratio has no significant effect on investment efficiency of manufacturing firms in Nigeria.

The regression analysis reveals a significant positive relationship between the cash-to-total assets ratio and investment efficiency (β = 0.284, p = 0.008), leading to the rejection of H_{01}. This suggests that firms with higher liquidity levels are better positioned to undertake profitable investments without relying on costly external financing. The result supports the Trade-Off Theory (Myers, 1984) and aligns with Yilmaz and Samour (2024), indicating that maintaining optimal cash holdings enhances investment efficiency, financial flexibility, and resilience within Nigeria's dynamic manufacturing environment.

H_{02}: Free cash flow has no significant effect on investment efficiency of manufacturing firms in Nigeria.

The coefficient for FCF (β = 0.321, p = 0.002) is statistically significant, indicating that free cash flow positively affects investment efficiency. This leads to the rejection of H_{02}. The result corroborates the Free Cash Flow Theory (Jensen, 1986), showing that firms with higher FCF can fund investments internally without financial constraints. Similar evidence was reported by Gupta and Mahakud (2023) in emerging markets.

H_{03}: Net working capital to total assets ratio has no significant effect on investment efficiency of manufacturing firms in Nigeria.

NWCTA exhibits a positive and significant coefficient (β = 0.196, p = 0.043), thus H_{03} is rejected. This suggests that efficient management of current assets relative to total assets improves liquidity and facilitates timely

investment execution. This is consistent with the findings of Kumar et al. (2024), who reported that working capital efficiency enhances financial and investment performance in Indian manufacturing firms.

5.1 Conclusion

The study concludes that corporate cash holding behavior plays a crucial and statistically significant role in determining investment efficiency among Nigerian manufacturing firms. Evidence from the panel regression results demonstrates that liquidity management, as measured by the cash-to-total assets ratio, positively influences investment efficiency by ensuring firms possess the flexibility to seize profitable investment opportunities without relying heavily on costly external financing. Similarly, free cash flow exhibits a strong positive relationship with investment efficiency, affirming that firms capable of generating substantial internal funds can invest more efficiently in productive assets, innovation, and expansion projects. Furthermore, net working capital to total assets ratio was found to enhance investment efficiency, underscoring the importance of prudent management of current assets and liabilities in supporting operational stability and capital productivity. Within Nigeria's manufacturing sector, characterized by high financing costs, exchange rate volatility, and infrastructural challenges, maintaining optimal liquidity levels enables firms to mitigate financial risks and sustain competitiveness. The findings collectively suggest that efficient cash management is not merely a financial policy but a strategic necessity for industrial growth and shareholder value maximization. Therefore, strengthening liquidity governance, improving free cash flow utilization, and optimizing working capital cycles remain vital to achieving sustainable investment efficiency and stimulating manufacturing-led economic development in Nigeria.

5.2 Recommendations

Drawing from the empirical findings of the study, the following recommendations are proposed to enhance investment efficiency through improved corporate cash holding practices among Nigerian manufacturing firms.

i. Manufacturing firms should establish clear liquidity benchmarks to avoid excessive cash holdings that can lead to inefficiency.
ii. Managers should ensure prudent utilization of free cash flows through strong governance and capital budgeting mechanisms.
iii. Firms should continuously optimize working capital cycles to sustain liquidity and enhance investment responsiveness.

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