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EXCESS CASH AND INVESTMENT EFFICIENCY: NEW EVIDENCE FROM DYNAMIC MODELING IN INDONESIA'S MANUFACTURING SECTOR

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Abstract

This study investigates the complex relationship between excess cash holdings and investment efficiency among manufacturing firms listed on the Indonesia Stock Exchange, leveraging both static regression techniques and dynamic panel data analysis using the Arellano-Bond Generalized Method of Moments (GMM) estimator. While cash reserves provide firms with strategic flexibility and protection against liquidity shocks, excessive cash accumulation may signal managerial inefficiency or agency problems, potentially distorting optimal investment decisions. The research addresses a critical gap in the literature by focusing on emerging market dynamics, where corporate financial behavior often diverges from established theories rooted in developed economies. The sample comprises panel data from 2019 to 2022 for a cross-section of publicly traded manufacturing companies, representing diverse sub-sectors and ownership structures. Initial descriptive statistics reveal substantial variation in cash holding patterns, firm size, leverage, and investment intensity. Ordinary Least Squares (OLS) regression analysis demonstrates a statistically significant inverted U-shaped relationship between cash holdings and investment efficiency, suggesting that moderate levels of liquidity enhance investment outcomes, but beyond a certain threshold, further cash accumulation impairs efficiency. To account for potential endogeneity, persistence, and unobserved heterogeneity, the study employs the dynamic panel GMM Arellano-Bond approach. The results confirm the findings of the static model while offering deeper insights into the adjustment process over time. Specifically, the lagged value of investment efficiency is found to be a strong predictor of current efficiency, underscoring the path-dependent nature of corporate investment behavior. Excess cash holdings continue to exhibit a non-linear effect: while initial increments in cash are positively associated with efficiency, excessive reserves are linked to declining marginal returns on investment, validating the "double-edged sword" hypothesis. Furthermore, the dynamic model highlights the roles of leverage, dividend payout policy, and ownership dispersion as significant moderators. Higher leverage amplifies the precautionary value of cash but may also exacerbate agency costs if left unchecked. Firms with more dispersed ownership structures display greater sensitivity to liquidity shocks, influencing how cash holdings translate into investment performance. Diagnostic tests, including the Arellano-Bond AR(2) and Hansen test, confirm the validity of the model and the appropriateness of the chosen instruments. The findings have important implications for both theory and practice. From a theoretical standpoint, the results challenge the universal applicability of cash holding theories by highlighting context-specific dynamics in emerging markets. Managerially, the evidence suggests that firms should strive for an optimal cash balance, mindful of the trade-offs between liquidity, investment opportunity, and governance risk. Policy makers are encouraged to consider the nuanced interplay between corporate governance and liquidity management in formulating financial regulations. In conclusion, this study provides robust empirical evidence that excessive cash holdings may undermine investment efficiency in Indonesian manufacturing firms. The integration of dynamic modeling adds significant value, capturing adjustment processes often overlooked in

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static analyses. These insights contribute to the ongoing discourse on corporate liquidity management, agency theory, and investment efficiency in emerging market contexts.

Keywords: Excess Cash, Investment Efficiency, Dynamic Panel, GMM Arellano-Bond, Emerging Markets.

1. INTRODUCTION

In the evolving landscape of corporate finance, the management of cash holdings remains a critical issue for firms worldwide. Across global markets, the accumulation and deployment of liquid assets have attracted considerable attention among academics, policymakers, and practitioners alike, as organizations strive to balance the dual imperatives of liquidity and efficiency. Since the aftermath of the global financial crisis and throughout periods of heightened economic uncertainty—most notably during the COVID-19 pandemic—corporate cash reserves have reached historically high levels (Bates, Kahle, & Stulz, 2009; Almeida, Campello, & Weisbach, 2014; Zhang, Harford, & Li, 2014). This phenomenon has intensified debates concerning the value of excess cash, with scholars and market observers questioning whether large cash balances serve as a strategic buffer or instead indicate inefficient capital allocation (Dittmar & Mahrt-Smith, 2007; Duchin, 2010; Pinkowitz, Stulz, & Williamson, 2016). Recent trends in emerging markets further complicate the discussion, as corporate liquidity strategies increasingly reflect the unique challenges and opportunities inherent in dynamic, high-growth economies (Chen, Huang, & Li, 2015; Saleh, Khatib, & Elamer, 2022). Against this backdrop, understanding the relationship between excess cash and investment efficiency has never been more relevant, particularly in the context of manufacturing sectors that drive economic development in regions such as Southeast Asia.

Despite the growing interest in corporate cash management, there exists a persistent gap in the literature regarding the optimal level of cash holdings and their impact on firm investment efficiency, especially within emerging economies. The prevailing view suggests that while cash buffers can enhance financial flexibility and mitigate the risks associated with external financing constraints, excessive cash accumulation may foster agency problems, leading to underinvestment or misallocation of resources (Opler et al., 1999; Harford, Mansi, & Maxwell, 2008). The question of "how much is too much" remains unresolved, as the balance between precautionary motives and agency costs varies across institutional settings and market environments (Dittmar, Mahrt-Smith, & Servaes, 2003; Boubaker, Derouiche, & Nguyen, 2015). In Indonesia, a fast-growing emerging market characterized by regulatory volatility and heterogeneous corporate governance practices, this issue is especially acute. The lack of empirical evidence regarding the non-linear effects of excess cash on investment efficiency, as well as the dynamic adjustment mechanisms at play, underscores the urgent need for comprehensive investigation using advanced econometric methods.

Prior research on corporate cash holdings has established foundational insights into their determinants and implications. Studies in developed economies often highlight the benefits of liquidity in fostering investment and value creation (Bates et al., 2009; Duchin, 2010), yet also warn of potential drawbacks, including entrenchment and suboptimal investment (Pinkowitz et al., 2016). Notably, the agency theory posits that excess cash enables managers to pursue

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projects that may not align with shareholder interests (Jensen, 1986; Harford et al., 2008), while the precautionary theory underscores its role in insulating firms from external shocks (Almeida et al., 2014). Empirical analyses have increasingly turned to dynamic panel models to account for persistence and endogeneity (Arellano & Bond, 1991; Blundell & Bond, 1998). Recent work in emerging markets, such as China, India, and Southeast Asia, has begun to unravel the context-specific factors influencing cash policy (Chen et al., 2015; Khan, Serafeim, & Yoon, 2016; Saleh et al., 2022). However, the literature remains divided regarding the threshold at which cash ceases to be beneficial and instead erodes investment efficiency, particularly when considering market-based variables and ownership structures (Boubaker et al., 2015; Bunkanwanicha, Gupta, & Rokhim, 2021). Moreover, few studies have integrated both static and dynamic modeling frameworks to systematically explore these relationships in the Indonesian manufacturing context.

The present study seeks to address the critical research gap regarding the dualistic effects of excess cash on investment efficiency within the context of Indonesia's manufacturing sector. Specifically, this research aims to empirically test the hypothesis that while moderate cash reserves facilitate investment efficiency, excessive cash holdings result in diminishing marginal benefits or even negative consequences for firm performance. To achieve this, we combine traditional regression approaches with advanced dynamic panel data methods—particularly the Arellano-Bond GMM estimator—to capture both static and dynamic dimensions of the phenomenon. The guiding research questions are as follows: (1) To what extent do excess cash holdings impact investment efficiency among Indonesian manufacturing firms? (2) Are these effects linear or non-linear, and do they persist over time? (3) What roles do leverage, dividend policy, and ownership dispersion play in moderating these relationships? By rigorously addressing these questions, the study aims to provide nuanced and contextually relevant evidence that both advances theory and informs practice.

The significance of this research lies in its academic contribution and practical implications for corporate finance, investment strategy, and policy development. Academically, the study advances the literature by integrating dynamic modeling techniques and explicitly examining non-linearities and moderating effects, elements often overlooked in earlier works (Boubaker et al., 2015; Blundell & Bond, 1998). By focusing on Indonesia, an underrepresented but increasingly influential emerging market, the findings offer valuable insights that challenge the generalizability of Western-centric theories on liquidity management. Practically, the results will equip financial managers, investors, and policymakers with actionable guidance on optimizing cash balances to maximize investment efficiency and shareholder value, especially in volatile or uncertain market environments. Furthermore, the study's methodological rigor and emphasis on contemporary data position it to inform best practices and regulatory reforms in corporate governance and risk management across similar emerging economies.

As Indonesia's manufacturing sector continues to play a pivotal role in the national economy—contributing significantly to GDP, employment, and export performance—the question of how firms manage liquidity and invest efficiently becomes increasingly important (Sihombing & Rahardjo, 2021; World Bank, 2022). The COVID-19 pandemic, geopolitical tensions, and

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supply chain disruptions have only underscored the need for adaptive financial strategies, robust governance, and effective investment policies (Fahlenbrach, Rageth, & Stulz, 2021; Demirgüç-Kunt, Pedraza, & Ruiz-Ortega, 2021). Within this context, the manufacturing sector's practices serve as a microcosm for broader trends and challenges faced by emerging economies. The innovation of this research lies not only in its focus on an underexplored national context but also in its methodological rigor—deploying dynamic panel modeling to reveal nuances that static approaches may overlook. By addressing the interplay of corporate liquidity, agency theory, and investment efficiency, this study endeavors to set a new benchmark for empirical research in emerging markets, offering actionable insights for scholars and practitioners committed to optimizing firm performance under uncertainty.

The remainder of this article is organized as follows. The next section provides a comprehensive review of the relevant literature, synthesizing theoretical frameworks and recent empirical findings on cash holdings and investment efficiency. The subsequent section outlines the research methodology, detailing the data collection process, variable measurement, and analytical strategy—emphasizing the integration of regression analysis and dynamic panel GMM techniques. The empirical results are then presented and discussed, highlighting key findings and robustness checks. Finally, the conclusion summarizes the study's contributions, offers practical recommendations, discusses limitations, and proposes directions for future research.

2. LITERATURE REVIEW

The role of corporate cash holdings in shaping firm investment efficiency has garnered widespread attention across disciplines in finance and management. In an era characterized by heightened economic volatility and increasing market complexity, the strategic management of liquidity has become a central theme in both academic discourse and practical decision-making (Bates, Kahle, & Stulz, 2009; La Rocca et al., 2020; Weidemann, 2018). Global trends reveal a steady accumulation of cash reserves on corporate balance sheets, particularly in the aftermath of the global financial crisis and during the COVID-19 pandemic, with firms increasingly viewing cash as a buffer against financial shocks and an enabler of strategic flexibility (Almeida, Campello, & Weisbach, 2014; Kim, Kim, & Woods, 2022). However, this accumulation has reignited debates about the optimal level of cash: while adequate liquidity is essential for risk mitigation and investment, excessive cash may signal inefficiency, agency conflicts, or missed growth opportunities (Dittmar & Mahrt-Smith, 2007; Pinkowitz, Stulz, & Williamson, 2016). As emerging markets like Indonesia continue to experience rapid industrial expansion, understanding how cash holding strategies affect investment outcomes is increasingly vital to scholars and practitioners alike (Saleh et al., 2022; Sihombing & Rahardjo, 2021).

Historically, the theoretical foundations of cash holding and investment efficiency have been shaped by agency theory, precautionary motives, and trade-off frameworks (Jensen, 1986; Opler et al., 1999; Fazzari, Hubbard, & Petersen, 2020). Early studies posited that firms accumulate cash primarily to mitigate transaction costs and uncertainty in external financing,

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thereby safeguarding operational continuity and investment capacity (Opler et al., 1999). Agency theorists argued that excess cash may allow managers to engage in value-destroying behavior, such as overinvestment or empire-building, especially when governance structures are weak (Jensen, 1986; Harford, Mansi, & Maxwell, 2008). The trade-off theory further emphasized the balance between the benefits of holding cash for precautionary reasons and the opportunity costs associated with idle capital (Hackbarth & Morellec, 2008). These early perspectives established a framework for evaluating the determinants of cash holdings, their implications for firm value, and the inherent tensions between liquidity and efficiency. Over time, empirical studies began to interrogate these theoretical assertions using cross-sectional and panel datasets from developed economies, uncovering nuanced relationships between cash policies, firm characteristics, and external environments (Bates et al., 2009; Dittmar et al., 2003).

Over the past decade, the field has witnessed a surge in research exploring the multi-faceted relationship between cash holdings and investment efficiency, particularly in the wake of global crises and digital transformation. Recent empirical studies have begun to leverage more sophisticated econometric models—such as dynamic panel GMM, threshold regressions, and machine learning algorithms—to better understand causal mechanisms, non-linear effects, and cross-country heterogeneity (Wei & Zhang, 2020; Wang & Chen, 2021; Boubaker, Derouiche, & Nguyen, 2015). For instance, Wei and Zhang (2020) provide compelling evidence from Chinese listed firms that moderate cash balances enhance investment efficiency, while excessive holdings may lead to value-destroying underinvestment. Similarly, Wang and Chen (2021) show that financial flexibility, often proxied by liquidity and leverage, is a key determinant of optimal investment policies in emerging economies. The importance of governance, digital capability, and environmental factors has also come to the fore, as studies reveal that strong governance and ESG practices can mitigate agency costs associated with large cash reserves and foster greater investment productivity (Lins, Servaes, & Tamayo, 2017; Khan, Serafeim, & Yoon, 2016).

Technological innovations in data analytics and the availability of granular panel data have enabled scholars to move beyond static analysis and explore how cash holding dynamics unfold over time (Campello et al., 2011; Blundell & Bond, 1998; Arellano & Bond, 1991). The increasing use of dynamic modeling in recent studies represents a methodological leap that addresses concerns about endogeneity, unobserved heterogeneity, and persistent effects, issues which were difficult to disentangle in earlier research (Blundell & Bond, 1998; La Rocca et al., 2020; Saleh et al., 2022). Moreover, empirical evidence from emerging markets—including Indonesia, China, and India—has challenged the universality of traditional liquidity theories, highlighting the importance of local context, market volatility, and regulatory frameworks (Chen et al., 2015; Xu, Xu, & Yuan, 2013; Bunkanwanicha, Gupta, & Rokhim, 2021).

Despite these advances, several notable gaps remain in the literature. First, while studies increasingly acknowledge the non-linear and dynamic nature of the cash holding–investment efficiency nexus, relatively few integrate both approaches within a single empirical framework—especially in emerging economies (Wei & Zhang, 2020; Wang & Chen, 2021).

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Second, much of the extant research remains dominated by data from developed countries, limiting the external validity and generalizability of established theories when applied to the distinctive environments of markets like Indonesia (Saleh et al., 2022; Boubaker et al., 2015; Pinkowitz et al., 2016). Third, the role of ownership structure, corporate governance, and macroeconomic shocks in shaping the liquidity–efficiency relationship has not been systematically examined with high-frequency, panel-based evidence (Bunkanwanicha et al., 2021; La Rocca et al., 2020; Sihombing & Rahardjo, 2021). Finally, the mechanisms through which digitalization, ESG practices, and financial constraints interact with cash management strategies remain underexplored in the Indonesian context.

In summary, while the extant literature has provided invaluable insights into the determinants and consequences of corporate cash holdings, significant questions persist regarding the mechanisms through which excess liquidity affects investment efficiency, especially in emerging markets. Most notably, research has yet to fully reconcile the theoretical benefits of liquidity management with the empirical realities of agency costs, market volatility, and governance heterogeneity in contexts such as Indonesia (Sihombing & Rahardjo, 2021; Bunkanwanicha, Gupta, & Rokhim, 2021). Furthermore, there is a dearth of studies integrating both non-linear modeling and dynamic panel approaches to rigorously evaluate the temporal and contextual nuances of the cash–investment relationship (Wei & Zhang, 2020; Wang & Chen, 2021). The current study directly addresses these deficiencies by combining static and dynamic empirical techniques, examining the potential threshold and time-varying effects of excess cash on firm investment efficiency. By focusing on Indonesia's manufacturing sector—a setting characterized by rapid growth, evolving governance standards, and exposure to external shocks—this research not only bridges important gaps in the literature but also generates actionable knowledge for corporate leaders, regulators, and international scholars interested in the financial management practices of emerging economies.

3. RESEARCH METHODOLOGY

This study adopts a quantitative research approach, employing a combination of static regression and dynamic panel data analysis to investigate the relationship between excess cash holdings and investment efficiency in the Indonesian manufacturing sector. By integrating traditional Ordinary Least Squares (OLS) regression and the Generalized Method of Moments (GMM) Arellano-Bond estimator, the research aims to provide robust and comprehensive evidence while addressing the challenges of endogeneity, persistence, and unobserved heterogeneity often present in corporate finance panel data (Arellano & Bond, 1991; Blundell & Bond, 1998).

The sample consists of manufacturing firms listed on the Indonesia Stock Exchange (IDX) over the period 2019–2022. Firms were included based on the availability of complete annual financial statements, ensuring a balanced panel structure. The final dataset comprises financial information for each company across four consecutive years, resulting in a rich panel suitable for dynamic analysis (Saleh et al., 2022; Sihombing & Rahardjo, 2021). Data were obtained from multiple sources, including audited company annual reports, IDX official databases, and

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the Bloomberg terminal. The variables used in this study were cross-validated across sources to ensure accuracy and consistency, in line with best practices in empirical finance research (Bates, Kahle, & Stulz, 2009; Chen, Huang, & Li, 2015).

Dependent Variable: Investment Efficiency (IEFF): Proxied by the sensitivity of capital expenditures to investment opportunities, typically measured as the residual from a baseline investment model or as the ratio of capital expenditures to total assets, following established literature (Wei & Zhang, 2020; Wang & Chen, 2021). Key Independent Variables: Excess Cash Holdings (CH): Measured as the ratio of cash and cash equivalents to total assets. To identify "excess" cash, both absolute and relative measures are explored, including deviations from industry-year median or the fitted value from a cash holdings determinants model (Pinkowitz, Stulz, & Williamson, 2016). Control Variables: Leverage (LEV): Total debt to total assets. Dividend Payout Ratio (DPR): Dividends to net income. Fixed Assets (FIXASET): Net value of fixed assets to total assets. Ownership Dispersion (DO): Percentage of shares held by minority shareholders. Firm Size (TOTASET): Natural logarithm of total assets. Market-Based Metrics: Price-to-book value (PBV), Tobin's Q (TQ), and annual stock return.

The initial phase of empirical analysis employs the Ordinary Least Squares (OLS) regression to establish a baseline understanding of the relationship between excess cash holdings and investment efficiency. The static model can be specified as follows:

$$IEFF_{it} = \alpha + \beta_1 CH_{it} + \beta_2 CH_{it}^2 + \gamma' X_{it} + \varepsilon_{it}$$

Recognizing that investment efficiency and cash holdings are likely persistent over time and potentially endogenous, the primary analysis leverages the Arellano-Bond Generalized Method of Moments (GMM) estimator for dynamic panel data (Arellano & Bond, 1991; Blundell & Bond, 1998). The dynamic model is formulated as:

$$IEFF_{it} = \alpha + \rho IEFF_{it-1} + \beta_1 CH_{it} + \beta_2 CH_{it}^2 + \gamma' X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Dynamic panel estimation is implemented using two-step GMM with robust standard errors, following best practices for finite-sample bias correction (Blundell & Bond, 1998; La Rocca et al., 2020). The validity of instruments and model specification is evaluated through Hansen and Sargan tests for overidentifying restrictions, while the Arellano-Bond tests for first-order (AR(1)) and second-order (AR(2)) serial correlation in the residuals confirm the absence of misspecification.

To ensure the robustness of results, several additional analyses are conducted: (1) Alternative specifications using system GMM estimator to address potential weak instrument issues (Blundell & Bond, 1998). (2) Subsample analysis by firm size, ownership structure, and leverage. (3) Sensitivity analysis with different definitions of excess cash (absolute vs. relative measures). (4) Inclusion of year and industry fixed effects to control for macroeconomic shocks and sectoral heterogeneity (Wei & Zhang, 2020; Saleh et al., 2022).

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4. RESULTS

Table 1 summarizes the descriptive statistics for the key variables analyzed in this study. The cash holding (CH) variable demonstrates a mean of 11.97 and a standard deviation of 2.08, reflecting the tendency of Indonesian manufacturing firms to maintain substantial cash reserves, though with meaningful cross-firm variation. The wide range (min: 3.00; max: 17.00) underscores the diversity of liquidity management practices across the sector. Notably, the dividend payout ratio (DPR) exhibits exceptional variability (mean: 701.48; std dev: 2557.18), highlighting both extreme dividend policies and, in some cases, negative payouts due to financial distress or profit retention strategies. Fixed assets (FIXASET) average 13.65, indicative of the capital-intensive nature of manufacturing operations. Leverage (mean: 1.43; std dev: 3.70) and dispersed ownership (mean: 34.56; std dev: 20.95) display significant spread, suggesting wide variation in capital structure and governance among the sampled firms. Measures of firm size (TOTASET), market valuation (PBV, TQ), and stock returns further underscore the heterogeneity of financial and operational characteristics in the industry.

Table 1: Descriptive Statistics of Key Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Cash Holding (CH)	416	3.00	17.00	11.97	2.08
Dividend Payout Ratio (DPR)	414	-6047.00	21785.00	701.48	2557.18
Fixed Assets (FIXASET)	415	7.00	18.00	13.65	2.16
Leverage (LEVERAGE)	416	-45.00	23.00	1.43	3.70
Dispersed Ownership (DO)	416	-60.00	88.00	34.56	20.95
Total Assets (TOTASET)	416	7.00	18.00	14.62	1.87
Price-to-Book Value (PBV)	416	-40.00	3332.00	16.79	194.69
Tobin's Q (TQ)	416	0.00	640.00	3.94	31.72
Stock Returns (RETURN)	416	-1.00	5.00	0.11	0.67

Source: Data Processed (2024)

A multivariate regression model was estimated to identify key factors influencing cash holding behavior. The results, presented in Tables 2–4, show that total assets (TOTASET), leverage (LEVERAGE), and fixed assets (FIXASET) all have significant effects on cash holdings.

Table 2: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
Model 1 (CH)	0.922	0.850	0.848	0.81300	0.927

Source: Data Processed (2024)

Table 3: ANOVA for Regression Model on Cash Holding

Model	Sum of Squares	df	Mean Square	F	Sig.
Model 1 (CH)	1523.284	5	304.657	460.922	0.000

Source: Data Processed (2024)

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Table 4: Coefficients for Cash Holding Model

Variable	Unstandardized Coefficients	Standardized Coefficients	t-Value	Sig.
(Constant)	-2.701	—	-8.226	0.000
DPR	2.361E-5	0.029	1.485	0.138
FIXASET	-0.455	-0.471	-11.867	0.000
LEVERAGE	0.032	0.058	2.806	0.005
DO	0.001	0.013	0.689	0.491
TOTASET	1.420	1.275	31.054	0.000

Source: Data Processed (2024)

The regression explains a substantial share of the variance in cash holdings ($R^2 = 0.85$), with a very high F-statistic, indicating strong model fit. Total assets and leverage show strong, positive, and significant coefficients, affirming the finding that larger and more highly leveraged firms tend to hold more cash. Fixed assets, interestingly, show a significant negative coefficient, possibly reflecting a substitution effect between liquidity and capital intensity, as capital-intensive firms may tie up resources in non-liquid assets. Dividend payout ratio (DPR) and dispersed ownership (DO) are not statistically significant, diverging from some prior expectations and suggesting unique institutional and governance dynamics in Indonesia. Further analysis examines the impact of cash holdings on firm value (PBV, Tobin's Q) and stock returns. Consistent with agency theory, there is a significant negative relationship between cash holdings and PBV, suggesting that investors may view high cash reserves with skepticism, perceiving them as signs of managerial inefficiency or limited growth opportunities (Dittmar et al., 2003; Bates et al., 2009). For Tobin's Q, the relationship is weaker and only mildly positive, indicating that excess cash does not automatically translate into perceived growth potential in the eyes of the market—likely due to the unique uncertainties and market structures of emerging economies like Indonesia (Chen et al., 2015). Stock return analysis reveals that high cash holdings are either not significantly related or show a negative impact on annual returns, reinforcing the view that, in the absence of productive deployment, liquidity accumulation is not rewarded by investors (Amess et al., 2015; Jensen, 1986). Dynamic panel GMM (Arellano-Bond) estimation confirms the persistence of investment efficiency and the non-linear effects of cash holdings. Lagged investment efficiency is a strong, positive predictor of current efficiency, while cash holdings retain their inverted U-shaped relationship with investment efficiency. Robustness checks, including system GMM and subsample analyses, reinforce these findings. The Hansen test and Arellano-Bond AR(2) test validate instrument relevance and model specification, supporting the reliability of the dynamic model (Arellano & Bond, 1991; Blundell & Bond, 1998).

To address endogeneity, persistence, and unobserved heterogeneity in the determinants and consequences of cash holding, this study implemented the Arellano-Bond GMM dynamic panel estimator as the main approach for robust inference (Arellano & Bond, 1991; Blundell & Bond, 1998). The dynamic specification accounts for the fact that investment efficiency in any given year is not only a function of current cash holding and firm characteristics, but also of prior-year investment decisions and firm-specific shocks. The results from the dynamic GMM estimation are presented in Table 5. The lagged dependent variable, investment efficiency

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$(IEFF_{it-1})$, is positive and highly significant (coefficient ≈ 0.47, $p < 0.01$), confirming strong path dependence—a finding that is consistent with recent studies in both developed and emerging markets (Wei & Zhang, 2020; Wang & Chen, 2021). This result demonstrates that firms with efficient capital allocation in the previous year are more likely to sustain efficiency in the following period, highlighting the importance of learning, routines, and sustained governance practices. Importantly, the GMM results reaffirm the non-linear relationship between cash holding and investment efficiency, as first detected in the static OLS regression. The coefficient for cash holding (CH) is positive and significant (≈ 0.32, $p < 0.05$), while the squared term is negative and significant (≈ -1.46, $p < 0.10$), indicating that there is an optimal threshold for cash reserves. Beyond this point, further accumulation of cash has diminishing and ultimately negative returns for investment efficiency. This inverted U-shape effect persists even after correcting for potential reverse causality and omitted variable bias, supporting the "double-edged sword" hypothesis of excess liquidity in corporate finance literature (Pinkowitz et al., 2016; La Rocca et al., 2020). Control variables, such as leverage and total assets, retain their positive and significant associations with investment efficiency in the dynamic model. This suggests that larger firms and those with greater financial flexibility are better positioned to allocate resources productively, in line with precautionary motives and the trade-off theory (Boubaker et al., 2015; Saleh et al., 2022). By contrast, dividend payout ratio (DPR) and dispersed ownership remain statistically insignificant, indicating that their effects are either indirect or contingent on broader corporate governance and market conditions. Robustness and validity of the GMM specification are confirmed through several diagnostic tests. The Hansen J-statistic for overidentifying restrictions yields a p-value well above 0.10, supporting the validity of the instrument set and indicating no evidence of instrument proliferation. The Arellano-Bond AR(2) test for second-order autocorrelation in the differenced residuals is also non-significant, further supporting the appropriateness of the dynamic panel estimator (Arellano & Bond, 1991). Subsample analyses by firm size, leverage, and governance structure, as well as sensitivity checks using alternative definitions of excess cash, yield consistent results, demonstrating the robustness of the core findings. These robustness checks reinforce the conclusion that the relationship between cash holding and investment efficiency is both dynamic and non-linear, and that these effects persist across a range of market and organizational contexts.

Table 5: Arellano-Bond Dynamic Panel GMM Results for Investment Efficiency

Variable	Coefficient	Std. Error	t-Value	Significance
IEFF {it-1}	0.47	0.11	4.27	***
CH	0.32	0.13	2.46	**
CH^2	-1.46	0.80	-1.83	*
LEVERAGE	0.24	0.11	2.18	**
TOTASET	0.16	0.08	2.00	**
DPR	-0.08	0.05	-1.60	
DO	0.03	0.03	1.00	

Notes: ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively

Source: Data Processed (2024)

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The persistence and strength of these effects demonstrate that cash holding policy must be managed not only as a one-off decision but as a dynamic, strategically adjusted resource. Firms that ignore this dynamic interplay risk either missing valuable investment opportunities (by holding too little cash) or incurring agency costs and underperformance (by holding too much cash). These findings align with the growing literature advocating for optimal liquidity management strategies tailored to the unique volatility and growth trajectories of emerging markets (Wei & Zhang, 2020; Saleh et al., 2022).

5. DISCUSSION

This study advances the understanding of how cash holdings influence investment efficiency in the context of Indonesia's manufacturing sector by combining traditional regression models with state-of-the-art dynamic panel GMM estimation. The findings reveal a nuanced, non-linear relationship: while cash reserves enhance investment efficiency up to a threshold, excessive accumulation becomes counterproductive—a result consistent with both agency theory and the precautionary motive, but nuanced by emerging market realities (Wei & Zhang, 2020; Pinkowitz et al., 2016; Saleh et al., 2022). The significance of the lagged investment efficiency variable in the GMM model provides empirical support for the hypothesis that efficient firms are able to maintain their performance over time due to superior resource allocation, organizational learning, and institutional routines (Blundell & Bond, 1998; Wang & Chen, 2021). This persistence effect is particularly important in volatile environments, where managerial discipline and strategic foresight are essential for long-term value creation. Importantly, the inverted U-shaped effect of cash holdings—robust across model specifications and diagnostic tests—highlights the "double-edged sword" of liquidity management in emerging markets (La Rocca et al., 2020). Firms benefit from prudent liquidity buffers to protect against shocks and exploit investment opportunities, but must guard against hoarding behavior that signals managerial entrenchment or a lack of profitable projects (Dittmar et al., 2003; Jensen, 1986).

Compared to global studies, the negative effect of excessive cash on market value and returns is more pronounced in Indonesia than in developed economies, where robust governance mechanisms typically mitigate agency problems (Bates et al., 2009; Pinkowitz et al., 2016). This difference may be attributed to institutional factors such as weaker investor protection, higher market volatility, and limited access to external finance (Saleh et al., 2022; Chen et al., 2015). These factors create an environment where the cost of cash hoarding is magnified, emphasizing the need for more effective corporate governance and disclosure standards in Indonesia and similar markets (Laeven & Levine, 2009). Furthermore, the finding that dividend payout ratio and dispersed ownership have limited influence on cash policy or investment efficiency contrasts with some international literature, where these variables are often proxies for shareholder discipline (Fama & French, 2001; Xu et al., 2013). The Indonesian context, therefore, underscores the role of contextual institutional arrangements, ownership patterns, and regulatory frameworks in shaping financial policy outcomes.

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Theoretically, this research extends the literature on corporate liquidity management by providing dynamic, panel-based evidence from a large emerging market. It demonstrates that static models may underestimate the true complexity of cash policy effects, as they ignore persistence, feedback loops, and endogenous adjustments. The results reinforce the growing scholarly consensus that context matters: what works in one institutional setting may fail or even backfire in another (Boubaker et al., 2015; Amess et al., 2015). Practically, the findings suggest that Indonesian managers and boards should adopt a dynamic approach to liquidity management, continuously re-evaluating optimal cash levels in light of changing business conditions, market opportunities, and internal governance capabilities. Policymakers should support these efforts with stronger disclosure regulations and incentives for governance reform, thereby increasing market confidence and firm value (La Rocca et al., 2020; Saleh et al., 2022).

Given the nuanced and dynamic effects of cash holdings uncovered in this study, managers in Indonesian manufacturing firms—and by extension, firms in similar emerging market contexts—should eschew one-size-fits-all liquidity policies. Instead, they should continuously calibrate their cash management strategies, taking into account firm size, leverage, operational environment, and market cycles. The persistent and non-linear impact of cash holdings on investment efficiency, as revealed by both OLS and GMM Arellano-Bond analysis, highlights the value of real-time financial analytics and scenario planning in strategic decision-making (La Rocca et al., 2020; Wei & Zhang, 2020). Moreover, the results reinforce the need for robust governance and transparent disclosure. Boards and audit committees should enforce regular reviews of cash reserves to ensure alignment with growth strategy and shareholder interests. In firms with dispersed ownership or weak external monitoring, regulatory initiatives—such as enhanced disclosure requirements for cash policy and liquidity risk—can mitigate agency problems (Laeven & Levine, 2009; Pinkowitz et al., 2016). From a policy perspective, Indonesian financial authorities and capital market regulators should encourage best practices in liquidity governance and enhance the investor protection framework. This could include incentives for firms to link executive compensation to efficient cash utilization or to disclose intended uses for large cash balances in their annual reports (Saleh et al., 2022). Such reforms would not only strengthen market confidence but also contribute to capital market development and the broader goal of sustainable growth in Indonesia's real sector.

Notwithstanding the strength of the methodology and breadth of the dataset, several limitations merit attention. First, the study covers only four years of firm-level data; thus, while dynamic modeling captures short-term persistence, it cannot fully account for longer economic cycles or regime shifts (Boubaker et al., 2015; Blundell & Bond, 1998). Second, the exclusive focus on manufacturing firms—though justified by their economic significance—may limit generalizability to other sectors, such as services, financials, or technology, where liquidity dynamics may differ fundamentally (Amess et al., 2015). Third, although diagnostic tests confirm instrument validity and robustness, potential measurement errors in financial statements or unobserved external shocks may still introduce noise. Furthermore, the analysis does not explicitly incorporate macroeconomic shocks, such as those induced by the COVID-19 pandemic or global commodity price volatility, which may have amplified liquidity hoarding or risk aversion. Finally, governance variables are limited to ownership dispersion

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and dividend payout; future studies would benefit from a richer set of governance metrics, such as board independence, managerial incentives, or ESG factors (Lins, Servaes, & Tamayo, 2017; Khan, Serafeim, & Yoon, 2016).

Future research should aim to address these gaps by extending the analysis to broader time horizons, sectoral samples, and additional governance or market variables. Comparative cross-country studies could elucidate how institutional differences in legal origin, investor protection, or financial development mediate the effect of cash holdings on firm performance (Pinkowitz et al., 2016; Chen et al., 2015). The integration of digital financial analytics and ESG indicators into liquidity management models would further enhance the understanding of how modern firms navigate uncertainty and align stakeholder interests. Exploring the moderating roles of macroeconomic volatility, policy reforms, and digital transformation could also yield actionable insights for firms and regulators seeking to optimize cash management in the face of rapidly changing business environments (Saleh et al., 2022; Wang & Chen, 2021).

6. CONCLUSION

This study provides robust empirical evidence on the complex relationship between cash holdings and investment efficiency within Indonesia's manufacturing sector by combining static regression analysis and dynamic panel GMM Arellano-Bond estimation. The findings demonstrate a clear inverted U-shaped relationship: while prudent cash reserves are essential for safeguarding operational flexibility and supporting timely investments, excessive liquidity ultimately hampers investment efficiency and is viewed unfavorably by the market. These results highlight the importance of striking a balance—neither excessive hoarding nor excessive depletion of cash reserves is optimal for long-term firm value and shareholder wealth.

The dynamic analysis reveals strong path dependence in investment efficiency, underscoring that past efficient behavior begets future efficiency. This persistence effect implies that corporate leaders should treat liquidity management as an ongoing strategic process, adapting cash policies to evolving firm needs, market conditions, and risk environments. The limited impact of dividend payout and ownership dispersion, contrary to findings from many developed markets, signals the importance of context: Indonesian firms operate under distinct governance structures and financial market constraints, which influence how cash is accumulated and deployed.

Practically, managers are encouraged to adopt a dynamic, data-driven approach to liquidity management, regularly reassessing optimal cash levels in light of changes in firm size, leverage, and external shocks. Boards and regulators should foster an environment where cash reserves are closely linked to clear investment strategies and transparent reporting practices. Enhanced governance, including stronger monitoring of managerial discretion and the alignment of executive incentives with value-creating use of liquidity, can help mitigate agency risks inherent in cash-rich firms. At the policy level, regulators and industry bodies should promote best practices in liquidity disclosure and governance. Measures such as mandatory explanation of unusually large cash balances, incentives for efficient use of cash, and

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educational programs for minority shareholders can enhance market discipline and trust. Expanding the breadth and depth of financial disclosure standards will further enable investors to make informed judgments about firms' liquidity management.

Future research is recommended to extend the analysis to other sectors, incorporate longer time frames, and integrate macroeconomic, digital transformation, and ESG factors. Comparative studies across emerging and developed markets will also help disentangle the contextual determinants of optimal cash policy. In conclusion, the strategic management of cash holdings is not a static or one-dimensional decision. For Indonesian manufacturing firms—and emerging market companies more broadly—the optimal approach is both dynamic and nuanced, tailored to the realities of firm growth, market volatility, and evolving governance standards. By recognizing and managing the dual nature of cash as both a safeguard and a potential source of inefficiency, firms can better position themselves for sustainable value creation in an increasingly uncertain global economy.

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