

Cash Holdings, Investment Efficiency, and the Russia–Ukraine War: Evidence from Indonesian Energy Firms

Mikha Valentino^{1*}, Retno Yuni Nur Susilowati²

Universitas Lampung^{1,2}

mikhavalentino3@gmail.com

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Corresponding author:

Mikha Valentino

Universitas Lampung

E-mail: mikhavalentino3@gmail.com

ABSTRACT

Purpose: This study examines the effect of cash holdings on corporate investment efficiency in energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2016 to 2023, with the Russian invasion of Ukraine as a moderating variable.

Methodology: Using a quantitative approach, secondary data from 62 energy firms (389 observations) were analyzed using Stata through descriptive statistics, panel model selection, classical assumptions, and hypothesis testing.

Results: The results indicate that cash holdings positively and significantly affect investment efficiency, while the Russian invasion of Ukraine does not moderate this relationship and only acts as a predictor moderator that shows a direct effect on investment efficiency.

Conclusions: The level of cash holdings plays an important role in influencing investment efficiency, whereas the Russian invasion of Ukraine does not affect this relationship in the Indonesian energy sector.

Limitations: This study is limited to Huang's (2020) model, which may vary in accuracy from alternatives, and a temporal dummy proxy for the Russian Invasion of Ukraine that fails to capture geopolitical shock intensity.

Contribution: This study contributes to the literature and corporate decision-making by providing empirical evidence on how cash holdings affect investment efficiency and highlighting the moderating role of the Russian invasion of Ukraine in this relationship.

Keywords: *Cash Holdings, Investment Efficiency, The Russian invasion of Ukrain*

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1. Introduction

Investment efficiency is a crucial determinant of business growth and shareholder wealth maximization (Abed et al., 2022). In practice, the availability of cash as a primary element of liquidity is a prerequisite for executing projects and sustaining corporate operations (Aksar, Hassan, Kayani, Khan, & Ahmed, 2022; E. A. Chandra, 2022). Optimal cash reserves provide strategic flexibility; thus, the level of cash holdings plays a significant role in determining the quality of investment decisions, particularly amid

economic uncertainty and market dynamics ([Arslan, Florackis, & Ozkan, 2006](#); [Asadi, Oladi, & Aghel, 2021](#); [Cahyono & Ardianto, 2024](#); [Zheng, 2022](#)). Cash holdings serve as a financial buffer amid economic uncertainty and global market fluctuations, providing firms with the flexibility to execute positive Net Present Value (NPV) investment opportunities ([Ariel & Susanti, 2024](#); [Chang & Yang, 2022](#)). Although optimal cash enhances investment efficiency, excessive cash accumulation can potentially trigger agency problems if not managed efficiently ([Cahyono & Ardianto, 2024](#); [Nugraheni, Kuntadi, & Pramukty, 2023](#)). Therefore, a profound understanding of the correlation between cash holdings and investment efficiency is crucial, particularly in the face of market pressures and external risks.

The relationship between cash holdings and investment efficiency is highly relevant in the Indonesian energy sector, which is capital-intensive and characterized by high price volatility ([Hyna & Vyshka, 2025](#)). Adequate cash availability mitigates dependence on external financing and enhances project execution flexibility ([Abed et al., 2022](#); [Cahyono & Ardianto, 2024](#)). However, weak managerial oversight can trigger overinvestment in negative NPV projects, creating inefficiencies due to agency problems ([Bhuiyan & Hooks, 2019](#)). Given that geopolitical uncertainty affects cash flows and energy stability globally, analyzing cash-holding strategies is crucial for investment sustainability in the Indonesian energy market ([Athari, Teneng, Çetinkaya, & Bahreini, 2024](#)).

The Russian invasion of Ukraine, which commenced on February 24, 2022, triggered significant uncertainty in the global energy sector, given the vital roles of both nations in supplying global energy commodities ([Huka & Kelen, 2022](#)). In Indonesia, this phenomenon has had a dual impact on the financial behavior of energy firms. First, the surge in energy prices induced economic uncertainty, prompting companies to increase their cash reserves for precautionary reasons. Second, this situation created momentum for mineral and coal exporters to fill global market gaps, thereby increasing sales volume, which, in turn, led to higher cash holdings accumulation ([Chang & Yang, 2022](#)). This is reflected in the significant profit growth within the coal, gas, and CPO subsectors, where Indonesian coal production in 2022 reportedly surged by 1,373% compared to that in the previous year ([Mulyani, Kurniawati, & Mufreni, 2023](#)).

Previous research indicates that an optimal cash reserve enhances investment efficiency by facilitating the execution of positive net present value (NPV) projects without relying on external financing ([Bhuiyan and Hooks, 2019](#)). Sufficient liquidity supports decision-making flexibility and mitigates the risk of underinvestment ([Duong, Nguyen, Nguyen, & Rhee, 2020](#)). However, the agency theory perspective warns that excess cash poses a risk of triggering overinvestment or inefficiencies due to managerial misuse ([Ardianto & Sulaiman, 2024](#); [Asadi et al., 2021](#)). This condition becomes increasingly complex amid economic uncertainty and geopolitical conflicts, such as the Russian invasion of Ukraine, which impacts cash flows and investment opportunities in the energy sector ([Zhang, Wang, & Wang, 2024](#)). Consequently, the proper management of cash holdings is crucial for optimizing investment efficiency while simultaneously mitigating agency and external risks.

To date, there is a paucity of literature examining how cash holding dynamics influence investment efficiency within the Indonesian energy sector, given its unique susceptibility to global market fluctuations. Consequently, this study aims to investigate and deliver empirical evidence on the nexus between cash holdings and investment efficiency while evaluating the moderating role of geopolitical conflicts. The insights gained from this study are expected to provide substantial guidance for managers striving to optimize cash levels amid global energy price volatility. Additionally, the outcomes provide a strategic benchmark for investors and policymakers to evaluate the resilience of investment efficiency in capital-intensive projects.

2. Literature Review and Hypothesis/es Development

2.1 Pecking Order Theory

Grounded in the foundational work of [Myers and Majluf \(1984\)](#), the pecking order theory asserts that corporations follow a distinct chronological hierarchy when selecting financing sources to minimize capital costs driven by information asymmetry between insiders and outsiders. This theory operates on

the premise that managers hold superior, comprehensive insights into a firm's actual performance and strategic prospects, a disparity that inherently induces transactional and asymmetric friction across various financing options ([Jaiswal & Elmarzouky, 2025](#); [Kakouris & Psychoyios, 2025](#)). Accordingly, enterprises heavily favor internal funding mechanisms, such as retained earnings and existing cash holdings, thereby avoiding flotation expenses and negative market perceptions. If internal liquidity falls short of investment demands, firms sequentially deploy debt issuance as a preferred intermediary step, explicitly treating new equity issuance as a final, non-preferred alternative to prevent investors from interpreting the issuance as a signal of an overvalued stock price.

Under the assumptions of this theory, cash holdings are viewed as essential financial slack or strategic liquidity reserves that function to alleviate investment friction caused by prohibitive asymmetric information costs ([Myers & Majluf, 1984](#)). Consequently, accumulated cash serves as a critical balancing mechanism, empowering managers to execute capital investments with greater flexibility and greater financial independence. Leveraging these liquid resources allows corporations to exploit time-sensitive investment avenues while bypassing the need to transmit detrimental signals to external markets, a phenomenon typically triggered by issuing riskier external securities that are prone to valuation distortions and mispricing.

Furthermore, in the context of investment efficiency, the pecking order theory provides a relevant explanation of how cash holdings may influence corporate investment decisions. Firms with sufficient internal liquidity are generally better positioned to finance profitable investment opportunities without excessively relying on external capital markets ([Perastia & Purnama, 2026](#)). This condition may reduce the likelihood of underinvestment, particularly when external financing is costly, restricted, or perceived negatively by investors ([Jumaah, 2025](#)). In industries characterized by high capital intensity, such as the energy sector, the availability of internal funds becomes even more crucial because investment projects often require substantial capital expenditures, long planning horizons, and high exposure to market uncertainty. Therefore, cash holdings may support investment efficiency by allowing firms to pursue value-enhancing projects at the right time.

However, excessive cash holdings may create potential inefficiencies when managers accumulate liquidity beyond their operational and investment needs. Large cash reserves may encourage managerial discretion and increase the possibility of overinvestment in projects with lower-than-expected returns. From this perspective, cash holdings can have a dual role: they may reduce financing constraints and support efficient investment, but they may also generate agency-related problems if not accompanied by strong governance and effective monitoring. Thus, the relationship between cash holdings and investment efficiency depends not only on the amount of liquidity available, but also on how managers allocate these resources.

In periods of external shock, such as geopolitical conflict, commodity price volatility, or macroeconomic uncertainty, the relevance of the pecking order theory becomes stronger. Firms may become more cautious in accessing external financing due to increased risk premiums and uncertain market conditions. Consequently, internal liquidity becomes a strategic buffer that enables firms to maintain investment continuity. For Indonesian energy companies, cash holdings may serve as a financial safeguard that helps stabilize investment decisions amid uncertainty while supporting more efficient capital allocation.

2.2 Investment Efficiency

Investment is fundamentally defined as the allocation of capital in the present period to specific assets or projects, carried out with the explicit expectation of generating future returns to achieve long-term financial objectives ([Sabatimy & Nur, 2023](#)). More comprehensively, this capital deployment is undertaken over a designated time horizon to secure returns that adequately compensate for the time value of money, projected inflation rates, and inherent uncertainty of associated risks. Consequently, investment does not merely involve the static allocation of financial funds; rather, it represents a pivotal strategic decision that meticulously weighs the complex trade-offs between anticipated future profitability and various dynamic external risk factors.

In a corporate context, investment efficiency refers to a firm's capability to optimally allocate capital and resources to generate maximized returns for shareholders while simultaneously maintaining operational productivity and earnings sustainability ([Ahmed et al., 2020](#); [Alsayegh, Abdul Rahman, & Homayoun, 2022](#)). This concept directly reflects the effectiveness with which a firm transforms capital inputs into anticipated strategic outputs, meticulously balancing financial parameters, risk factors, and broader social and environmental dimensions ([Phan, Lai, Li, Le, & Nguyen, 2024](#); [Saputra & Novita, 2023](#); [Zhi, 2023](#)). Consequently, investment efficiency serves as a comprehensive metric that harmonizes long-term corporate profitability with a responsible approach to managing the firm's external impacts.

An investment is deemed efficient when its realized outcomes align seamlessly with the firm's strategic planning without falling into states of capital inefficiency ([Marsya & Dewi, 2022](#)). This investment inefficiency generally manifests in two distinct forms: underinvestment, which occurs when a firm fails to execute optimal and value-enhancing investment decisions, and overinvestment, which represents the excessive allocation of capital toward projects that fail to generate maximized or positive net returns ([Biddle, Hilary, & Verdi, 2009](#)). Both scenarios inherently reflect the managerial inability to effectively orchestrate capital allocation. Conversely, efficient investment explicitly aims to augment profitability and corporate value, thereby delivering substantial benefits to shareholders while simultaneously ensuring timely fulfillment of financial obligations to creditors ([Nathaniel & Butar, 2019](#)).

Furthermore, investment efficiency is strongly associated with the quality of managerial decision-making and the availability of reliable financial information. Managers are expected to evaluate investment opportunities based on objective assessments of expected returns, risk exposure, capital costs, and a firm's long-term strategic direction. When managers possess accurate information and apply sound financial judgment, investment decisions are more likely to reflect a firm's actual economic needs. In contrast, poor information quality, weak monitoring, and managerial opportunism may lead to inefficient investment behavior, either through excessive investment in unproductive projects or the rejection of profitable opportunities ([Bhimasta, Surya, & Pramudita, 2025](#)).

In practice, investment efficiency is also influenced by a firm's financial flexibility. Companies with sufficient internal resources, including cash holdings, are generally better able to respond to profitable investment opportunities without depending heavily on external financing ([R. Chandra, Satriawan, & Dewi, 2025](#)). This condition is particularly important when capital market access is limited or when external financing becomes costly because of uncertainty. However, financial flexibility must be managed carefully because excessive liquidity may create incentives for managers to invest in projects that do not necessarily maximize firm value.

In the energy sector, investment efficiency is becoming increasingly important because firms often operate in capital-intensive environments that require substantial funding for exploration, infrastructure development, technology adoption, and operational expansion. These investments typically involve long-term commitments and high exposure to commodity price fluctuations, regulatory changes, and geopolitical risks. Therefore, energy companies must carefully balance investment expansion and financial prudence to avoid inefficient capital allocation. Thus, investment efficiency can be understood not only as the ability to invest, but also as the ability to invest appropriately and effectively. Efficient firms can allocate resources to projects that support sustainable growth, enhance profitability, and strengthen firm value while avoiding underinvestment and overinvestment.

2.3 Cash Holdings and Its Impact on Investment Efficiency

Cash holdings encompass the total cash and cash equivalents maintained under a firm's control to sustain its daily operational stability ([Santioso & Daryatno, 2023](#)). As the primary liquidity instrument, cash plays a highly strategic role in supporting a broad spectrum of corporate financial decisions, ranging from the settlement of corporate obligations and dividend distributions to executing share buyback programs. Beyond its immediate operational function, cash availability serves as a critical safety buffer designed to mitigate unforeseen risks while granting managers the necessary financial flexibility to swiftly exploit lucrative investment opportunities in the future ([Ariel & Susanti, 2024](#)).

An optimal level of cash holdings is achieved when a firm maintains sufficient liquidity to satisfy all its short-term obligations in a timely manner ([Moloi, 2024](#)). Failure to preserve adequate liquidity thresholds can trigger negative perceptions among investors, which ultimately exerts downward pressure on a firm's overall valuation ([Sun & Zhao, 2025](#)). Conversely, excessive cash accumulation must also be avoided, as it generates substantial opportunity costs and signals the presence of unproductive, idle funds. This may lead investors to perceive management as ineffective in orchestrating financial resources. Consequently, maintaining cash holdings at an equilibrium level is critical, given that cash serves as the primary working capital that guarantees operational continuity while significantly influencing shareholder interests ([Banjade & Diltz, 2022](#); [Kim, Jin, & Park, 2023](#)).

In terms of investment efficiency, [Aksar et al. \(2022\)](#) demonstrate that firms maintaining adequate cash reserves can successfully bypass dependence on costly external financing, thereby enabling the timely execution of productive projects. Aligned with this view, [Arianpoor and Mehrfard \(2023\)](#) reveal a significantly positive relationship between cash holdings and investment efficiency, arguing that the availability of substantial free cash flow grants firms strategic flexibility to optimize various available investment avenues. Concurrently, [Elfeky, Elbrashy, and Issa \(2024\)](#) further support the positive impact of cash holdings on investment efficiency. Firms characterized by high-growth investment opportunities tend to accumulate larger cash buffers to guarantee internal funding availability, ensuring that they do not forfeit prospective investments due to external financing constraints. This underlines that the level of cash reserves plays a significant role in determining the quality of investment decisions, particularly when navigating economic uncertainty and unpredictable market dynamics. Consequently, the strategic management of cash holdings functions not only as a liquidity instrument but also as a critical determinant in minimizing financial constraints and elevating overall investment decision-making quality.

2.4 The Russian Invasion of Ukraine as a Moderating Variable

The Russian invasion of Ukraine in February 2022 constituted a major geopolitical shock that triggered widespread global economic uncertainty and heightened operational risks in the business environment ([Nerlinger & Utz, 2022](#)). This conflict has induced extreme volatility in oil and natural gas prices owing to severe disruptions in global supply chains. Such conditions exerted both immense pressure and unique opportunities for energy corporations, prompting management to build larger cash reserves as a strategic risk buffer to safeguard operational flexibility amidst highly erratic market dynamics ([Kennedy, 2023](#); [Mulyani et al., 2023](#)). Consequently, this geopolitical event has emerged as a material factor that heavily influences corporate financial policies and investment decision-making processes.

[Huka and Kelen \(2022\)](#) state in their study that the Russian invasion of Ukraine has generated severe economic uncertainty through surges in energy commodity prices, specifically oil and gas. This has significantly impacted Indonesia's energy sector, where energy-importing firms face immense pressure, while enterprises oriented toward mineral and coal exports benefit substantially from rising commodity prices. Furthermore, [Jahan and Ryu \(2026\)](#) demonstrate that the economic uncertainty induced by the Russia-Ukraine invasion exacerbates information asymmetry, which consequently escalates the costs of external financing. Under such circumstances, firms tend to increase their cash holdings as an anticipatory measure to safeguard ongoing operations.

On the other hand, [Agaton \(2022\)](#) reveals that the geopolitical conflict between Russia and Ukraine has generated extreme energy price uncertainty, which, from the perspective of real options theory, increases the option value to defer investment for energy firms in Southeast Asia. Based on this rationale, the concurrent rise in profitability and economic uncertainty can lead to an accumulation of corporate cash driven either by increased export revenues or precautionary motives for risk mitigation. However, this surge in cash holdings, if not accompanied by the execution of strategic projects due to investment deferrals, has the potential to inadvertently diminish overall investment efficiency.

Moreover, the moderating role of the Russian invasion of Ukraine can be understood through its ability to alter the strength and direction of the relationship between cash holdings and investment efficiency. Under normal economic conditions, cash holdings may function as internal financing that enables firms

to undertake profitable investment opportunities without facing excessive external financing constraints. However, during periods of geopolitical instability, the role of cash becomes increasingly complex. Energy companies may increase cash reserves not only to support investment activities but also to protect themselves from uncertainty related to commodity price fluctuations, supply chain disruptions, exchange rate volatility, and rising financing costs ([Annisa & Hamzah, 2025](#)).

In this context, invasion may strengthen the precautionary motive for holding cash. Firms operating in the energy sector are highly exposed to changes in global energy prices, making financial flexibility crucial. Companies with sufficient cash reserves may be better able to maintain operational continuity, secure raw material supplies, and respond quickly to market opportunities created by increasing energy prices. Therefore, cash holdings can improve investment efficiency when used to finance productive and value-enhancing projects.

However, the same geopolitical shock may also weaken the positive effect of cash holdings on investment efficiency if firms become overly cautious. High uncertainty may encourage management to postpone capital expenditures, delay expansion plans, or retain cash without allocating it to strategic investments. Consequently, accumulated cash may not directly translate into efficient investment decisions. Instead, it may reflect defensive financial behavior aimed at preserving liquidity, rather than maximizing firm value. Thus, the Russian invasion of Ukraine is relevant as a moderating variable because it creates external uncertainty that may influence firms use of cash holdings. The event may either enhance investment efficiency by increasing the strategic value of internal liquidity or reduce it when uncertainty encourages investment delays and conservative policies. Therefore, the relationship between cash holdings and investment efficiency is expected to differ before and after the geopolitical shock.

2.5 Research Gap and Hypotheses Development

Based on the literature review presented above, research urgency arises due to the lack of studies explaining the relationship between cash holdings and investment efficiency from the lens of pecking order theory, which offers a contrasting perspective to agency theory views. This gap creates theoretical ambiguity in understanding corporate financial policies, particularly in the wake of geopolitical shocks such as the Russian invasion of Ukraine. Given the unique characteristics of Indonesia's energy sector regarding global market fluctuations, understanding how this uncertainty influences cash management and investment effectiveness is crucial. This distinct research gap motivates the present study to re-examine the relationships between these variables within the Indonesian energy sector for the period 2016–2023. Therefore, we propose the following hypothesis:

H₁: Cash holdings have a positive effect on investment efficiency in Indonesian energy companies

H₂: The Russian invasion of Ukraine weakens the positive effect of cash holdings on investment efficiency in Indonesian energy companies

3. Methodology

This study adopts a quantitative approach by utilizing secondary data sourced from the annual financial statements of energy sector companies listed on the Indonesia Stock Exchange (IDX) spanning the period from 2016 to 2023. Sample selection was executed using a purposive sampling technique, where the inclusion criteria required energy sector firms to be continuously listed on the IDX during the observation period and to provide complete data for all research instruments and variables. Using this method, a final sample size of 389 firm-year observations from 62 companies was obtained. The dependent variable in this study is investment efficiency, which is measured by calculating the absolute value of the residuals derived from the investment model equation developed by [Huang \(2020\)](#) and formulated as follows:

$$INVEST_{i,t} = \beta_0 + \beta_1 MTB_{i,t-1} + \beta_2 SGI_{i,t-1} + \beta_3 FCF_{i,t} + \beta_4 LEV_{i,t-1} + \beta_5 LOGSALE_{i,t-1} + \sum \beta_k YEAR_DUMMIES + \epsilon_{i,t} \quad (1)$$

The resulting residual value was transformed into its absolute form and subsequently multiplied by -1 to ensure that the dependent variable reflected corporate investment efficiency in a negative direction. This adjustment is necessary to align the variable's value with the concept of investment efficiency, whereby a higher value of the dependent variable indicates a greater degree of investment efficiency.

The primary independent variable investigated in this study is corporate cash holdings, which are meticulously measured by dividing the total aggregate of cash and cash equivalents by the firm's total assets. To effectively capture the profound macroeconomic impact of the Russian invasion of Ukraine, a specific moderating variable labeled invasion (INV) was introduced into the empirical model. This indicator variable is assigned a value of 1 if the firm's fiscal year falls precisely within the years 2022 and 2023, which directly represents the specific period heavily impacted by this geopolitical conflict, and 0 otherwise. Additionally, this study incorporates several essential control variables, including firm age, firm size, and year dummies, to control for fixed time effects, thereby ensuring that the estimated empirical coefficients of the primary variables are not distorted or biased by broader macroeconomic dynamics or shifting external environmental factors that occurred during those specific periods.

The data analysis technique employed in this study is panel data regression integrated with the Moderated Regression Analysis (MRA) approach, which is computationally processed using STATA statistical software. The analytical procedure was executed systematically through several sequential stages, encompassing descriptive statistical analysis, the selection of the optimal panel data regression estimation model, classical assumption testing, and formal hypothesis testing. Within the MRA framework, empirical testing is conducted using two distinct and separate equation models, wherein the first equation is specifically directed to test Hypothesis 1, while the second equation is functionalized to evaluate and test Hypothesis 2.

$$INVEST_EFF_{it} = \beta_0 + \beta_1 CASH_HOLDINGS_{i,t} + \beta_2 INV_{i,t} + \beta_3 FIRM_AGE_{i,t} + \beta_4 FIRM_SIZE_{i,t} + \sum \beta_k YEAR_DUMMIES + \epsilon_{i,t} \quad (2)$$

$$INVEST_EFF_{it} = \beta_0 + \beta_1 CASH_HOLDINGS_{i,t} + \beta_2 CASH_HOLDINGS * INV_{i,t} + \beta_3 INV_{i,t} + \beta_4 FIRM_AGE_{i,t} + \beta_5 FIRM_SIZE_{i,t} + \sum \beta_k YEAR_DUMMIES + \epsilon_{i,t} \quad (3)$$

4. Results and Discussion

The results indicate that cash holdings significantly affect investment efficiency among energy sector companies listed on the Indonesia Stock Exchange (IDX) for the 2016–2023 period. Cash holdings, proxied by the ratio of cash and cash equivalents to total assets, have a positive and significant influence on investment efficiency. This finding indicates that higher cash availability can increase corporate investment efficiency, considering that these liquidity reserves provide financial flexibility in executing strategic investment opportunities. These empirical results are consistent with the pecking order theory, which positions internal cash as financial slack and the primary financing priority to avoid high capital costs resulting from information asymmetry. In addition, these results reinforce previous studies confirming the existence of a positive relationship between cash holdings and investment efficiency.

In addition, the Russian invasion of Ukraine (INV) does not play a moderating role in the relationship between cash holdings and investment efficiency. This finding indicates that the Russian invasion of Ukraine variable only acts as a moderating predictor, which means it has a significant direct effect on investment efficiency but does not interactively influence the strength of the relationship between cash holdings and corporate investment efficiency. In line with [Agaton \(2022\)](#), this condition reflects that the Russian invasion of Ukraine increases the tendency of companies to postpone investment due to high global uncertainty, which ultimately impacts the decline in investment efficiency during the conflict period. Meanwhile, the geopolitical shock that occurred, although affecting global energy price fluctuations as stated by [Huka and Kelen \(2022\)](#), did not exert sufficiently extreme pressure on the internal financing fundamentals of Indonesian energy companies. The following is a summary of the hypothesis-testing results:

Table 1. Summary of hypothesis testing results

Variable	Coefficient	Sig.	Conclusion
Independent			
^[1] Cash Holdings	Positive Significant	<0.05	Supported
Moderating			
^[1] INV	Negative Significant	<0.05	Rejected
^[2] Cash Holdings*INV	Non-significant	>0.05	
Control			
^[1] Firm Size	Positive Significant	<0.05	-
^[1] Firm Age	Positive Significant	<0.05	-
Year Dummies	<i>Included</i>		-

^[1] From the First MRA Equation

^[2] From the Second MRA Equation

5. Conclusions

5.1 Conclusion

This study examines the effect of cash holdings on investment efficiency, with the Russian invasion of Ukraine (INV) as a moderating variable in energy sector companies listed on the Indonesia Stock Exchange (IDX) for the 2016–2023 period. The results of this study show that cash holdings have a positive and significant effect on investment efficiency, which indicates that companies with higher cash reserves tend to increase corporate investment efficiency. Furthermore, the Russian invasion of Ukraine did not moderate the relationship between cash holdings and corporate investment efficiency. Therefore, the objectives of this study have been successfully achieved, as this research provides empirical evidence regarding how cash holdings affect investment efficiency and whether the Russian invasion of Ukraine influences this relationship within the Indonesian energy sector.

5.2 Research Limitations

This study had several limitations. First, the scope of this research is limited to energy sector companies listed on the Indonesia Stock Exchange (IDX); therefore, the findings on cash management and investment efficiency cannot necessarily be generalized to other industrial sectors with different cost structures. Second, the measurement of investment efficiency relies entirely on a regression residual model, which allows the possibility that alternative or complementary models may provide different accuracy. Finally, the impact of the Russian invasion of Ukraine was proxied using a dummy variable that only captured the time dimension without representing the actual intensity of the shock. Therefore, the estimation results reflect the cumulative influence of macroeconomic dynamics during the observation period.

5.3 Suggestions and Directions for Future Research

Based on the conclusions and limitations outlined above, several strategies are suggested. Energy companies in Indonesia are encouraged to optimize cash holdings management policies to ensure the availability of internal funds for positive Net Present Value (NPV) investments while strengthening internal supervision to minimize the risks of underinvestment and overinvestment. Investors and stakeholders are expected to engage more proactively with management to promote transparency in liquidity management amid economic uncertainty. Future researchers are advised to expand the analytical scope by using alternative or complementary investment efficiency measurement models and replacing the geopolitical event dummy variable with a continuous variable, such as the world energy price index, to capture the degree of uncertainty more precisely and comprehensively.

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