International Journal of Research on Financial & Business (IJRFB) ISSN: 3046-4609 (Online)
Vol 11, No 1, November 2026, pp. 1-14 ISSN: 3032-7806 (Print)

THE EFFECT OF ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) PRACTICES ON INVESTMENT EFFICIENCY: THE MODERATING ROLE OF DIGITAL TRANSFORMATION

Mochamad Rifqi Wijdan[1], Sari Atmini[2]
[1,2]*Accounting Department, Faculty of Economics and Business, University of Brawijaya, Indonesia*

Abstract. This study aims to analyze and provide empirical evidence regarding the effect of Environmental, Social, and Governance (ESG) practices on investment efficiency, as well as the moderating effect of digital transformation on the relationship between ESG practices and investment efficiency. This research uses secondary data in the form of financial reports and annual reports. From the population of all companies listed on the Indonesia Stock Exchange (IDX) in 2023, a number of 123 samples was obtained using a purposive sampling technique. The data were analyzed using moderation regression analysis with SPSS version 30. The results show that ESG practices do not affect investment efficiency, and digital transformation does not strengthen the relationship between ESG practices and investment efficiency.

Keywords: ESG, investment efficiency, digital transformation

I. INTRODUCTION

In general, investment refers to the allocation of capital to specific sectors or areas with the expectation of generating returns in the future (Firawan & Dewanto, 2021). Companies need to ensure that their investments generate benefits and are carried out efficiently. They must avoid waste and activities that do not create added value in order to preserve investment value.

Well-targeted investment activities can be achieved when companies have clearly defined objectives, ensuring that their investments do not result in undesirable conditions and ultimately achieve investment efficiency. Accordingly, investment efficiency can be understood as a condition in which companies avoid both overinvestment and underinvestment (Aryonanto & Dewayanto, 2022). These conditions represent forms of investment deviation and constitute obstacles that prevent companies from achieving investment efficiency.

Overinvestment refers to a situation in which companies make inefficient and suboptimal investment decisions due to limited investment opportunities and high capital investment coefficients prior to transactions (Cherkasova & Zakharova, 2016). In other words, overinvestment occurs when the actual investment made by a company exceeds its expected or estimated investment level. Companies may experience overinvestment when they have excessive free cash flow but relatively low growth opportunities, resulting in investment activities that are suboptimal and inefficient (Sari & Suaryana, 2014).

Underinvestment occurs when companies undertake investment activities using debt financing without having sufficient resources to meet their debt obligations. This situation arises because the company's investment activities cannot be realized as expected, prompting

the company to seek alternative approaches to implement its investments (Sari & Suaryana, 2014). One alternative is to improve the quality of profit generation, thereby increasing company revenue. Furthermore, companies with effective cash flow utilization tend to demonstrate better financial performance, which positively affects their earnings. Companies capable of generating higher profits have greater flexibility in making investment decisions, thereby increasing their likelihood of achieving investment efficiency. This is consistent with the findings of Pratomo et al. (2024), who demonstrated that profitability can improve investment efficiency.

Investment conditions in Indonesia remain relatively far from achieving efficiency. This may indicate that investment activities undertaken by companies in Indonesia are not yet sufficiently efficient. One indicator used to assess investment efficiency is the Incremental Capital Output Ratio (ICOR) in Indonesia. ICOR represents the ratio of investment to Gross Domestic Product (GDP) and serves as one of the macroeconomic indicators for measuring the level of economic efficiency in a country (Yamani et al., 2022). A lower ICOR value indicates a higher level of investment efficiency. Indonesia's ICOR values in 2021, 2022, and 2023 were 8.6, 6.02, and 6.33, respectively (Heniyatun, 2024). These figures are higher than those of other countries within the Association of Southeast Asian Nations (ASEAN). The average ICOR among ASEAN countries ranges from 4 to 5 (Muslimawati, 2025).

Investment efficiency is often associated with Environmental, Social, and Governance (ESG) practices. The ESG concept emphasizes investment activities and corporate decision-making that prioritize environmental sustainability, social responsibility, and good corporate governance. Several previous studies have found evidence that corporate ESG disclosure promotes investment efficiency. Hai et al. (2022), Lian and Weng (2024), Wang et al. (2022), and Allman (2022) found evidence of the role of ESG in improving corporate efficiency.

Ellili (2022) found that ESG disclosure reduces information asymmetry, enhances corporate transparency, and contributes to investment efficiency. For companies experiencing overinvestment and underinvestment, ESG engagement has been found to mitigate only overinvestment problems (Bilyay-Erdogan et al., 2024). Underinvestment is generally caused by corporate financial constraints. To address financial constraints that may lead to underinvestment, companies need to improve their ability to generate profits so that their investment activities can be implemented as expected. This is supported by Lestari et al. (2024), who found that financial reporting quality and profitability performance improve investment efficiency. Similarly, Pratomo et al. (2024) found evidence that profitability enhances investment efficiency. The higher the revenue generated by a company, the greater its flexibility in utilizing those revenues to undertake efficient investment activities.

Information asymmetry and agency conflicts contribute to investment inefficiency. Information asymmetry occurs when one party possesses more information than another. Such information imbalances may give rise to agency conflicts between investors and managers. As a complement to financial information, ESG disclosure can reduce information asymmetry and enhance transparency. By adopting ESG practices, companies can obtain several benefits, including the protection of shareholders' interests, the assurance that management decisions are aligned with their intended objectives, and improved oversight of corporate organizations (Minggu et al., 2023). In other words, ESG practices can reduce conflicts between internal corporate parties and stakeholders. Issues such as information asymmetry and agency conflicts represent obstacles to business operations in developing countries (Zhao & Xiao, 2019). This

finding is supported by Bhandari and Javakhadze (2017), who found that developing countries need to provide clearer information disclosure to attract more selective external investors.

Contrasting findings were reported by Aryonanto and Dewayanto (2022), who found that ESG has no significant effect on investment efficiency. This may occur because ESG disclosure requires substantial costs, leading companies to perceive such expenditures as a potential source of investment inefficiency (Harymawan et al., 2022). Irianingsih et al. (2024) also found evidence that higher levels of ESG disclosure are associated with lower corporate investment efficiency. These inconsistent findings provide the rationale for conducting further research on the effect of ESG on investment efficiency.

The inconsistencies in previous research findings have encouraged the researcher to consider additional factors that may help companies translate ESG practices into greater investment efficiency. Accordingly, this study incorporates digital transformation as a moderating variable. Digital transformation is defined as the adoption of new technologies to generate corporate innovations, thereby stimulating companies to create additional value (Verhoef et al., 2021). According to Lu et al. (2024), digital transformation, with its technological sophistication, can help companies improve production processes, enhance management functions, and strengthen the collection of information required by companies. These capabilities are considered factors that can improve the quality of corporate governance. The adoption of new technologies is expected to accelerate information dissemination and thereby reduce information asymmetry.

Digital transformation at the corporate level is expected to reduce operational costs, consistent with a fundamental economic principle of achieving maximum returns with minimal capital investment. Digital transformation improves corporate performance through lower costs, greater operational efficiency, and increased innovation success (Zhai et al., 2022). Su et al. (2023) found evidence that digital transformation can enhance total factor productivity and strengthen both the willingness and capacity of companies to fulfill their corporate social responsibilities. These findings are consistent with Pristiwaningsih et al. (2024), who found that by incorporating a greater focus on technologies such as automation, the Internet of Things, and data analytics, even small-scale manufacturers can increase production output and reduce non-value-added costs. Furthermore, digital transformation can support management in making investment decisions by identifying profitable investment projects and preventing overinvestment or underinvestment, thereby facilitating investment efficiency. The inclusion of digital transformation as a moderating variable represents the novelty of this study.

II. LITERATURE REVIEW

A. Information Asymmetry

Akerlof (1970) illustrated the impact of information asymmetry on the used-car market, in which sellers possess more information about the goods being traded than buyers. This situation places buyers in a state of uncertainty, thereby exerting downward pressure on market prices. Scott (2015) distinguishes between two types of information asymmetry: adverse selection and moral hazard. Adverse selection refers to a type of information asymmetry in which one party possesses an informational advantage over another party in a business transaction. Moral hazard refers to a type of information asymmetry in which, within a contractual agreement, one or more parties can observe their own actions in fulfilling the contract, while the other party cannot.

In other words, information asymmetry refers to a condition in which managers possess more information about the company's condition than shareholders. This perspective allows researchers to analyze the extent to which information asymmetry influences managerial decision-making, particularly when determining investment activities.

B. Agency Theory

Jensen and Meckling (1976) define an agency relationship as a contractual arrangement in which one or more individuals, referred to as principals, engage another individual, referred to as an agent, to perform a task on their behalf by delegating certain decision-making authority to the agent. Essentially, principals and agents share the same objective of creating additional value for the company. However, in practice, their objectives often diverge, resulting in conflicts of interest. To prevent such conflicts, principals need to obtain information equivalent to that available to agents so that they can effectively monitor the agents' actions.

C. Investment Efficiency

Efficient investment or capital allocation refers to a condition in which a company undertakes investment activities and successfully achieves its targeted returns within a predetermined period, resulting in a positive Net Present Value (NPV) (Widyatama & Radianto, 2024). Investment efficiency is associated with a company's capability to undertake investment activities optimally, as reflected in the availability of investment opportunities and financial resources sufficient to support such investments (Syentia & Wahyuni, 2021). Efficient investment occurs when a company can allocate its capital and resources wisely to assets with high profit potential, involving an assessment of project profitability, operational costs, and other investment risks (Fitri et al., 2024). A company with greater flexibility in allocating its capital for investment reflects a condition in which it does not face financial constraints. Such flexibility enables the company to identify and evaluate profitable projects, thereby increasing the likelihood of achieving investment efficiency.

Ma (2025) identifies three factors influencing investment efficiency: cash flow, principal-agent relationships, and information asymmetry. A company's cash flow can indicate the effectiveness of its cash management. This management process is closely related to managerial decision-making, which should be aligned with the company's objectives and the interests of its stakeholders. Stakeholders need access to information equivalent to that available to managers so that they can effectively monitor managerial behavior.

D. Environmental, Social, and Governance (ESG)

ESG is a concept that requires companies to consider three criteria in their business practices: environmental, social, and corporate governance aspects. The Global Sustainable Investment Alliance states that investors are attracted to the ESG concept because of its potential to improve investment returns (Donghui et al., 2023).

ESG enhances corporate transparency. Governance practices and comprehensive disclosure are essential for increasing firm value. Companies seeking to enhance their firm value must improve their performance and the management of their environmental, social, and governance disclosures (Wau, 2023). In the financial sector, ESG is commonly represented through scores or ratings (Kiehne, 2019). These scores serve as benchmarks for assessing the extent of ESG information disclosure.

The Indonesia Stock Exchange (IDX), as the regulator and facilitator of Indonesia's capital market, contributes to supporting ESG implementation by issuing ESG-based stock indices. These indices include IDXESG Leaders, SRI-KEHATI, ESG Sector Leaders IDX KEHATI, and ESG Quality 45 IDX KEHATI. Among these four indices, only IDXESG Leaders collaborates with Morningstar Sustainalytics, while the other three are the result of collaboration between the IDX and the KEHATI Foundation.

E. Digital Transformation

Digital transformation is a fundamental organizational change process driven by the adoption of digital technologies. This process involves the integration of various technologies, including information systems, computing, communication networks, and internet connectivity, to create added value (Vial, 2019). Reis et al. (2018) conceptualize digital transformation through three distinct elements: technology, organization, and society.

Digital transformation refers to the process of integrating digital technologies into a company's business model, with the aim of developing and implementing digital-based business models that encourage value creation and improve the ways in which companies deliver value to their stakeholders (Ningsih et al., 2024). The implementation of digital transformation has become increasingly important due to its practical and efficient applications, supported by automation features. Gao (2021) states that digital transformation is an effective approach to addressing investment deviation problems arising from financial constraints. Another advantage, as demonstrated by Heryana and Soeratin (2025), is that digital transformation has successfully increased customer satisfaction in the financial sector by 25%.

F. Research Framework

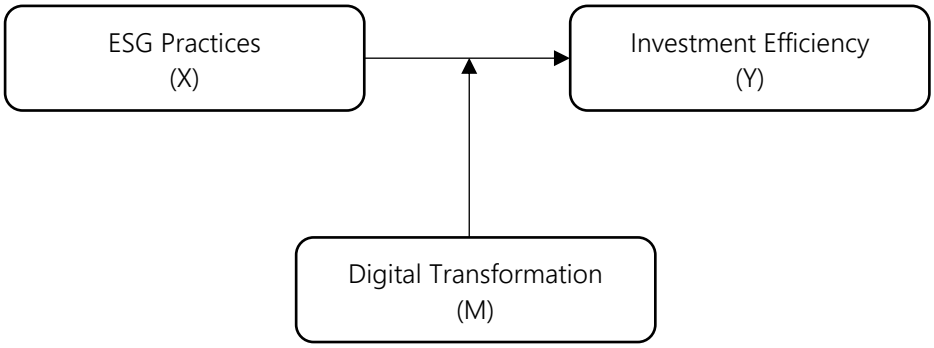


Figure 1 Research Framework

G. Hypothesis Development

The Effect of ESG Practices on Investment Efficiency Through Information Asymmetry and Agency Theory

ESG is believed to enhance corporate transparency, thereby improving investment efficiency through the reduction of information asymmetry and agency conflicts (Bilyay-Erdogan et al., 2024). This is consistent with the findings of Allman and Won (2022), who provided empirical evidence that ESG disclosure can reduce information asymmetry. Furthermore, Donghui et al. (2023) provided empirical evidence that ESG can improve

investment efficiency by reducing agency costs, which ultimately leads to greater investment efficiency.
H1: ESG practices improve investment efficiency.

The Moderating Role of Digital Transformation

The use of such technologies indirectly reduces the information gap between principals and agents (Wang, 2024). Through integrated systems, information regarding corporate operations, performance, and risks becomes more transparent and easily accessible to both management and shareholders (Yang, 2023). Furthermore, digital transformation can assist companies in analyzing risks, thereby reducing the likelihood of managers making less objective decisions (Jiang et al., 2022). This helps prevent managers from engaging in value-destroying activities.

From an operational perspective, Zhai et al. (2022) provide evidence that digital transformation improves corporate performance by reducing operational costs and enhancing innovation. A company's ability to reduce operational costs and increase productivity may indicate that its resource utilization processes are being carried out efficiently.
H2: Digital transformation strengthens the relationship between ESG practices and investment efficiency.

III. RESEARCH METHODOLOGY

A. Type of Research

This study employs a quantitative research approach. Quantitative research is a method grounded in the philosophy of positivism, which is used to examine specific populations or samples. Research instruments are employed to collect data, and the data are analyzed using quantitative statistical techniques (Bougie & Sekaran, 2019).

B. Population and Sample

The population refers to the entire group of people, events, or objects of interest that researchers intend to investigate (Bougie & Sekaran, 2019, p. 222). The population in this study consists of publicly listed companies on the Indonesia Stock Exchange (IDX) in 2023.

This study employs a purposive sampling technique to select the research sample. Purposive sampling is a sampling method in which samples are selected based on specific predetermined criteria. The criteria for selecting the research sample are as follows: (1) companies that have ESG scores available on Bloomberg Terminal in 2023; (2) non-financial companies; (3) companies with complete data required for this study; and (4) companies whose financial reporting periods end on December 31. Financial companies, such as banks, insurance companies, and securities firms, are excluded from the sample because they have different business models and sources of revenue.

C. Types and Source of Data

This study uses secondary data. Secondary data refer to data that are not collected directly by the researcher. The data used in this study are quantitative in nature and expressed in numerical form, which will subsequently be subjected to statistical testing. Data for the ESG practices variable are obtained from Bloomberg Terminal. Meanwhile, data for the investment efficiency and digital transformation variables are obtained from companies' annual reports,

which are downloaded from the official website of the Indonesia Stock Exchange (IDX) or the respective companies' official websites.

D. Data Analysis Method

This study uses IBM Statistical Package for the Social Sciences (SPSS) version 30 software to analyze the data. The analysis involves a series of statistical tests, including normality, multicollinearity, and heteroscedasticity tests, moderated regression analysis (MRA), and an additional bootstrap test to assess the consistency of the research findings.

IV. RESULT AND DISCUSSION

A. Description of the Research Sample

The determination of the research sample criteria was based on the research objectives to ensure that the study could achieve its intended purpose. The sample selection procedure is presented in the following table:

Table 1. Research Sample Selection

No	Sample Criteria	Number of Companies
1	Companies listed on the Indonesia Stock Exchange in 2023	975
2	Companies that did not disclose ESG scores on Bloomberg Terminal	(815)
3	Financial companies	(29)
4	Companies with incomplete data	(1)
5	Companies whose financial reporting periods did not end on December 31	(1)
6	Total Sample	129
7	Companies excluded due to outlier tests	(6)
	Final sample used for data analysis	123

In this study, outliers were identified using the Interquartile Range (IQR) method. This method identifies outliers by determining the upper and lower boundaries and excluding observations that fall outside these ranges. In other words, outliers are defined as values falling outside the range of Q1 – 1.5 × IQR and Q3 + 1.5 × IQR (Tukey, 1977). The companies excluded from the research sample due to outlier observations were PT Amman Mineral Internasional Tbk, PT Dian Swastatika Sentosa Tbk, PT DFI Retail Nusantara Tbk, PT Steel Pipe Industry of Indonesia Tbk, PT Mitra Adiperkasa Tbk, and PT Trias Sentosa Tbk.

B. Classical Assumption Test

Normality Test

Tabel 2. Normality Test Results

	Unstandardized Residual
N	123
Test Statistic	0,067
Assymp. Sig. (2-tailed)	0,200

Multicolinearity Test

Table 3. Multicolinearity Test Results

Variabel	*Collinearity Statistics*		Keterangan
	Tolerance	VIF	
ESG	0,580	1,725	No Multicolinearity
Digital Transformation	0,046	21,886	Multicolinearity
Interaction	0,041	24,335	Multicolinearity
Firm Size	0,973	1,028	No Multicolinearity
Firm Age	0,889	1,125	No Multicolinearity
Cash flow	0,890	1,124	No Multicolinearity

The multicollinearity test results indicate the presence of multicollinearity, as two independent variables have tolerance values below 0.10 and VIF values above 10. According to Murniati et al. (2013), one approach to addressing multicollinearity when using moderating variables is mean-centering, which involves subtracting the mean value from the ESG and digital transformation variables. The results of the multicollinearity test after applying mean-centering are presented in the following table:

Table 5. Multicollinearity Test Results After Mean-Centering

Variabel	Collinearity Statistics	
	Tolerance	VIF
ESG Practices	0,871	1,148
Digital Transformation	0,861	1,162
Interaction	0,905	1,105
Firm Size	0,973	1,028
Firm Age	0,889	1,125
Cash flow	0,890	1,124

Based on the multicollinearity test results after mean-centering, as presented in Table 4.6, all independent variables have tolerance values greater than 0.10 and Variance Inflation Factor (VIF) values below 10. Therefore, the multicollinearity assumption is satisfied.

Heteroscedasticity Test

Tabel 5. Heteroscedasticity Test Results

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	0,001	11	0,000	1,532	0,130
Residual	0,004	111	0,000		
Total	0,005	122			

Based on the White test results presented in Table 4.7, the significance value is 0.130, which is greater than 0.05. A significance value exceeding 0.05 indicates that there is no evidence of heteroscedasticity in the regression model.

C. Hypothesis Test

Moderated Regression Analysis

Table 6. Moderated Regression Analysis Results

Variables	Expectation	Coefficient	t	Sig. (p-value)
ESG Practices	Positive	0,000	-0,362	0,718
Interaction	Positive	0,000	-0,394	0,694
Digital Transformation	Positive	0,017	1,492	0,138
Firm size	Positive	0,000	0,039	0,694
Firm age	Positive	-0,019	-3,359	0,001
Cash flow	Positive	-0,003	-0,066	0,947
R Squared		0,120		
Adj. R Squared		0,74		
F-statistic		2,636		
Sig. F		0,020		

The R-squared value of 0.120 indicates that investment efficiency can be explained by ESG practices, digital transformation, and control variables, including firm size, firm age, and cash flow, by 12%. Thus, the independent and control variables account for only 12% of the variation in the dependent variable, while the remaining 88% is explained by other factors outside the regression model. Meanwhile, the F-test significance value of less than 0.05 indicates that the regression model developed in this study is statistically fit.

The moderated regression analysis results indicate that the significance values of the independent variable and the interaction variable are greater than 0.05. Therefore, both Hypothesis 1 and Hypothesis 2 are not supported. Accordingly, this study fails to find evidence that ESG practices improve investment efficiency or that digital transformation strengthens the effect of ESG practices on investment efficiency. As presented in Table 6, all variables in the main regression model, except firm age, have significance values greater than 0.05. Consequently, Hypothesis 1 and Hypothesis 2 are rejected. It can therefore be concluded that ESG practices do not improve investment efficiency and that digital transformation does not strengthen the relationship between ESG practices and investment efficiency.

Additional Test

Table 7. Additional Test Results

Variabel	B	Sig. (2-tailed)	CI 95%	
			Lower	Upper
ESG Practices	-0,001	0,192	-0,004	0,000
Digital Transformation	-0,013	0,353	-0,037	0,015
Interaction	0,001	0,431	-0,001	0,004
Firm Size	-0,002	0,270	-0,005	0,001
Firm Age	-0,017	0,058	-0,032	-0,003
Cash Flow	-0,067	0,215	-0,173	0,029

Based on the regression results, the research sample did not satisfy the normality assumption. Therefore, an additional analysis was conducted using the bootstrap method with 1,000 resampling iterations. The results indicate that none of the variables has a statistically significant effect on the dependent variable. This is reflected in significance values greater than 0.05 and 95% confidence intervals that include zero. Among all the independent variables examined, only the control variable firm age approaches the 0.05 significance threshold, although it can be considered statistically significant under a conservative interpretation. These findings are consistent with the main regression model, which also indicates no statistically significant effects on the dependent variable, except for firm age.

These results indicate that differences in the number of observations used in the research sample do not change the overall testing results. Furthermore, differences in the measurement of the dependent variable do not produce different findings. Thus, the additional test results are consistent with those of the main regression model. It can therefore be concluded that the additional tests support the findings of the main regression model, further strengthening the robustness of the main regression results.

D. Discussion

The Effect of ESG Practices on Investment Efficiency

This study fails to provide evidence that ESG practices improve investment efficiency. This finding is inconsistent with the study by Lin et al. (2023), which found that ESG practices enhance investment efficiency. However, it is consistent with the findings of Aryonanto and Dewayanto (2022), Lu (2024), and Irianingsih et al. (2024), who reported that ESG has no significant effect on investment efficiency. According to Waddock and Graves (1997), ESG practices may adversely affect companies because they consume corporate resources, thereby generating additional costs associated with ESG implementation. These additional costs and resource expenditures may further widen the gap between companies and the achievement of investment efficiency.

The Moderating Role of Digital Transformation

This study fails to find evidence that digital transformation strengthens the positive effect of ESG practices on investment efficiency. This finding is inconsistent with the results of Lin et al. (2023) and Ningsih et al. (2024), who found that digital transformation strengthens the relationship between ESG practices and investment efficiency. Lin et al. (2023) reported a mean value of 0.596 for the digital transformation variable, indicating that companies had reached an intermediate to mature stage of technology adoption. However, in this study, the binary value of 1 has a frequency of 47. This indicates that the proportion of companies implementing digital transformation within the research sample remains relatively low.

V. CONCLUSION

This study fails to provide evidence that ESG practices improve investment efficiency or that digital transformation strengthens the relationship between ESG practices and investment efficiency. Meanwhile, the additional test results are consistent with the main findings of this study. Therefore, it can be concluded that the findings of this study are robust.

The findings of this study do not imply that ESG practices are unimportant or should not be implemented. This is because ESG is grounded in the concept of sustainability, meaning that the benefits of ESG practices may not necessarily be realized in the short term but may become apparent over a longer period.

ACKNOWLEDGEMENT

The author would like to express gratitude to all the people who have helped in the completion of this study.

REFERENCES

Allman, E., & Won, J. (2022). The Effect of ESG Disclosure on Corporate Investment Efficiency *. https://ssrn.com/abstract=3816592

Aryonanto, F. A., & Dewayanto, T. (2022). PENGARUH PENGUNGKAPAN ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) DAN KUALITAS LAPORAN KEUANGAN PADA EFISIENSI INVESTASI. DIPONEGORO JOURNAL OF ACCOUNTING, 11(3), 1–9. http://ejournal-s1.undip.ac.id/index.php/accounting

Bhandari, A., & Javakhadze, D. (2017). Corporate social responsibility and capital allocation efficiency. Journal of Corporate Finance, 43, 354–377. https://doi.org/https://doi.org/10.1016/j.jcorpfin.2017.01.012

Biddle, G. C., Hilary, G., & Verdi, R. S. (2009). How Does Financial Reporting Quality Relate to Investment Efficiency?

Bilyay-Erdogan, S., Danisman, G. O., & Demir, E. (2024). ESG performance and investment efficiency: The impact of information asymmetry. Journal of International Financial Markets, Institutions and Money, 91. https://doi.org/10.1016/j.intfin.2023.101919

Bougie, R., & Sekaran, U. (2019). Research Methods for Business.

Cherkasova, V., & Zakharova, E. (2016). Suboptimal investments and M & A deals in emerging capital markets. Economic Annals, 61(208), 93–120. https://doi.org/10.2298/EKA1608093C

Donghui, Z., Salleh, M. F. M., Yusoff, W. S., Lin, N. S., Jamil, A. H., Rani, M. J. bin A., & Shaari, M. S. (2023). The Impact of ESG and the Institutional Environment on Investment Efficiency in China through the Mediators of Agency Costs and Financial Constraints. https://ssrn.com/abstract=4820210

Ellili, N. O. D. (2022). Impact of ESG disclosure and financial reporting quality on investment efficiency. Corporate Governance (Bingley), 22(5), 1094–1111. https://doi.org/10.1108/CG-06-2021-0209

Firawan, P. A., & Dewanto, T. (2021). PENGARUH KUALITAS AUDIT DAN KUALITAS PELAPORAN KEUANGAN TERHADAP EFISIENSI INVESTASI PADA PERUSAHAAN MANUFAKTUR YANG TERDAFTAR DI BEI PADA TAHUN 2017 – 2019.

Fitri, A. K., Marietza, F., & Fitri, K. A. (2024). The influence of Investment Efficiency on Financial Performance. EKOMBIS REVIEW: Jurnal Ilmiah Ekonomi Dan Bisnis, 12(1). https://doi.org/10.37676/ekombis.v12i1

Gao, T. (2021). Research on the Impact of Digital Finance Coverage on the Investment Efficiency of SMEs.

Hai, M., Fang, Z., & Li, Z. (2022). Does Business Group's Conscious of Social Responsibility Enhance its Investment Efficiency? Evidence from ESG Disclosure of China's Listed Companies. Sustainability (Switzerland), 14(8). https://doi.org/10.3390/su14084817

Harymawan, I., Nasih, M., Agustia, D., Putra, F. K. G., & Djajadikerta, H. G. (2022). Investment efficiency and environmental, social, and governance reporting: Perspective from corporate integration management. Corporate Social Responsibility and Environmental Management, 29(5), 1186–1202. https://doi.org/https://doi.org/10.1002/csr.2263

Heniyatun, I. (2024, November 28). Mahalnya Biaya Investasi di Indonesia. Djpb Kemenkeu. https://djpb.kemenkeu.go.id/kppn/solok/id/data-publikasi/artikel/3341-mahalnya-biaya-investasi-di-indonesia.html

Heryana, R. P., & Soeratin, H. Z. (2025). Analisis Pengaruh ESG Terhadap Kinerja Keuangan Perusahaan Dengan Transformasi Digital Sebagai Variabel Pemoderasi. Journal of Business Economics and Management, 01(03), 373–380.

Irianingsih, E., Nazir Ahmad, G., Dharmawan Buchdadi, A., & Author, C. (2024). The Influence of Environmental, Social and Governance and the Risk of Financial Information Disclosure on Investment Efficiency in Environmentally Sensitive Industrial Companies in ASEAN 5 Period 2018-2022. 12, 2988–7615. https://doi.org/10.47353/ijema.v1i12.134

Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. In Journal of Financial Economics (Issue 4). Harvard University Press. http://hupress.harvard.edu/catalog/JENTHF.html

Jiang, K., Du, X., & Chen, Z. (2022). Firms' digitalization and stock price crash risk. International Review of Financial Analysis, 82, 102196. https://doi.org/https://doi.org/10.1016/j.irfa.2022.102196

Kiehne, D.-O. (2019). Environmental, social and corporate governance (ESG)-also an innovation driver? https://www.cooperativepatentclassification.org/cpcScheme

Lestari, P. P., Damayanti, & Pentiana, D. (2024). 2347-Article Text-8253-1-10-20250102.

Lian, Y., & Weng, X. (2024). ESG performance and investment efficiency. Finance Research Letters, 62. https://doi.org/10.1016/j.frl.2024.105084

Lin, Y., Lu, Z., & Wang, Y. (2023). The impact of environmental, social, and governance (ESG) practices on investment efficiency in China: Does digital transformation matter? Research in International Business and Finance, 66. https://doi.org/10.1016/j.ribaf.2023.102050

Lu, Y. (2024). Environmental, Social, and Governance (ESG) Transparency and Investment Efficiency.

Lu, Y., Xu, C., Zhu, B., & Sun, Y. (2024). Digitalization transformation and ESG performance: Evidence from China. Business Strategy and the Environment, 33(2), 352–368. https://doi.org/https://doi.org/10.1002/bse.3494

Ma, H. (2025). Stock Liquidity and Corporate Investment Efficiency. Frontiers in Business, Economics and Management, 18.

Minggu, A. M., Aboladaka, J., & Neonufa, G. F. (2023). Environmental, Social dan Governance (ESG) dan Kinerja Keuangan Perusahaan Publik di Indonesia. Owner, 7(2), 1186–1195. https://doi.org/10.33395/owner.v7i2.1371

Murniati, M. P., Purnamasari, St. V., R, A. S. D., Sihombing, R., & Warastuti, Y. (2013). Alat-alat pengujian hipotesis.

Muslimawati, N. (2025, January 15). RI Sering Disalip Vietnam, Mulai dari Pertumbuhan Ekonomi hingga Pasar Durian. KumparanBISNIS.

Ningsih, S. S., Zaitul, & Ilona, D. (2024). Pengungkapan Esg Dan Efisiensi Investasi Investigasi Peran Kualitas Audit Dan Transformasi Digital Sebagai Variabel Moderasi. Jurnal Akuntansi, Manajemen Dan Ilmu Ekonomi (JASMIEN), 5(1). https://doi.org/10.54209/jasmien.xxxx.xxx

Pratomo, D. A. G. P., Prajanto, A., & Durya, N. P. M. A. (2024). Faktor-Faktor Yang Mempengaruhi Efisiensi Investasi Pada Perusahaan Sektor Transportasi Periode 2018-2022. Jurnal Maneksi, 13(1).

Pristiwaningsih, E. R., Rizky, D., Atmojo, T. A., & Nadhifah, F. (2024). Transformasi Digital di Industri Manufaktur: Dampak pada Efisiensi Operasional Afiliation: Corresponding email estin@polije.ac.id. Jurnal Sains Dan Teknologi Elektro, 14, 2830–3512. https://doi.org/10.47709/elektriese.v14i02.4809

Reis, J., Amorim, M., Melão, N., & Matos, P. (2018). Digital transformation: A literature review and guidelines for future research. Advances in Intelligent Systems and Computing, 745, 411–421. https://doi.org/10.1007/978-3-319-77703-0_41

Sari, L. I. N., & Suaryana, I. G. N. A. (2014). PENGARUH KUALITAS LAPORAN KEUANGAN PADA EFISIENSI INVESTASI PERUSAHAAN PERTAMBANGAN. E-Jurnal Akuntansi Universitas Udayana, 8.

Scott, W. R. (2015). Financial Accounting Theory (Seventh). https://universitytime.home.blog/wp-content/uploads/2020/08/afm-401-scott-financial-accounting-theory-7ed.pdf

Su, J., Wei, Y., Wang, S., & Liu, Q. (2023). The impact of digital transformation on the total factor productivity of heavily polluting enterprises. Scientific Reports, 13(1). https://doi.org/10.1038/s41598-023-33553-w

Syentia, L., & Wahyuni, D. F. (2021). INVEST : Jurnal Inovasi Bisnis dan Akuntansi Financial Reporting Quality, Disclosure of Corporate Social Responsibility (CSR), and Investment Efficiency. http://journal.al-matani.com/index.php/invest/index

Tukey, J. (1977). Exploratory Data Analysis 1977 (F. Mosteller, Ed.). Addison-Wesley Publishing Company.

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Qi Dong, J., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889–901. https://doi.org/10.1016/j.jbusres.2019.09.022

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems, 28(2), 118–144. https://doi.org/https://doi.org/10.1016/j.jsis.2019.01.003

Waddock, S. A., & Graves, S. B. (1997). The corporate social performance-financial performance link. Strategic Management Journal, 18(4), 303–319. https://doi.org/10.1002/(SICI)1097-0266(199704)18:4<303::AID-SMJ869>3.0.CO;2-G

Wang, H. (2024). A study on the impact of enterprise digital transformation on informed trading. PLoS ONE, 19(12). https://doi.org/10.1371/journal.pone.0313623

Wang, W., Yu, Y., & Li, X. (2022). ESG performance, auditing quality, and investment efficiency: Empirical evidence from China. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.948674

Wau, H. R. (2023). PENGARUH ENVIRONMENTAL, SOCIAL DAN GOVERNANCE DISCLOSURE (ESG) TERHADAP NILAI PERUSAHAAN PADA PERUSAHAAN MANUFAKTUR SUB SEKTOR MAKANANDAN MINUMAN YANG TERDAFTAR DI BURSA EFEK INDONESIA TAHUN 2017-2021 [UNIVERSITAS MEDAN AREA]. repository.uma.ac.id

Widyatama, J. C., & Radianto, W. E. D. (2024). Analisis Kepemilikan Manajerial, Dewan Komisaris Independen, Kepemilikan Institusional Terhadap Efisiensi Investasi Pada Saham Sri KEHATI. Media Akuntansi Dan Perpajakan Indonesia, 6.

Yamani, M., Riptek, J., & Kunci, K. (2022). Analisis Incremental Capital Output Ratio (ICOR) Kota Semarang. Jurnal Riptek, 6(1), 15–20. http://riptek.semarangkota.go.id

Yang, L. (2023). The Impact of Intelligent Manufacturing on Company Investment Efficiency. In Business, Economics and Management EDMI (Vol. 2023).

Zhai, H., Yang, M., & Chan, K. C. (2022). Does digital transformation enhance a firm's performance? Evidence from China. Technology in Society, 68, 101841. https://doi.org/10.1016/J.TECHSOC.2021.101841

Zhao, T., & Xiao, X. (2019). The impact of corporate social responsibility on financial constraints: Does the life cycle stage of a firm matter? International Review of Economics & Finance, 63, 76–93. https://doi.org/https://doi.org/10.1016/j.iref.2018.08.010