Environmental Strategy and Investor Response: The Role of Green Innovation, Green Strategy and Carbon Strategy in Determining Cumulative Abnormal Returns

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Abstract

Purpose: *Environmental concern can enhance a company's competitive advantage and reputation, influencing investor assessments. In Indonesia, rising carbon emissions and stakeholder pressure encourage firms to adopt green innovation and carbon strategies to reduce environmental impact, increase corporate value, and affect market reactions.*

Methodology/approach: *This study is quantitative, and purpose to analyze the factors that influence cumulative abnormal return (CAR). The independent variables are green innovation, green strategy, and carbon strategy, while firm size and profitability are used as control variables. Secondary Data were collected from IDX-listed energy, automotive, and transportation companies during 2021–2024. The sample was selected using purposive sampling and analyzed using multiple linear regression via SPSS 30.*

Findings: *The results indicate that green innovation has influence on CAR, green innovation is able to create a high level of competitiveness for firms through productivity optimization and cost efficiency. Likewise, green strategy does not influence on CAR, because investors do not yet fully value or understand it as a source of long-term financial value. In contrast, carbon strategy positively influences CAR, companies proactively implementing carbon strategy are viewed as better prepared for future carbon emissions regulation and, more capable of managing environmental risk.*

Practical implications: *Sustainability requires significant investment in human and financial resources, with benefits that are indirect and often only visible in the long term.*

Originality/Value: *The government as a regulator needs to require public companies in Indonesia to implement sustainability strategies to support sustainable development.*

Keywords:
Green Innovation; Green Strategy; Carbon Strategy; Cumulative Abnormal Return.

For citation:
Fitriani, U. D., & Handoko, J. (2026). Environmental Strategy and Investor Response: The Role of Green Innovation, Green Strategy and Carbon Strategy in Determining Cumulative Abnormal Returns. *Akuntansi: Jurnal Akuntansi Integratif, 12* (1), 103-123. 10.29080/jai.v12i1.2436

DOI: 10.29080/jai.v12i1.2436

Declaration of conflict of interest: The author declare no conflict of interest.

Received: 19 February, 2026
Accepted: 15 April, 2026
Published: 30 April, 2026

INTRODUCTION

The increase in the Earth's average temperature is clear evidence of climate change, which has a global impact on the environment, businesses, and society. Global pressure is driving various parties to undertake efforts to mitigate and adapt to climate change. The energy, automotive, and transportation sectors are often highlighted as major contributors to carbon emissions, requiring companies to adopt sustainability strategies to reduce environmental impact while increasing competitiveness and creating long-term value.

Companies that care about the environment can gain a competitive advantage and a positive image, ultimately influencing investors' assessment of the company's risks and prospects as financial institutions (Erlangga, Fauzi, and Sumiati, 2021). In the modern business context, company success is no longer measured solely by financial performance but also by its ability to sustainably manage environmental, social, and governance aspects over the long term (Susanti, Sinaga and Rahayu, 2025). The focus of measurement encompasses not only economic aspects but also the company's contribution to environmental preservation and social welfare (Anggrainy, Rosini, and Nofryanti, 2025). In Indonesia, increasing carbon emissions, coupled with regulatory and stakeholder pressure, are driving companies to implement environmentally friendly business practices through green innovation, green strategies, and carbon strategies to reduce environmental impacts, create corporate value, and influence market reactions. Market reactions are external factors that reflect investor responses to company information, policies, and performance. A positive market response serves as a signal for management to maintain or enhance the company's commitment to sustainability (Itan, Febriana, Chen, and Septiany, 2025).

Green innovation is a company's approach to minimizing environmental impact by integrating environmentally friendly practices into business operations to create long-term corporate value (Rizqillah and Pamulang, 2022). Green innovation is a crucial aspect in the business world, referring to the development of more environmentally friendly and sustainable products, processes, or technologies, especially for companies operating in markets with increasing demands for social and ecological responsibility. Companies that successfully implement green innovation effectively have the potential to gain a competitive advantage and increase corporate value, along with growing awareness among the public, government, and consumers about the importance of environmental conservation (Dewi and Rahmianingsih, 2020). The impetus for green innovation arises from various external pressures. Today, consumers and the public are increasingly concerned about the environmental impact of economic activities and are beginning to change their lifestyles and preferences, which in turn encourages companies to produce more environmentally friendly products (Fathoni, Shintyamani, and Dianawati, 2025).

Zoomlion's commitment to green strategy was a key highlight at the Indonesian international construction machinery exhibition and Mining and Construction Indonesia 2025. Through the Green and Intelligent concept, the company introduced more than 20 new machine models equipped with lithium battery technology and artificial intelligence (AI), as a form of support for a more sustainable and efficient construction industry. President of Zoomlion Indonesia, Aaron Yan, emphasized that the green strategy being carried out is not just a passing trend, but a concrete form of corporate responsibility. Aaron added that Indonesia is a strategic market in the company's global expansion. Through a combination of high-tech green innovation and a localization approach, Zoomlion targets growth alongside the national industry while opening up new opportunities in the construction and mining sectors. With large contracts and a series of environmentally friendly innovations, Zoomlion affirms its commitment to strengthening its green strategy and deepening its presence in Indonesia, while building close partnerships with local customers and partners to create sustainable growth (Rahmatul Fajri, 2025).

Based on the article above, a green strategy is a company's effort to develop technologies, processes, and products aimed at minimizing environmental impacts. This strategy emphasizes responsible resource use, environmental conservation, and meeting current needs without compromising the needs of future generations (Alshammari and Alshammari, 2023). A green strategy is a strategic choice that balances economic and environmental interests by reducing the negative impacts of production and operational processes, encouraging technological and conceptual innovation, and improving both green performance and company competitiveness (Luan, Cao, and Qu, 2023). A green strategy encourages the efficient use of raw materials to reduce costs and waste, and prioritizes energy conservation and clean production through improvements to existing technologies (increased efficiency) and the implementation of new, resource-efficient technologies to support recycling and reduce pollutant emissions (Sun and Sun, 2021).

The introduction of renewable energy is a crucial strategy for reducing carbon emissions. Countries are encouraging its development through initial subsidies and, in the long term, shifting the responsibility for carbon emission reduction to companies for implementation in their operations (Zhao, Liu, Hao, and Liu, 2020). Industrial decarbonization efforts require the implementation of various technologies such as carbon capture, utilization, and storage (CCUS), electrification, hydrogen, and increased energy efficiency. All of these carbon strategy solutions can only be optimally implemented if supported by the availability of affordable clean energy and integrated with decarbonization processes in the transportation, energy, waste management, forestry, and land use sectors (Gendy, Rabie, and El-Khair, 2025).

Investors are increasingly sensitive to sustainability information. Companies that fail to meet these expectations risk losing investor trust, experiencing stock price volatility, and experiencing long-term

value declines. Companies that implement green innovation, green strategies, and carbon strategies have the potential to achieve positive market reactions and support environmental conservation (Fathoni et al., 2025). In the capital market context, policies implemented by companies and governments regarding corporate sustainability can trigger investor reactions (Putri dan Halimatusyadiah, 2024). Investor reaction can be measured through cumulative abnormal return (CAR), which is the cumulative daily return for each stock (Hapsoro and Husain, 2019). Abnormal return measures the difference between the actual return obtained and the expected return over a given period, where cumulative abnormal return (CAR) is the total accumulated daily abnormal return for each company's stock (Hapsoro and Husain, 2019). CAR indicates that investors can gain long-term added value through the acquisition of a controlling stake in a target company (Magnanelli, Nasta, and Ramazio, 2022). CAR is an important indicator used by investors to analyze a company's performance and evaluate promising investment opportunities (Nabila and Wahyuningtyas, 2023).

Several indicators influencing cumulative abnormal return (CAR) include those proposed by Putri and Halimatusyadiah (2024), who stated that cumulative abnormal return (CAR) is influenced by the implementation of green investment in the Indonesian capital market. Research conducted by (Hutama, 2022) states that cumulative abnormal return (CAR) is influenced by environmental, social, and governance performance. Research conducted by Ningrum and Usman (2024) states that cumulative abnormal return (CAR) is influenced by return on equity, moderated by sustainability disclosure.

Several studies in Indonesia related to cumulative abnormal return (CAR) have been conducted, but research linking green innovation, green strategy, and carbon strategy is still limited. Therefore, this research is important to conduct because it is expected to contribute to enriching the literature on the relationship between sustainability strategies through the integration of green innovation, green strategy, and carbon strategy with market reactions proxied by cumulative abnormal return (CAR). It also provides practical contributions to company management, stakeholders, and regulators regarding the effectiveness of sustainability strategies as a tool for creating value and managing market risk. Thus, this research can provide direction and strategies for companies in terms of making sustainability strategy decisions that can influence market reactions.

This research is supported by legitimacy theory and signaling theory. Legitimacy theory explains that a company's legitimacy is created when its activities align with societal values and norms. Violations or non-conformities threaten this legitimacy and can damage its image and reputation among stakeholders (Hutama, 2022). Therefore, legitimacy is a crucial foundation for companies to maintain public trust through the implementation of sustainability strategies such as green innovation, green strategy, and carbon strategy. Signaling theory explains that allocating funds to sustainable projects sends a positive signal to investors that the company cares about sustainability and long-term

value (Meilani and Sukmawati, 2023). Therefore, the implementation of these strategies demonstrates the company's commitment and consistency in meeting social expectations regarding environmental protection and operational responsibility to the community and investors. Consequently, the market tends to respond positively. This is reflected in stock price reactions and the formation of cumulative abnormal returns (CAR) as a form of investor appreciation for the company's efforts to maintain legitimacy and mitigate risks related to environmental issues.

This study examines the influence of green innovation, green strategy, and carbon strategy on cumulative abnormal return (CAR) with firm size and profitability as control variables. This study expands on the research conducted by Putri and Halimatusyadiah (2024). The difference between this study and previous studies is that this study uses cumulative abnormal return (CAR) as the dependent variable, and uses green innovation, green strategy, and carbon strategy as independent variables, while using firm size and profitability as control variables. This study uses control variables to ensure that the influence of the independent variables green innovation, green strategy, and carbon strategy on the dependent variable, cumulative abnormal return (CAR), is not influenced by other factors outside the study. The control variables used in this study are firm size and profitability, proxied by return on assets. By using firm size as a control variable, this study aims to examine whether large companies have stronger financial and operational capacity and are able to implement environmentally friendly programs more optimally. In addition, this study also assesses whether large companies will receive a positive reaction from investors, thereby increasing the cumulative abnormal return value more significantly compared to small companies. Return on Assets was chosen because it demonstrates a company's ability to generate profit from its total assets. Companies with a high return on assets generally receive a positive market reaction, as reflected in their cumulative abnormal return (CAR).

This study uses a sample of companies in the energy-intensive, automotive, and transportation sectors listed on the Indonesia Stock Exchange (IDX) for the 2021–2024 period. These sectors were selected because they have high levels of energy consumption and carbon emissions, thus facing greater regulatory pressure and sustainability demands. Therefore, these sectors provide a relevant context for examining the influence of green innovation, green strategy, and carbon strategy on market reactions, as reflected in cumulative abnormal returns (CAR).

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Legitimacy Theory

According to Dowling and Pfeffer (1975), legitimacy theory explains that companies have a social contract with society and must therefore conduct business in accordance with social norms and expectations to gain trust and legitimacy. Therefore, companies need to demonstrate environmental awareness through information transparency and the implementation of

environmentally-based strategies. This is done as an effort to gain legitimacy for corporate activities in society (Ghozali dan Chariri, 2007). From a legitimacy theory perspective, a sustainability strategy is a sign that a company complies with social and environmental norms, thereby increasing public legitimacy. This increased legitimacy has the potential to influence investor reactions in the capital market and is reflected in cumulative abnormal returns (CAR).

A company's commitment to green innovation and green strategy creates an environmentally friendly image, enhances legitimacy, and increases corporate trust, thus encouraging long-term and sustainable business development (Wang, 2023). In conducting their business, companies constantly interact with various networks of stakeholders, including investors, customers, employees, regulators, and the wider community, with the expectation that their interests can be met to maintain their legitimacy and achieve long-term success. Sustainability practices, such as a transparent carbon strategy that aligns with stakeholder expectations, strengthen corporate accountability, enhance reputation, and contribute to corporate value (Liu, Rahman, and Jamil 2025). Based on legitimacy theory, the implementation of green innovation, green strategy, and carbon strategy helps companies respond to regulatory pressures and societal expectations, while also sending a positive signal to the market regarding responsibility and resilience to environmental risks. This has the potential to encourage a positive market reaction, reflected in an increase in cumulative abnormal returns (CAR).

Signal Theory

Signaling theory, first introduced by Spence (1973), explains that parties with better information (insider) will send signals to parties with less information (outsider) to reduce information asymmetry. In a business context, companies use signals to demonstrate their commitment to certain values, such as sustainability or innovation, to stakeholders, including investors, customers, and regulators.

Publication of reports on green innovation, green strategy, and carbon strategy reflects a company's transparency in disclosing financial and non-financial information. This transparency can reduce information asymmetry, enhance the company's reputation, and encourage a positive response from investors (Vannia and Lindrianasari, 2025). Based on signaling theory, green innovation, green strategy, and carbon strategy are not only operational actions but also strategic communication tools that influence investor perceptions and a company's market value. These three strategies signal a company's capability, vision, and responsibility for sustainability, potentially driving a positive market reaction, reflected in an increase in cumulative abnormal returns (CAR).

Cumulative Abnormal Return (CAR)

Cumulative Abnormal Return (CAR) is a measure used to assess the extent to which the stock market responds to an event or information announced by a company. CAR reflects the accumulation

of abnormal returns (the difference between actual returns and expected returns) over a certain period surrounding the announcement date of an event (MacKinlay, 1997). According to MacKinlay (1997), the use of CAR is based on the efficient market hypothesis, which states that stock prices reflect all relevant information quickly and accurately. Therefore, when an event or new information emerges, the market reaction will be immediately reflected in changes in stock prices, which can be measured through CAR. A significant CAR value indicates that the market assesses the information as relevant to the company's value. Several factors can influence the size of CAR, including company size, profitability, capital structure, stock liquidity, and industry conditions (Brown and Warner, 1985). The higher the level of investor confidence in the information announced by the company, the greater the potential for positive CAR to emerge in the market.

Research by Flammer (2013) and (Andriopoulos , Plakas, Birbas, Papalexopoulos (2024) shows that announcing a green strategy or environmentally friendly innovation can elicit a positive market reaction, reflected in a significant increase in capital adequacy (CAR). This is because investors view green innovation, green strategy, and carbon strategy as positive signals regarding a company's long-term commitment to sustainability and environmental risk mitigation. Thus, these actions not only strengthen the company's social legitimacy but also enhance its perceived value in the eyes of the market. Within the framework of signaling theory, a sustainability strategy serves as a signal of management credibility that can increase investor confidence, resulting in a higher CAR.

Green Innovation

According to Chen, Lai, Wen (2006) green innovation encompasses all efforts undertaken by companies to produce innovations that are not only environmentally friendly but also support long-term sustainability and enhance corporate competitiveness. Chen et al. (2006) emphasize that green innovation plays a crucial role in reducing energy consumption, the use of hazardous raw materials, and pollution generated by production processes. This aligns with the global need to preserve the environment and slow the negative impacts of climate change. In this context, green innovation is viewed as a business strategy that not only strengthens a company's reputation among consumers and stakeholders but also provides long-term economic benefits.

Green innovation is essentially similar in concept to innovation in general, but places greater emphasis on reducing negative environmental impacts as a competitive advantage (Dai and Xue, 2022). Green innovation emerges as a company's response to current environmental and social issues and refers to environmentally friendly processes or products that not only contribute to improving environmental performance but also support the company's economic performance. Cahyaningtyas, Isnaini, and Ramadhani (2022) explain that green innovation aims to minimize the environmental damage resulting from a company's operational activities.

Green Strategy

A green strategy is a business strategy that prioritizes environmental development and occupational safety and health, supported by genuine commitment, engagement, and leadership at all levels, and demonstrated in all organizational actions (Andrian and Kevin, 2021). Furthermore, public trust, intangible assets, and corporate value tend to increase when companies disclose their carbon emissions and implement environmentally friendly strategies (Rachmawati, 2021). Environmentally friendly techniques include controlling an organization's business tasks to reduce the impact of fossil fuel byproducts using fossil fuel byproduct exposure reports through management reports (Tila, 2019).

According to Sun dan Sun (2021), green strategy is driven by several main reasons. First, to increase the efficiency of raw materials, energy, and environmentally friendly technologies, thereby reducing waste and emissions, and encouraging sustainable innovation that provides economic and environmental benefits. Second, implementing a green strategy reflects a company's proactive stance on environmental issues, even though it requires greater resources, capabilities, and costs. Therefore, this strategy requires companies to allocate and coordinate resources effectively to mitigate environmental risks from their processes and outputs.

Carbon Strategy

A carbon strategy is a series of steps and policies taken by a company to reduce carbon dioxide and other greenhouse gas emissions as part of efforts to address climate change. According to Damert, Paul, and Baumgartner (2017) a carbon strategy involves strategic corporate actions to reduce a company's carbon footprint through more efficient operational approaches, the use of clean technologies, and a commitment to global environmental policies. A carbon strategy is implemented with the aim of supporting a company's long-term sustainability while complying with increasingly stringent environmental regulations.

Company Size

Company size is an indicator that describes the condition and characteristics of an entity, which can be assessed through various parameters. Some commonly used metrics to determine company size include total assets, sales level, stock market value, and other financial variables (Resya, Wardayanti, and Roziq, 2021). Larger companies have greater resources to implement sustainability strategies, thereby increasing investor confidence and strengthening market reactions, as reflected in Cumulative Abnormal Return (CAR).

Profitability

A company's profitability reflects the company's level of success in utilizing its assets in an effective way to produce benefits. Thus, profitability can be measured through comparison between profit earned in a period with total assets or capital used company (Resya, et al., 2021). Level of profitability can influence investor perceptions regarding a company's financial stability and

capabilities for adopting a sustainability strategy. Companies with high ROA tend to own financial reserves and flexibility, better operational for investment in green innovation, green strategy, and carbon strategy. Therefore, when a company with high profitability announces implementation of sustainability strategies in the company, then matter the show good signal to market reaction, so that it is capable of increasing mark Cumulative Abnormal Return (CAR).

The Influence of Green Innovation on Cumulative Abnormal Return

Integration green Innovation allows company in differentiate self from competitors through approach proactive to sustainability, which increases efficiency operational, strengthening image environment, interesting investor confidence, as well as increase performance finance and value sustainable companies (Liu, et al., 2025). Chen, et al. (2006) defines green innovation strategy as series activity innovative, good device hard and device software, which focuses on processes and products friendly environment for example technology prevention pollution, efficiency energy, recycling repeat waste, design green product, and practice management environment company.

Research conducted by Andriosopoulos, et al. (2022) revealed that the announcement green innovation activities in companies have an impact positive to mark holder shares , which are reflected through increasing abnormal returns after incident announcement the findings. This strengthen view that green innovation provides signal positive to the market about commitment and resilience term long company to challenge environment. Research Ma, Zhai, Zhang, and Ji (2024) in Chinese market context disclose that performance environment good company impact positive on excess stock returns, this show that investors respond positive practice sustainability that is carried out company. Based on the description above, the following research hypothesis can be drawn:

H_1 : Green innovation has a positive effect on cumulative abnormal returns.

The Influence of Green Strategy on Cumulative Abnormal Return

Green strategy encompasses various approaches, such as incentive programs, reward systems, and training initiatives designed to inspire and encourage individuals' active participation in green innovation. Implementing such a corporate strategy can strengthen the impact of green innovation on achieving sustainability (Alshammari & Alshammari, 2023). Green strategy is a crucial factor in helping companies align environmental protection with business operations and build competitive advantage. Through the integration of environmental issues, technological innovation, process innovation, and appropriate resource allocation, green strategy can provide a company with an advantage, thereby generating environmental benefits (Luan, Cao, and Qu 2023). Companies adopting a green strategy aim to improve production and operational processes to reduce negative environmental impacts and proactively integrate environmental responsibility into strategic planning to align the organization's conditions with external environmental demands (Sun dan Sun, 2021).

Damert et al. (2017) found that companies implementing a strong green strategy tend to be perceived as more financially stable and have better growth prospects, which ultimately results in increased market value. Furthermore, research by Putri, Sulbahri, and Kusuma (2023) shows that a green marketing strategy, as part of a green strategy, positively impacts a company's financial and non-financial performance. This indicates that the success of a green strategy in improving a company's reputation and profitability can also translate into increased investor confidence and a more positive market reaction to company information. Thus, an effective green strategy can enhance a company's legitimacy and trigger a positive market reaction, reflected in an increase in CAR, as investors view the strategy as a commitment to the company's sustainability and long-term prospects. Based on this, the following research hypothesis is formulated:

H_2 : Green strategy has a positive effect on cumulative abnormal returns

The Influence of Carbon Strategy on Cumulative Abnormal Return

A carbon strategy is a strategic step taken by a company to manage and reduce carbon emissions resulting from its operational activities. A carbon strategy can enhance a company's reputation by signaling a commitment to sustainability, fostering a positive corporate image, and strengthening consumer and stakeholder trust. This creates a competitive advantage by differentiating a company's position in the market, encouraging resource-saving practices, and ensuring compliance with environmental regulations, thereby reducing legal and operational risks (Liu et al., 2025). Research by Khatib and Al Amosh (2023) supports this view by showing that companies with good carbon performance, demonstrated through reduced emissions and more effective environmental management, are perceived as more responsible and sustainable by the market.

The implementation of a carbon strategy reflects a company's commitment to managing its environmental impact by reducing emissions and increasing energy efficiency. This strategy provides not only ecological benefits but also economic and reputational benefits, as it signals a responsible and long-term-oriented company. In the capital market, an effective carbon strategy sends a positive signal to investors that the company has good environmental governance and is capable of addressing regulatory and climate change risks, thereby increasing investor confidence and encouraging a positive market response. Therefore, the stronger the implementation of a carbon strategy, the more likely the market will respond positively, reflected in an increase in Cumulative Abnormal Return (CAR) around the company's information announcement period. Based on the explanation above, the following research hypothesis is formulated:

H3: Carbon Strategy has a positive effect on cumulative abnormal returns

METHOD

This research is quantitative. The data collection method used documentation techniques. The

data used in this study is secondary data in the form of annual reports and sustainability reports of public companies listed on the Indonesia Stock Exchange (IDX) in the energy, automotive, and transportation sectors for the 2021-2024 period. The reason for taking samples from these three sectors is because these companies have a significant environmental impact, carbon management strategies are very relevant to analyze from the capital market and investor perspective. The sampling technique used purposive sampling to obtain samples that meet the criteria specified in the study.

Table 1. Variable Definition

Variable	Definition	Indicators /	Measurement
CAR	Size used for evaluate how far the stock market respond something incident or information announced by the company.		$CAR_{it} = \sum_{t=-7}^{t=+7} AR_{it}$
Green Innovation (GI)	Innovation carried out by companies to minimize negative impacts on the environment through the development of environmentally friendly products or processes.	Dummy variable, given the number 1 if the indicator keyword is found and given the number 0 if the indicator keyword is not found.	$GI = \frac{\text{Total Score}}{\text{Maximum Score}} \text{ x } 100\%$
Green Strategy (GS)	Business strategy that places development environment and safety and health Work as priority primary , supported by genuine commitment , engagement and leadership across all levels , and shown in all action organization (Andrian and Kevin, 2021)	Dummy variable, given the number 1 if the indicator keyword is found and given the number 0 if the indicator keyword is not found. .	$GS = \frac{\text{Total Score}}{\text{Maximum Score}} \text{ x } 100\%$
Carbon Strategy (CS)	Strategies implemented by companies to manage carbon emissions and environmental impacts resulting from their operational activities	Dummy variable, given the number 1 if the indicator keyword is found and given the number 0 if the indicator keyword is not found.	$CS = \frac{\text{Total Score "1"}}{\text{Total Indikator}} \text{ x } 100\%$
Company Size (Firm Size)	Variables that reflect the scale of a company.		$UP = \text{Ln (Total Aset)}$
Profitability	The company's ability to generate profits relative to its assets, equity, or sales.		$ROA = \frac{\text{Net Margin}}{\text{Total Aset}} \text{ x } 100\%$

RESULTS AND DISCUSSION

Table 2. Statistical Results Descriptive

	N	Minimum	Maximum	Mean	Std. Deviation
CAR	132	-6.071	5.379	-0.005	0.722
GI	132	0.000	0.500	0.289	0.104
GS	132	0.000	0.438	0.139	0.100
CS	132	0.000	1.000	0.342	0.265
FS	132	17.892	33.790	28.660	3.250
P	132	-58.030	207.180	15.495	31.691
Valid N (listwise)	132				

The dependent variable Cumulative Abnormal Return (CAR) has a minimum value of -6,071; a maximum value of 5,379; a mean value of -0,005 and a standard deviation value of 0,722. The independent variable green innovation (GI) has a minimum value of 0.000; a maximum value of 0.500; a mean value of 0.289 and a standard deviation value of 0.104. The independent variable green strategy (GS) has a minimum value of 0.000; a maximum value of 0.438; a mean value of 0.139 and a standard deviation value of 0.100. The independent variable carbon strategy (CS) has a minimum value of 0.000; a maximum value of 1.000; a mean value of 0.342 and a standard deviation value of 0.265. Control variable firm size (FS) has a minimum value of 17,892; The maximum value is 33.790; the mean value is 28,660 and the standard deviation value is 3.250. Control variable profitability (P) has a minimum value of -58.030; a maximum value of 207.180; a mean value of 15,495 and a standard deviation value of 31,691.

Normality Test

Table 3. Normality Test Results

	Unstandardized Residual	Information
Sig, (2-tailed)	0,200	Normally Distributed

Based on the results of the normality test in table 3 above, it can be seen that the sig value is 0.200, this indicates that the data is normally distributed because the significance value is above 5% or 0.05.

Multicollinearity Test

Table 4. Multicollinearity Test

	Tolerance	VIF	Information
GI	0,391	2,559	No multicollinearity
GS	0,793	1,261	No multicollinearity
CS	0,358	2,796	No multicollinearity

	UP	0,946	1,057	No multicollinearity
	P	0,873	1,145	No multicollinearity

The multicollinearity test results in table 4 above indicate that the tolerance value and Variance Inflation Factor (VIF) values pass the multicollinearity test. This conclusion is based on the tolerance and VIF requirements. A tolerance value ≥0.10 and a VIF value ≤10 are the requirements for passing the multicollinearity test.

Autocorrelation Test

Table 5. Autocorrelation Test

Model Summary[b]					
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Durbin-Watson**
1	0.365[a]	0.133	0.041	1.35217	2.074

The autocorrelation test in table 5 above show mark Durbin-Watson (dw) is 2.074. This is show that the data passes the autocorrelation test. This conclusion made based on condition value of more than small from dw and more small from 4-du to pass the autocorrelation test.

Heteroscedasticity Test

Table 6. Heteroscedasticity Test

N	Sig	Information
132	0.771	Not occur heteroscedasticity

Significance value of 0.771 which is presented in table 6 above show that not happen symptom heteroscedasticity in the data. Conclusion This made on base mark significance above 5% or 0.05. With thus show that No happen symptom heteroscedasticity.

Coefficient Test Determination (R^2)

Table 7. Coefficient Test Determination (R2 Test)

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.313[a]	0.098	0.046	0.70865

Adjusted R^2 value in Table 7 above shows the number 0.046. The number show that variables independent green innovation (GI), green strategy (GS), and carbon strategy (CS) as well variables control firm size (FS) and profitability (P) are able explain variables dependent that is Cumulative Abnormal Return (CAR) by 4,6%. Meanwhile the rest 95,4 % is explained by other factors outside the model studied.

F Statistical Test

Table 8. Significance Level Test (F Test)

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.737	5	0.947	1.887	0.105[b]

Residual	43.690	127	0.502
Total	48.427	132	

Significance value in table 8 above shows mark significance of 0.105, this indicates that simultaneously or jointly, the independent variables consisting of green innovation, green strategy, and carbon strategy do not have a significant effect on the dependent variable, cumulative abnormal return.

Hypothesis Test (t)

Table 9. Hypothesis Test (t-Test)

		Unstandardized Coefficients				
	Model	B	Std. Error	**t**	**Sig.**	**Information**
1	(Constant)	-0.729	2.493	-0.292	0.771	
	GI	1.013	0.378	2.681	0.009	Significant
	GS	-0.183	0.159	-1.149	0.254	Not Significant
	CS	-0.431	0.190	-2.270	0.026	Significant
	FS	0.436	0.725	0.601	0.549	Not Significant
	P	0.012	0.052	0.231	0.818	Not Significant

Hypothesis test results in table above produce equality regression as following:

CAR = -0,729 + 1,013 GI – 0,183 GS – 0,431 CS + 0,436 FS + 0,012 P + e

Based on results the tests presented in table 9 above, the results study show that variables green innovation (GI) influential to cumulative abnormal return due to mark the probability is 0.009 is bellow mark significance of 0.05 with coefficient regression 2,681. With thus can concluded that $_{H1}$ is accepted. Green innovation is able to create a high level of competitiveness for firms through productivity optimization, increased product diversification, cost efficiency, and the creation of market opportunities through the development of innovative products that are capable of competing in the market (Zameer, Wang, Yasmeen, dan Mubarak, 2020). These advantages are perceived by investors as indicators of a firm's ability to generate stable cash flows.

These findings align with legitimacy theory, which states that a company's success depends heavily on its ability to comply with social norms and environmental responsibilities. The legitimacy process helps companies gain legal recognition and normative acceptance by society (Mardawaningati and Handayani, 2025). Green innovation is a strategic corporate response to increasing public and stakeholder demands regarding environmental issues. When companies adopt environmentally friendly innovations, they are perceived as operating in accordance with prevailing social norms, thereby gaining stronger legitimacy. This legitimacy then increases investor confidence

and lowers risk perceptions, ultimately reflecting a positive reaction in the capital market.

Based on signaling theory, companies that have implemented green innovation indirectly send a signal to investors by implementing environmental commitments and environmentally friendly practices, demonstrating quality management and sustainable long-term prospects. This environmentally friendly innovation plays a significant role in increasing a company's future cash flow. This provides a positive signal to financial markets, encouraging investors to place higher values on companies that consistently demonstrate environmental commitment (Mardawaningati and Handayani, 2025). Thus, this positive signal is perceived by investors as an indication of better future prospects, thus driving increased stock demand and triggering positive abnormal returns. Based on the explanation above, the significant influence of green innovation on cumulative abnormal returns strengthens the argument that sustainability practices serve not only as a means of social legitimacy but also as a strategic signal with economic value in the eyes of the capital market.

Based on results the tests presented in table above, the results study show that variables green strategy (GS) no influential to cumulative abnormal return due to mark the probability is 0.254 is above mark significance of 0.05 with coefficient regression -1.149. With thus can concluded that H_2 is rejected. The results of the study show that companies that do disclosure green strategy with score tall namely PT. Golden Energy Mines, Tbk in 2022 with GS score of 0.313 has mark cumulative abnormal return of -105,546. PT. AKR Corporindo, Tbk in 2021 had GS score of 0.313 has mark cumulative abnormal return of -15,973. A high GS score indicates a company's relatively strong commitment to a green strategy, but a very low, negative CAR. From the perspective of signaling theory proposed by Spence (1973), investors interpret this as a negative signal to the market, as a negative CAR indicates that a green strategy involves high costs with uncertain future benefits. Therefore, it tends to influence the decline in cumulative abnormal returns. Green strategy does not influential significant to cumulative abnormal return, matter this caused by because investors may not yet fully value or understanding green strategies as mark financial long term, more investors see green strategy is project with investment big value financially seen in term long. Some investors only focus with profit financial term short, generally they think about profit company and stock returns that will shared as fast as possible for fulfil prosperity holder shares. With thus, green strategy no bring reaction positive in the market so that influence the decline mark cumulative abnormal return.

Based on results the tests presented in table above, the results study show that variables carbon strategy (CS) has an influence against cumulative abnormal returns because mark the probability is 0.026 is below mark significance of 0.05 with coefficient regression -2,270. With thus can concluded that H_3 is accepted. Carbon strategy has an effect significant against cumulative abnormal returns

because companies that have proactive apply carbon strategy is considered as companies that have ready face regulations emission future carbon, capable manage risk environment with good, have efficiency more operational tall, and has prospects term longer stable. Companies with level emission high carbon own high sensitivity to change regulations, so that carbon strategy become factor crucial in form investor response (Florackis, Mukit, Sainani, and Zhang (2025). Based on perspective signal theory by Spence (1973), application carbon strategy in companies considered strong signal in evaluate market reaction due to carbon strategy is measurable as well as own impact direct to risk operational and costs energy. With apply carbon strategy show existence transparency in disclosure environment. Disclosure the contain information positive that will bring in reaction positive from investors and can interesting potential investors for increase reputation company (Asyari and Arieftiara, 2022). With thus, the market assesses carbon strategy is valuable information high, so that bring reaction positive in the stock market through improvement mark cumulative abnormal return. Based on corner view theory legitimacy, carbon strategy show legitimacy company in committed support mitigation change climate, meet social norms, and maintain reputation public. Disclosure carbon strategy and performance environment company is step for get legitimacy from public place company operating. Recognition legitimacy public this is very important for company for maintain its existence in the environment social company (Asyari and Arieftiara, 2022). This action strengthen trust public and investors so that with increasing legitimacy will lower risk company, the market will respond positive price share so that increase mark cumulative abnormal return.

Based on results the tests presented in table above, the results study show that variables firm size (FS) does not influential to cumulative abnormal return due to mark the probability is 0.549 is above mark significance of 0.05 with coefficient regression 0,601. With thus can concluded that H_4 rejected firm size company not influential significant to cumulative abnormal return, this caused by because investors at the moment this no again prioritize size company when report finance published, because information the assessed not enough informative and not factor main in the process of taking decision investment. Size the company is also considered not capable become proper basis for estimate level return shares. Investors' views at the moment this show that company big not always provide high returns, while company small precisely potential produce higher returns big for investors (Kurnia, Agustia, Darlis, Supriono, and Silalahi, 2022). With thus, the firm size not cause positive market reaction so that not influential to cumulative abnormal return. Research results show that company with size large, such as PT. Astra International Tbk which has firm size relatively tall consecutive start in 2021, 2022, and 2023 it was 33.54; 33.66; and 33.73, respectively own number tended cumulative abnormal returns negative that is of -8,046; -6,948; and -17,085. With thus, the findings this indicates that firm size not ensure existence positive market

response to information published. In other words, the firm size not become determining factors in formation cumulative abnormal return, so that more investor reactions influenced by quality information and other fundamental factors, not by scale asset company.

Based on results the tests presented in table above, the results study show that variables profitability (P) has an effect to Cumulative Abnormal Return due to mark the probability is 0.818 is above mark significance of 0.05 with coefficient regression 0.231. With thus can concluded that H_4 rejected. Profitability does not affect cumulative abnormal return because high profitability is not always interpreted as a signal of growth or an increase in future cash flows, particularly when it is not accompanied by clear innovation strategies, expansion plans, or sustainability practices. According to signaling theory, only information that is credible, difficult to imitate, and has strong long-term implications will be responded to by the market (Spence, 1973). High profitability does not always meet these characteristics, as it may be temporary, influenced by business cycle conditions, or derived from short-term efficiency without a sustainability-oriented strategy. Consequently, investors tend not to perceive profitability as a strong signal of management quality or the firm's future prospects.

The manufacturing, energy, and transportation sectors are heavily influenced by external factors such as infrastructure, government regulations, and operational dynamics that require high costs. Therefore, increasing profitability in these three sectors does not always reflect healthy growth. This condition makes profitability less relevant as a primary indicator in assessing the stock prospects of companies in these sectors (Adilah and Wiliyanti, 2025). High investment costs can suppress free cash flow, thereby reducing investor expectations regarding the distribution of economic value in the future. This condition prevents investors from responding quickly to high profitability as a positive signal, thus not triggering a significant stock price reaction, which is reflected in low capital adequacy ratio (CAR).

CONCLUSION, IMPLICATION AND LIMITATION

Based on results analysis and discussion that has been described in chapter previously, then obtained conclusion as following: green innovation influential to cumulative abnormal return, because the market perceives green innovation as important information that can trigger stock price reactions. Green innovation is able to create a high level of competitiveness for firms through productivity optimization, increased product diversification, cost efficiency, and the creation of market opportunities through the development of innovative products that are capable of competing in the market. Green strategy not influential to cumulative abnormal return, because investors have not yet fully value or understanding green strategies as mark financial term long, more investors see green strategy is project with investment big value financially seen in term long. Carbon strategy

influential to cumulative abnormal return, because companies that have proactive apply carbon strategy is considered as companies that have ready face regulations emission future carbon, capable manage risk environment with good, have efficiency more operational tall, and has prospects term longer stable.

This study have a number of limitations include: variables analyzed in this study limited to corporate strategy in sustainability, whereas still lots other possible variables can influence cumulative abnormal return and can used for next research, such as ESG performance scores. Period observation in this study limited only during three years, so that not enough adequate for catch effect term long from sustainability strategy company to market reaction (cumulative abnormal return). In addition, the sample study not covers all over companies listed on the IDX, but rather only a number of sector certain. This is limit generalization findings, so that results study possible can't generalized to all over sector industry.

Suggestions that can be given for study next among others: research furthermore can do exploration cross-country especially compare implementation regulations and sustainability strategies of developed versus developing countries. Government as a regulator it is necessary obligatory all over company public in Indonesia for implementing sustainability strategies in a way comprehensive, because the matter not only support development sustainable but also encourage transparency and accountability reporting greater high sustainability. Sustainability strategy requires cost investment source human power and financial significant, with benefits that are not directly and often new seen in long term. Therefore that, research furthermore can test connection between level cost investment sustainability with its impact on cumulative abnormal return (CAR), to evaluate how the trade-off between investment with CAR and market reaction in Indonesia.

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