

Sugiarto, Agus; Puspani, Ni Nyoman; Fathia, Fara

Article

ESG leverage towards stock performance in Indonesia stock exchange

Provided in Cooperation with:

International Journal of Energy Economics and Policy (IJEPP)

Reference: Sugiarto, Agus/Puspani, Ni Nyoman et. al. (2023). ESG leverage towards stock performance in Indonesia stock exchange. In: International Journal of Energy Economics and Policy 13 (5), S. 593 - 606.

<https://www.econjournals.com/index.php/ijeep/article/download/14384/7520/34449>.

doi:10.32479/ijeep.14384.

This Version is available at:

<http://hdl.handle.net/11159/631254>

Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics
Düsternbrooker Weg 120
24105 Kiel (Germany)
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)
<https://www.zbw.eu/econis-archiv/>

Standard-Nutzungsbedingungen:

Dieses Dokument darf zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden. Sie dürfen dieses Dokument nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen. Sofern für das Dokument eine Open-Content-Lizenz verwendet wurde, so gelten abweichend von diesen Nutzungsbedingungen die in der Lizenz gewährten Nutzungsrechte.

<https://zbw.eu/econis-archiv/terms-of-use>

Terms of use:

This document may be saved and copied for your personal and scholarly purposes. You are not to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public. If the document is made available under a Creative Commons Licence you may exercise further usage rights as specified in the licence.



ESG Leverage towards Stock Performance in Indonesia Stock Exchange

Agus Sugiarto, Ni Nyoman Puspani, Fara Fathia*

OJK Institute, Indonesia. *Email: fara.fathia@ojk.go.id

Received: 06 April 2023

Accepted: 12 August 2023

DOI: <https://doi.org/10.32479/ijeep.14384>

ABSTRACT

Increased numbers of policy tools related to *sustainable finance* has encourage investors to consider the factor of *environmental, social, and governance* (ESG) in their investment decisions, which has also become one of the main drivers of the recent surge of *assets under management* of global and Indonesian ESGs. This study analyzes the impact of ESG factors on the performance of stocks by using *fixed effect model* as well as analyzing the perception of investor to ESG as an indicator to determine investment by using the survey method. The results show that the ESG value has a positive impact on the stock performance which was proxied by the value of the market capitalization. Of the three ESG factors, only social factors that have a positive and significant impact on stock performance. Based on the survey results, individual and institutional investors in Indonesia already have a good understanding of ESG; have high interest in ESG; and have allocated their investment towards ESG stocks. In addition, the factor that investors are considered the most in their investment decisions are carbon emissions and waste management in environmental factors; social impact on social factors; and reputation on the governance factors.

Keywords: *Environmental, Social, and Governance*, Stock Performance, Fixed Effect Model, Survey, Investor Perception

JEL Classifications: C33, G11, G23, Q56

1. INTRODUCTION

Climate change due to global warming is the biggest human challenge that threatens the continuity of all aspects of life. According to Intergovernmental Panel on Climate Change (IPCC, 2021), the Earth temperature is projected to rise 1.5°C (from pre-industrial levels) in 2034 hence potentially to increase the frequency of acute hazards such as extreme weather, heat waves and floods, as well as chronic hazards such as drought and sea level rise.

The World Economic Forum (2021) stated that more than half of the world's Gross Domestic Product (GDP) is highly dependent on natural conditions. This statement is supported by the results of research by Swiss Re (2021) which shows that a global temperature increase of 3.2°C can erase up to 18.1% of world economic GDP in 2050. In line with this, Indonesia's GDP can shrink by 16.7 up to 30.2% due to the impact of climate change if the earth's temperature

increases by 2–2.6°C (BI, 2022). Indonesia has also the potential to experience economic losses of up to 544 trillion rupiahs during 2020–2024 due to the effects of climate change, if there is no policy intervention (business as usual) (Bappenas, 2022).

Based on these matters, various global commitments were formed in dealing with climate change to form coordinated solutions at all levels. One of them is through the Paris Agreement in 2015 (COP21) to restrain the rate of increase in global temperatures to below 2°C and limit temperature changes to at least 1.5°C in 2100 (UNFCCC, 2015). In the context of Indonesia, the Government has signed the Paris Agreement on April 22, 2016 and ratified it into Law Number 16 of 2016. In addition, Indonesia has sent nationally determined contributions (NDC) with a commitment to reduce greenhouse gas emissions by up to 29% unconditionally and up to 41% conditionally from emissions business as usual (BAU) by 2030.

The huge impact of climate change on economic instability is driving sharp growth in sustainable investment, namely the implementation of the approach of the environmental, social, and governance factors or ESG in investment decisions (PRI, 2022). Asset Under Management (The collective ESG AUM) represented by the 3,826 signatories to the Principle for Responsible Investment (PRI) increased 17% from USD 103.4 trillion in 2020 to over USD 121 trillion as of March 2021 (PRI, 2022). In line with this, the value of AUM ESG in Indonesia has increased by 8,782% in the last 7 years, namely IDR 38 billion in 2014 and to IDR 3,375 billion in 2021 (IDX, 2021).

The ESG stock index has also performed well. Figure 1 shows that the return of IDX ESG Leaders index (IDXESGL) has always surpasses the JCI and the LQ45 blue chip index. Figure 2 shows a comparison of the stock prices of the ESG index with composite and conventional indices in various countries. Malaysia, USA and UK has also the same trend as Indonesia, where the share price of the ESG index almost always surpasses the JCI and the LQ45 blue chip index, even during the Covid-19 pandemic. In Singapore, the ESG index share price trend is below the blue chips index but better than the composite index. Different trends occurred in Hong Kong,

Thailand, Japan, Australia, Germany and China, where the ESG index share price was at the bottom.

Based on the OECD study (2021), assets that depend on fossil materials will reduce market valuations due to higher operational costs because of the rising carbon prices (OECD, 2021). 2,512 companies on stock exchanges in developed and developing countries with high ESG value have lower cost of capital, cost of equity, and cost of debt compared to companies with low ESG scores (MSCI, 2020; Dasgupta Review, 2021; Raimo et al., 2021). This indicates that ESG has a positive impact on financial performance (Friede et al., 2015; Busch et al., 2015; Buallay, 2019; Whelan et al., 2021) and increases company efficiency (Xie et al., 2019). This is because ESG factors are able to capture the scope of financial performance that is not raised in accounting records (Bassen and Kovacs, 2009). Financial performance and company stock performance have a causal relationship (Meriç et al., 2017; Suhadak et al., 2019; Agrawal et al., 2020; Sholichah et al., 2021), so that the positive impact of ESG disclosure on company financial performance (Friede et al., 2015; Busch et al., 2015; Xie et al., 2019; Buallay, 2019) are expected to in line with the stock performance.

ESG market characteristics in developed countries are much more mature than developing countries (Eurosif, 2016; Zahid et al., 2022), but the majority of ESG-related studies are also still focused on the US, UK, and other developed countries (Tarmuji et al., 2016; Wu et al., 2022). Each ESG factor (Environment, Social, and Governance) have a different effect on the company's financial performance (Friede et al., 2015; Atan et al., 2018; Xie et al., 2019; Buallay, 2019). Based on these matters, a study is needed to analyze how the impact of ESG and each ESG factor has on stock performance on stock exchanges in developing countries such as Indonesia.

Sharp increases in AUM, implementation reports, and ESG indices indicate that investors are aware that ESG risks have a material

Figure 1: Performance Comparison of INDEX *environmental, social, and governance* Leaders, IHSG, and LQ45 (BEI, 2021)

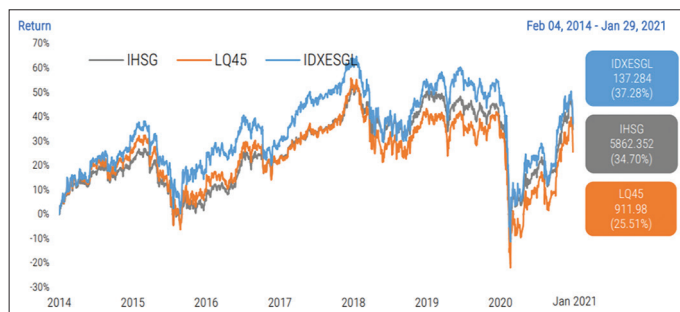
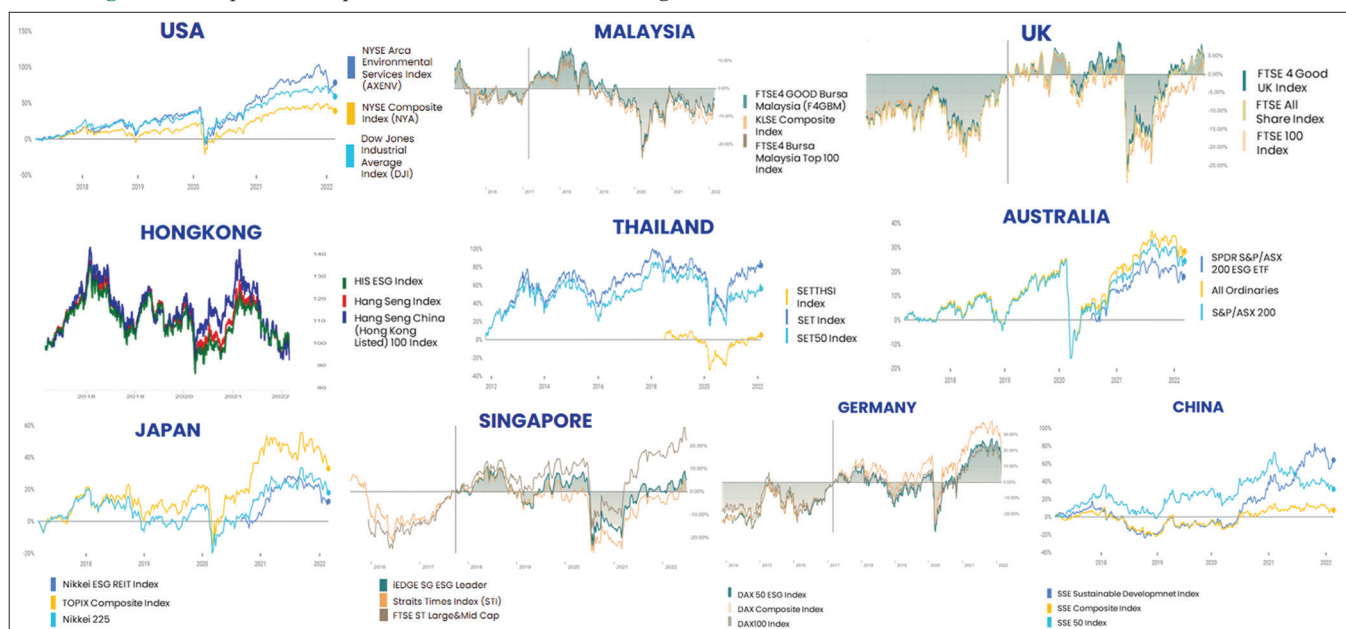


Figure 2: Comparison Graph of *environmental, social, and governance* Index and Conventional Index in Various Countries



impact on investments (Eccles and Viviers, 2011; Huber et al., 2017; UN PRI, 2021; BEI, 2021), but the analysis of the investors perception of ESG in determining investment has never been done in Indonesia. In this regard, a study is needed to analyze how Indonesian investors perceive ESG as an indicator in determining investment.

2. LITERATURE REVIEW

ESG is a set of company operational standard concepts consisting of three main criterias, Environmental, Social, and Governance (OECD, 2022). ESG is an expansion and enrichment of the concept of green economy, corporate social responsibility, and responsible investment, to measure the level of sustainable development (MSCI, 2022). Every organization has different ESG indicators, but this study uses ESG indicators from Morgan Stanley Capital International (MSCI) which consist of ten indicators with 37 main ESG issues. Company ratings are divided into a seven-point scale (ratings) namely 'AAA' to 'CCC' according to exposure to ESG risk and ability to manage this risk relative to other companies in similar industries (Figure 3).

Responsible investment are strategies and practices for incorporating environmental, social, and governance (ESG) factors in the investment decision-making process (MSCI, 2018; PRI, 2021). ESG ratings integrate the considerations of sustainability into the investment process and can support investors to evaluate the financial materiality of environmental, social and governance risks in the medium to long term (UN and IPSF, 2021). Additionally, ESG ratings can also support enterprise risk management by highlighting climate change impacts and others sustainability risks on the company's performance from time to time. ESG ratings is suitable to integrate into the financial analysis benchmarks (Giese et al., 2019).

The relevance of ESG as one of the factors that can affect a company's financial performance is supported by a lot of literature. Of the 2,000 studies in the last 50 years, more than 60% show a positive relationship between ESG and company financial performance (Busch et al., 2015). In line with this, as many as 58% of 1000 studies in 2015–2020 also show a positive relationship between ESG and company financial performance (Whelan et al., 2021). Even based on Friede et al. (2015), 90% of 2,200 empirical studies found that ESG has a positive impact on a company's financial performance and is stable over time. In addition, the study of Xie et al. (2019) on 6,631 companies in 74 countries showed that transparency of ESG information has a positive relationship with company efficiency.

ESG is transmitted to company valuations and performance through systematic risk profiles (lower cost of capital and higher valuations) and idiosyncratic risk profiles (higher profitability and lower risk exposure) so that they can affect market valuations (Clark et al., 2015; Friede et al., 2015; Busch et al., 2015; Xie et al., 2019; Buallay, 2019; Giese et al., 2019; MSCI, 2020; Dasgupta Review, 2021; OECD, 2021; Whelan et al., 2021). ESG factors are able to capture the scope of financial performance that is not raised in the records accounting which includes reputation, investor attractiveness, employee satisfaction, and innovation that can affect stock performance (Lantos, 2001; Kriström and Lundgren, 2003; Escrig-Olmedo et al., 2007; Bassen and Kovacs, 2009; Zhu and Yin, 2014; Kushwaha and Sharma, 2016; Guerrero-Villegas et al., 2018).

Financial performance and company stock performance have a causal relationship (Meriç et al., 2017; Suhadak et al., 2019; Agrawal et al., 2020; Sholichah et al., 2021), so that the positive impact of ESG disclosure on company financial performance

Figure 3: Environmental, social, and governance Rating Model and Indicator (MSCI, 2021)

ESG (IVA) Rating									
Environment Pillar				Social Pillar				Governance Pillar	
Climate Change	Natural Capital	Pollution & Waste	Env. Opportunities	Human Capital	Product Liability	Stakeholder Opposition	Social Opportunities	Corporate Governance	Corporate Behavior
Carbon Emissions	Water Stress	Toxic Emissions & Waste	Opportunities in Clean Tech	Labor Management	Product Safety & Quality	Controversial Sourcing	Access to Communication	Ownership & Control	Business Ethics
Product Carbon Footprint	Biodiversity & Land Use	Packaging Material & Waste	Opportunities in Green Building	Health & Safety	Chemical Safety	Community Relations	Access to Finance	Board	Tax Transparency
Financing Environmental Impact	Raw Material Sourcing	Electronic Waste	Opportunities in Renewable Energy	Human Capital Development	Consumer Financial Protection		Access to Health Care	Pay	
Climate Change Vulnerability				Supply Chain Labor Standards	Privacy & Data Security		Opportunities in Nutrition & Health	Accounting	
					Responsible Investment				
					Insuring Health & Demographic Risk				

Table 1: Operational definition of variable

Variable	Symbol	Definition	Source
Dependent variable			
Market capitalization	MC	The multiplication between the share price and the number of outstanding shares	OJK, IDX
Independent variable			
ESG score	ESGS	Company management's assessment of financially relevant ESG risks and opportunities	MSCI
Environment score	ES	The company management values of the financially relevant risks and opportunities of the environmental factors.	MSCI
Social score	SS	The company management values of the financially relevant risks and opportunities of the social factors.	MSCI
Governance score	GS	The company management values of the financially relevant risks and opportunities of the governance factors.	MSCI
Debt to equity ratio	DER	Financial ratios that compare the amount of debt and equity	OJK, IDX
Earnings per share	EPS	The company's net profit divided by the number of outstanding shares	OJK, IDX
Price to book value	PBV	Market value of equity and book value of total debt divided by the book value of total assets	OJK, IDX
Net income	NI	Company net profit	OJK, IDX
Total asset	TA	Total company assets	OJK, IDX
Inflation	Inflation	National inflation rate per quarter	BPS
Return market	RM	Market rate of return (IHSG)	IDX

Table 2: Number of research samples

Investor Category	Number of Investors February 2022	Proportion	Respondents Amount	Adjustments
Individual	8.011.160	99,75%	309	279
Institutional	20.322	0,25%	1	31
Total	8.031.482	100,00%	310	310

(Friede et al., 2015; Busch et al., 2015; Xie et al., 2019; Buallay, 2019; Whelan et al., 2021) allegedly in line with stock performance. This statement is also supported by findings (Clark et al., 2015; Lo and Kwan (2017), namely the strong practice of sustainability has a positive impact on investment performance. Based on a study of 736 US public companies from 2005 to 2015, the long-term strategy of carbon efficient companies can generate abnormal annual returns rate of 3.5% - 5.4% (In et al., 2019). This shows that investing in ESG companies can be profitable even without government incentives.

Volatility of company's stock prices with good ESG ratings is lower than companies with bad ESG ratings (Zhou and Zhou, 2021). Good ESG performance plays a role in increasing resilience and stabilizing stock prices, especially during times of crisis. This evidence is driving increased market interest in stocks and company ESG performance through ESG reports and indexes to assess and measure company performance. This indicates that investors are aware of ESG risks which have a material impact on investment performance (Eccles and Viviers, 2011; Huber et al., 2017; Zadeh and Serafeim, 2017; UN PRI, 2021; BEI, 2021).

The results of the studies above strengthen the argument that there is a relationship between ESG ratings with stock performance. There is a series of correlations that better management of ESG problems and risks has a positive impact on the company's financial performance, so that it can also have a positive impact on stock performance. In addition, sharp increases in AUM, implementation reports, and the ESG index indicate that investors are aware that ESG risks have a material impact on investments. Understanding these relationships makes further research even more important.

3. RESEARCH METHODOLOGY

This research uses a mixed method approach which combines quantitative and qualitative research (Creswell and Plano Clark, 2015). Panel data regression with fixed effect model (FEM) was conducted to analyze the effect of ESG and ESG factors on stock performance. This research uses secondary data in the form of stock prices, JCI, inflation, and company financial data obtained from OJK, IDX, and BPS as well as ESG data score obtained from MSCI. The unit analysis of stock performance is proxied by market capitalization, the impact of ESG is proxied through ESG datascore, while ESG factors are proxied based on the data of Environmental, Social, and Governance Scores. In addition, a survey method was conducted for individual and institutional investors to analyze investors' perceptions of ESG in investment decision making.

3.1. Panel Data Regression

Panel data regression with FEM is used because there are constant unobserved variables over time that might affect ESG scores of a company. In addition, a model suitability test was carried out consisting of the Chow Test, Hausman Test, and Langrange Multiplier (LM) Test to ensure the selection of the best regression model. The variables used is described in Table 1. The general model of the regression equation used is as follows:

$$Ln_{MC_{it}} = \beta_0 + \beta_1 ESG_{it} + \beta_2 EPS_{it} + \beta_3 RM_{it} + \beta_4 PBV_{it} + \beta_5 NI_{it} + \beta_6 DER_{it} + \beta_7 TA_{it} + \beta_8 Inflation_{it} + \varepsilon_{it} \quad (1)$$

$$Ln_{MC_{it}} = \beta_0 + \beta_1 ES_{it} + \beta_2 EPS_{it} + \beta_3 RM_{it} + \beta_4 PBV_{it} + \beta_5 NI_{it} + \beta_6 DER_{it} + \beta_7 TA_{it} + \beta_8 Inflation_{it} + \varepsilon_{it} \quad (2)$$

$$\begin{aligned} Ln_{MC_{it}} = & \beta_0 + \beta_1 SS_{it} + \beta_2 EPS_{it} + \beta_3 RM_{it} + \beta_4 PBV_{it} \\ & + \beta_5 NI_{it} + \beta_6 DER_{it} + \beta_7 TA_{it} + \beta_8 Inflation_{it} + \varepsilon_{it} \end{aligned} \quad (3)$$

$$\begin{aligned} Ln_{MC_{it}} = & \beta_0 + \beta_1 GS_{it} + \beta_2 EPS_{it} + \beta_3 RM_{it} + \beta_4 PBV_{it} \\ & + \beta_5 NI_{it} + \beta_6 DER_{it} + \beta_7 TA_{it} + \beta_8 Inflation_{it} + \varepsilon_{it} \end{aligned} \quad (4)$$

3.2. Survey

The general sampling criteria for surveys are as follows:

1. Institutional investors
2. Individual investors
3. Classification based on age, namely: 1. Age 17–24 years; 2. Age 25–40 years; 3. Age 41–56 years; 4. Age 57–75 years; and 5. Age 76 years and over. Each age category is represented at least 10% of the total respondents
4. Domicile: 60% of investors in Java and 40% outside Java.

Determination of the minimum sample size according to Hair et al (2010), namely (number of indicators) \times (5–10 times). There are 31 indicators (11 personal investor indicators and 20 core indicators). Based on this formula, the number of respondents targeted is detailed in Table 2.

$$\text{Number of respondents} = (31) \times (10) = 310 \text{ respondents}$$

4. RESEARCH RESULTS

4.1. The Impact of ESG and ESG Factors on Stock Performance

The data sample for the regression consisted of 23 companies with a time period of 29 quarters in 2015 to 2022 which resulted in 667 observations (Table 3). The mean market capitalization (MC) is IDR 141 trillion, with the highest and lowest MC valued at IDR 973 trillion and IDR 5.86 trillion, respectively. ESG scores (ESGS) has a mean of 4.17 with the highest and lowest ESGS being 6.3 and 0.9 respectively. Next, for environment score (ICE), social score (SS), and governance score (GS) sequentially has a mean of 4.2; 4.8; and 3.8. The highest scores of ES, SS, and GS are respectively 10; 9.5; and 8.9 while the lowest value of the three is the same, namely 0.

Based on the results of the model fit test, FEM is the best regression model. The results of the regression analysis presented in Table 4 show that ESG scores significantly have positive effect

on the increasing market capitalization. In addition, ESG forming factors, namely corporate social factors significantly increase market capitalization. In contrast, environmental factors and corporate governance do not have a significant effect on market capitalization.

As a comparison, the company's financial performance can be measured by EPS, so the robustness check is done with EPS as the dependent variable. Based on Table 5, it is found that ESG values and the ESG forming factors such as social, environmental and governance factors do not have a significant effect on earnings per share (EPS) of the company even though the relationship is negative. Therefore, EPS cannot be used as the main indicator in determining the company's stock performance because it is not significantly affected by ESG.

Apart from using different dependent variables, robustness check can be done using different methods or models. The comparison model used is difference-in-difference (DiD). Based on Table 6, it is known that the Paris Agreement (PA) encourages the application of ESG in investment which has a positive impact on increasing company market capitalization. However, the effect is not significant so that the DiD model cannot provide analytical results that support the literature.

4.2. Investor Perceptions of ESG in Investment Decisions Making

The survey was conducted to 279 individual investor respondents and 34 institutional investors. Based on the risk profile (Figure 4), 42% of individual investors are considered conservative, 40% are moderate, and 18% are aggressive, while 41% of institutional investors are considered moderate, 38% are conservative, and 21% are aggressive.

Investment decision making is based on several main factors (Figure 5). 36% of individual investor respondents chose fundamental analysis as the first ranking factor on which to base investment decisions; 27% of respondents chose technical analysis as the second rank; 31% of respondents consider business risk as the third rank; 35% of respondents consider volatility returns as the fourth rank; 27% of respondents chose the industrial sector as the fifth rank; 27% of respondents chose the behavior of market participants as the sixth rank; and 33% of respondents consider the latest issues or information as the last ranking.

Table 3: Descriptive statistics

Variabel	N	Mean	Median	Std.dev.	Variance	Min	Max
MC	667	1.41e+14	6.96e+13	1.60e+14	2.57e+28	5.86e+12	9.73e+14
ESGS	667	4.165667	4.4	1.120398	1.255291	0.9	6.3
ES	667	4.210195	3.9	2.49449	6.222478	0	10
SS	667	4.790705	5.1	2.076214	4.310664	0	9.5
GS	667	3.829985	3.6	1.630932	2.65994	0	8.9
EPS	667	481.4406	219.1877	716.4895	513357.2	-359.4544	5654.993
RM	667	0.0144348	0.0353484	0.0859454	0.0073866	-0.2794822	0.2277259
PBV	667	5.124978	1.973329	11.54097	133.1939	-44.2847	82.44443
NI	667	5.33e+12	2.41e+12	6.97e+12	4.86e+25	-9.64e+12	3.44e+13
DER	667	1.989191	0.971533	2.223532	4.944097	0.098396	16.53323
TA	667	2.37e+14	7.09e+13	3.79e+14	1.43e+29	1.38e+12	1.73e+15
Inflation	667	0.0325345	0.0312	0.0147349	0.0002171	0.0133	0.0726

Table 4: Panel data regression results with FEM

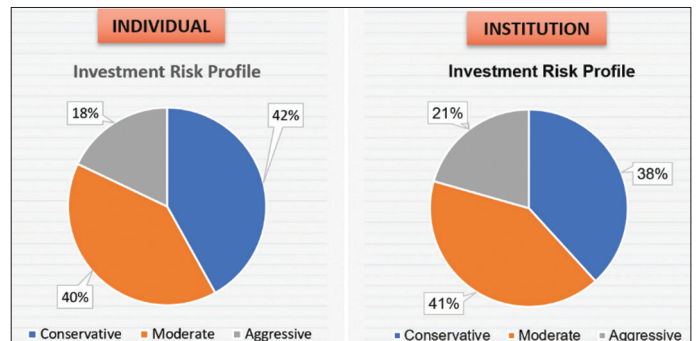
	MODEL 1	MODEL 2	MODEL 3	MODEL 4
	MC_ESG	MC_E	MC_S	MC_G
ESGS	0.108*** (3.80)			
ES		0.0116 (0.76)		
SS			0.0640*** (4.83)	
GS				-0.0151 (-1.46)
EPS	0.0000585* (1.72)	0.0000567* (1.65)	0.0000617* (1.83)	0.0000588* (1.71)
RM	0.736*** (4.85)	0.710*** (4.62)	0.822*** (5.41)	0.740*** (4.81)
PBV	0.00939*** (3.94)	0.00976*** (4.04)	0.00979*** (4.13)	0.00978*** (4.06)
NI	8.79e-15*** (2.71)	8.83e-15*** (2.69)	8.37e-15*** (2.60)	8.62e-15*** (2.63)
DER	-0.0615*** (-4.32)	-0.0718*** (-5.08)	-0.0702*** (-5.07)	-0.0752*** (-5.30)
TA	1.13e-15*** (7.38)	9.04e-16*** (5.85)	9.92e-16*** (6.89)	8.82e-16*** (5.82)
Inflation	5.135*** (5.19)	4.865*** (4.84)	5.972*** (5.94)	5.435*** (5.15)
_cons	31.12*** (204.73)	31.61*** (373.28)	31.29*** (316.52)	31.71*** (408.89)
N	667	667	667	667
R-Squared	0.6399	0.6992	0.6338	0.6843

Table 5: Robustness check with EPS dependent variable

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
	MC_ESG	MC_E	MC_S	MC_G
ESGS	-14.73 (-0.45)			
ES		-9.198 (-0.52)		
SS			-13.37 (-0.86)	
GS				15.56 (1.31)
RM	688.6*** (3.94)	698.0*** (3.98)	668.7*** (3.79)	667.7*** (3.80)
PBV	3.590 (1.29)	3.486 (1.25)	3.524 (1.27)	3.438 (1.24)
NI	3.07e-11*** (8.56)	3.06e-11*** (8.54)	3.07e-11*** (8.58)	3.07e-11*** (8.59)
DER	13.22 (0.80)	14.11 (0.87)	14.24 (0.88)	17.45 (1.07)
TA	-1.25e-12*** (-7.29)	-1.19e-12*** (-6.95)	-1.23e-12*** (-7.61)	-1.16e-12*** (-6.87)
Inflation	3743.1*** (3.27)	3827.1*** (3.33)	3550.8*** (3.03)	3248.8*** (2.68)
_cons	499.5*** (2.83)	459.9*** (4.79)	503.0*** (4.40)	365.8*** (4.14)
N	667	667	667	667
R-Squared	0.2139	0.2140	0.2146	0.2158

Table 6: Robustness check with DiD model

	Before PA	After PA	After-Before
Market capitalization	0.758 (0.21)	0.798 (0.082)	0.040 (0.22)

Figure 4: Investment risk profile

Furthermore, for institutional investors, 50% of respondents chose fundamental analysis as the first ranking of factor underlying investment decisions; 32% of respondents consider business risk as the second rank; 24% of respondents consider volatility returns as the third rank; 29% of respondents consider business risk as the fourth rank; 29% of respondents consider volatility returns as the fifth rank; 29% of respondents consider the behavior of market participants as the sixth rank; and 24% of respondents chose technical analysis and current issues as the last rating (Figure 6).

This survey explores investor's understanding towards ESG (Figure 7). Individual investors who are categorized as really understand ESG are 39%, moderately understand are 41%, and do not understand are 20%. Meanwhile, 50% of institutional investors are categorized really understand ESG, 47% are categorized understand enough, and only 3% are categorized don't understand.

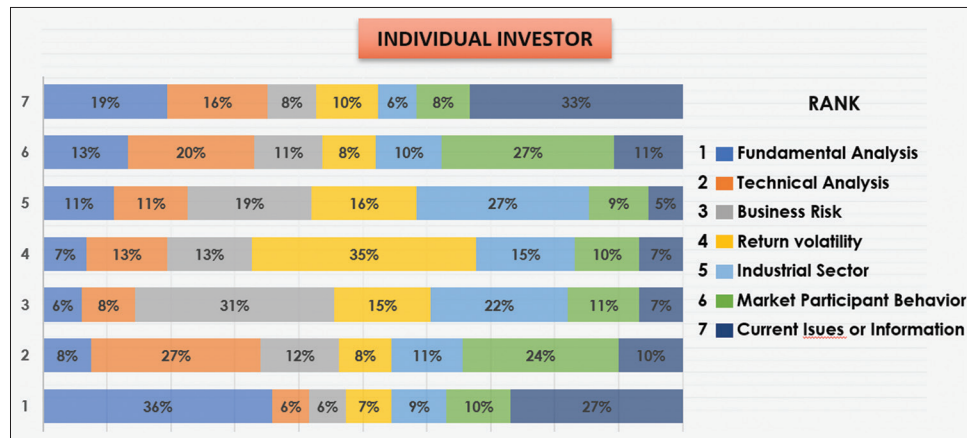
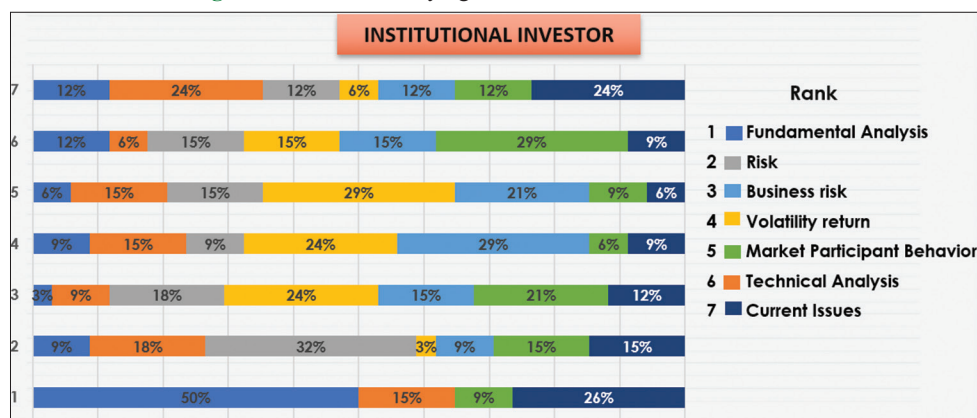
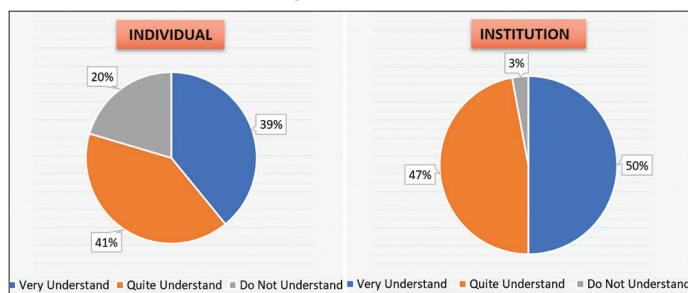
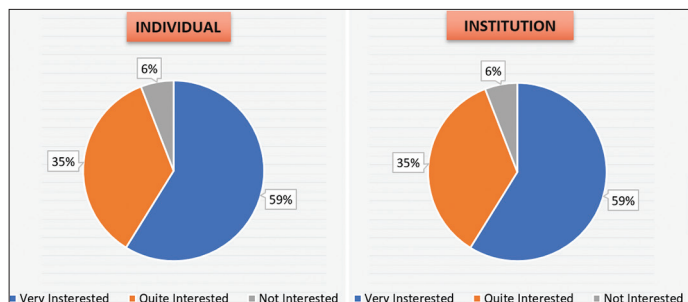
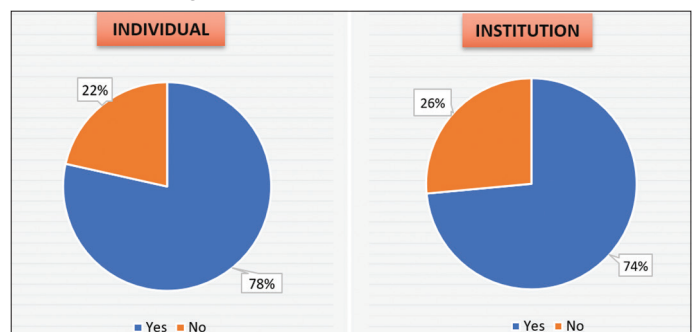
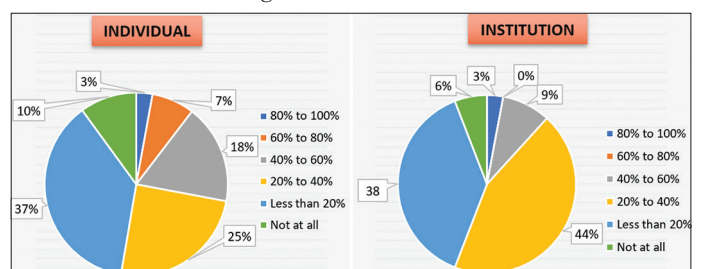
Individual and institutional investors share the same interest in ESG stock (Figure 8). 59% of individual and institutional investor respondents are categorized very interested in ESG, 35% are moderately interested, and 6% are not interested.

The majority of individual investors (78%) and institutional investors (74%) consider ESG factors in investing (Figure 9). The others, 22% of individual investors and 26% of institutional investors, do not consider ESG factors in investing.

This survey also asks how much investment allocation investors have for ESG shares (Figure 10). 3% of individual investor respondents allocate 80%–100% of their investment portfolio for ESG stocks; 7% of respondents allocate 60%–80%; 18% of respondents allocate 40%–60%; 25% of respondents allocate 20%–40%; 37% of respondents allocate <20%; and 10% of respondents do not allocate ESG shares in their investment portfolio.

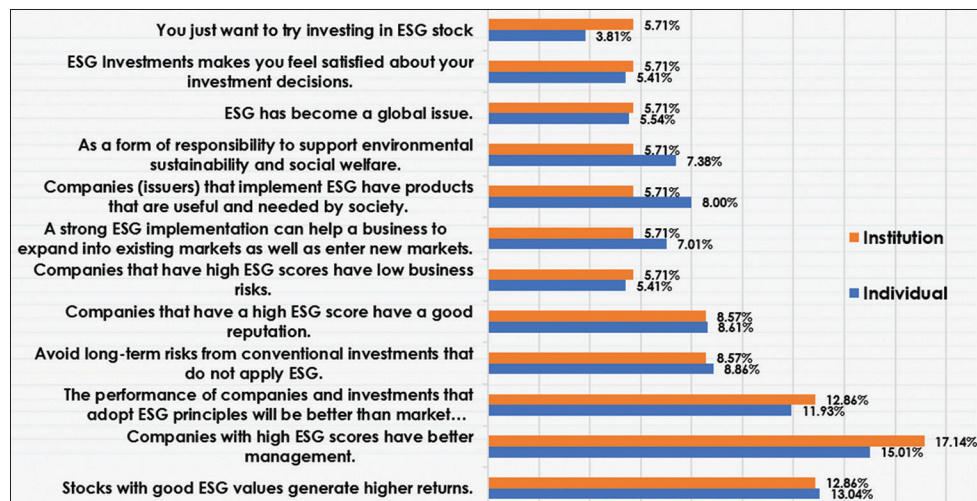
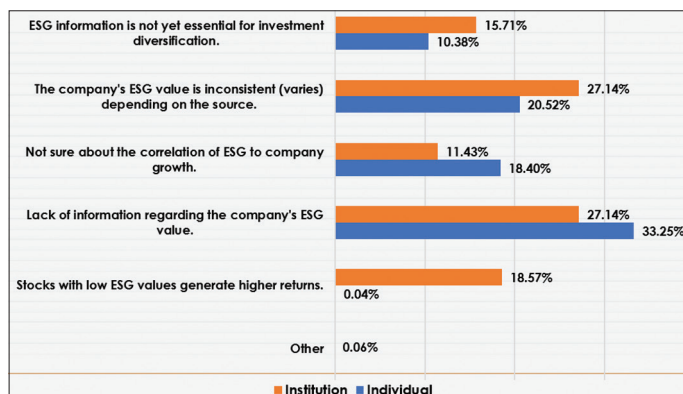
For institutional investors, 3% of respondents allocate 80%–100% of their investment portfolio for ESG stocks; no respondent allocated 60%–80%; 9% of respondents allocate 40%–60%; 44% of respondents allocate 20%–40%; 38% of respondents allocate less than 20%; and 6% of respondents do not allocate ESG shares in their investment portfolio.

Next, the survey explores investor's reasons for investing in ESG stocks (Figure 11). Individual and institutional investor

Figure 5: Factors underlying individual investor investment decisions**Figure 6:** Factors underlying institutional investment decisions**Figure 7:** Investors understanding of *environmental, social, and governance***Figure 8:** Investor interest in *environmental, social, and governance* stocks**Figure 9:** Investor considerations on *environmental, social, and governance* factors in investments**Figure 10:** Investment allocation for *environmental, social, and governance* shares

respondents share the same main reasons, namely companies with high ESG scores have better management. The second reason is

that stocks with good ESG scores produce higher returns. The third reason is that the performance of companies and investments

Figure 11: Reason to invest in *environmental, social, and governance* stocks**Figure 12:** Reason not to invest in *environmental, social, and governance* stocks

that adopt ESG principles will be better than market performance in the long term.

There are several reasons for investors to not to invest in ESG stock (Figure 12). Individual and institutional investor respondents share the same main reason, namely the lack of information regarding the company's ESG score. The second reason is that the company's ESG score is inconsistent (it varies) depending on the source. The third reason is that individual investors are not sure about the ESG correlation with company growth, while institutional investors argue that stocks with low ESG scores generate higher returns.

Investor expectations of ESG ratings (ESG score) of the company is also analyzed (Figure 13). Individual and institutional investor respondents share the same main reasons, namely companies with high ESG scores have better financial performance. The second expectation is that companies with high ESG scores also earns higher returns. The third expectation is that companies with high ESG scores have lower stock volatility.

Furthermore, the survey also asks how the actual effect of the ESG score is on the investor's investment portfolio (Figure 14). 32.5% of individual investor respondents and 32.8% of institutional investor respondents stated that ESG scores generate higher returns; 28.5% of individual investor respondents and 29.5% of institutional investor respondents stated that ESG scores reduce portfolio volatility.

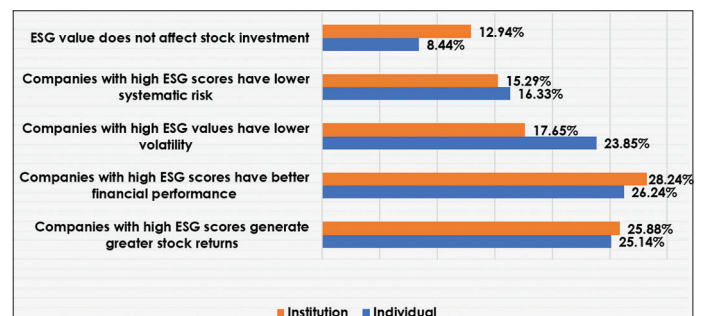
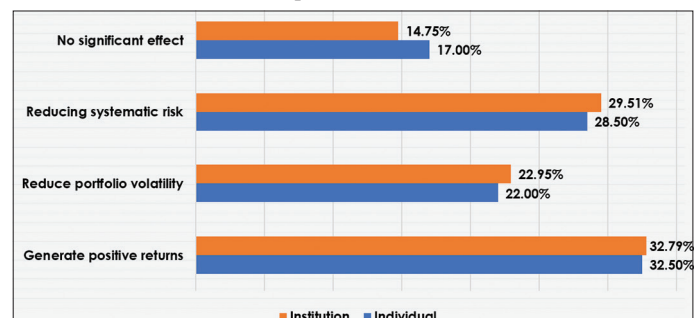
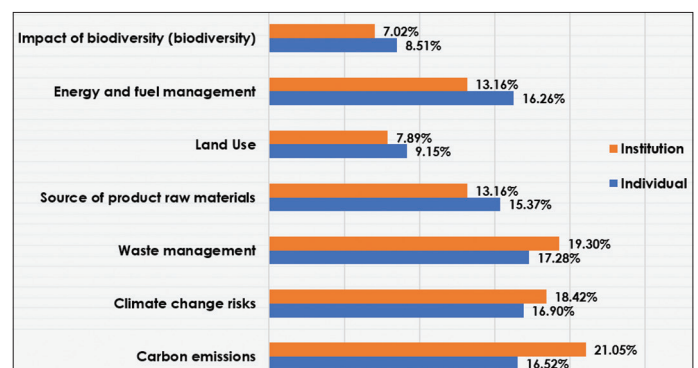
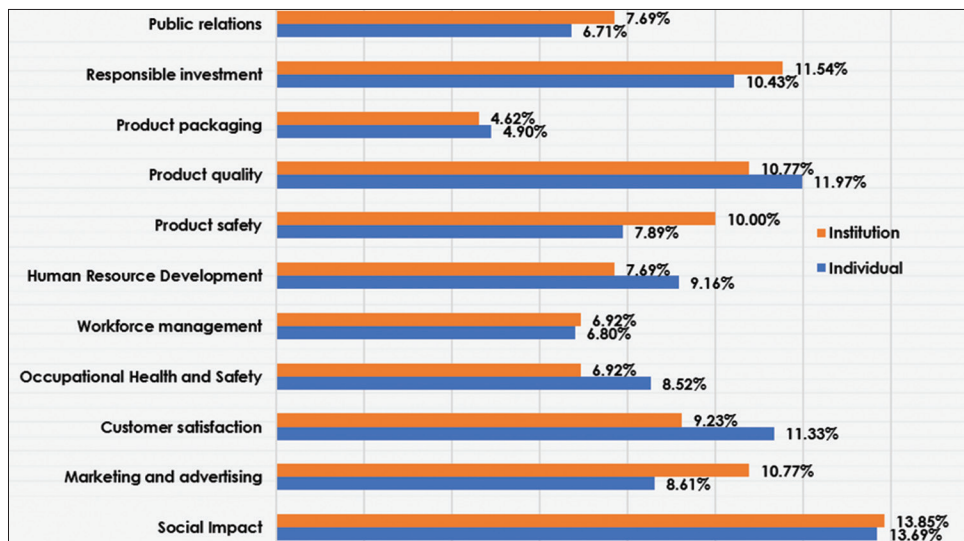
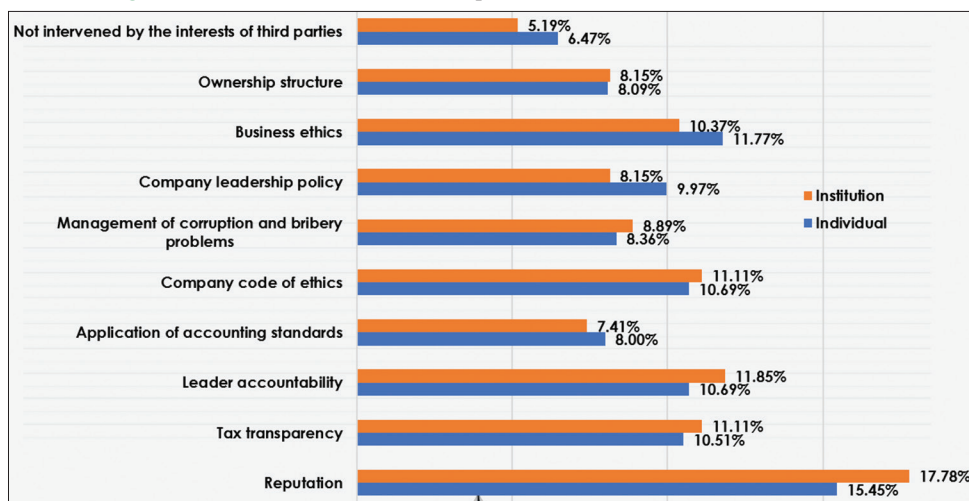
Figure 13: Expectations for environmental, social, and governance ratings**Figure 14:** Effect of *environmental, social, and governance* value on investment portfolio characteristics**Figure 15:** Environmental factors in companies considered in investment decision

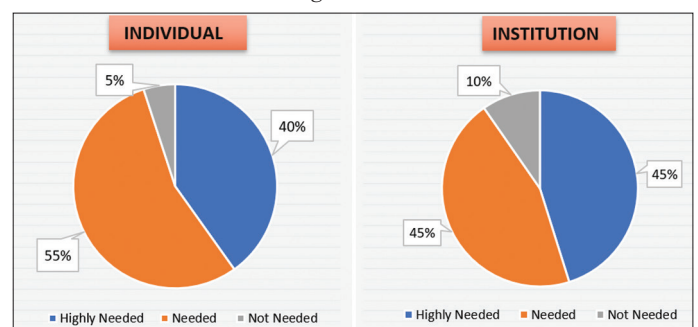
Figure 16: Social factors in companies considered in investment decision**Figure 17:** Governance factors in companies considered in investment decisions

of institutional investor respondents stated that the ESG scores reduces systematic risk; 22% of individual investor respondents and 23% of institutional investor respondents stated that ESG scores reduce portfolio volatility; and 17% of individual investor respondents and 14.8% of institutional investor respondents stated that the ESG scores does not significantly affect the investment portfolio.

In making investment decisions, the environmental factors that are most considered by investors are waste management, carbon emissions, and the risk of climate change (Figure 15).

In addition to environmental factors, social factors that are the most considered by investors in investment decisions are social impact, product quality, and responsible investment (Figure 16).

The final ESG forming factor, governance factor, that is the most considered by investors in investment decisions is reputation, leader accountability, business ethics, and the company's code of ethics (Figure 17).

Figure 18: The urgency of regulations creation related to environmental, social, and governance measurement standards

Finally, this survey also asks for investors' responses in terms of the urgency of making regulations related to ESG measurement standards (Figure 18). 40% of individual investors say regulation is very necessary, 55% are needed, and 5% say it is not needed. Accordingly, 45% of institutional investors think regulation is necessary, 45% are necessary, and 10% are not.

5. CONCLUSION AND POLICY RECOMMENDATIONS

5.1. Conclusion

The regression results show that the ESG score has a positive impact on the company's stock performance proxied by the market capitalization value (market capitalization). This shows that the increase in company's ESG value will also increase the market capitalization because it can reduce company costs and provide a positive perception to investors so that the valuation value and the market capitalization increase (MSCI, 2020; Dasgupta Review, 2021; Raimo et al., 2021; Janicka and Sajnog, 2022).

Of the three ESG factors, social factors is the factor that have a positive and significant impact on the stock performance. On the other hand, environmental factors and governance factors has no significant effect on stock performance. This shows that an increase in corporate social value will increase market capitalization which is in line with the survey results which show that social impact is the aspect that investors consider the most in social ESG factors. It is also supported by stakeholder contract costs theory (Jones, 1995) and good management theory (Waddock and Graves, 1997) which states that corporate social performance can decrease relational costs with stakeholders and that the market appreciates companies that have social programs more. In addition, companies that carry out social activities are more popular because the impact is directly felt by the community so they are more exposed (Richter et al., 2019; Ahmad et al., 2021).

Based on the survey results, individual and institutional investors in Indonesia already have a good understanding of ESG; has high interest and has allocated investment in ESG stock due to better management and yield higher returns. Meanwhile, the main reason why some investors do not invest in ESG is because of the lack of ESG information and the inconsistency of ESG ratings which are dependent on ESG rating agencies, so that investors perceive that it is necessary to make regulations related to standards of ESG ratings measurements.

In addition, the survey results show that the things investors consider the most in their investment decisions on environmental factors are carbon emissions and waste management; on social factors is social impact; and on the governance factor is reputation.

5.2. Policy Recommendations

Investors can make ESG ratings as one of the main indicators in determining investment because it is proven to have a significant effect on improving stock performance. Therefore, companies need to improve ESG performance because it can improve stock performance. Companies need to document ESG implementation through a Sustainability Report in accordance with Otoritas Jasa Keuangan (OJK) Regulation Number 51/POJK.03/2017 concerning the Implementation of Sustainable Finance for Financial Services Institutions, Issuers, and Public Companies because of the high market interest in transparency of ESG performance and practices.

Besides that, the framework of standarized ESG ratings measurement needs to be organized to maintain the consistency and accuracy of

ESG ratings as well as to increase investor confidence that the ESG analysis has a robust methodology. Easy access and ESG ratings publication on a regular basis needs to be implemented so that the whole stakeholders can make the most out of it.

REFERENCES

- Agrawal, O.P., Bansal, P., Kathpal, S. (2020), Effect of financial performance on corporate social responsibility and stock price: A study of BSE listed companies. *International Journal on Emerging Technologies*, 11(1), 286-291.
- Amel-Zadeh, Amir and Serafeim, George, Why and How Investors Use ESG Information: Evidence from a Global Survey (July 1, 2017). *Financial Analysts Journal*, 2018, Volume 74 Issue 3, pp. 87-103., Available at SSRN: <https://ssrn.com/abstract=2925310> or <http://dx.doi.org/10.2139/ssrn.2925310>
- Ahmad, N., Mobarek, A., Roni, N.N. (2021), Revisiting the impact of ESG on financial performance of FTSE350 UK firms: Static and dynamic panel data analysis. *Cogent Business and Management*, 8(1), 1900500.
- Bank of Indonesia (BI). (2022), Sinergi dan Inovasi Memperkuat Ketahanan dan Kebangkitan Menuju Indonesia Maju. Indonesia: Bank of Indonesia.
- Bassen, Alexander., & Kovács, Ana Maria (2009): Corporate Responsibility als Kennzahlensystem, in: Wall, Friederike/Schröder, Regina W. (Hrsg.), *Controlling zwischen Shareholder Value und Stakeholder Value*, Neue Anforderungen, Konzepte und Instrumente, München 2009, S. 309-321.
- BEI. (2021), IDX Quality30 Index Fact Sheet. Available from: https://www.idx.co.id/media/9786/factsheet_210129_05_idxq30.pdf
- Buallay, A. (2019), Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector. *Management of Environmental Quality*, 30(1), 98-115.
- Clark, Gordon L. and Feiner, Andreas and Viehs, Michael, From the Stockholder to the Stakeholder: How Sustainability Can Drive Financial Outperformance (March 5, 2015). Available at SSRN: <https://ssrn.com/abstract=2508281> or <http://dx.doi.org/10.2139/ssrn.2508281>
- Creswell, J.W., Plano Clark, V.L. (2015), *Designing and Conducting Mixed Methods Research*. 3rd ed. Thousand Oaks, CA: Sage Publications.
- Dasgupta, P. (2021), *The Economics of Biodiversity: The Dasgupta review*. United Kingdom: Hm Treasury.
- Eccles, N.S., Viviers, S. (2011), The origins and meanings of names describing investment practices that integrate a consideration of ESG issues in the academic literature. *Journal of Business Ethics*, 104(3), 389-402.
- Escrig-Olmedo, E., Rivera-Lirio, J. M., Muñoz-Torres, M. J., & Fernández-Izquierdo, M. Á. (2017). Integrating multiple ESG investors' preferences into sustainable investment: A fuzzy multicriteria methodological approach. *Journal of cleaner production*, 162, 1334-1345.
- Eurosif. (2016), *European SRI Study*. Available from: <https://www.eurosif.org/wp-content/uploads/2022/03/Eurosif-SRI-study-2016.pdf>
- Friede, G., Busch, T., Bassen, A. (2015), ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance and Investment*, 5(4), 210-233.
- Giese, G., Lee, L.E., Melas, D., Nagy, Z., Nishikawa, L. (2019), Foundations of ESG investing: How ESG affects equity valuation, risk, and performance. *The Journal of Portfolio Management*, 45(5), 69-83.
- Guerrero-Villegas, J., Sierra-García, L., & Palacios-Florencio, B. (2018). The role of sustainable development and innovation on firm performance. *Corporate Social Responsibility and Environmental*

- Management, 25(6), 1350–1362.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (Seven ed.). Upper Saddle River, NJ: Prentice Hall: Pearson.
- Huber, B.M., Comstock, M., Polk, D., Wardwell, L.L.P. (2017), *ESG Reports and Ratings: What They are, Why They Matter*. Vol. 44. United States: Harvard Law School Forum on Corporate Governance and Financial Regulation.
- In, Soh Young., Park, Ki Young., & Monk, Ashby, Is 'Being Green' Rewarded in the Market?: An Empirical Investigation of Decarbonization and Stock Returns (April 16, 2019). Stanford Global Project Center Working Paper, Available at SSRN: <https://ssrn.com/abstract=3020304>
- Intergovernmental Panel on Climate Change (IPCC). (2021), Chapter 1: The physical science basis. In: Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S.L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M.I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J.B.R., Maycock, T.K., Waterfield, T., Yelekçi, O., Yu, R., Zhou, B., editors. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, USA: Cambridge University Press.
- Janicka, M., Sajnog, A. (2022), The ESG reporting of EU public companies. Does the company's capitalisation matter? *Sustainability*, 14(7), 4279.
- Jones, T.M. (1995), Instrumental stakeholder theory: A synthesis of ethics and economics. *Academy of Management Review*, 20(2), 404-437.
- Kriström, B., Lundgren, T. (2003), Abatement investments and green goodwill. *Applied Economics*, 35(18), 1915-1921.
- Kushwaha, G.S., Sharma, N.K. (2016), Green initiatives: A step towards sustainable development and firm's performance in the automobile industry. *Journal of Cleaner Production*, 121, 116-129.
- Lantos, G.P. (2001), The boundaries of strategic corporate social responsibility. *Journal of Consumer Marketing*, 18, 595-630.
- LCDI Indonesia. (2022), *Bappenas Prediksi Kerugian Akibat Perubahan Iklim Rp 544 T, Begini Rinciannya*. Indonesia: LCDI Indonesia. Available from: <https://lcdiindonesia.id/2022/01/11/bappenas-prediksi-kerugian-akibat-perubahan-iklim-rp-544-t-begini-rinciannya>
- Lo, K.Y., Kwan, C.L. (2017), The effect of environmental, social, governance and sustainability initiatives on stock value-examining market response to initiatives undertaken by listed companies. *Corporate Social Responsibility and Environmental Management*, 24(6), 606-619.
- Meriç, E., Kamışlı, M., Temizel, F. (2017), Interactions among stock price and financial ratios: The case of Turkish banking sector. *Applied Economics and Finance*, 4(6), 107-115.
- MSCI ESG Research. (2018), *Introducing ESG Investing*. United States: MSCI ESG.
- MSCI Indonesia ESG Leaders Index. (2022), *A Market Capitalization-Weighted Index Designed to Measure the Performance of the Large and Mid Cap Segments of the Indonesian Market that Have High Environmental, Social, and Governance (ESG) Ratings and Performance*. United States: MSCI.
- MSCI Research. (2020), *ESG and the Cost of Capital*. United States: MSCI.
- MSCI, Eurosif. (2014), *European SRI Study*. United States: MSCI. p1-68. <http://scholar.google.com/scholar?hl=en&btnq=searchandq=i&intitle=european+sri+study#8>
- MSCI. (2021), *ESG Ratings Key Issue Framework*. United States: MSCI. Available from: <https://www.msci.com/our-solutions/esg-investing/esg-ratings/esg-ratings-key-issue-framework>
- OECD. (2020), *OECD Business and Finance Outlook 2020: Sustainable and Resilient Finance*. Paris: OECD Publishing.
- OECD. (2021), *ESG Investing and Climate Transition: Market Practices, Issues and Policy Considerations*. Paris: OECD. Available from: <https://www.oecd.org/finance/ESG-investing-and-climate-transition-Market-practices-issues-and-policy-considerations.pdf>
- OECD. (2022), *ESG Ratings and Climate Transition: An Assessment of the Alignment of E-Pillar Scores and Metrics*. OECD Business and Finance Policy Papers, No. 06. Paris: OECD Publishing.
- Principles for Responsible Investment (PRI), (2022), *The PRI 2022/23 Work Programme Supporting Our Signatories*. New York City: Principles for Responsible Investment. Available from: <https://www.unpri.org/download?ac=16132>
- Raimo, N., Caragnano, A., Zito, M., Vitolla, F., Mariani, M. (2021), Extending the benefits of ESG disclosure: The effect on the cost of debt financing. *Corporate Social Responsibility and Environmental Management*, 28, 1412-1421.
- Richter, R., Fink, M., Lang, R., Maresch, D. (2019), *Social Entrepreneurship and Innovation in Rural Europe*. UK: Routledge.
- Russo, A. (2020), *Half of world's GDP Moderately or Highly Dependent on Nature*, Says New Report. World Economic Forum. Available from: <https://www.weforum.org/press/2020/01/half-of-world-s-gdp-moderately-or-highly-dependent-on-nature-says-new-report>
- Sholichah, F., Asfiah, N., Ambarwati, T., Widagdo, B., Ulfa, M., Jihadi, M. (2021), The effects of profitability and solvability on stock prices: Empirical evidence from Indonesia. *Journal of Asian Finance, Economics and Business*, 8(3), 885-894.
- Suhadak, S., Rahayu, S.M., Handayani, S.R. (2019), GCG, financial architecture on stock return, financial performance and corporate value. *International Journal of Productivity and Performance Management*, 69, 1813-1831.
- Tarmuji, I., Maelah, R., & Tarmuji, N. H. (2016). The impact of environmental, social and governance practices (ESG) on economic performance: Evidence from ESG score. *International Journal of Trade, Economics and Finance*, 7(3), 67.
- United Nations Department of Economic and Social Affairs (UN DESA) & International Platform on Sustainable Finance (IPSF). (2021). *Input Paper for The G20 Sustainable Finance Working Group (SFWG)*.
- UN PRI. (2021), *Investment Mandates Embedding ESG Factors, Improving Sustainability Outcomes*. Available from: <https://www.unpri.org/mandate-requirements-and-rfps/embedding-esg-factors-in-investment-mandates/8563.article>
- United Nations Framework Convention on Climate Change. (2015), *Synthesis Report on the Aggregate Effect of the Intended Nationally Determined Contributions*. United States: United Nations. Available from: <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>
- Waddock, S.A., Graves, S.B. (1997), The corporate social performance-financial performance link. *Strategic Management Journal*, 18(4), 303-319.
- Whelan, T., Atz, Ulrich., Van Holt, Tracy., & Clark, Casey. (2021). *ESG and Financial Performance. Uncovering the Relationship by Aggregating Evidence from 1,000 Plus Studies Published Between 2015–2020*.
- Wu, S., Li, X., Du, X., Li, Z. (2022), The impact of ESG performance on firm value: The moderating role of ownership structure. *Sustainability*, 14(21), 14507.
- Xie, J., Nozawa, W., Yagi, M., Fujii, H., Managi, S. (2019), Do environmental, social, and governance activities improve corporate financial performance? *Business Strategy and the Environment*, 28(2), 286-300.
- Zahid, R. A., Taran, A., Khan, M. K., & Chersan, I. C. (2022). ESG, Dividend Payout Policy and The Moderating Role of Audit Quality: Empirical Evidence from Western Europe. *Borsa Istanbul Review*. Volume 23, Issue 2, 2023, Pages 350-367, ISSN 2214-8450, <https://doi.org/10.1016/j.bir.2022.10.012>.
- Zhou, D., Zhou, R. (2021), ESG performance and stock price volatility in public health crisis: Evidence from COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 19(1), 202.
- Zhu, C., Yin, J., Li, Q. (2014), A stock decision support system based on DBNs. *Journal of Computational Information Systems*, 10(2), 883-893.

APPENDIXES

Appendix I: Research Sample Regression

No.	Code	Share Name	No.	Code	Share Name
1	ADRO	Ace Hardware Indonesia Tbk.	13	HMSP	H.M. Sampoerna Tbk.
2	ASII	Astra International Tbk.	14	INTP	Indocement Tunggul Prakarsa Tbk.
3	BBCA	Bank Central Asia Tbk.	15	JSMR	Jasa Marga (Persero) Tbk.
4	BBNI	Bank Negara Indonesia (Persero) Tbk.	16	KLBF	Kalbe Farma Tbk
5	BBRI	Bank Rakyat Indonesia (Persero) Tbk.	17	MNCN	Media Nusantara Citra Tbk.
6	BMRI	Bank Mandiri (Persero) Tbk.	18	PGAS	Perusahaan Gas Negara Tbk.
7	BSDE	Bumi Serpong Damai Tbk.	19	SMGR	Semen Indonesia (Persero) Tbk
8	CPIN	Charoen Pokphand Indonesia Tbk.	20	TBIG	Tower Bersama Infrastructure Tbk.
9	EXCL	XL Axiata Tbk.	21	TLKM	Telkom Indonesia (Persero) Tbk.
10	GGRM	Gudang Garam Tbk.	22	UNTR	United Tractors Tbk
11	ICBP	Indofood CBP Sukses Makmur Tbk	23	UNVR	Unilever Indonesia Tbk.
12	INDF	Indofood Sukses Makmur Tbk			

Appendix II: Individual Investor Respondents

This survey considers the age distribution of each individual investor group provided that each age category can be represented at a minimum of 10%, and considers the distribution of domiciles of 60% representing Java and 40% outside Java.

Age Category	Percentage	Respondent	Minimum Retail Respondent					
			Java	Sumatera	Kalimantan	Sulawesi	Bali, NTT, and NTB	Maluku and Papua
17 until 24 year old	52%	144	86	32	10	7	6	2
25 until 40 year old	18%	51	31	11	4	3	2	1
41 until 56 year old	10%	28	17	6	2	2	1	0
57 until 75 year old	10%	28	17	6	2	2	1	0
76 year old or above	10%	28	17	6	2	2	1	0
Total	100%	279	168	61	20	16	11	3
Total Percentage			Java=60%		Outside Java=40%			

Taking into account the level of financial literacy and financial inclusion in various provinces in Indonesia, the main target provinces in Java and Outside Java are sought for respondents based on provinces with levels of financial literacy and financial inclusion that are above the national average level of financial literacy and financial inclusion in Indonesia.

Retail Respondents Target Based on Provincial Financial Literacy and Financial Inclusion						
	Java	Sumatera	Kalimantan	Sulawesi	Bali, NTT, and NTB	Maluku and Papua
Province	DKI Jakarta Banten West Java Central Java Yogyakarta East Java	Bengkulu North Sumatera South Sumatera Riau and Riau Island Aceh	East Kalimantan	South Sulawesi North Sulawesi Central Sulawesi	Bali	West Maluku
Total Respondents	168	61	20	16	11	3

Appendix III: Institutional Investor Respondents

This survey considers the proportion of the number of investors by category types of institutions as well as for each category of types of institutions can be taken at least 10% of the total institutional respondents in the hope that more diverse respondents can be obtained from each category of existing types of institutions.

Institution Category	Percentage	Number of respondents
Company	60	19
Foundation	10	3
Bank	10	3
Insurance	10	3
Pension Fund	10	3
Total	100	31

Appendix IV: Variable Correlation Analysis

	Ln_MC	ES	EPS	RM	PBV	NI	DER	TA	Inflat-n
Ln_MC	1.0000								
ES	-0.2095	1.0000							
EPS	0.2861	-0.3335	1.0000						
RM	0.0511	0.0211	0.0710	1.0000					
PBV	0.2778	0.2467	0.0443	0.0238	1.0000				
NI	0.7099	-0.1341	0.2125	0.0829	-0.0521	1.0000			
DER	0.2475	-0.1276	-0.0209	-0.0045	0.1141	0.2405	1.0000		
TA	0.6178	-0.4183	0.0634	0.0187	-0.1301	0.6340	0.5527	1.0000	
Inflation	0.0196	-0.0298	0.0988	-0.3317	0.1375	-0.0953	0.0444	-0.1041	1.0000

Based on the results of the variable correlation analysis, it is known that the ESG value has a positive relationship to the company's market capitalization value. On the other hand, the ESG forming factors, namely social and governance, have a positive correlation with the company's market capitalization. Conversely, environmental factors have a negative correlation with market capitalization.

Appendix V: Classical Assumption Test

1. Multicollinearity

The multicollinearity test aims to identify a correlation relationship between independent variables whether they have a strong impact on one another (Jauhari, 2020).

Model	1	2	3	4
VIF	3.34	2.71	2.70	3.31

Conclusion: All models are free from multicollinearity due to the mean value variance inflation factor(VIF) <10.

2. Autocorrelation

Hypothesis: H0: If (Prob > F) > 0.05, there is no autocorrelation H1: If (Prob > F) < 0.05, there is autocorrelation.

	Model 1	Model 2	Model 3	Model 4
Prob >F	0.1908	0.1899	0.1900	0.1870
Decision	No Reject H0	No Reject H0	No Reject H0	No Reject H0

Conclusion: There is no autocorrelation in all models.

3. Heteroscedasticity

The heteroscedasticity test aims to test whether the variance remains constant even though there is a change in the independent variable (Gujarati, 2004).

Hypothesis:

H0: If $(P > \chi^2) > 0.05$, the model indicates homoscedasticity H1: If $(P > \chi^2) < 0.05$, the model indicates heteroscedasticity.

	Model 1	Model 2	Model 3	Model 4
Chi-square	2265.85	1399.44	1185.97	1181.08
Prob >Chi-square	0.0000	0.0000	0.0000	0.0000
Decision	Reject H0	Reject H0	Reject H0	Reject H0

Conclusion: All models have heteroscedasticity problems, so a Robust Standard Error is needed to solve these problems (Wooldridge, 2022).

To overcome the problem of heteroscedasticity, namely inconsistent variance, robust regression is needed with the aim of creating a model with standard errors that are free from heteroscedasticity problems. After using robust regression, the problem of heteroscedasticity can be resolved.

Model 1	Coef.	Robust Std. Err.
ESGS	0.1077901	0.0501048
EPS	0.0000585	0.0000341
RM	0.7358141	0.1572535
PBV	0.0093916	0.0018751
NI	8.79E-15	3.29E-15
DER	-0.0615056	0.0154633
TA	1.13E-15	3.32E-16
Inflation	5.134818	2.300928
_cons	31.12388	0.297716

Model 3	Coef.	Robust Std. Err.
SS	0.0640159	0.0295569
EPS	0.0000617	0.0000334
RM	0.8224142	0.149383
PBV	0.009791	0.0017589
NI	8.37E-15	3.09E-15
DER	-0.0702343	0.01545
TA	9.92E-16	3.33E-16
Inflation	5.971818	2.045145
_cons	31.28585	0.1938704

Model 2	Coef.	Robust Std. Err.
ES	0.0115869	0.0336951
EPS	0.0000567	0.0000324
RM	0.7102336	0.1607041
PBV	0.0097565	0.0018433
NI	8.83E-15	3.23E-15
DER	-0.0717894	0.0134746
TA	9.04E-16	3.68E-16
Inflation	4.865411	2.343422
_cons	31.6057	0.1728861

Model 4	Coef.	Robust Std. Err.
GS	-0.0150845	0.0203311
EPS	0.0000588	0.0000332
RM	0.7402549	0.1463281
PBV	0.0097771	0.0018208
NI	8.62E-15	3.27E-15
DER	-0.0752445	0.0131089
TA	8.82E-16	3.61E-16
Inflation	5.434642	2.22148
_cons	31.70524	0.1695789