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The effect of ESG performance on stock price volatility: A study of emerging markets in Asia

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Abstract
This study aims to investigate the influence of Environmental, Social, and Governance (ESG) on the volatility of stock prices for public firms in emerging Asia. This study uses the selection of ESG score data and employs multiple regression, dummy variables, and Difference-in-Differences (DID) models using Coronavirus Disease 2019 (COVID-19), an exogenous event. This study uses two periods to compare the volatility of stock prices before and after COVID-19, which are 2020 and 2021. Meanwhile, this study examines the volatility of a firm based on its ESG performance over one year. Therefore, this study uses the ESG score in 2019 and 2020. There are three findings from this study. First, this study indicates that firms with higher ESG performance have less volatility than firms with lower ESG performance. Second, the findings indicate that higher ESG performance, as opposed to lower ESG performance, mitigates the increase in stock price volatility caused by the COVID-19 shock. Third, ESG performance helps to stabilise stock prices. The analysis of the effect of ESG performance on the volatility of stock prices in this article is supported by new empirical data, which also includes suggestions for businesses and investors. This research has several implications. First, the study implies that firms can enhance profitability by actively improving their ESG performance through initiatives like renewable energy adoption, equitable wages, and strong governance practices. Second, investors are also encouraged to prioritise firms with robust ESG performance.

Keywords:
COVID-19; emerging market; ESG; stock price; volatility.

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Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic is a coronavirus outbreak caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus (World Health Organisation, 2020a). The virus is rapidly

spreading to countries throughout the globe. On January 30, 2020, World Health Organisation (2020b) declared a public health emergency of international concern and a pandemic on March 11, 2020. All nations employ isolation, regional quarantine, and large-scale social restrictions to prevent or suppress the spread of COVID-19.

COVID-19 significantly negatively influences firm value (Ramadhan et al., 2023). Consequently, numerous businesses have implemented massive layoffs, reduced investment and other capital expenditures, and even shut down entire industrial divisions. This resulted in a panic in the financial markets, a significant decline in stock and other security prices, and a further decrease in economic activity (Rababah et al., 2020). During economic downturns, investors pay particular attention to the types of firm equities that perform better or reduce systemic risk (Zhou & Zhou, 2021). Investors will seek out firm equities that are believed to be able to withstand the COVID-19 pandemic's crisis period.

Research has been conducted on the capital market and state responses to COVID-19 (Phan & Narayan, 2020). They anticipate that the market will react to unexpected news. COVID-19-related news affects the capital market (Haldar & Sethi, 2021). In this instance, news concerning the COVID-19 pandemic has caused the stock market to react.

As the stock market transforms, the risk associated with stock market investments increases. The volatility of securities presents investors with a substantial risk. According to Lim & Sek (2013), volatility is a measurement of risk, with greater volatility causing more significant variations in returns and increasing risk. Danielsson (2011) also identified volatility as the most common indicator of market uncertainty. Thus, investors can use this volatility to evaluate the firm's stock performance and determine the risk associated with the stock.

Currently, the firm report consists of analyses of its financial statements and sustainability reports, also known as Environmental, Social, and Governance (ESG) reports. According to Aydoğmuş et al. (2022), ESG scores positively correlate with firm value. This suggests that firms with a high ESG score may be able to enhance their performance. ESG performance can considerably reduce corporate risk-taking and lead to a more stable corporate environment (He et al., 2023).

ESG consists of three main criteria: (1) Environmental, which considers the impact of business operations on the operating environment and how the firm can play a role as an environmental steward; (2) Social, which considers the relationship and reputation of the firm with its stakeholders and how the firm fosters its stakeholders (community, community, suppliers, consumers, employees, and related parties); (3) Governance, which evaluates the principles of self-regulating corporate governance (IDX, 2022).

ESG is one of the methods used to enhance firm performance and reduce volatility. The public firm has increased its ESG disclosures in recent years as it seeks to engage with stakeholders, respond to investor requests, establish credibility, and respond to crises and competition within its industry (Olsen et al., 2021).

ESG emphasises investment strategies that consider firms' environmental, social, and governance impacts. ESG investment strategy may entail investing in firms that rank in the top quartile based on ESG factors (Sabbaghi, 2022). ESG investing is a technique that takes ESG performance into consideration when choosing investments in the financial decision (Liu et al., 2023). Many businesses have invested in ESG, but leaders must recognise that choosing a sustainable business model is integral to attain profits and business growth (Polman & Winston, 2022). In this instance, they continue to perceive ESG-related expenditures as costs and expenses, not investments. Investment decisions positively impact the firm's value (Sumiati et al., 2022). It implies that the firm's value will increase if the management makes the right investments, including locating excellent ESG investments.

Investing in ESG requires the firm to spend money, but multiple studies have shown that investing in ESG is one of the worthwhile investments and benefits the firm. ESG has a positive relationship with ROA and Tobin's Q. Sustainability strategies and management's commitment positively enhance ESG performance, which positively impacts firm performance (Rahman et al., 2023). ESG is also believed to increase firm productivity in addition to enhance firm performance. ESG scores positively correlate with firm productivity (Deng et al., 2023). This means that the firm's productivity will increase proportionately to its ESG score.

Zhou & Zhou (2021) have demonstrated that ESG can enhance firm performance, but fewer have examined the effect of ESG on firm volatility. The higher the ESG score of a firm, the lower its volatility. They also discovered that firms with higher ESG scores are more resilient and can recover from the effects of COVID-19 more quickly.

This research is an extension of previous Zhou & Zhou (2021) research by adding samples to Asia's emerging markets nations: China, India, Indonesia, Malaysia, Philippines, and Thailand. The emerging market was chosen in this research since Feng et al. (2022) found that developed countries have incorporated ESG valuation into their portfolio management, while investors in emergent markets continue to rely solely on speculation. In addition, emerging markets are more volatile and less liquid, have poor corporate governance, are subject to greater political risk, are more segregated from the global market, and, most importantly, share socioeconomic characteristics with gambling investors (Hsin & Peng, 2023). This study aims to investigate the influence of ESG performance on the volatility of stock prices. Thus, this

research contributes to the literature on the relationship between ESG performance and stock price volatility.

This study uses Garman & Klass (1980) and Yang & Zhang (2000) to calculate the volatility. Garman-Klass combined open and close volatility calculations and claimed that this estimate was 7.4 times more precise than the conventional variance based on closing prices (Todorova, 2012). Moreover, Garman-Klass is anticipated to outperform Parkinson's disease regarding bias and efficacy in the presence of drift. Yang & Zhang (2000) present a new volatility estimator based on multiple historical open, close, high, and low periods. This estimator is impartial within continuous limits, independent of drift, and consistent when dealing with open prices that experience price surges. This study also uses a regression model with Ordinary Least Square (OLS) estimation methods and a Difference-in-Differences (DID) method.

In addition, this study has three stages. First, a regression model with OLS estimation methods is used to examine the influence of ESG performance on the volatility of stock prices during the COVID-19 pandemic. Second, the sample will be classified based on ESG scores, with the group of firms with higher ESG scores and those with lower ESG scores selected. This study uses dummy variables to determine whether firms with a higher ESG score will experience less volatility than those with a lower ESG score. This study also uses regression with the OLS estimation method to examine whether firms with higher ESG scores are less volatile than firms with lower ESG scores. Third, the DID method is utilised to investigate the impact of the COVID-19 pandemic.

Literature review

ESG performance on stock price volatility

Previous research shows the relationship between ESG and a firm's risk. Activities related to ESG issues, particularly environmental issues, can reduce a firm's adverse risk (Hoepner et al., 2016). In addition, firms with a higher ESG score have a reduced insolvency risk. As the term structure of default risk increases, the mitigating effect increases (Li et al., 2022).

ESG equity portfolios in emerging markets also offer investors higher returns and lower risk than non ESG equity portfolios (Sherwood & Pollard, 2018). Broadstock et al. (2021) conducted a study on the role of ESG scores during the global financial crisis triggered by the COVID-19 pandemic, and the results of the research found that high ESG portfolios outperform low ESG portfolios and ESG scores can reduce financial risk during financial crises. Furthermore, corporate ESG performance has also been shown to considerably lower stock price volatility (Xu, 2023). Considering these perspectives, this study proposes the following hypothesis.

H1: ESG performance negatively affects firm stock price volatility.

ESG performance on stock price volatility

According to Feng et al. (2022), there is a negative correlation between ESG scores and the danger of a stock price crash. This demonstrates the validity of the stakeholder theory, which states that the higher the ESG score of a firm, the lower the risk of a stock price collapse. Cerqueti et al. (2021) revealed that firms with a higher ESG score experience less market value loss than firms with a lower ESG score during periods of reduced volatility. Zhou & Zhou (2021) also discovered that firms with a higher ESG score experience less stock price volatility than firms with a lower ESG score. The COVID-19 pandemic exacerbated the stock price volatility; however, the share price volatility of firms with a higher ESG score is minimal.

The study conducted by Dinh (2023) also determined the impact of ESG on stock returns and risks. The results showed that after obtaining an ESG score, short-term ESG portfolios had similar stock returns but lower risks compared to portfolios without an ESG score. Additionally, Wang et al. (2023) found a negative correlation between stock price fragility and ESG performance, indicating that stronger ESG performance reduces stock price fragility. Considering these perspectives, this study proposes the following second hypothesis.

H2: There is a difference between firms with high ESG performance and those with low ESG performance regarding stock price volatility.

ESG performance on firms' stability

The COVID-19 pandemic had a significant impact on nations worldwide. Junaedi & Salistia (2020) stated that the COVID-19 pandemic has affected all nations. The COVID-19 pandemic is also believed to exacerbate the effects of the nationwide economic contraction. COVID-19 has also affected the Standard and Poor's 500 (S&P 500), the leading stock market index in the United States. On April 13, 2020, the S&P 500 index closed down by 1.01 percent, while the Dow Jones Industrial Average index fell by 1.39 percent. This decline indicates that investors in public firm stocks in Indonesia were also affected by the COVID-19 pandemic. The decline in the stock price is another obstacle for the firm (Andriani, 2020).

ESG is believed to mitigate the increase in stock price volatility caused by COVID-19. Liu et al. (2023) revealed that pursuing more sustainable social and economic development through ESG investments can stabilise the financial market system simultaneously. Zhou & Zhou (2021) found that a high ESG score improves resilience and stabilises stock prices. During the COVID-19 pandemic in Japan, ESG performance enhanced stock market stability and boosted market liquidity (Liu et al., 2023). As a result, adhering to ethical investing standards, such as those for ESG stocks, is expected to make the Indonesian stock market more stable and prudent in the long run (Gunawan et

al., 2022). Additionally, investors who prioritised purchasing ESG stocks recognised these companies' resilience and continued investing in them even during the pandemic crisis (Cardillo et al., 2023). Considering these perspectives, this study proposes the following third hypothesis.

H3: Firms with high ESG performance and low ESG performance have varying degrees of stability and recovery.

Research method

Scope of study

This study focuses on public firms in Asia's emerging markets: China, India, Indonesia, Malaysia, Philippines, and Thailand. It is essential to determine whether ESG can affect volatility in these markets. The data period for stock prices is divided into two periods to compare the volatility before and after COVID-19. The first period covers the COVID-19 era, from January 1 to December 31, 2020. The second period corresponds to the "new normal," from January 1 to December 31, 2021. Since this study investigates the influence of ESG performance, it examines a firm's volatility based on its ESG performance with a one-year lag. Therefore, this study uses ESG scores from 2019 and 2020. The sample characteristics for this study are as follows: (1) public firms listed in their home country before 2020, (2) public firms with an existing ESG score, and (3) firms with available data for all variables required in the financial statements for the 2020-2021 period. This study utilises secondary data obtained from Refinitiv Eikon. The total sample includes 957 firms for the period before COVID-19 and 1,213 firms for the period after COVID-19.

Data preprocessing

This paper utilises the volatility of Garman & Klass (1980) and Yang & Zhang (2000) to discuss the volatility of stock prices since it combines high, low, open, and close to reduce bias and increase productivity. The calculation of Garman & Klass (1980) volatility is available in formula (1).

$$\sigma GK = \sqrt{\frac{1}{2}(\ln(\frac{ht}{lt}))^2 - (2ln2 - 1)(\ln(\frac{ct}{ot}))^2} \quad (1)$$

Yang & Zhang (2000)'s estimator was choosen for this study because of its' objectivity independent of drift, and consistent as open prices fluctuate, resulting in minimal error in the results, as shown in formula (2) until (6).

$$\sigma Yang - Zhang = \sqrt{\sigma^2 o + k\sigma^2 c + (1-k)\sigma^2 rs} \quad (2)$$

$$k = \frac{0{,}34}{1{,}34 + \frac{n+1}{n-1}} \quad (3)$$

$$\sigma^2 o = (ln \frac{Ot}{Ct-1})^2 \quad (4)$$

$$\sigma^2 c = (ln \frac{Ct}{Ot})^2 \quad (5)$$

$$\sigma^2 = Rogers - Satchell\ volatility \quad (6)$$

This study employs cross-sectional data for which the regression model estimation can be specified using OLS. The initial data is cleansed, filtered, and formatted using Microsoft Excel, and regression analysis is performed using Stata software. After cleansing the data, 854 firms were collected for the period before COVID-19 and 1,075 firms for the period after COVID-19.

Data analysis

The ESG score is the independent variable, while volatility is the dependent variable. This study uses size, leverage, Tobin's Q, and cash as control variables. Following the findings of Broadstock et al. (2021) and Zhou & Zhou (2021), the following enterprise characteristic variables are selected as control: enterprise size (size), financial leverage (lev), Tobin's Q, and cash holding ratio (cash). The research model involves three stages. First, the following research paradigm is utilised to analyse the influence of ESG performance on stock price volatility. This research employs a regression model using OLS estimation methods with Stata, as shown in formula (7).

$$Volatilityi = \alpha_0 + \alpha_1 ESGi + \alpha_2 Sizei + \alpha_3 Levi + \alpha_4 TobinQi + \alpha_5 Cashi + \in i \quad (7)$$

Second, firms are divided into two groups: those with high ESG scores and those with low ESG scores. This model employs a dummy variable, ESGf, where the top 25% of firms with high ESG scores are categorised as 1, and the bottom 25% of firms with low ESG scores are categorised as 0. This research uses a regression model with OLS estimation methods in Stata, as shown in formula (8).

$$Volatilityi = \alpha_0 + \alpha_1 ESGfi + \alpha_2 Sizei + \alpha_3 Levi + \alpha_4 TobinQi + \alpha_5 Cashi + \in i \quad (8)$$

Third, the objective of the following research model is to compare the stability of firms with high ESG scores to those with low ESG scores. This

research uses the Difference-in-Differences (DID) method with Stata, as shown in formula (9). The DID method is employed in this model to determine whether firms with high ESG performance exhibit greater stability and recover more rapidly from the effects of COVID-19 than firms with low ESG performance.

$$Volatilityi = \beta_0 + \beta_1 ESGfit + \beta_2 Postit + \beta_3 ESGfit\ x\ Postit + \beta_4 Sizeit + \beta_5 Levit + \beta_6 TobinQit + \beta_7 Cashit + \in it \quad (9)$$

Results

Appendix 1 provides descriptive statistics for the period before COVID-19, with a total sample size of 854. Appendix 2 provides descriptive statistics for the period after COVID-19, with a total sample size of 1,075. The mean volatility presented in Appendix 1 and 2 indicates a decline in volatility after COVID-19. Additionally, the mean ESG score increased from 36.965 to 37.916. The increase in the total number of samples and the mean ESG score from 2020 to 2021 indicates that more firms are becoming aware of ESG and achieving higher ESG scores.

In addition, this study conducted multicollinearity and heteroscedasticity tests to confirm that linear regression is the appropriate method for this investigation. The results of the multicollinearity test, presented in Appendix 3 and 4, indicate that the VIF values are less than 10 and that the 1/VIF values are greater than 0.1. Therefore, this model is free from multicollinearity issues.

Table 1.

Regression results of ESG performance on stock price volatility

	2020		2021	
Variables	Garman Klass	Yang-Zhang	Garman Klass	Yang-Zhang
ESG	-0.0000483**	-0.0000179	-0.0001543***	-0.000112***
	(0.020)	(0.343)	(0.000)	(0.000)
Size	0.0004156*	0.0000713	0.0001576	0.000007
	(0.098)	(0.741)	(0.412)	(0.967)
Leverage	0.0034466**	0.0047946***	0.0048813**	0.0036219*
	(0.032)	(0.003)	(0.002)	(0.007)
Tobin's Q	0.0002139***	0.0001367***	0.0002534**	0.0001665**
	(0.000)	(0.000)	(0.003)	(0.019)
Cash	-0.0033958	-0.0019223	0.163736***	0.0118716***
	(0.224)	(0.459)	(0.000)	(0.000)
Constant term	0.0242416***	0.0271747***	0.0289193***	0.0269766***
	(0.000)	(0.000)	(0.000)	(0.000)
Total Sample	854	854	1,075	1,075
R-squared	0.0325	0.0219	0.1381	0.1061

Note: *, **, and *** represent significance at 0.1, 0.05, and 0.01, respectively.

Source: Authors' work (2023)

The results of the heteroscedasticity test, presented in Appendix 5, show that the P>|t| values for ESG 2019, size, and Tobin's Q are above 0.05,

indicating no heteroscedasticity. However, the values for leverage and cash are below 0.05, indicating the presence of heteroscedasticity. Similarly, the results in Appendix 6 indicate that the P>|t| values for ESG 2020, size, and cash are above 0.05, indicating no heteroscedasticity, while leverage and Tobin's Q are below 0.05, suggesting heteroscedasticity issues. The regression was conducted using robust standard errors in Stata to address potential issues. Additionally, this study utilises two methods for calculating volatility, Garman-Klass and Yang-Zhang, to ensure robustness in the results.

Based on the regression analysis results of ESG performance on stock price volatility presented in Table 1. ESG performance has a negative and significant influence on stock price volatility as measured by the Garman-Klass method for both 2020 and 2021. Meanwhile, ESG performance had a negative but insignificant influence on stock price volatility as measured by the Yang-Zhang method for the 2020 period but a negative and significant influence for the 2021 period.

Table 2.

Regression results of ESG performance on the volatility of stock price

	2020		2021	
Variables	Garman Klass	Yang-Zhang	Garman Klass	Yang-Zhang
ESGf	-0.0025544**	-0.0012942	-0.0060762***	0.0046047***
	(0.015)	(0.190)	(0.000)	(0.000)
Size	0.0002192	-0.0001162	0.0001703	0.0000375
	(0.401)	(0.620)	(0.503)	(0.860)
Leverage	0.0024034	0.0042295*	0.002965	0.0015491
	(0.163)	(0.055)	(0.187)	(0.432)
Tobin’s Q	0.0001923***	0.0001095***	0.0004111**	0.0002455*
	(0.000)	(0.009)	(0.018)	(0.079)
Cash	-0.0020737	-0.0003996	0.0162926***	0.0096938***
	(0.607)	(0.919)	(0.000)	(0.002)
Constant term	0.0294823***	0.032402***	0.0260803***	0.0252432***
	(0.000)	(0.000)	(0.000)	(0.000)
Total Samples	428	428	538	538
R-squared	0.0407	0.0240	0.1874	0.1415

Note: *, **, and *** represent significance at 0.1, 0.05, and 0.01, respectively.
Source: Authors’ work (2023)

Tobin's Q or q ratio, according to Brealey et al. (2018), is the ratio between the firm's assets and their market value (market value of outstanding stocks + debt) and the cost to replace those assets or book value. A higher Tobin's Q is viewed as profitable because it indicates excellent performance. However, potential risks are associated with a firm's high value when it is overvalued. Habib & Hasan (2017) stated that equity overvaluation increases the likelihood of a market collapse in the future. Thus, the results of Tobin's Q regression in Table 1 are consistent with prior research, indicating that Tobin's Q has a positive and statistically significant influence on volatility.

The results in Table 2 indicate that firms with high ESG performance can reduce stock price volatility relative to those with low ESG performance. This is evident in Table 2, where the volatility of firms with a high ESG score is between 0.0025544 and 0.0060762 points lower than that of firms with a low ESG score. Using the Yang-Zhang method, firms with a high ESG score show volatility between 0.0012942 and 0.0046047 points lower than firms with a low ESG score.

Table 3.

Regression result of the influence of ESG performance on firms' stability

Variables	Garman Klass	Garman Klass	Yang-Zhang	Yang-Zhang
Post	-0.0024272***	-0.0023188***	-0.0041262***	-0.004052***
	(0.005)	(0.007)	(0.000)	(0.000)
ESGf	-0.0024272***	-0.0019016**	-0.0013107*	-0.0010504
	(0.007)	(0.042)	(0.096)	(0.209)
ESGf*Post	-0.003835***	-0.0039258***	-0.0033495***	-0.0033984***
	(0.002)	(0.001)	(0.002)	(0.001)
Size		0.000015		-0.0001565
		(0.933)		(0.274)
Leverage		*0.0022697		0.0025811*
		(0.101)		(0.083)
Tobin's Q		0.0002381***		0.0001529***
		(0.000)		(0.001)
Cash		0.0066213***		0.0025114
		(0.014)		(0.290)
Constant term	-0.036068***	0.0327739***	-0.0318932***	0.0335729***
	(0.000)	(0.000)	(0.000)	(0.000)
Total Samples	824	824	824	824
R-squared	0.1154	0.1463	0.1616	0.1771

Note: *, **, and *** represent significance at 0.1, 0.05, and 0.01, respectively.
Source: Authors' work (2023)

The results in Table 3 indicate that, after excluding other impacts of COVID-19, the increased volatility measured by the Garman-Klass method was 0.003835 points lower in firms with high ESG scores compared to firms with low ESG scores. The Yang-Zhang method shows that the increase in volatility for firms with high ESG scores was 0.0033495 points less than for those with low ESG scores. Both results are statistically significant.

Discussion

ESG performance on stock price volatility

The findings of this study indicate that ESG performance is negatively related to stock price volatility and demonstrate that firms with higher ESG performance are more stable than those with lower ESG performance. Additionally, firms with a higher ESG score exhibit greater stability than those with a lower ESG score. Therefore, although firms must invest resources to

implement ESG practices, the benefits of strong ESG performance are worthwhile for the firm.

These findings are consistent with hypothesis 1 and previous research indicating that ESG performance has a negative and significant influence on stock price volatility (Zhou & Zhou, 2021). This result indicates that a firm's high ESG performance can help reduce stock price volatility. The greater a firm's ESG performance, the lower its volatility.

The regression results using the Garman-Klass model in 2020 indicate that firm size has a positive and significant impact on volatility. According to Wijaya et al. (2022), the influence of size on financial performance is evident. Therefore, large firms should enhance their corporate governance to reduce risk. However, the results of the regression using the Garman-Klass model in 2021 and the Yang-Zhang model in 2020 and 2021 indicate that size has a positive but insignificant impact on volatility. This may imply that the larger the scale of a firm, the greater its volatility, which is consistent with previous studies by Sabbaghi (2022), which found that firm size does not significantly moderate the relationship between ESG and stock price volatility.

The leverage ratio reflects a firm's ability to fulfil its short- and long-term obligations in the event of liquidation. The regression results for leverage show a positive and statistically significant influence on stock price volatility. This finding aligns with research conducted by Chon & Kim (2021), which stated that when negative information about a firm's value enters the financial market, the firm's value declines, leading to a high debt-to-equity ratio. This financial leverage channel increases the firm's equity risk, ultimately manifesting as high volatility

Both the Garman-Klass and Yang-Zhang models produced negative and insignificant results for the cash regression in 2020. Cash on hand should mitigate the negative impact of the COVID-19 shock on corporate payouts, and COVID-19 is less severe for firms with greater cash reserves (Ntantamis & Zhou, 2022). This finding aligns with previous studies showing that stock price volatility decreases if a firm has more cash. However, the regression results for 2021 indicate that cash has a positive and significant influence on stock price volatility. According to agency theory, the amount of cash on hand can be manipulated by management, thereby increasing the risks associated with having more cash (Chen, 2021). When a firm holds more cash, its executives are more likely to invest in riskier initiatives, which increases its overall risk. Chen (2021) discovered that cash positively influences the risk of a stock market crash, suggesting that a firm's cash reserves, risk level, and stock price volatility are greater.

The influence of ESG performance on stock price volatility

These findings align with prior research indicating that firms with superior ESG performance can reduce stock price volatility compared to firms with poor ESG performance (Zhou & Zhou, 2021). For instance, Albuquerque et al. (2019) found that companies with strong ESG practices are better equipped to handle crises, leading to less volatile stock prices. However, some studies challenge this view. For example, Giese et al. (2019) noted that while ESG factors can mitigate certain risks, they do not necessarily lead to lower stock volatility across all sectors or market conditions, suggesting that the relationship between ESG performance and volatility may be more complex and context-dependent. Additionally, Bouslah et al. (2013) argued that in certain circumstances, the costs associated with implementing ESG practices might outweigh the benefits, potentially leading to increased volatility, especially in the short term. Therefore, while significant evidence supports the stabilising effect of superior ESG performance, this relationship is not universally observed and may vary depending on the specific context and measurement criteria used.

The influence of ESG performance on firm stability

This finding is consistent with previous research by Zhou & Zhou (2021), which suggests that strong ESG performance can help firms survive crises like the COVID-19 pandemic by enhancing their stability and enabling quicker recovery from shocks. This view is supported by Liu et al. (2023), who found that ESG investments contribute to stabilising the financial market system, providing resilience during periods of economic uncertainty. However, not all studies are in full agreement; some research indicates that the benefits of ESG performance may vary depending on industry-specific factors and the time horizon considered. For example, Sassen et al. (2016) caution that while ESG efforts can enhance long-term stability, they may also introduce short-term costs and complexities that could increase volatility in certain sectors.

Conclusion, limitation, and future research

The test results indicate that ESG performance significantly impacts stock price volatility. This study confirms the negative relationship between ESG performance and stock price volatility, with firms exhibiting stronger ESG performance experiencing less volatility compared to those with weaker ESG performance. Higher ESG performance contributes to greater stability, suggesting that firms with robust ESG practices can reduce their volatility and ensure business stability even in unfavourable economic conditions.

These findings suggest that firms should proactively engage in ESG activities and improve their ESG performance. Investing in ESG can be profitable, and firms might consider initiatives such as adopting renewable

energy or achieving net zero carbon emissions in the environmental sphere, ensuring equitable wages and non-discrimination in the social sphere, and implementing good corporate governance practices. This research also suggests that investors should consider investing in firms with strong ESG performance. This research has certain limitations. The study's scope excludes developed countries, and the research period is limited to 2020 and 2021. Therefore, it would be beneficial to include more countries and extend the research period beyond the COVID-19 pandemic for future research.

Author contribution

Marlina Kurniawan: Conceptualisation and Research Design, Data Collection and Analysis, Methodology, Writing. **Zaäfri Ananto Husodo:** Supervision and Review.

Declaration of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Appendix 1.

Descriptive statistics on stock prices 2020 and ESG score 2019

Variables	Obs	Mean	Std. dev.	Min.	Max.
Garman Klass	854	0.035	0.0099	0.01	0.1
Yang-Zhang	854	0.031	0.0087	0.01	0.09
ESG	854	36.965	17.924	1.23	87.73
Size	854	25.064	1.843	19.2	33.42
Leverage	854	0.544	0.238	0.01	2.68
Tobin's Q	854	3.135	6.604	0	85.07
Cash	854	0.105	0.113	0	0.77

Source: Authors' work (2023)

Appendix 2.

Descriptive statistics on stock prices for 2021 and ESG score 2020

Variables	Obs	Mean	Std. dev.	Min.	Max.
Garman Klass	1,075	0.032	0.010	0.01	0.07
Yang-Zhang	1,075	0.027	0.008	0.01	0.06
ESG	1,075	37.916	17.616	1.11	91.17
Size	1,075	24.939	1.835	19	33.62
Leverage	1,075	0.534	0.220	0.05	2.13
Tobin's Q	1,075	2.882	5.938	0	93.08
Cash	1,075	0.110	0.110	0	0.79

Source: Authors' work (2023)

Appendix 3.

Multicollinearity test 2020 stock prices for 2020 and 2019 ESG score

Variables	VIF	1/VIF
ESG 2019	1.20	0.832
Cash	1.18	0.849
Leverage	1.15	0.867
Tobin's Q	1.13	0.883
Size	1.13	0.888
Mean VIF	1.16	

Source: Authors' work (2023)

Appendix 4.

Multicollinearity test 2021 stock prices and 2020 ESG score

Variables	VIF	1/VIF
ESG 2020	1.16	0.863
Cash	1.14	0.876
Leverage	1.14	0.879
Tobin's Q	1.14	0.879
Size	1.13	0.887
Mean VIF	1.14	

Source: Authors' work (2023)

Appendix 5.

Heteroscedasticity test 2020 stock prices and 2019 ESG score

Variables	P>|t|
ESG 2019	0.151
Size	0.237
Leverage	0.000
Tobin's Q	0.160
Cash	0.0015

Source: Authors' work (2023)

Appendix 6.

Heteroscedasticity test 2021 stock prices and 2020 ESG score

Variables	P>|t|
ESG 2020	0.395
Size	0.194
Leverage	0.008
Tobin's Q	0.023
Cash	0.756

Source: Authors' work (2023)