Can SET ESG Ratings Surpass the Benchmarks Before, During, and After the COVID-19 Pandemic?

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Abstract

Sustainability investment has gained significant momentum globally as investors increasingly consider the long-term environmental and social impacts of their investments, especially the climate change that increases business risk. This paper commences by exploring our primary research questions, specifically examining whether SET ESG Ratings exhibit superior performance compared to the benchmark before, during, and after the COVID-19 pandemic. Our findings reveal that prior to the COVID-19 crisis, the SET 50 Index outperformed the ranks, boasting the highest Sharpe Ratio, Sortino Ratio, and Treynor Ratio. However, during the COVID-19 pandemic crisis, post-COVID-19 pandemic crisis, and across the total periods, SET ESG Ratings demonstrated superior performance. In our regression analysis, it was observed that SET ESG ratings consistently demonstrated lower risk when compared to the SET 50 Index across various periods. While SET ESG ratings exhibited higher risk than the SET Index for all periods except the post COVID-19 pandemic, where SET ESG ratings starting to display lower risk than the SET Index. Our findings indicate that investing stocks in SET ESG Ratings has the potential to enhance the risk-adjusted returns of a portfolio compared to its corresponding market benchmark indices including SET 50 and SET indices. Sustainability investments have proven advantageous since the COVID-19 pandemic crisis.
Keywords: 1) Sustainability Investment 2) Environmental, Social, and Governance 3) ESG investment 4) SET ESG Ratings 5) COVID-19

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Introduction

Sustainability investment (SI), socially responsible investment (SRI) or Environmental, Social, and Governance (ESG) investment, is a concept that focuses on three sustainability-linked investments in terms of environment, social, and governance.

For the environment component, it concerns a stable climate and abundant natural resources. The growth of population and economy has accelerated to the extent that the world is unable to produce natural resources in time to meet demand. Global Footprint Network (2023), an international nonprofit organization established in 2003, marks the date when people consume natural resources for the year exceeds the capacity of the planet to regenerate those resources, which illustrates as the Earth Overshoot Day (EOD). In sequence, people retrieve local resource reserves and release carbon dioxide into the atmosphere for the rest of the year.

Regarding the social aspect, the aging society highly affects the budget of healthcare system and national pension system. To save the budget to take care of the elderly, the government may force companies to extend the retirement age. Investors in the pension fund must cautiously plan their wealth so that they have enough money when they retire. According to income inequality data in 2021, the top 10% of people in Thailand control 55.97% of the total income in Thailand. Meanwhile, the poorest half of the Thai population, or more than 35.8 million people, own only 9.66% of total income. (WID, 2021)

Governance in ESG involves the structures, processes, and practices that guide a company's commitment to environmentally and socially responsible behavior, with a focus on accountability, transparency, and long-term sustainability. Caputo, et al. (2021, pp. 3470-3484) researched on the transparency of the disclosure of non-financial reports and found that companies avoid the disclosure of unfavorable or inaccessible environmental information through impression management. In addition, Gjergji, et al. (2021, pp. 683-693) studied the small and medium enterprises (SMEs) have higher cost to disclose non-financial reports. While Whelan (2022) mentioned that ESG disclosures cannot replace real sustainability. Investors who rely solely on the ESG reports are misleading since the ESG disclosures uses process-oriented output measures such as whether the company has a policy on chemical treatment or not. However, it does not keep track of the performance of the company to improve efficiency or reduce waste, water usage, and energy consumption.

The evolution and current state of ESG investing can be traced back from 1993 to 1996 when the Stock Exchange of Thailand (SET) mandated independent directors and audit committees for listed companies to enhance checks and balances and protect minority shareholders. Infrastructure efforts from 1999 to 2006 included the Institute of Directors and Corporate Governance (CG) Center. The SET initiated CG and CSR awards in 2004, fostering shareholder activism. From 2007 to 2012, CSR practices were encouraged, and SET achieved the highest ASEAN CG Scorecard score. Post-2013, SET focused on integrating CG and Sus-

tainable Development, introducing sustainability assessments, and joining the United Nations Sustainable Stock Exchanges (UN SSE). By 2022, SETTHSI Index emphasized ESG disclosure. On November 6, 2023, it rebranded to SET ESG Ratings, categorizing 193 listed companies.

To compare the performance of ESG investments with the broader market, this research utilizes benchmark indices- SET50 Index and the SET Index. The SET50 Index comprises the 50 largest stocks by market capitalization on the Stock Exchange of Thailand, while the SET Index includes a more extensive list of companies.

Additionally, this study evaluates the performance of SET ESG Ratings, SET50 Index, and SET Index investments across different time periods: total period, Pre, during and Post COVID-19 pandemic. Total period provides insights into long-term trends. Pre COVID-19 pandemic serves as a baseline for ESG performance. During COVID-19 pandemic reveals investor behavior during the crisis. Post COVID-19 pandemic indicates potential shifts toward ESG investing.

which can provide valuable insights for investors and policy makers.

SET50 Index and SET Index for the period from 2 July 2017, which is the first issued date of SET ESG Ratings to 28 December 2023. The data was grouped into total period, pre-COVID-19 Pandemic crisis, COVID-19 Pandemic crisis and post-COVID-19 Pandemic crisis, then it was analyzed with quantitative methods to evaluate performance of the SET ESG Ratings. It is expected to see more business responsibility after the crisis.

The paper is structured as follows. Section 2 consists of a literature review on Sustainability Investment and COVID-19 Pandemic crisis, Sustainability trends in the Stock Exchange of Thailand, and the COVID-19 Pandemic crisis in Thailand, Risk-Adjusted Performance Measurements and Linear Regression Analysis. Section 3 consists of the methodology, and Section 4 summarizes the research results. Section 5 provides the conclusion and discussion on the study's main implications. Section 6 exhibits the limitations and recommendations for further research.

Literature Review

1.Sustainability investment and COVID-19 Pandemic crisis

Sustainability investment is characterized by the integration of ESG factors into investment decision-making, has evolved from a niche concept to a mainstream investment strategy worldwide including Thailand (Ryu, Hwanga and Ryu, 2016, pp. 16-30; Hodkum and Chanruang, 2017, pp. 47-53; Ryu, Ryu and Hwang, 2017, pp. 50-91; Kim, Park and Ryu, 2017, pp. 381-402; Khan, 2019, pp. 103-123; Asvathitanont and Tangjitprom, 2020, pp. 253-261; Pedersen, Fitzgibbons and Pomorski, 2021, pp. 572-597; Avramov, et al., 2022, pp. 642-664; Cheng, Kim and Ryu, 2023, pp. 1-15). It is a result of the increasing recognition of the environmental and social challenges facing the global community. Thailand, as a dynamic emerging economy in Southeast Asia, has also witnessed the emergence of sustainability investment as an integral part of its financial landscape.

Within the broader investigation of sustainability investment performance during crises, the prevailing idea is that sustainability investment not only enhances shareholder value in normal circumstances but becomes even more beneficial during crisis periods. This notion is grounded in the risk management hypothesis, positing that sustainability investment functions as a form of 'insurance-like' protection (Godfrey, Merril and Hansen, 2009, pp. 425-445; Suwannapak and Chancharat, 2022, pp. 1-9). Studies focused on the 2008-2009 Global Financial Crisis supported the argument that ESG factors act as mitigators of downside risk (Cornett, Erhemjamts and Tehranian, 2016, pp. 137-159; Lins, Servaes and Tamayo, 2017, pp. 1785-1824; Lins, Servaes and Tamayo, 2019, pp. 59-71; Nofsinger and Varma, 2014, pp. 180-193). The higher ESG ratings have significantly higher returns, lower return volatility, and higher operating profit margins during the period of COVID-19 Pandemic crisis (Albuquerque, et al., 2020, pp. 593-621). Díaz, Ibrushi and Zhao, (2021, pp. 1-6) and Suttipun (2023, pp. 1-13) showed the ESG factor significantly increased industry returns in addition to Fama-French factors.

Contrastingly, recent studies indicate a lack of consistent evidence regarding the resilience of sustainable investing during the difference Crisis. Berkman, Li and Lu (2021, pp. 4955-4965) found no evidence that high CSR firms outperformed low CSR firms during the 2008-2009 Global Financial Crisis using the same data set with Lins, Servaes and Tamayo, (2017, pp. 1785-1824) Bae, et al. (2021, pp. 1-47) found no evidence that ESG affected stock returns. Chiappini, Vento and De Palma. (2021, pp. 1-18) examined sustainable indexes that did not show statistically significant different abnormal returns compared to traditional indexes during the COVID-19 Pandemic crisis. While ESG did not provide immunity to stocks amid the COVID-19 crisis, investments in intangible assets proved to be resilient (Demers, et al., 2021, pp. 433-462).

2.Sustainability trends in the Stock Exchange of Thailand

From 1993 to 1996, in accordance with the regulatory evolution of the Stock Exchange of Thailand (SET), the SET mandated that listed companies appoint independent directors to establish an effective system of checks and balances, safeguarding the rights of minority shareholders. In 1995, the SET further directed listed firms to establish audit committees, reinforcing internal control mechanisms and risk management systems. The following year witnessed the establishment of the foundation for Corporate Governance (CG) knowledge among listed companies by the SET.

Between 1999 and 2006, the SET dedicated efforts to constructing infrastructure and networks. The Institute of Directors was founded in 1999 by the collaboration of SET, SEC, Bank of Thailand, and the World Bank, with the initiation of CG Report Assessment in 2001. In 2002, the SET inaugurated the CG Center, released CG Principles Version 1, and fostered shareholder activism through the Thai Investors Association. The year 2004 marked the launch of CG Awards and IR Awards to spotlight exemplary performance models. In 2006, SET issued CG Principles Version 2 and

championed Corporate Social Responsibility (CSR), introducing CSR Awards.

From 2007 to 2012, the SET actively promoted CG and CSR. In 2007, the Corporate Social Responsibility Institute (CSRI) was established to encourage CSR practices among listed firms, later evolving into the SR Center in 2014. The year 2008 saw the issuance of CSR Principles. In the period of 2009-2011, the SET introduced the CG Advisory Program and IR Advisory Program. In 2012, CSR and Reporting Guidelines, CG Principles Version 3, IR Handbook, and the promotion of ASEAN CG Scorecard assessment were undertaken, securing the highest score among ASEAN countries in the inaugural year.

From 2013 onwards, the SET has concentrated on integrating CG and Sustainable Development (SD). In 2013, Practice Guidelines for each industry group were issued, and listed firms were encouraged to participate in the DJSI sustainability assessment. In 2014, the SET became the first exchange in ASEAN to join UN SSE. In 2015, the Thailand Sustainability Investment (THSI) and Sustainable Stock List were introduced, along with the presentation of Sustainability Awards. The year 2017 witnessed the SEC launching the CG Code for listed companies and the Investment Governance Code for Institutional Investors (I Code).

Between 2018 and 2022, the SET introduced the SETTHSI Index, issued the Corporate Sustainability Guide for Thai Listed Companies, and elevated Environmental, Social, and Governance (ESG) disclosure through the 56-1 One Report. Presently, the SET is committed to expanding its network, establishing ESG Experts to generate content, share experiences, and encourage listed companies to disclose sustainability reports.

On November 6, 2023, the SET changed the name of SETTHSI Index to SET ESG Ratings and announced the ratings of ESG Stocks into 4 categories: AAA, AA, A, and BBB for 193 listed companies. (SET, 2023)

3.The COVID-19 Pandemic crisis in Thailand

On December 30, 2019, it was reported that an outbreak of a new virus strain was found. In the group of respiratory diseases of unknown etiology, which was related to the seafood market in Wuhan, Hubei Province, People's Republic of China. The World Health Organization (WHO) had identified this type of virus as the coronavirus or COVID-19. The outbreak had spread to many countries. There had been a rapid increase in the number of infected people and deaths resulting in the public health systems in various countries unable to accommodate all patients. On March 11, 2020, the World Health Organization declared coronavirus disease It is a disease that has spread widely (WHO, 2020). The SET Index dropped as deep as 33% as of March 20, 2020 compared to the end of last year. More than 7 trillion baht worth of value has been lost on the stock market from its lowest point in August 2018, which is equivalent to a loss of more than 40% of GDP. (Mitihoon, 2020).

In Thailand, the first infected person was found in January 2020 when a Chinese woman traveling in Thailand. On January 31, 2020, the first Thai patient was found. He was a taxi driver who had no history of traveling abroad but he had a history of driving a taxi

for Chinese patient. Since then, the number of COVID-19 patients had been gradually increasing. And in May 2021, the Delta strain of Covid was found in Thailand from the Lak Si worker camp. On November 26, 2021, the World Health Organization officially confirmed the outbreak of the novel coronavirus. called Omicron, which spreads more easily than other species. The government policy changed from "Zero COVID" case in 2020 to "Living with COVID" in the year of 2021 and declared COVID-19 disease as a local disease. The government also provided vaccines and medicines to treat COVID-19 patients. This made the death rate very low.

4.Risk-Adjusted Performance Measurements

To conduct performance measurements of SET ESG Ratings in comparison to SET50 Index and SET Index, which are traditional investment portfolios, we calculated logarithmic returns of each index. Then I minus the returns with risk-free interest rates to get the excess returns of each index.

$$r_{i,t} = ln\left(\frac{Price_{i,t}}{Price_{i,t-1}}\right)$$

The risk-free rate is collected from the interest rates of 10-years government bond (Thailand 10-year benchmark) divided by 365 to get daily rate, which is highly liquidity. We employed descriptive analysis such as logarithmic mean excess returns, standard deviation, excess kurtosis, skewness, minimum, maximum, and count to the characteristic of data.

Simply concentrating on returns is insufficient as it overlooks the crucial aspect of risk exposure. For better comparison, there are several ways to measure the risk-adjusted performance of the portfolio or individual asset. Sharpe Ratio, Sortino Ratio and Treynor Ratio are popular among them.

Sharpe (1964, pp. 425-442), Sharpe (1966, pp. 119-138) and Sharpe (1994, pp. 49-58) invented the Sharpe Ratio to evaluate the risk-adjusted performance of an investment portfolio by dividing the excess returns by the standard deviation of the returns. A fundamental principle asserts that investors should be rewarded with greater compensation for assuming the additional risk associated with holding a risky asset, as opposed to a risk-free asset. It is defined as the difference between the returns of an asset and the risk-free interest rates, divided by the standard deviation of the asset.

$$Sharpe\ ratio = \frac{r_i - r_f}{\sigma_{(r_i)}}$$

where r_i = the returns on asset i

r_f = the risk-free rate

$\sigma_{(ri)}$ = the standard deviation of the returns of the asset

However, the most common critique of the Sharpe ratio is how the standard deviation of the portfolio is used as the proxy for risk. In the calculation of a portfolio's Sharpe ratio, risk is assessed using the standard deviation of all return values. In contrast, the Sortino ratio incorporates only the standard deviation of negative portfolio returns when computing risk (Sortino and Hopelain, 1980, pp. 21-23; Sortino and Van Der Meer, 1991, pp. 27-31; Sortino and Price, 1994, pp. 59-64). Simply put, the Sortino ratio is derived from the downside deviation of returns rather than considering the

overall standard deviation, especially when the not normal is considered.

$$Sortino\ ratio = \frac{r_i - r_f}{\sigma_{neg(r_i)}}$$

where r_i = the returns on asset i

r_f = the risk-free rate

$\sigma_{neg(ri)}$ = the standard deviation of the negative returns of the asset

Another popular ratio is Treynor ratio (Treynor, 1966, pp. 63-75). It also measures risk-adjusted return performance. It evaluates excess return relative to its systematic risk, specifically the market volatility of the portfolio. Commonly known as the "reward-to-volatility ratio," the Treynor ratio seeks to assess the risk associated with expected returns in relation to the overall non-diversifiable risk inherent in the market.

$$Treynor\ ratio = \frac{r_i - r_f}{\beta}$$

where r_i = the returns on asset i

r_f = the risk-free rate

β = the beta of the asset

Beta is calculated as

$$\beta = \frac{Cov(r_i, r_m)}{\sigma_m^2}$$

where r_i = the returns on asset i

r_m = the return of market

σ_m^2 = the standard deviation of the returns of the market

Each performance measure has its own attraction. However, they do not offer consistent assessments of performance because the risk measures used to adjust returns vary significantly. The Sharpe ratio focuses on total volatility, while the Treynor ratio focuses on systematic risk. This paper focuses on the downside deviation of returns, the Sortino ratio, as we are examining performance during the COVID-19 pandemic crisis.

5.Linear Regression Analysis on CAPM

The Capital Asset Pricing Model (CAPM) was developed independently by Sharpe (1964, pp. 425-442), Lintner (1965a, pp. 13-37), Lintner (1965b, pp. 587-615), and Mossin (1966, pp. 768-783). The model posits that the expected return on a security is linearly related to its beta, a measure of its sensitivity to market returns. The alpha from the regression is called Jensen's Alpha (Jensen, 1968, pp. 389-416). Jensen's alpha quantifies the additional return that remains unaccounted for by the risk exposure relative to the excess returns of the benchmark index. The equation of linear regression in CAPM is

$$r_i - r_f = \alpha_i + \beta_i(r_M - r_f) + \varepsilon_i$$

where r_i = the returns on asset i

r_f = the risk-free rate

r_M = the returns on the market portfolio

α = intercept

β = the slope coefficient

ε = error term

Methods

This quantitative research approach was developed by examining the performance of SET ESG Ratings or formerly known as Thailand Sustainability Investment (THSI). Data are collected as the price level of each index including SET ESG Ratings, SET 50 and SET indices. Risk free interest rates are interest rates of 10-year Thailand government bond (TH10YT). The period used in this research are between 2 July 2017 (the first issued date) and 28 December 2023, a total of 1,335 trading

days from Thomson Reuters Refinitiv Eikon database. Then data was sub-categorized into three groups 1) pre-COVID-19 pandemic (2 July 2017 to 30 December 2019, a total of trading 367 days) 2) COVID-19 pandemic (2 January 2020 to 31 December 2021, a total of trading 485 days) and 3) post COVID-19 pandemic (4 January 2022 to 28 December 2023, a total of trading 485 days). To calculate annualized Sharpe ratio, Sortino ratio and Treynor ratio, we multiplied all ratios by square root 252.

Linear regression analysis is applied to examine whether the SET ESG Ratings can be replicated by SET 50 and SET indices, which closely approximate the benchmark or the investment universe of SET ESG Ratings. In Sharpe (1964, pp. 425-442) discussion of beta within the Capital Asset Pricing Model (CAPM), a beta coefficient exceeding 1 indicates high risk for the excess returns of SET ESG Ratings in relation to the excess returns of market including SET 50 and SET indices. When the beta coefficient equals 1, the ESG index mirrors the systemic risk inherent in the benchmark. Conversely, a beta coefficient below 1 indicates that the excess returns of SET ESG Ratings carry a diminished risk compared to the benchmark. Augmented Dicky-Fuller Test (ADF) is used to taste the null hypothesis that a unit root is presence in a time series sample (Dickey and Fuller, 1979, pp. 427-431). If the ADF is more negative, it indicates the strong rejection of the null hypothesis. The presence of both heteroskedasticity and autocorrelation of the unknown form are handled with Heteroskedasticity and Autocorrelation Consistent or HAC-Newey-West to adjusted standard errors (Newey and West, 1986, pp. 703-708). The Bartlett kernel is a crucial component in the Newey-West estimator for HAC covariance matrix estimation. The Bartlett kernel assigns weights to observations based on their separation in time, ensuring that the resulting covariance matrix is positive semi-definite. The Newey-West fixed bandwidth determines the maximum lag considered for controlling autocorrelation.

Linear regressions:

$$r_{SETESG_t} - r_{f_t} = \alpha + \beta\left(r_{SET50_t} - r_{f_t}\right)$$
$$r_{SETESG_t} - r_{f_t} = \alpha + \beta\left(r_{SET_t} - r_{f_t}\right)$$

Results

In this section, we compare the price level of each index including SET ESG Ratings, SET 50 and SET indices. From Figure 1, the SET ESG Ratings tracks its level very close to SET50 Index. The SET ESG Ratings are close to SET50 Index. There are 35 stocks out of 65 ESG stocks from SET 50 Index at 2 July 2018. Since high market capital companies that are mostly weighted in the SET50 Index have expertise and resources to disclose ESG data. The results in Table 1 confirm the high correlation among these indices. The SET ESG Ratings were below the SET50 Index until the end of 2021, the SET ESG Ratings started to rise above the SET 50 Index. After the COVID-19 Pandemic crisis, investors started to support the companies that are more responsible for ESG practices.

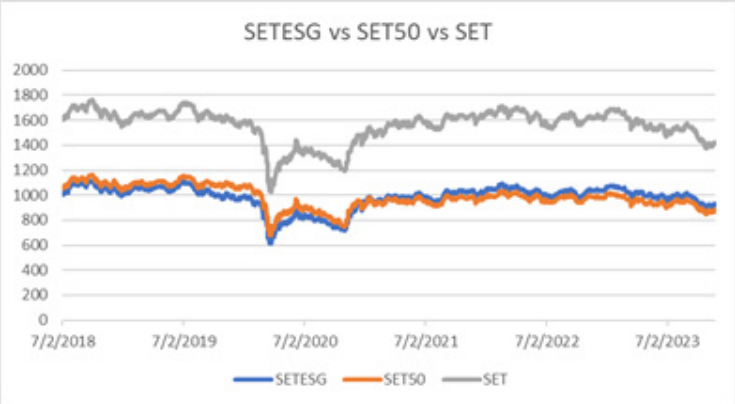

Figure 1 SET ESG Ratings vs SET50 Index and SET Index

Table 1 Correlation of SET ESG Ratings, SET 50 and SET indices

	SETESG	SET50	SET
SETESG	1		
SET50	0.9843	1	
SET	0.9848	0.9839	1

Table 2 shows that the excess returns of SET ESG Index, SET50 Index and SET Index have high kurtosis, which means higher fat-tails than normal distribution. In addition, the Skewness of SET ESG Index, SET50 Index and SET Index are less than -1, which indicates highly negative skewed or left-hand tail is longer. SET ESG Ratings has the highest annualized Sharpe Ratio, annualized Sortino Ratio, and annualized Treynor Ratio comparing with SET 50 and SET indices.

Total Period	SETESG Index - Rf	SET50 Index - Rf	SET Index - Rf
Excess Return (Daily)	-0.0120%	-0.0200%	-0.0153%
Standard Deviation (Daily)	1.1567%	1.1671%	1.0404%
Standard Deviation Draw Down (Daily)	0.8008%	0.8066%	0.7318%
Excess Kurtosis (Daily)	24.5412	25.3084	25.3191
Skewness (Daily)	-1.7211	-1.5764	-1.8898
Minimum (Daily)	-0.1233	-0.1244	-0.1143
Maximum (Daily)	0.0847	0.0886	0.0765
Count (Daily)	1334	1334	1334
Annualized Sharpe Ratio	-0.1643	-0.2722	-0.2334
Annualized Sortino Ratio	-0.2373	-0.3939	-0.3318
Annualized Treynor Ratio	-0.0017	-0.0029	-0.0024

Before the COVID-19 Pandemic crisis as shown in Table 3, the excess returns of SET ESG Index, SET50 Index and SET Index have excess kurtosis more than 0, which means slightly higher fat-tails than normal distribution. In addition, the Skewness of SET ESG Index, SET50 Index and SET Index are between -0.5 to 0.5, which indicates symmetrical distribution. SET 50 Index has the highest annualized Sharpe Ratio, annualized Sortino Ratio, and annualized Treynor Ratio comparing with SET ESG Ratings and SET Index.

Table 3 Pre-COVID-19 Pandemic crisis period: SETESG Index, SET50 Index and SET Index performances from 2 July 2017 to 30 December 2019 with 367 days.

Pre COVID-19	SETESG Index - Rf	SET50 Index - Rf	SET Index - Rf
Excess Return (Daily)	-0.0135%	-0.0042%	-0.0116%
Standard Deviation (Daily)	0.7591%	0.7620%	0.6789%
Standard Deviation Draw Down (Daily)	0.4505%	0.4558%	0.4179%
Excess Kurtosis (Daily)	0.5882	1.0798	0.8887
Skewness (Daily)	0.0791	0.0338	-0.1252
Minimum (Daily)	-0.0237	-0.0261	-0.0229
Maximum (Daily)	0.0242	0.0280	0.0226
Count (Daily)	366	366	366
Annualized Sharpe Ratio	-0.2814	0.0873	-0.2704
Annualized Sortino Ratio	-0.4741	-0.1460	-0.4392
Annualized Treynor Ratio	-0.0020	-0.0006	-0.00184

During the COVID-19 Pandemic crisis as shown in Table 4, the excess returns of SET ESG Index, SET50 Index and SET Index have high kurtosis, which means higher fat-tails than normal distribution. In addition, the Skewness of SET ESG Index, SET50 Index and SET Index are less than -1, which indicates highly negative skewed or left-hand tail is longer. SET ESG Ratings has the highest annualized Sharpe Ratio, annualized Sortino Ratio, and annualized Treynor Ratio comparing with SET 50 and SET indices.

Table 4 COVID-19 Pandemic crisis Period: SETESG Index, SET50 Index and SET Index performances from 2 January 2020 to 30 December 2021 with 484 days.

During COVID-19	SETESG Index - Rf	SET50 Index - Rf	SET Index - Rf
Excess Return (Daily)	0.0076%	-0.0206%	0.0050%
Standard Deviation (Daily)	1.6524%	1.6633%	1.4565%
Standard Deviation Draw Down (Daily)	1.1755%	1.1796%	1.0593%
Excess Kurtosis (Daily)	15.1813	15.7739	17.2097

During COVID-19	SETESG Index - Rf	SET50 Index - Rf	SET Index - Rf
Skewness (Daily)	-1.6552	-1.5008	-1.9019
Minimum (Daily)	-0.1233	-0.1245	-0.1143
Maximum (Daily)	0.0847	0.0885	0.0765
Count (Daily)	484	484	484
Annualized Sharpe Ratio	0.0733	-0.1962	0.0543
Annualized Sortino Ratio	0.1030	-0.2766	0.0747
Annualized Treynor Ratio	0.0011	-0.0029	0.0008

After the COVID-19 Pandemic crisis as shown in Table 5, the excess returns of SET ESG Index, SET50 Index and SET Index have excess kurtosis more than 0, which means slightly higher fat-tails than normal distribution. In addition, the Skewness of SET ESG Index, SET50 Index and SET Index are between -0.5 to 0.5, which indicates symmetrical distribution. SET ESG Ratings has the highest annualized Sharpe Ratio, annualized Sortino Ratio, and annualized Treynor Ratio comparing with SET 50 and SET indices.

Table 5 Post-COVID-19 Pandemic crisis: SETESG Index, SET50 Index and SET Index performances from 4 January 2022 to 28 December 2023 with 484 days.

Post COVID-19	SETESG Index	SET50 Index	SET Index
Excess Return (Daily)	-0.0304%	-0.0314%	-0.0383%
Standard Deviation (Daily)	0.7253%	0.7441%	0.7188%
Standard Deviation Draw Down (Daily)	0.4626%	0.4728%	0.4623%
Excess Kurtosis (Daily)	1.4735	1.2899	1.4264
Skewness (Daily)	-0.1976	-0.1325	-0.2515
Minimum (Daily)	-0.0323	-0.0311	-0.0319
Maximum (Daily)	0.0275	0.0294	0.0265
Count (Daily)	484	484	484
Annualized Sharpe Ratio	-0.6652	-0.6696	-0.8470
Annualized Sortino Ratio	-1.0544	-1.0645	-1.3287
Annualized Treynor Ratio	-0.0049	-0.0050	-0.0061

Normality Test

In this section, we plotted histogram of the Logarithmic excess returns of SET ESG Ratings, SET 50 and SET indices, together with QQ-plots. From Figure 2, histogram confirmed the descriptive statistics in Table 2, 3, 4, and 5 that during total period and COVID-19 Pandemic period indicates highly negative skewed or left-hand tail is longer. From Figure 3, we can see that in Q-Q plots the data values tend to

deviate from the 45-degree line especially on the tail ends during total period and COVID-19 Pandemic crisis, which could be an indication that the data set is not normally distributed.

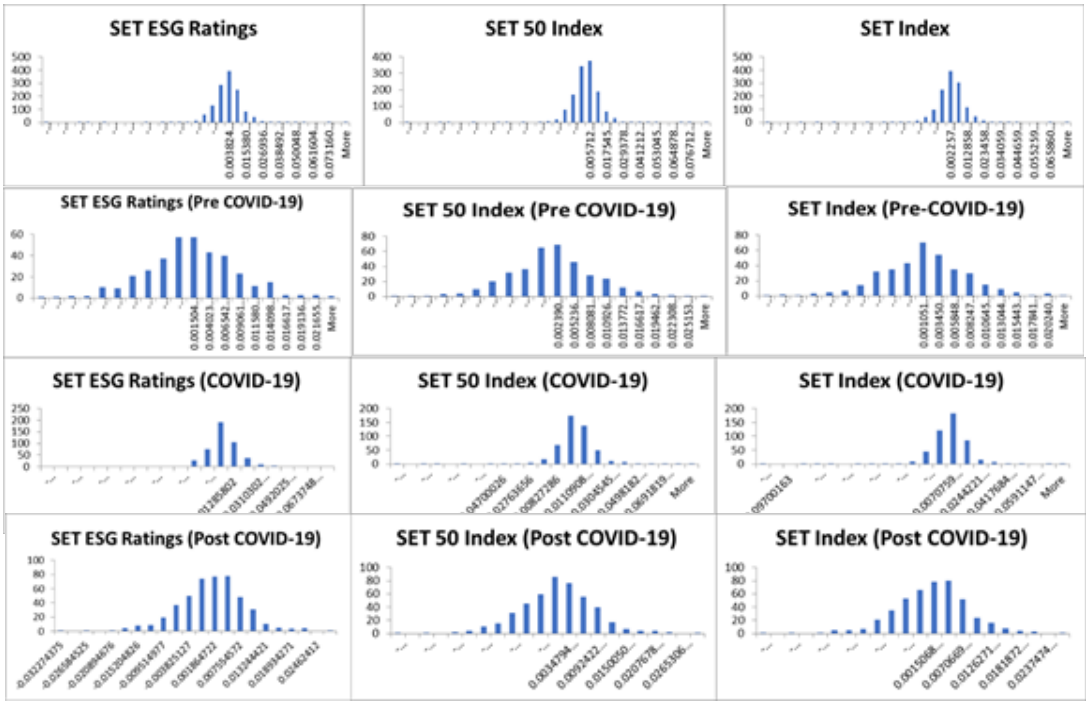

Figure 2 Histograms of Logarithmic excess returns of SET ESG Ratings, SET 50 and SET indices

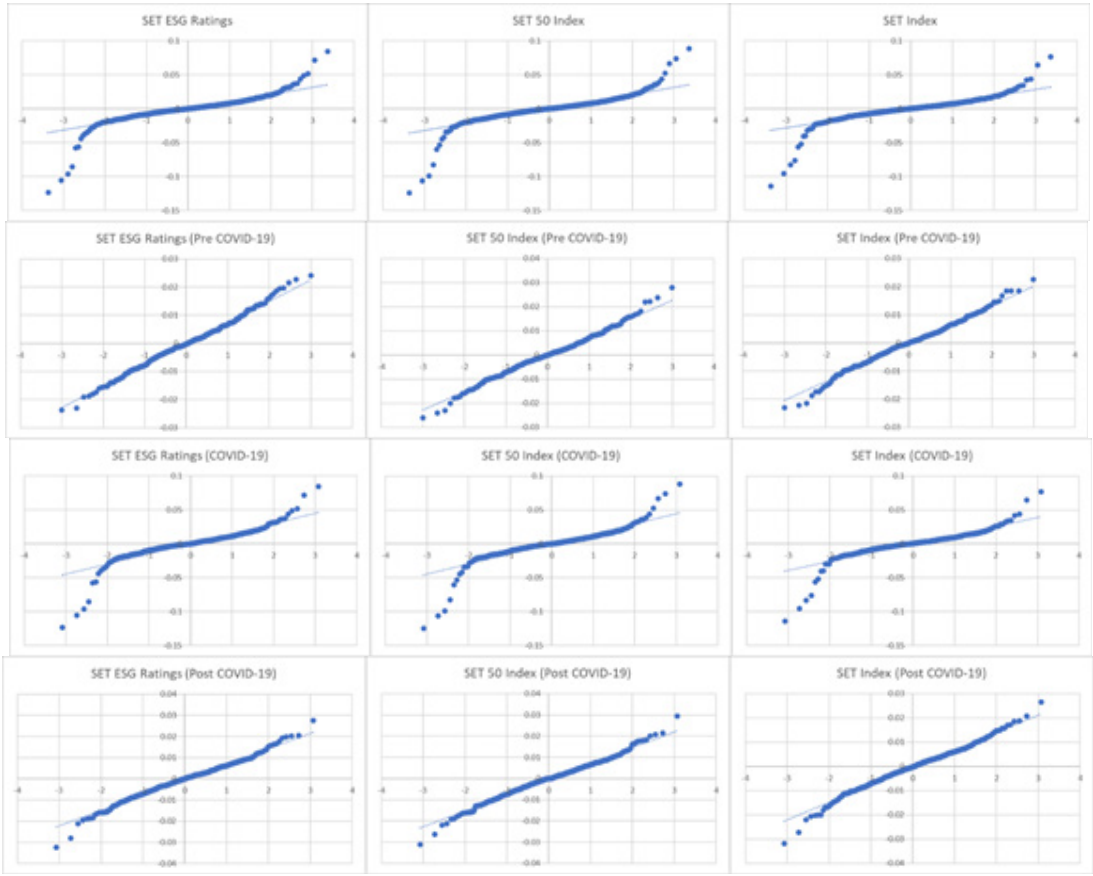

Figure 3 Q-Q Plots of Logarithmic excess returns of SET ESG Ratings, SET 50 and SET indices

Regression Analysis

In this section, we further explore the regression analysis of excess returns of SET ESG Ratings with the excess returns of SET 50 Index and the excess returns of SET Index as benchmarks. Table 6 represents the linear regression of the Logarithmic excess returns of SET ESG ratings as a dependent variable and the Logarithmic excess returns of SET 50 Index as an independent variable in 4 periods including total periods, pre COVID-19 Pandemic crisis, During COVID-19 Pandemic crisis and Post COVID-19 Pandemic crisis. The empirical result shows that during COVID-19 Pandemic crisis, alpha is highest with significant from zero at 5 percent significant level, whereas coefficients of the logarithmic returns of SET 50 Index are significant from zero at 1 percent significant level in all periods. Since the coefficient is interpreted as a measure of relative risk of the SET ESG Ratings as compared to the SET 50 Index, we found that SET ESG Ratings has higher risk when holding it for a total period. However, SET ESG Ratings have lower risk in all periods of crisis when compared to the SET 50 Index.

Table 6 Regression analysis with Logarithmic excess returns of SET ESG Ratings as dependent variable and Logarithmic excess returns of SET 50 Index as independent variable

	Total Period	Pre COVID-19	During COVID-19	Post COVID-19
Intercept	0.0000	-0.0001	0.0003 **	0.0000
(P-value)	(0.1566)	(0.3018)	(0.0157)	(0.9385)
SET 50 Index	0.9755 ***	0.9720 ***	0.9798 ***	0.9565 ***
(P-value)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Adjusted R-square	0.9688	0.9520	0.9728	0.9630
Observations	1334	366	484	484
Augmented Dicky-Fuller Test (ADF)	-25.9465	-13.4516	-15.4585	-16.4927
HAC standard errors and covariance (Bartlett Kernel, Newwey-West fixed bandwidth)	8	6	6	6

, * indicate statistically significant at 5 percent and 1 percent, respectively.

Table 7 represents the linear regression of excess returns of SET ESG ratings as a dependent variable and excess returns of SET Index as an independent variable in 4 periods including total periods, pre COVID-19 Pandemic crisis, During COVID-19 Pandemic crisis and Post COVID-19 Pandemic crisis. The empirical result shows alphas in all periods are not significant from zero at 1 percent significant level. Since the coefficient is interpreted as a measure of relative risk of the SET ESG Ratings as compared to the SET Index, we found that SET ESG Ratings has lower risk when holding it during post COVID-19 Pandemic crisis. However, SET ESG Ratings have higher risk in total period, pre COVID-19 Pandemic crisis, and during COVID-19 Pandemic crisis when compared to the SET Index.

Table 7 Regression analysis with Logarithmic excess returns of SET ESG Ratings as dependent variable and Logarithmic excess returns of SET Index as independent variable

	Total Period	Pre COVID-19	During COVID-19	Post COVID-19
Intercept	0.0000	0.0000	0.0000	0.0000
P-value	(0.4196)	(0.9250)	(0.8510)	(0.4079)
SET Index	1.095 ***	1.0862 ***	1.1245 ***	0.9794 ***
P-value	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Adjusted R-square	0.9698	0.9435	0.9824	0.9423
Observations	1334	366	484	484
Augmented Dicky-Fuller Test (ADF)	-25.0870	-12.9302	-14.9208	-16.0333
HAC standard errors and covariance (Bartlett Kernel, Newwey-West fixed bandwidth)	8	6	6	6

*** indicate statistically significant at 1 percent.

Conclusion and Discussion

ESG investment in equities has evolved into a substantial segment of global capital markets, a trend also observed in developing nations like Thailand. For prospective investors, understanding the distinctions between the SET ESG Ratings and traditional benchmark indices such as SET 50 and SET indices are crucial. At the beginning of this paper, we delve into our primary research questions, focusing on the specific concerns whether SET ESG Ratings perform better than the benchmark before, during and after COVID-19 pandemic. We found that before the COVID-19 Pandemic crisis, SET 50 Index performed better than SET ESG Ratings and SET Index with the highest annualized Sharpe Ratio, annualized Sortino Ratio, and annualized Treynor Ratio. During the COVID-19 Pandemic crisis, post COVID-19 Pandemic crisis, and total periods, SET ESG Ratings performed better than SET 50 and SET indices with the highest annualized Sharpe Ratio, annualized Sortino Ratio, and annualized Treynor Ratio. This can be explained by Farinelli and Tibiletti (2008, pp. 1542-1547) that while the traditional risk-reward Sharpe ratio aligns well with the assumption of normality in return distributions, its effectiveness becomes uncertain when evaluating risk-adjusted performance and ranking risky investments with non-normal distributions as demonstrating in normality test section.

In regression analysis, we found that SET ESG ratings have lower risk compared with SET 50 Index in all periods including before, during, after the COVID-19 pandemic, and across the total periods. While SET ESG ratings have higher risk compared with SET Index for 3 periods including pre COVID-19 pandemic crisis, during COVID-19 pandemic crisis, and total period except for the post COVID-19 pandemic crisis that SET ESG ratings exhibited lower risk.

In conclusion, our findings indicate that investing stocks in SET ESG Ratings has the potential to enhance the risk-adjusted returns of a portfolio compared to its corresponding market benchmark indices including SET 50 and SET indices. Therefore, there is a possibility that ESG investing can outperform the market in Thailand. Sustainability investments also prove advantageous during periods of crisis.

This research demonstrated that investors are more concerned about the ESG initiatives of the business, especially since COVID-19 pandemic time. Investing in SET ESG ratings can enhance risk-adjusted returns of a portfolio relative to SET and SET50 indices. The pandemic highlighted the importance of resilience and risk management in companies. Investors are recognizing that strong ESG practices can help companies navigate turbulent times and mitigate risks, making them more attractive investment options as supported by research of Cornett, Erhemjamts and Tehranian (2016, pp. 137-159), Godfrey, Merrill and Hensen (2009, pp. 425-445), Lins, Servaes and Tamayo (2017, pp. 1785-1824), Lins, Servaes and Tamayo (2019, pp. 59-71) Nofsinger and Varma (2014, pp. 180-193) and Suwannapak and Chancharat (2022, pp. 1-9). Businesses that prioritize ESG factors are more likely to adapt to changing market conditions, which can contribute to more stable and resilient financial performance over time, which supports the research of Albuquerque, et al. (2020, pp. 593-621), Díaz, Ibrushi and Zhao (2021, pp. 1-6) and Suttipun (2023, pp. 1-13).

As the demand for ESG investments grows, companies that meet these criteria may attract more investors, leading to increased stock prices and improved overall performance.

In addition, ESG considerations involve a focus on relationships with various stakeholders, including employees, customers, and communities. Positive interactions with these stakeholders can lead to improved employee morale, customer satisfaction, and community support, all of which can contribute to better financial outcomes.

Since 21 November 2023, Thailand Government announced that investors who invest in the Thailand ESG fund (TESG) can deduct tax up to 30% of annual income and permits investments of up to 100,000 Baht without a minimum investment period, though investors must hold the fund units for at least 8 years from the purchase date. This initiative represents the government support on ESG investing to stimulate the demand.

It's important to note that while there is a growing body of evidence supporting the idea that ESG considerations can contribute to improved risk-adjusted returns, individual investor goals, access to information, risk tolerance, and time horizons should be taken into account when incorporating ESG strategies into a portfolio. While historical data and research suggest that ESG investing can outperform the market in certain cases, past performance is not indicative of future results, and risks are inherent in all investment strategies. Additionally, the effectiveness of ESG investing may vary across different markets and industries.

Understanding these limitations is crucial for researchers and analysts to interpret

results accurately and to consider alternative methods when faced with situations where linear regression may not be the most appropriate model.

Based on our research findings, which highlight the inclusion of a substantial number of companies, particularly those with significant market capitalization, within SET ESG Ratings, we strongly advocate for collaborative efforts among investors, regulatory authorities, and corporate stakeholders to elevate and promote sustainability investments in the country. We offer valuable recommendations for potential investors in Thailand to incorporate ESG factors into the investment decision. We recommend regulatory authorities to enforce consistent ESG reporting based on materiality principles and mandate ESG disclosure for publicly traded companies, and to create tax breaks or incentives for ESG investments. For corporate stakeholders, we recommend corporates to engage employees, customers, and communities.

Recognizing the manifold benefits of sustainable practices, such as integrating ESG criteria into decision-making processes, which can contribute to long-term financial performance, we suggest these as potential areas for further research. Given that ESG-focused companies often demonstrate innovation and efficiency, leading to cost reduction, increased productivity, and a competitive advantage, there is a strong potential for improved financial outcomes.

Additionally, we recommend studying whether companies with robust ESG practices can secure a lower cost of capital. Such companies are perceived as less risky, and lower financing costs may contribute to higher profitability and, consequently, enhanced returns for investors.

Considering that the Stock Exchange of Thailand announced ESG ratings on November 6, 2023, we propose exploring whether companies with high ESG ratings outperform their counterparts over the long term. This assessment can provide valuable insights into the impact of ESG considerations on overall company performance.

Bibliography

Albuquerque, R., Koskinen, Y., Yang, S. and Zhang, C. (2020). Resiliency of environmental and social stocks: An analysis of the exogenous COVID-19 market crash. **The Review of Corporate Finance Studies,** 9(3), 593-621.

Asvathitanont, C. and Tangjitprom, N. (2020) The performance of environmental, social, and governance investment in Thailand. **International Journal of Financial Research,** 11(6), 253-261.

Avramov, D., Cheng, S., Lioui, A. and Tarelli, A. (2022). Sustainable investing with ESG rating uncertainty. **Journal of Financial Economics,** 145(2), 642–664.

Bae, K. H., Ghoul, E. S., Gong, Z. and Guedhami, O. (2021). Does CSR matter in times of crisis? Evidence from the COVID-19 pandemic. **Journal of Corporate Finance,** 67, 1-47.

Berkman, H., Li, M. and Lu, H. (2021). Trust and the value of CSR during the global financial crisis. **Accounting and Finance,** 61(3), 4955-4965.

Caputo, F., Pizzi, S., Ligorio, L. and Leopizzi, R. (2021). Enhancing environmental information transparency through corporate social responsibility reporting regulation. **Business Strategy and the Environment,** 30(8), 3470-3484.

Cheng, R., Kim, H. and Ryu, D. (2023). ESG performance and firm value in the Chinese market. **Investment Analysts Journal,** 53(3), 1-15.

Chiappini, H., Vento, G. and De Palma, L. (2021). The impact of COVID-19 lockdowns on sustainable indexes. **Sustainability,** 13(4), 1-18.

Cornett, M. M., Erhemjamts, O. and Tehranian, H. (2016). Greed or good deeds: An examination of the relation between corporate social responsibility and the financial performance of U.S. commercial banks around the financial crisis. **Journal of Banking & Finance,** 70, 137-159.

Demers, E., Hendrikse, J., Joos, P. and Lev, B. (2021). ESG did not immunize stocks during the COVID-19 crisis, but investments in intangible assets did. **Journal of Business Finance and Accounting,** 48(3-4), 433-462.

Díaz, V., Ibrushi, D. and Zhao, J. (2021). Reconsidering systematic factors during the Covid-19 pandemic – The rising importance of ESG. **Financial Research Letter,** 38, 1-6.

Dickey, D. A. and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. **Journal of the American Statistical Association,** 74 (366a), 427-431.

Farinelli, S. and Tibiletti, L. (2008). Sharpe thinking in asset ranking with one-sided measures. **European Journal of Operational Research,** 185(3), 1542-1547.

Global Footprint Network. (2023). **Earth overshoot day.** Retrieved October 2, 2023, from https://www.footprintnetwork.org/our-work/earth-overshoot-day/

Gjergji, R., Vena, L., Sciascia, S. and Cortesi, A. (2021). The effects of environmental, social and governance disclosure on the cost of capital in small and medium enterprises: The role of family business status. **Business strategy and the environment,** 30(1), 683-693.

Godfrey, P. C., Merrill, C. B. and Hansen, J. M. (2009). The relationship between corporate social responsibility and shareholder value: An empirical test of the risk management hypothesis. **Strategic Management Journal,** 30(4), 425-445.

Hodkum, H. and Chanruang, S. (2017). The study of relationship between the level of sustainability report disclosure and security prices of listed companies in the stock exchange of Thailand. **Journal of Global Business Review,** 19(1), 47-53.

Jensen, M. C. (1968). The performance of mutual funds in the period. **The Journal of Finance,** 23(2), 389–416.

Khan, M. (2019). Corporate governance, ESG, and stock returns around the world. **Financial Analysts Journal,** 75(4), 103–123.

Kim, H., Park, K. and Ryu, D. (2017). Corporate environmental responsibility: A legal origins perspective. **Journal of Business Ethics,** 140(3), 381–402.

Lins, K. V., Servaes, H. and Tamayo, A. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. **The Journal of Finance,** 72(4), 1785-1824.

Lins, K. V., Servaes, H. and Tamayo, A. (2019). Social capital, trust, and corporate performance: How CSR helped companies during the financial crisis (and why it can keep helping them). **Journal of Applied Corporate Finance,** 31(2), 59-71.

Lintner, J. (1965a). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. **The Review of Economics and Statistics,** 47(1), 13-37.

Lintner, J. (1965b). Security prices, risk and maximal gains from diversification. **Journal of Finance,** 20(4), 587-615.

Mitihoon. (2020). **The threat of COVID-19 has led to a new crisis risk.** Retrieved October 2, 2023, from https://www.mitihoon.com/2020/03/30/168911/

Mossin, J. (1966). Equilibrium in a capital asset market. **Econometrica,** 34(4), 768-783.

Newey, K. W. and West, K. D. (1986). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. **Econometrica,** 55(3), 703–708.

Nofsinger, J. and Varma, A. (2014). Socially responsible funds and market crises. **Journal of Banking and Finance,** 48, 180-193.

Pedersen, L., Fitzgibbons, S. and Pomorski, L. (2021). Responsible investing: The ESG-efficient frontier. **Journal of Financial Economics,** 142(2), 572–597.

Ryu, D., Hwanga, J. H. and Ryu, D. (2016). Corporate social responsibility, market competition, and shareholder wealth. **Investment Analysts Journal,** 45(1), 16-30.

Ryu, D., Ryu, D. and Hwang, J. H. (2017). Corporate governance, product-market competition, and stock returns: Evidence from the Korean market. **Asian Business & Management,** 16(1-2), 50–91.

SET. (2023). **SET ESG ratings.** Retrieved October 2, 2023, from https://setsustainability.com/libraries/1258/item/set-esg-ratings

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. **The Journal of Finance,** 19(3), 425-442.

Sharpe, W. F. (1966). Mutual fund performance. **The Journal of Business,** 39(1), 119-138.

Sharpe, W. F. (1994). The sharpe ratio. **The Journal of Portfolio Management,** 21(1), 49-58.

Sortino, F. A. and Hopelain, D. (1980). The pension fund: Investment, or capital budgeting. decision. **Financial Executive Magazine,** 48, 21-23.

Sortino, F. A. and Price, L. N. (1994). Performance measurement in a downside risk framework. **The Journal of Investing,** 3(3), 59-64.

Sortino, F. A. and Van Der Meer, R. (1991). Downside risk. **The Journal of Portfolio Management,** 17(4), 27-31.

Suttipun, M. (2023). ESG performance and corporate financial risk of the alternative capital market in Thailand. **Cogent Business & Management,** 10(1), 1-13.

Suwannapak, S. and Chancharat, S. (2022). Stock market volatility response to COVID-19: evidence from Thailand. **Journal of Risk and Financial Management,** 15(12), 592.

Treynor, J. (1965). How to rate management of investment funds. **Harvard Business Review,** 43(1), 63-75.

Whelan, T. (2022). **ESG reports Aren't a replacement for real sustainability.** Retrieved October 2, 2023, from https://hbr.org/2022/07/esg-reports-arent-a-replacement-for-real-sustainability

WHO. (2020). **Coronavirus disease (COVID-19) pandemic.** Retrieved October 2, 2023, from https://www.who.int/europe/emergencies/situations/covid-19

WID. (2021). **Top 10% national income share.** Retrieved October 2, 2023, from https://wid.world/data/#countriestimeseries/shweal_p90p100_z/WO/1820/2022/eu/k/p/yearly/s