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Comparative Analysis of Dynamic Volatility in ESG Stock Indices: A TGARCH Model Approach in Egypt and Turkey

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Abstract

This study aims to assess the dynamic volatility of Environment, Social, and Governance (ESG) stock indices in the Egyptian and Turkish stock exchange markets using the Threshold GARCH (TGARCH) model. The research aims to fill a gap in the literature by examining the asymmetric volatility behavior of ESG indices in emerging markets. The study employs daily data for the benchmark EGX30 index and the S&P/EGX ESG index in Egypt, and the BIST 100 index and the BIST Sustainability 25 index in Turkey, covering periods from January 2020 to January 2025. The findings reveal that the Egyptian S&P/EGX ESG index exhibits significant short-term volatility with notable persistence in long-term volatility, while the EGX30 index shows even stronger long-term persistence. In Turkey, the BIST Sustainability 25 index shows pronounced short-term volatility and long-term persistence, whereas the BIST 100 index has a more pronounced short-term impact but lower long-term persistence. The results suggest that ESG investments in Egypt offer higher returns with manageable short-term volatility, making them attractive for long-term investors. Conversely, in Turkey, short positions in ESG stocks might be safer due to lower long-term volatility persistence. These findings contribute to the ESG theory by highlighting the importance of considering both short-term and long-term risk dynamics when making investment decisions.

Introduction

Recently the integration of Environmental, Social, and Governance (ESG) factors in investment strategies has gained significant interest, as the increasing awareness of sustainability challenges and the potential for ESG factors to influence financial performance.

ESG investments refers to the practice of merging environmental, social, and governance factors into the investment decision-making process. These factors are considered to influence a company's long-term sustainability and financial performance (Khan & Iqbal, 2024). The environmental factors include practices related to a company's impact on the environment, such as carbon emissions and waste management (Senadheera et al., 2021). The social factors include aspects like employee relations, community impact, and product safety (Baid & Jayaraman, 2022). Governance factors concern corporate governance practices, including board structure, executive compensation, and shareholder rights (Kouaib et al., 2020; Manita et al., 2018).

So we tend to maintain our knowledge about the effect of ESG factors on the riskiness of the companies' stocks return which adopts those practices our research

Literature review

The examination of the risk-return dynamics of ESG indices in comparison to traditional benchmarks has gained substantial attention in recent academic research. Duttilo et al. (2023) performed a comprehensive study for the returns and volatility of various ESG indices and their traditional counterparts over a six-year period from 2016 to 2022. Their study included the US, Europe, and emerging markets. The findings showed that the European ESG index had lower volatility relative to its market benchmark indices. However, other markets exhibited volatility levels that were comparable to their traditional indices. The study further confirmed that ESG indices exhibited variations in terms of the impact of turmoil periods, risk premium, and leverage effect. These findings align with the results of Abedifar et al. (2023), who documented the superior performance of environmental and social stocks during the COVID-19 pandemic. Additionally, Bannier et al. (2023) concluded that sustainable investments offer adequate compensation for the risk-return tradeoff.

In addition to examining risk-return characteristics, several studies have utilized advanced econometric models to evaluate the dynamic volatility of ESG stock indices. For example, Shaik and Rehman (2023) applied the Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) model to explore the volatility connectedness among major ESG stock indices from regions, including the US, Latin America, Europe, the Middle East, and Africa, and Asia Pacific regions. Their research uncovered that ESG stock indices in the Middle East, Africa, and Latin America function as net shock transmitters, while the US and Asia Pacific regions serve as net volatility receivers. This suggests that volatility originating from emerging markets can reflect effects on developed markets. The study also revealed that pairwise intercorrelations are more pronounced among US, Latin America, and Europe region group pairs compared to those involving the Middle East, Africa, and Asia Pacific regions. This pattern implies the existence of contagion within both developed and emerging regions. Similarly, Broadstock et al. (2021) investigated the role of ESG performance during financial crises, particularly during the COVID-19 pandemic, and determined that ESG performance can act as a buffer against market volatility.

Otaify (2021) conducted a comparative analysis of the risk and return characteristics of the Egyptian S&P/EGX ESG index and the conventional EGX30 index over a 13-year period from June 2007 to September 2020. The results indicated that the annualized returns of the ESG index surpassed those of the EGX30 index, especially during exogenous shock periods such as the global financial crisis (GFC) in 2008, political uncertainty following the Egyptian revolution in 2011, and the COVID-19 pandemic. However, the ESG index returns were found to underperform during normal periods. This finding is corroborated by the study of Albuquerque et al. (2020), which demonstrated the strong performance of environmental and social stocks during the exogenous COVID-19 market crash.

Nandwani and Japee (2024) scrutinized the risk-return and conditional volatility of the NIFTY100ESG, NIFTY500, and NIFTY100 indexes over a 12.5-year period from April 1, 2011, to December 31, 2023. Their research revealed that the NIFTY100ESG index achieved higher annualized returns and outperformed the NIFTY500 in Jensen's alpha, Sharpe, and Treynor ratios. The GARCH (1,1) model results indicated volatility clustering in all three

indexes, with the NIFTY100ESG index displaying much higher volatility than the benchmarks. This finding is consistent with the study by Endri et al. (2021), which demonstrated that stock price volatility during the COVID-19 pandemic can be effectively modeled using the GARCH model.

Numerous research has concentrated on the empirical analysis of ESG ratings and their correlation with stock price volatility. study by Wang et al. (2023) examined the spillover of stock price crash risk and determined that ESG factors play a significant role in mitigating such risks. This finding is supported by the study of Engelhardt et al. (2021), which revealed a close relationship between ESG ratings and stock performance during the COVID-19 crisis.

The use of econometric models such as the DCC-GARCH and GARCH (1,1) has become widespread in analyzing the dynamic volatility of ESG indices. These models facilitate a deeper understanding of the interconnectedness and volatility spillovers across different regions and indices. For instance, Broadstock et al. (2021) examined the role of ESG performance during times of financial crisis, particularly during the COVID-19 pandemic, and concluded that ESG performance can act as a buffer against market volatility.

Recent studies have also been in the studying cross-border ESG rating dynamics and their impact on portfolio returns and volatilities. For example, Akhtaruzzaman and Shamsuddin (2016) analyzed the differences between the relationships of rating changes and the returns of portfolios constructed and analyzed according to different evaluation pillars (E, S, G, and ESG) in the USA and Canada. The study employed the Antonakakis and Gabauer's (2017) time-varying parameter vector autoregression (TVP-VAR) model to assess the dynamic return and volatility connectedness. The findings indicated that both connectedness metrics exhibited high amplitudes following the global financial crisis, which subsequently weakened over the years and then stabilized.

Zeng et al. (2025) introduced a theoretical model to investigate the mechanism through which ESG disagreement impacts stock returns. The empirical analysis confirmed that ESG disagreement enhances stock returns by intensifying return volatility risk, primarily driven by idiosyncratic volatility. This finding is consistent with the study by Renneboog et al. (2008), which demonstrated that socially responsible investments (SRI) can provide long-term returns due to the reduction in potential risks. Another study by Sabbaghi (2023) provided international evidence on the relationship between ESG and volatility risk, emphasizing the significance of integrating ESG factors into investment strategies.

The literature on the dynamic volatility of ESG stock indices underscores the critical role of incorporating ESG factors into investment strategies. The findings collectively suggest that ESG indices can offer lower volatility and better risk-adjusted returns compared to traditional indices, particularly during periods of crisis. This evidence highlights the potential benefits of ESG investing in enhancing portfolio resilience and mitigating risks.

While existing studies have extensively examined the risk-return profiles and volatility dynamics of ESG indices using models like GARCH (1,1) and DCC-GARCH, there is absence of research that use the TGARCH model to analyze the asymmetric volatility behavior of ESG indices in emerging markets, also TGARCH model is particularly suited for capturing the leverage effect (where negative shocks have a greater impact on volatility than

positive shocks), TGARCH-based study could reveal whether ESG indices in emerging markets exhibit lower volatility persistence or a weaker leverage effect during crises, which would support the argument for their role as a stabilizing factor in portfolios, so by applying the TGARCH model, the study would address the methodological gap in the literature by providing a more comprehensive analysis of the asymmetric volatility behavior of ESG indices in emerging markets.

Data and Methodology

1. Data and variables

While Egypt and Turkey are among the largest and most significant stock markets in the MENA region, they are not the largest as Saudi Arabia and the UAE have larger market capitalizations and are considered the top financial markets in the region. However, Egypt and Turkey are still crucial for research on ESG indices due to their economic influence, market liquidity, market lead in entering ESG indices and growing emphasis on sustainable investing, also Egypt and Turkey offer a diverse set of market conditions within the MENA region. This diversity allows for a robust comparative analysis of how different market structures and regulatory environments impact ESG performance and volatility, This period offers a rich dataset to analyze how ESG indices perform under stress and during recovery in both countries, providing valuable insights for sustainable investing in the MENA region, We use in Egypt stock market a daily data for the benchmark EGX30 index as well as for the S&P/EGX ESG index over the period from 5th January 2020 to 29th January 2025, we use daily data for the benchmark BIST 100 index and the BIST Sustainability 25 index for Turkey over the period from 23rd November 2022 to 29th January 2025, as the BIST Sustainable 25 index was launched on 22nd November 2022.

The primary variable of interest are the indices returns, we will use the following equation for calculating the return as used by Abedifar, P., Bouslah, K., et.al (2023) and Sabbaghi, A. (2023).

Returns are calculated using the following formula:

$$Rt = \ln \frac{P(t) - P(t-1)}{P(t-1)}$$

where Rt is the return at time t, and $P(t)$ is the price at time t.

2. Methodology

The study aims to assess the dynamic volatility of Environment, Social, and Governance (ESG) stock indices in the Egyptian and Turkish stock exchange markets using the Threshold GARCH (TGARCH) model, so we first use Augmented Dickey-Fuller (ADF) test for Unit Root To ensure the stationarity of the time series, we conduct unit root tests on both prices and returns (Dickey & Fuller, 1979), secondly we use Heteroskedasticity Test for ARCH effect To test for the presence of heteroskedasticity in the residuals, we employ the ARCH test proposed by Engle (1982), Finally we make the (TGARCH) model which is an extension of the GARCH model that allows for asymmetric effects of positive and negative shocks on volatility, where negative shocks have a larger impact on volatility than positive shocks of the

same magnitude (Engle & Ng, 1993; Glosten et al., 1993), The TGARCH(1,1) model is specified as follows:

$\sigma_t^2=\omega+\alpha u_{t-1}^2+\gamma(u_{t-1}^2 \cdot I_{t-1})+\beta\sigma_{t-1}$

where:

- σ_t^2 is the conditional variance at time t,
- ω is a constant term,
- α is the coefficient for the lagged squared residual,
- γ is the coefficient for the asymmetric effect,
- β is the coefficient for the lagged conditional variance,
- u_{t-1} is the residual at time $t-1$,
- I_{t-1} is an indicator function that equals 1 if $ut-1$ is negative and 0 otherwise.

Results

1) Descriptive statistics

According to the descriptive statistics for Egyptian indices shown in table 1, both the S&P/EGX ESG and EGX30 indices exhibit significant volatility in prices and returns, as shown in high standard deviations and wide ranges. Positive skewness in prices suggests that both indices have experienced some very high price levels, while the negative skewness in returns indicates a higher frequency of extremely negative returns. The high kurtosis values for returns suggest that both indices are prone to extreme movements, which is a characteristic of non-normal distributions. These findings explore the importance of considering the non-normal characteristics of financial data when making risk assessments.

Table 1. Egypt indices descriptive statistics

Statistic	S&P/EGX ESG Price	S&P/EGX ESG Return	EGX30 Price	EGX30 Return
Mean	2922.822	0.000996	16421.28	0.000621
Median	1906.7	0.00152	11655.72	0.000627
Maximum	6863.46	0.068641	33382.51	0.057525
Minimum	1225.45	-0.08673	8657.5	-0.09808
Standard Deviation	1710.545	0.015698	7444.822	0.014879
Skewness	1.12233	-0.84635	0.907498	-0.52478
Kurtosis	2.688212	7.081833	2.225712	7.883123
Jarque-Bera	263.8472	1003.18	200.0404	1281.626
Probability	0	0	0	0
Sum	3603840	1.228355	20247433	0.765722
Sum Sq. Dev.	3.60E+09	0.303597	6.83E+10	0.27274

According to the descriptive statistics for Turkish indices shown in table 2, both the BIST Sustainability 25 and BIST 100 indices exhibit significant volatility in prices and returns, as evidenced by the high standard deviations and wide ranges. The slight negative skewness in prices suggests that both indices have experienced more extremely low prices than high prices. The negative skewness in returns indicates a higher frequency of extreme negative returns. The high kurtosis values for returns suggest that both indices are prone to extreme movements, which is a

characteristic of non-normal distributions. These findings also explain the role of non-normal characteristics of financial data when making risk assessments.

Table 2. Turkish indices descriptive statistics

Statistic	BIST Sustainability 25 Price	BIST Sustainability 25 Return	BIST 100 Price	BIST 100 Return
Mean	10460.05	0.001756	7923.607	0.001363
Median	10175.51	0.001057	8141.33	0.00107
Maximum	16443.07	0.095085	11172.75	0.094219
Minimum	5285.96	-0.08953	4400.76	-0.09011
Standard Deviation	3318.127	0.019874	2015.565	0.019205
Skewness	-0.07867	-0.05639	-0.32964	-0.15814
Kurtosis	1.678584	5.608473	1.748219	5.737815
Jarque-Bera	40.43546	155.3674	45.62	173.1177
Probability	0	0	0	0
Sum	5732110	0.960793	4334213	0.745659
Sum Sq. Dev.	6.02E+09	0.215648	2.22E+09	0.201378
Observations	548	547	547	547

2) Unit root test

Augmented Dickey–Fuller (ADF) unit root test for egyptian indices shown in table 3, the results show That price series for both the S&P/EGX ESG and EGX30 indices have unit roots and are non-stationary, so we take the first difference in calculating the return, as a result return series for both the S&P/EGX ESG and EGX30 indices are stationary and the same results indications from Turkish indices shown in table 4, results suggest that while the prices of the indices are not mean reverting and exhibit a random walk behavior, the returns are mean reverting and can be used in statistical models without the risk of spurious results.

Table 3. Egyptian indices Augmented Dickey–Fuller test

Index	Variable	ADF Test Statistic	p-value	1% Critical Value	Conclusion
S&P/EGX ESG	Price	1.575919	0.9995	-3.43544	Non-stationary
S&P/EGX ESG	Return	-32.1103	4.31E-33	-3.43544	Stationary
EGX30	Price	0.476896	0.9859	-3.43544	Non-stationary
EGX30	Return	-31.1405	0	-3.43545	Stationary

Table 4. Turkish indices Augmented Dickey–Fuller test

Index	Variable	ADF Test Statistic	p-value	1% Critical Value	Conclusion
BIST Sustainability 25	Price	-1.10434	0.7156	-3.44208	Non-stationary
BIST Sustainability 25	Return	-22.8923	0	-3.4421	Stationary
BIST 100	Price	-1.1947	0.6783	-3.44208	Non-stationary
BIST 100	Return	-22.7181	0	-3.4421	Stationary

3) Heteroskedasticity Test for ARCH

The Heteroskedasticity Test for ARCH (Autoregressive Conditional Heteroskedasticity) is used to determine whether the residuals from a time series model exhibit time-varying volatility, for both Egyptian and Turkish indices as shown in the tables 5, results indicate strong evidence of ARCH effects in the residuals as shown in The F-statistic and Obs*R-squared values are very high, and their corresponding p-values are extremely low. This indicates strong evidence that there is an ARCH effects, also The coefficient of RESID^2(-1) is positive and statistically significant, suggesting that past squared residuals significantly influence current squared residuals.

Table 5. Egyptian and Turkish indices Heteroskedasticity Test for ARCH

country	Egypt		Turkey	
Index	S&P/EGX ESG	EGX30	BIST Sustainability 25	BIST 100
Test Statistic	83.14441	114.9739	0.384816	3.004005
p-value (F-statistic)	0	1.05E-25	0.5353	0.0836
Obs*R-squared	78.00659	105.3164	0.385958	2.998491
p-value (Chi-Square)	0	1.04E-24	0.5344	0.0833
Coefficient of RESID^2(-1)	0.24744	0.291116	0.026592	0.074114
t-Statistic RESID^2(-1)	9.118356	10.72259	0.620335	1.733207
p-value RESID^2(-1)	0	1.05E-25	0.5353	0.0836
R-squared	0.063317	0.085484	0.000707	0.005492
Adjusted R-squared	0.062556	0.084741	-0.00113	0.003664

4) TGARCH model

According to table 6, In the Egyptian stock market, the S&P/EGX ESG index exhibits significant short-term volatility, with an ARCH term of 0.111871, indicating a strong responsiveness to recent shocks. The asymmetric term of 0.059706 highlights that negative shocks have a notable impact on short-term volatility. In the long term, the GARCH term of 0.746775 shows high persistence in volatility, meaning that past volatility has a lasting influence on current volatility. This suggests that volatility shocks tend to remain elevated for extended periods, indicating higher long-term risk.

In contrast, the EGX30 index has a slightly higher ARCH term of 0.117478, suggesting a slightly greater responsiveness to recent shocks in the short term. However, its asymmetric term of 0.049132 indicates a less pronounced impact from negative shocks compared to the S&P/EGX ESG index. In the long term, the EGX30 index has an even higher GARCH term of 0.831883, indicating even stronger persistence in volatility. This implies that volatility shocks have an even more lasting impact, making the EGX30 index potentially riskier in the long run compared to the S&P/EGX ESG index. Overall, while both indices show significant volatility, the EGX30 index appears to have a higher long-term risk due to its stronger volatility persistence.

Table 6. Egyptian and Turkish indices TGARCH model

Index	Constant (C) in Variance Equation	ARCH Term (RESID(-1)^2)	Asymmetric Term (RESID(-1)^2*(RESID(-1)<0))	GARCH Term (GARCH(-1))
Egyptian Indices				
S&P/EGX ESG	0.259239	0.111871	0.059706	0.746775
EGX30	6.69E-06	0.117478	0.049132	0.831883
Turkish Indices				
BIST Sustainability 25	2.92E-05	0.075148	0.172962	0.776324
BIST 100	3.50E-05	0.080423	0.321843	0.688885

While in Turkish stock market, The BIST Sustainability 25 index exhibits notable short-term volatility, with an ARCH term of 0.075148, indicating a significant responsiveness to recent shocks. The asymmetric term of 0.172962 highlights that negative shocks have a pronounced impact on short-term volatility, suggesting that adverse market movements can significantly increase volatility. In the long term, the GARCH term of 0.776324 shows high persistence in volatility, meaning that past volatility has a lasting influence on current volatility. This indicates that volatility shocks tend to remain elevated for extended periods, contributing to higher long-term risk.

In contrast, the BIST 100 index has a slightly higher ARCH term of 0.080423, suggesting a slightly greater responsiveness to recent shocks in the short term. The asymmetric term of 0.321843 indicates an even more pronounced impact from negative shocks compared to the BIST Sustainability 25 index, suggesting that adverse market movements have a stronger effect on short-term volatility. In the long term, the BIST 100 index has a GARCH term of 0.688885, which is lower than that of the BIST Sustainability 25 index, indicating slightly less persistence in volatility. This implies that while volatility shocks still have a lasting impact, the effect is somewhat

less pronounced compared to the BIST Sustainability 25 index. Overall, the BIST 100 index exhibits greater short-term risk due to its higher responsiveness to recent shocks and a more pronounced impact from negative shocks, while the BIST Sustainability 25 index is riskier in the long term due to its stronger persistence in volatility, as indicated by the higher GARCH term.

So, we can say in the Egyptian stock market taking along position in ESG stocks is more safer with high return, while in opposite the Turkish stock market taking a short position is more safer, which is a great contribution for the the ESG theory by highlighting the importance of considering both short-term and long-term risk dynamics when making investment decisions, This nuanced understanding can help investors make more informed decisions based on their risk tolerance and investment horizon.

Discussion

The analysis of the TGARCH models for the Egyptian and Turkish indices provides valuable insights into the risk-return dynamics of ESG (Environmental, Social, and Governance) investments. These findings can be contextualized and compared with existing literature to further understand the implications for investment strategies and ESG theory. The results highlight the importance of considering both short-term and long-term risk dynamics when evaluating ESG investments.

In the Egyptian stock market, the S&P/EGX ESG index shows significant short-term volatility, indicating a strong responsiveness to recent shocks. The asymmetric term highlights that negative shocks have a notable impact on short-term volatility. In the long term, the GARCH term shows high persistence in volatility, meaning that past volatility has a lasting influence on current volatility. This suggests that volatility shocks tend to remain elevated for extended periods, indicating higher long-term risk. In contrast, the EGX30 index has a slightly higher responsiveness to recent shocks in the short term. However, its asymmetric term indicates a less pronounced impact from negative shocks compared to the S&P/EGX ESG index. In the long term, the EGX30 index has even stronger persistence in volatility, implying that volatility shocks have an even more lasting impact, making it potentially riskier in the long run compared to the S&P/EGX ESG index.

Comparing these findings with existing literature, studies such as Abedifar et al. (2023) and Albuquerque et al. (2020) suggest that ESG stocks can exhibit higher resilience during market downturns. The findings from the Egyptian market align with this, showing that the S&P/EGX ESG index has a notable impact from negative shocks but also offers higher returns, indicating potential resilience and reward for long-term investors. Broadstock et al. (2021) and Shaik & Rehman (2023) examine the role of ESG performance during financial crises, suggesting that ESG stocks can exhibit higher volatility during crises but may also offer resilience. The findings from the Turkish market align with this, showing that the BIST Sustainability 25 index has a pronounced impact from negative shocks but also higher long-term persistence in volatility.

Bannier et al. (2023) explore the risk-return tradeoff for sustainable investments, suggesting that sustainable investments can offer better risk-adjusted returns. The results from the

Egyptian market support this idea, indicating that taking a long position in ESG stocks is safer with higher returns. Nandwani & Japee (2024) analyze the risk-return and conditional volatility of ESG indices in India, suggesting that short-term volatility can be managed more effectively in certain markets. The results from the Turkish market support this idea, indicating that taking a short position in ESG stocks might be safer due to the lower long-term persistence in volatility.

Sabbaghi (2023) provides international evidence on the relationship between ESG and volatility risk, highlighting the importance of considering both short-term and long-term volatility when investing in ESG stocks. The findings from the Turkish market support Sabbaghi's conclusions. Otaify (2021) examines the risk and return characteristics of the Egyptian S&P/EGX ESG index, highlighting the importance of considering both short-term and long-term volatility when investing in ESG stocks in the Egyptian market. The findings from the TGARCH model support Otaify's conclusions.

The results from the TGARCH models and the comparison with existing literature highlight several key insights for ESG investments. The risk-return dynamics of ESG investments can vary significantly between different markets. In the Egyptian market, ESG investments appear to offer higher returns with manageable short-term volatility, making them attractive for long-term investors. In contrast, in the Turkish market, the higher short-term volatility and pronounced impact from negative shocks suggest that short positions might be safer, especially considering the lower long-term persistence in volatility. ESG investments can exhibit resilience during market downturns, as shown by the studies of Abedifar et al. (2023) and Albuquerque et al. (2020). This resilience is supported by the findings from the Egyptian market, where the S&P/EGX ESG index shows a notable impact from negative shocks but also higher returns. The persistence of volatility is a critical factor in ESG investments. The higher GARCH terms in both the Egyptian and Turkish markets indicate that past volatility has a lasting influence on current volatility. Investors need to consider both short-term responsiveness and long-term persistence when making investment decisions. The findings suggest that investment strategies should be tailored to the specific characteristics of the market. In the Egyptian market, long positions in ESG stocks appear to be safer and more rewarding, while in the Turkish market, short positions might be preferred due to lower long-term volatility persistence.

In conclusion, the analysis of the TGARCH models for the Egyptian and Turkish indices, in conjunction with existing literature, underscores the importance of considering both short-term and long-term risk dynamics when evaluating ESG investments. The results highlight the market-specific nature of ESG investments and the need for nuanced investment strategies that account for volatility persistence and responsiveness to shocks. These insights contribute to the ESG theory by providing empirical evidence that supports the idea that sustainable investments can offer resilience and reward, while also highlighting

Conclusion

The TGARCH models for the Egyptian and Turkish indices reveal the importance of considering both short-term and long-term risk dynamics when evaluating ESG investments. The findings indicate that the risk-return dynamics of ESG investments can vary significantly

between different markets. In the Egyptian market, ESG investments appear to offer higher returns with manageable short-term volatility, making them attractive for long-term investors. In contrast, in the Turkish market, the higher short-term volatility and pronounced impact from negative shocks suggest that short positions might be safer, especially considering the lower long-term persistence in volatility. The study supports existing literature suggesting that ESG investments can exhibit resilience during market downturns and offer better risk-adjusted returns. The persistence of volatility is a critical factor in ESG investments, and investors need to consider both short-term responsiveness and long-term persistence when making investment decisions. The findings suggest that investment strategies should be tailored to the specific characteristics of the market. In the Egyptian market, long positions in ESG stocks appear to be safer and more rewarding, while in the Turkish market, short positions might be preferred due to lower long-term volatility persistence. This study contributes to the ESG theory by providing empirical evidence that supports the idea that sustainable investments can offer resilience and reward, while also highlighting the need for careful risk management. Future research could explore the dynamic volatility of ESG indices in other emerging markets and further investigate the factors influencing the risk-return profiles of ESG investments.

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