Does market fear affect the ESG asset prices in the USA and India

Abstract

This study explores the effect of market fear on the ESG asset prices in the USA and India, using quantile regression. We have considered the ESG stocks and ETFs for the analysis. The volatility index is used as a proxy for market fear. The volatility index has a negative relationship with the ESG stock and ETF. The magnitude of this effect varies across the quantiles and assets in both countries. This study will help the stakeholders.

Key words: Volatility index, ESG stock, ESG ETF, quantile regression

I. Introduction

There are a lot of research papers to measure the performance of stocks of ESG ratings firms. The ESG stands for environment, social and governance. The rating agencies rank the companies based on their performance in environmental, social, and governance factors. This is useful to understand the sustainability practices, management of climate risk and internal management.

Motivation:

The wide range of studies has shown the interaction between the implied volatility index and stock returns across countries and sectors. The emerging literature on ESG has shown that the performance of high ESG rating firms' stock performs well and has a risk premium. To measure the stock performance of high-performing ESG firms, the ESG stock indices are formed. These indices are used in emerging studies are emerging studies to understand the dynamics of the high ESG firms' stock returns. Wan et al. (2024) show that the ESG indices of the developed countries are net transmitters of the volatility spill-over. Whereas the developing country ESG indices are the recipients of the spillover. These ESG indices are sensitive to climate transition risk and technology transition risk (Guo et al. 2024). On the other hand, green bonds are preferred over ESG stocks by investors in the long run in the USA and China. We aim to explore the dynamic relationship between the implied volatility and ESG stock return in this paper.

Contribution

This is the first study to examine the relationship between the volatility index and ESG asset prices. This study focuses on exploring how the ESG stocks and ETFs of the USA and India interact with the implied volatility index. We find that this interaction is negative across the quartiles. The magnitude of the interaction varies across the assets and countries.

The remaining part of the paper contains II) literature review, III) Data and methodology, IV) Results and Analysis, V) Conclusion

II. Literature review

The volatility index of the market is termed as the market fear proxy which affects the stock return as per studies. Giot (2005) finds the CBOE volatility index's impact on the stock return in low volatility market conditions compared to the high volatility market conditions. In an intertemporal analysis, Sarwar (2012) deduce that the CBOE volatility index not only affects the US stock market return but also stock returns in Brazil, India, and China

Smales (2022) argues that the US stock market uncertainty (implied volatility, i.e., VIX) is transmitted to the fear and panic in stock markets of other countries. It does not happen the other way around. The author does the study in the G7 and BRIC countries.

Fernandes et al. (2014) find that the implied volatility index negatively relates to the market index in the USA. As an indicator of global stock market instability, Zhang et al. (2024) examined the contagion effect of VIX on stock markets. They find the existence of symmetric volatility contagions across the VIX and Chinese futures markets.

Dai et al. (2025) Use the CBOE VIX data to construct the Japanese candlesticks' upper and lower shadows (ULD) to predict stock returns. They show that the CBOE VIX data can be used to predict the stock returns. They argue that the VIX measures market risk and the investors' panic.

ESG stock indices

The ESG is an emerging thematic index that consists of firms with high-performing ESG metrics. The ESG metrics measure the environment, sustainable and ethical practices in the firms. To help investors understand how ESG stocks are performing, the capital market of different countries has their own ESG indices. The studies find that ESG portfolios outperform other portfolios and investors prefer ESG portfolio approach due to the long-term sustainability approach (Singh, 2020).

Naeem et al., (2023) examine the relationship between the asymmetric efficiency of ESG stocks in four different regions, applying the asymmetric multifractal detrended fluctuation analysis (A-MF-DFA) approach. The regions are the Americas (south and north), Europe, Asia, and the Pacific. They deduce that the global factors like Stock market volatility (VIX), Oil market volatility (OVX), Gold market volatility (GVZ), Currency market volatility (EVZ), and Treasury market volatility (MOVE) produce the asymmetric efficiency in the ESG stock market. Among all European ESG markets, it is the most efficient.

Wan et al. (2024) examine the connectedness between return and volatility connectedness across ESG indices using TP VAR time and frequency connectedness. They find that Europe, the USA, Canada, and the UK are the net transmitters of return connectedness. The developing (BRICS) countries are the net receiver of connectedness. In terms of volatility connectedness, Canada, the USA, Russia, and Europe act as net transmitters, whereas the remaining markets function as net receivers. Developed countries in Europe and the USA show outward spillover. This indicates their role in the information and risk transmission. The Asia-Pacific countries show inward spillover.

Guo et al. (2024) investigate the cross-country spillover using ESG indices of six countries. These countries are the USA, the UK, France, Germany, Japan and Canada. Germany and France are risk emitters, while the Japanese and Canadian markets mainly absorb risk. The ESG indices are sensitive to the climate transition risk and technology transition risk.

Deng et al. (2024) examines the interaction between the green bond and ESG stocks in the USA and China. They apply wavelet and quantile-on-quantile regression. They find different results in both countries. The green bond market impacts the ESG stocks in extreme quantiles in both countries, though. In the long run, the green bond has a negative impact in the USA. But the negative impact of green bonds on ESG stocks is seen in the long run in both countries.

Sun et al., (2025) examine the ESG divergence rating on stock price crash risk among Chinese A-share listed companies. They find that the ESG divergence rating reduces the stock price crash risks. The method of measurement of stock price crash risk is different from Ruan et al., 2024)

Xu et al. (2025) investigate the effect of different volatility indices' connectedness with different regional ETF indices to different global events. They find that the global common volatility index is the net receiver and the VIX is the net emitter of risk. The developed market ESG indices transmit risk. The European ESG indices have last connectedness with volatility indices.

III. Data and Methodology

The ESG indices and implied volatility indices (VIX) of the USA and India are analysed in this study. The daily frequency data is considered. The duration of the sample depends on availability. In the context of the USA, the sample duration is from 16th March 2020 to 14th April 2025. In the context of India, the sample duration is from 26th April 2022 to 1st April 2025. The data are extracted from the Investing.com webpage. For the volatility index, the

respective country volatility indices are used, such as the Chicago Board Options Exchange's CBOE Volatility Index for the USA and Nifty VIX for India. The ESG indices are

$$ESG_i = a_0 + VIX_i$$

Where $ESG_i = Ln\ \frac{ESG_t}{ESG_{t-1}}$ is the first natural logarithm of the ESG indices of the USA and India. It is the measurement of return or change in the ESG indices. Similarly, $VIX_i = Ln\ \frac{VIX_t}{VIX_{t-1}}$

Koenker & Bassett (1978) introduce the quantile regression. Koenker and Hallock (2001) argue that the quantile regression estimator does not respond to the presence of outlier observations, skewness, and heterogeneity in the independent variable.

$$Q_{y_i}(\tau|x) = \alpha(\tau) + x_i'\beta(\tau)$$

IV. Results and discussion

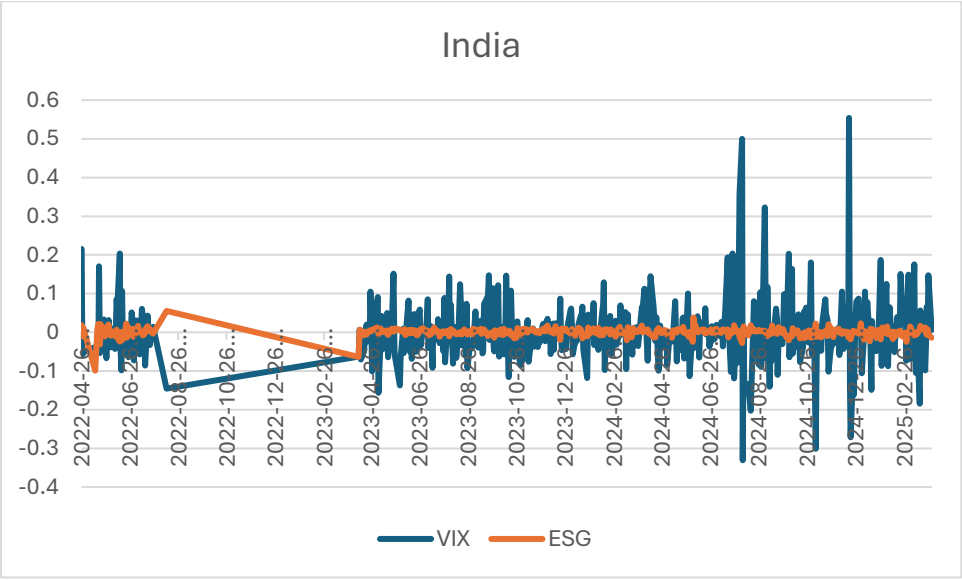

Figure 1: The return trends of the volatility index and the ESG stock index in India

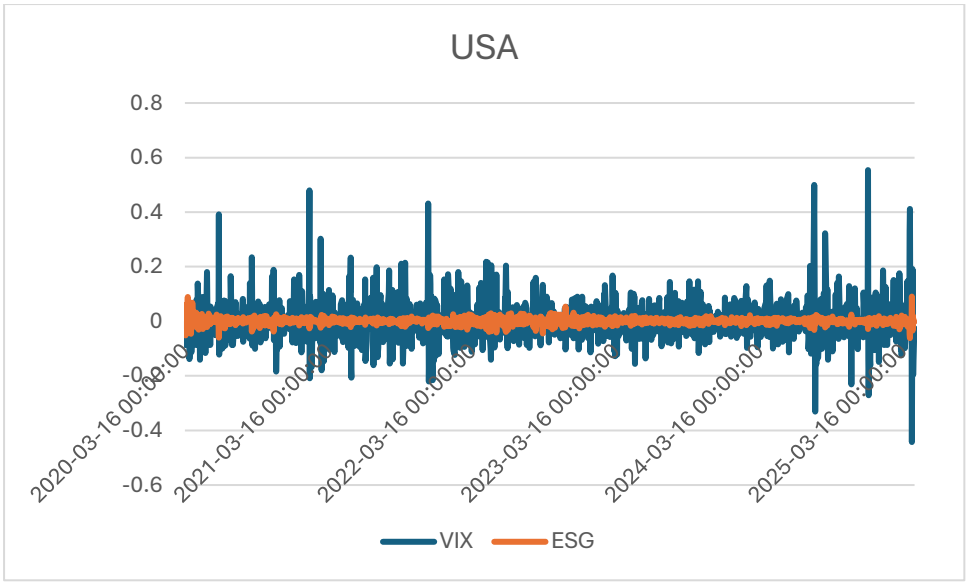

Figure 2: The return trends of the volatility index and the ESG stock index in the USA

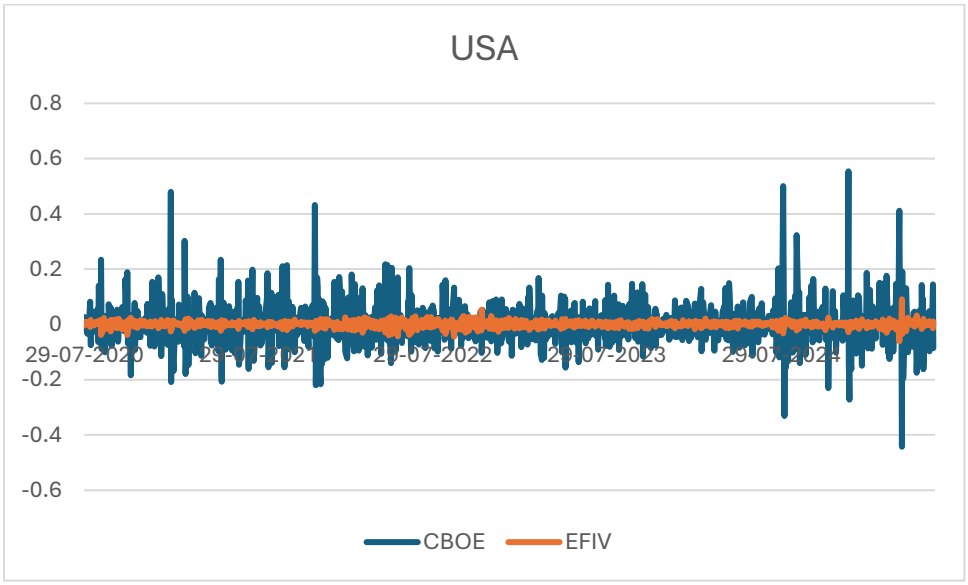

Figure 3: The return trends of the volatility index and the ESG ETF in the USA

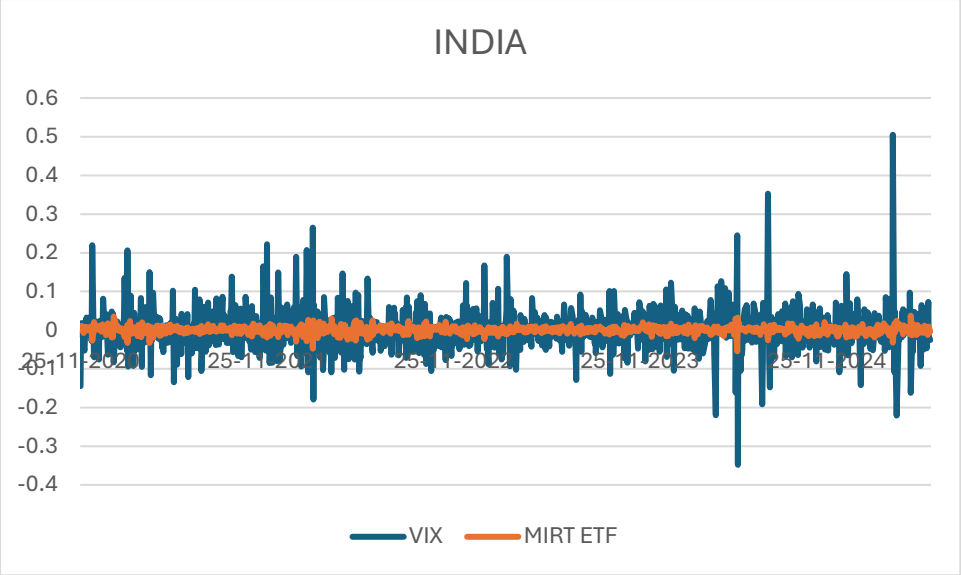

Figure 4: The return trends of the volatility index and the ESG stock index return in India

Table 1: Summary statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
VIX India	502	-0.0004	0.0778	0.3306	0.5541
ESG India	502	0.0005	0.0102	-0.0990	0.0552
VIX USA	1,278	-0.0007	0.0771	-0.4424	0.5541
ESG USA	1,278	0.0006	0.0124	-0.0616	0.0905
VIX India	1127	-.0004	.0541	-.3481	.5050
MIRTETF	1127	.0006	.009	-.0545	.0373
VIX USA	1226	-.0002	.0769	-.4424	.5541
EFIV	1226	.0005	.0111	-.0607	.0910

The summary statistics show that the features of the data are different. The mean of ESG stock returns is different in India and the USA. The USA ESG stock ae generating more returns than that of India. On the other hand, the ETF return of the USA is higher than that of India. This shows the better performance of ESG stocks and ETFs in India. The volatility is measured as the standard deviation. The USA ESG stock and ESG ETF show volatility in comparison to India.

Table 2 demonstrates the effect of the volatility index on the ESG stocks across all quantiles in the USA and India. This interaction is negative across the quantiles in both countries. In the

USA, a strong linkage is seen in the lower quantiles. Whereas in India, the stronger linkage is seen in the upper quantiles. Table 3 shows the relationship between the volatility index and ESG ETFs across all quantiles in the USA and India. The volatility index is seen across quantiles in the USA and India. This interaction is similar across all quantiles except quantile 0.95. In India, the effect of the volatility index is seen across all quantiles. This interaction is stronger in the lower quintiles.

V. Conclusion

This study examines the interaction between the implied volatility and ESG stock return in the USA and India, applying quantile regression. We find that the volatility index has a different relationship with ESG stock returns in the USA and India. In the USA, the ESG stock reacts strongly to the market fear and the interaction is positive. On the one hand, the market fear effect is stronger in extreme quantities.

In the emerging scenarios of environment and climate issues, the researchers try to find stocks related to ESG parameters. The findings of this study will be useful to investors and portfolio managers to make strategies for investment in ESG stocks. The academics and researchers will expand their research to understand the dynamics of the ESG stock.

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Table 2: The volatility index (VIX) effect on ESG stock return

The VIX effect on the US ESG stock returns

VARIABLES	0.05	0.10	0.20	0.50	0.80	0.90	0.95	0.05
VIX USA	-8.981***	-7.954***		-7.496***	-5.482***	-5.692***	-5.604***	-3.591***
	(0.291)	(0.301)		(0.348)	(0.206)	(0.316)	(0.687)	(0.729)
Constant	506.2***	494.7***		496.1***	482.3***	547.1***	608.7***	583.6***
	(4.746)	(5.830)		(6.751)	(3.936)	(7.099)	(11.20)	(11.37)
Observations	1,279	1,279		1,279	1,279	1,279	1,279	1,279

The VIX effect on the Indian ESG stock returns

VARIABLES	0.05	0.10	0.20	0.50	0.80	0.90	0.95
VIX India	-0.0286***	-0.0207*	-0.0187**	-0.0139**	-0.0216**	-0.0199**	-0.0297***
	(0.0108)	(0.0118)	(0.00950)	(0.00689)	(0.00999)	(0.00835)	(0.00924)
Constant	-0.0140***	-0.0111***	-0.00506***	0.00144***	0.00696***	0.00993***	0.0138***
	(0.000853)	(0.00107)	(0.000768)	(0.000169)	(0.000465)	(0.000721)	(0.000913)
Observations	502	502	502	502	502	502	502

Table 3: The volatility index (VIX) effect on ESG ETF return

The VIX on the USA ESG ETF return

VARIABLES	0.05	0.10	0.20	0.50	0.80	0.90	0.95
VIX USA	-0.120***	-0.112***	-0.110***	-0.108***	-0.104***	-0.104***	-0.0990***
	(0.00746)	(0.00529)	(0.00377)	(0.00328)	(0.00563)	(0.00968)	(0.0160)
Constant	-0.0112***	-0.00774***	-0.00451***	0.000318**	0.00550***	0.00923***	0.0123***

	(0.000825)	(0.000411)	(0.000235)	(0.000157)	(0.000426)	(0.000446)	(0.000809)
Observations	1,226	1,226	1,226	1,226	1,226	1,226	1,226

The VIX on the Indian ESG ETF return

VARIABLES	0.05	0.10	0.20	0.50	0.80	0.90	0.95
VIX India	-0.122***	-0.112***	-0.107***	-0.0880***	-0.0797***	-0.0703***	-0.0754***
	(0.0112)	(0.00689)	(0.00480)	(0.00648)	(0.00514)	(0.0105)	(0.0102)
Constant	-0.0109***	-0.00854***	-0.00548***	0.000241	0.00627***	0.00947***	0.0126***
	(0.000408)	(0.000296)	(0.000342)	(0.000181)	(0.000369)	(0.000436)	(0.000440)
Observations	1,127	1,127	1,127	1,127	1,127	1,127	1,127