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The Volatility Spillover Between ESG and Stock Return in the Selected Countries of G7

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The primary focus of this study is to analyse the impact of volatility spillover among Environmental, Social, and Governance (ESG) and stock returns in the group of seven (G7) countries. The study reveals that 62.80% of the shock to one index spreads to all other indices, including ESG, on average. Additionally, the study indicates that the TSX (Canada) and Dow Jones (United States) stock returns play a vital role as transmitters of shocks.

I. Introduction

The focus of the present study is to investigate how Environmental, Social, and Governance (ESG) factors influence stock returns in the G7 countries. The study holds significant importance for three reasons. Firstly, ESG has a noteworthy impact on a company's stock returns, as environmentally conscious investors tend to favor stock markets that take ESG factors into account. Secondly, investors take into consideration the sustainability and responsibility of companies when making financial decisions. Lastly, policymakers rely on information related to ESG and stock returns to formulate policies that tackle issues such as climate change, social inequality, and corporate responsibility.

The present study is based on asset pricing models that incorporate ESG investors. The study aims to increase stock prices of firms, including green firms, and to reduce the cost of capital, following the theoretical frameworks of Pástor et al. (2021) and Oehmke and Opp (2022). Empirical literature has shown a positive relationship between ESG and stock returns, as demonstrated by Verheyden (2016) and Khan (2019). Some empirical studies also focus on the crude oil, stock returns, commodity futures and COIVD-19 pandemic (Liu et al., 2021; Ogbonna & Olubusoye, 2021; Owuru, 2021; Prabheesh & Kumar, 2021; Raifu, 2023). However, studies, such as Gibson (2021), suggest that stock returns influence ESG ratings. Shanaev and Ghimire (2022) have shown that ESG rating upgrades lead to positive returns, but their significance is inconsistent monthly. Based on this analysis, two gaps in the existing literature are evident. Firstly, no research has investigated the volatility spillover among ESG and stock returns. Secondly, there is a lack of a common understanding about the relationship between ESG and stock returns. To fill these gaps, this study examines the volatility spillover between ESG and stock returns.

The theoretical relationship between ESG factors and stock returns is multifaceted. On one hand, high ESG scores can signal strong corporate governance and long-term planning, potentially reducing risk and thus positively influencing stock returns (Eccles et al., 2014). On the other hand, ESG initiatives often require significant investment, which could detract from short-term financial performance, affecting stock returns negatively in the short-run (Margolis et al., 2009). From the above mentioned theoretical and empirical literature. We propose a hypothesis that there is interconnectedness among ESG and stock returns. Furthermore, we hypothesize that this interconnectedness exists between stock indices and ESG.

To the best of our knowledge, no prior research has examined the volatility spillover among ESG and stock returns, making this study unique. This research is distinct for several reasons. Firstly, while many studies focus on ESG ratings, our study concentrates on the ESG index. Secondly, although some literature has analyzed the relationship between ESG and stock return (as referenced), this study focuses on the volatility spillover in selected G7 countries. Although the stock markets in G7 countries are mature, ESG is a crucial factor that affects stock returns. Therefore, it is essential to investigate the volatility spillover among ESG and stock returns in these countries to help policymakers and investors understand the market's risk dynamics. Thirdly, we employ DCC-GARCH-based volatility connectedness instead of VAR-based connected-

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ness (as in Diebold & Yilmaz, 2009, 2012) due to its various advantages.

Our study has three outcomes. Firstly, concerning volatility connectedness, we found that on average, 62.80% of the shock to one index spills over to all other indices, including the ESG, while 37.20% of the shock affects itself, on average. Secondly, our results suggest that the TSX (Canada) and Dow Jones (USA) stock returns are the primary transmitters of shocks, transmitting an average of 73.18% and 71.69% of shocks, respectively. Thirdly, we found that the ESG, Nagoya Composite (Japan), and FTSE (United Kingdom) stock returns are net receivers of shocks.

This article is structured as follows. Section II describes the data and methodology employed in our study. Section III provides a concise overview of our empirical results, while Section IV presents our conclusions.

II. Data and Methodology

Daily data from 24th October 2019 to 18th November 2022 was gathered for our study. The dataset is selected based on the availability. The CIEC database was utilized to extract the ESG index and closing stock prices of benchmark indices for stock markets in selected G7 countries, namely TSX for Canada, Nagoya Composite for Japan, FTSE for the United Kingdom, and Dow Jones for the United States. To calculate stock returns, we used the closing price data series from each country and computed the average returns from all four countries to obtain the G7 stock returns.

Our study employs the dynamic connectedness methodology, specifically the DCC-GARCH-based volatility connectedness developed by Gabauer (2020). This approach has several advantages over the VAR-based connectedness proposed by Diebold and Yilmaz (2009, 2012). First, it eliminates the need to select a window size to obtain dynamic connectedness measures. Second, only one model is required to estimate the conditional volatility transmission mechanism, unlike the VAR-based method which needs two models.

III. Results

Initially, we examine the descriptive statistics of the variables. The results are presented in Table 1. It is discovered that the ESG has a negative mean value, while a minimum positive value is reported for the stock indices. Additionally, the ESG exhibits higher volatility of 4.16% than any other stock indices. Based on the kurtosis results, the study concludes that the distribution of stock returns is peaked and has thick tails. Lastly, it is observed that both ESG and stock returns are asymmetric.

Moving on, we examined the volatility spillover between ESG and stock returns. Table 2 presents the results of our dynamic connectedness analysis, which indicates the extent of spillover between these variables. Our study yields three main outcomes. Firstly, in terms of volatility connectedness, on average, 62.80% of the shock to one index spills over to all other indices, including the ESG, while 37.20% of the shock affects the same index. Secondly, our results show that TSX (Canada) and Dow Jones (USA) stock returns are the major transmitters of shocks, transmitting, respectively, 73.18% and 71.69% of the shocks, on average. Thirdly, the ESG, Nagoya Composite (Japan), and FTSE (UK) stock returns are net receivers of shocks. Our findings on interconnectedness are consistent with the results obtained by Gabauer (2020) and Bouri et al. (2021).

A. Robustness

Moreover, to ensure the robustness of our findings, we conduct a subsample analysis using data from January 4, 2020, to November 18, 2022. We apply the dynamic connectedness approach proposed by Gabauer (2020) and present the results in Table 3. Our results indicate that all the stock market indices, including the ESG, exhibit interconnectedness. On average, 43.80% of the shock to one index spills over to all other indices, whereas on average, 56.20% of the shock affects itself. Notably, the results from Table 3 are consistent with those obtained from Table 2, indicating the robustness of our findings to alternative approaches.

IV. Conclusion

Our study investigates the transmission of volatility between ESG and stock returns in the G7 countries. Using the dynamic connectedness approach, we confirm the presence of volatility spillovers between these variables. Specifically, we observe that, on average, 62.80% of the shock to one index spills over to all other indices, including the ESG, while only 37.20% of the shock affects itself. We also find that the TSX (Canada) and Dow Jones (USA) stock returns are major transmitters of shocks, transmitting, on average, 73.18% and 71.69% of the shocks, respectively. In contrast, ESG, Nagoya Composite (Japan), and FTSE (United Kingdom) stock returns are net receivers of shocks.

Our study has policy implications for environmentally conscious investors by providing them with information on green investment options. For instance, if the dynamic interconnectedness between ESG and stock returns is high, it may be more appropriate for investors to engage in short-term trading of green stocks rather than holding them for longer periods. Furthermore, the observed volatility transmission between ESG and stock returns can help foreign institutional investors in deciding which country's stock markets to invest in based on their ESG adherence.

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Table 1. Descriptive Statistics

	ESG	TSX	Nagoya Composite	FTSE	Dow Jones	G7
Mean	0.002	0.001	0.001	0.001	0.002	0.001
Standard Deviation	0.041	0.006	0.006	0.005	0.007	0.005
Kurtosis	0.670	25.777	3.176	6.541	12.881	17.633
Skewness	0.233	-1.559	0.098	-0.836	-0.699	-1.284

Note: This table depicts descriptive statistics of ESG and stock indices of G7 countries. It is observed that the ESG is more volatile whereas stock indices have a higher peak and a thick tail. Finally, all the indices are asymmetric in nature.

Table 2. Average Connectedness with ESG and Stock Returns

	ESG	TSX	Nagoya Composite	FTSE	Dow Jones	G7	FROM
ESG	92.51	1.34	0.94	0.99	2.50	1.77	7.49
TSX	0.42	34.17	3.55	10.43	21.08	30.34	65.83
Nagoya Composite	0.70	9.27	51.14	12.37	11.75	14.77	48.86
FTSE	0.24	14.21	6.60	43.75	11.44	22.76	56.25
Dow Jones	1.07	22.09	3.98	9.05	35.13	28.67	64.87
G7	0.52	26.27	5.18	14.81	23.93	29.29	70.71
Contribution TO others	2.96	73.18	20.22	47.67	71.69	98.31	314.02
NET Directional Connectedness	-0.53	7.35	-28.64	-8.60	6.82	27.60	62.80

Note: This table reports volatility spillover among ESG and stock returns. The variables under consideration are found to be interconnected. We find that TSX(Canada) and Dow Jones (USA) stock returns are major transmitter of shocks. Furthermore, the average return of G7 is also the major transmitter of shock. It is observed that ESG, Nagoya Composite (Japan), and FTSE (UK) are the major receivers of shocks.

Table 3. Average Connectedness Results with Sub-Sample Data

	ESG	TSX	Nagoya Composite	FTSE	Dow Jones	G7	FROM
ESG	99.31	0.06	0.07	0.09	0.32	0.15	0.69
TSX	0.04	49.96	1.13	7.18	16.99	24.69	50.04
Nagoya Composite	0.35	9.41	61.29	7.77	7.27	13.92	38.71
FTSE	0.05	6.30	0.82	80.42	3.99	8.41	19.58
Dow Jones	0.22	19.50	1.00	5.22	50.26	23.79	49.74
G7	0.10	26.20	1.78	10.16	22.00	39.76	60.24
Contribution TO others	0.75	61.48	4.81	30.42	50.58	70.97	TCI
NET Directional Connectedness	0.06	11.44	-33.90	10.84	0.84	43.80	43.80

Notes: The results indicate stock returns and ESG are interconnected. Further, we find that TSX(Canada) and G7 average stock returns are major transmitter of shocks. It is observed that ESG, Nagoya Composite (Japan), and Dow Jones (USA) are the major receivers of shocks.

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