Is ESG more Resilient than Conventional Investments? Evidence from the COVID-19 Pandemic

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Abstract

This study investigates the impact of the COVID-19 pandemic on US ESG indices and their conventional counterparts. Impulse response functions computed from a vector autoregression show that the pandemic had a significant negative impact on the indices. However, ESG and conventional indices exhibited similar responses to pandemic-related shocks, casting doubt on claims of superior performance and risk mitigation characteristics of socially responsible investments during market crises.

Keywords: COVID-19, ESG, Vector autoregression

JEL Classifications: C32, G01

1. Introduction

The Pax World Fund was launched in 1971 as the first fund explicitly constructed to cater to socially conscious investors, using exclusionary screening to avoid stocks of companies that contributed to the Vietnam War. In the fifty plus years since, socially responsible investing has grown from a niche segment of the investment industry into a $46 trillion-dollar global business (Foster, 2022).Reasons for the surge in investor interest in socially responsible investing vary, though a survey by Amel-Zadeh and Serafeim (2018) finds a primary motivation to be the perception that socially responsible investments provide superior performance relative to their conventional counterparts. Further findings from the CFA Institute suggest that investment firms consider ESG information primarily to manage investment risks, closely followed by catering to client demand (CFA Institute, 2020).

While investment performance and risk management may be among the top motivations for the growth in socially responsible investing, empirical evidence supporting the view of such benefits is mixed. In a seminal work, Hamilton et al. (1993) find no statistical difference between the returns of socially responsible investment (SRI) funds and conventional funds. With no penalty to investing in SRI funds versus conventional funds, their results suggest that investors can, in essence, have their cake and eat it too. In a follow-up paper, Statman (2000) finds that the excess returns of both SRI and conventional funds exhibit negative alpha's during the sample period, and that there is no statistical difference between the alphas of the SRI and conventional funds.

While the studies of Hamilton et al. (1993) and Statman (2000) find no performance benefit of SRI funds, other studies have come to differing opinions. Nofsinger and Varma (2014) test the excess returns of SRI and conventional mutual funds from 2000 to 2011 and find an asymmetric performance characteristic. During crisis periods, SRI funds outperform conventional funds, but during non-crisis periods conventional funds perform better. In contrast, Dottling and Kim (2022) analyze the flow of funds into mutual funds during the COVID-19 pandemic and find that funds with high sustainability ratings experience larger declines in net fund flows and have a greater likelihood of experiencing net outflows relative to conventional mutual funds. They conclude that socially responsible investing involves non-pecuniary benefits that are akin to luxury goods, which investors are not willing to pay for during economic crises. Also looking at fund flows, Ferriani and Natoli (2021) come to the opposite conclusion, finding higher fund flows migrating to funds with lower ESG risk, with this effect more pronounced during the market crash episode of the covid pandemic.[1]

In a departure from the prior studies, Morales et al. (2019) test SRI indices and their conventional benchmarks or counterparts and find that the SRI indices tend to underperform during times of political uncertainty and economic crises. In contrast to tests of mutual funds, indices are used to remove the bias imparted from active fund management. Capelle-Blancard et al. (2021) also test SRI and conventional indices during the COVID-19 pandemic, but find that the

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[1] While SRI and ESG have different technical meanings, they are used interchangeably in this paper to refer to green or sustainable investment.

SRI indices performed similar to the conventional indices, neither outperforming, nor exhibiting less downside risk than their conventional counterparts.

This paper adds to the long list of research that looks at the performance of socially responsible and conventional investments during the heightened volatility that arose during the COVID-19 pandemic. In contrast to prior research, this study investigates the response of US large, medium, and small-cap indices and their ESG counterparts to shocks related to COVID-19. In doing so, the aim is to establish further evidence regarding the attributes of socially responsible and conventional investments during crisis periods. The dynamic relationship between these indices and COVID-19 related shocks is modeled using a vector autoregression. Impulse response functions computed from the vector autoregression show that both ESG and conventional US indices responded negatively to COVID-19 shocks, with daily returns falling as much as 1.5 percent. More importantly, the analysis also shows that both ESG and conventional indices responded in a similar manner, with no distinguishable differences, thereby casting doubt on the claim that socially responsible investments have less downside risk than their conventional counterparts during periods of economic crisis.

The rest of this paper is organized as follows. Section two describes the vector autoregression and impulse response function analysis, and details the variables used to represent US ESG and conventional market indices, as well as those variables related to the pandemic that may have an impact on financial markets. Section three provides the results of the vector autoregressions and impulse response function analysis. Finally, section four presents concluding remarks, summarizing the findings of this study.

2. Data and Methodology

This study looks at the impact of the pandemic on US conventional and ESG market indices from December 31, 2019 to February 28, 2022. This sample period is longer than most research that has currently looked at the financial impact of the virus, allowing for the market effects of the pandemic to present themselves through the initial outbreak, subsequent lockdowns, vaccine availability, and mutations of the virus. The empirical impact of the pandemic on these indices is estimated using a vector autoregression model (VAR) and computing the corresponding generalized impulse response functions from the VAR (Koop et. al., 1996; Pesaran and Shin, 1998).

Daily closing prices on three US indices that have ESG and conventional counterparts comes from FactSet. These include the S&P 500 and 500 ESG large-cap indices, the S&P 400 and 400 ESG mid-cap indices, and the S&P 600 and 600 ESG small-cap indices.

Data on COVID-19 infections by state come from the Centers for Disease Control and Prevention. Daily infections are aggregated across all states to obtain a daily number of cases for the country. Daily deaths from COVID-19 are also obtained from the CDC and aggregated in the same manner as infections to come up with a daily number of deaths at the national level. These two series produced from the CDC data are represented by the variable CASE for COVID-19 infections, and DEATH for COVID-19 deaths. Vaccinations against COVID-19 are reported daily by Johns Hopkins and begin well after the initial infections and deaths, with reported vaccinations starting on December 14, 2020. Vaccinations are represented by the variable VACC.

Recognizing that the public and investors may look to social media rather than go to the CDC website for information related to the virus, a measure of public attention is constructed using the number of searches logged in Google Trends. Similar to Milani (2021), the information from Google Trends searches is incorporated into the measure GTRENDS. This measure is constructed for the US only as the daily queries on Google using the terms COVID, coronavirus, and pandemic. This produces an index scaled from 1 to 100, where 1 is a period with the minimum number of queries, and 100 is a period with the maximum number of queries.

The final variable used in this study is the Chicago Board Options Exchange's CBOE volatility index, or VIX for short. This index measures market volatility by computing the implied volatility from S&P 500 index options. Daily values for the VIX come from FactSet.

Because the VAR model assumes each variable is stationary, augmented Dickey-Fuller (ADF) tests are conducted on each series. ADF tests confirm that the VIX series is stationary, rejecting the hypothesis of a unit root at the 5% level. Tests of the indices, the Google Trends index, and the CDC cases, deaths, and vaccinations series fail to reject the hypothesis of a unit root at the 5% level. To obtain stationarity, first difference log transformations are taken for each of the S&P indices, GTRENDS, CASE, DEATH, and VACC. Summary statistics for all variables used in the VARs and impulse response functions are presented in Table 1.

The Akaike information criteria is used to determine the optimal order of the VARs. Based on this measure, each VAR is estimated with eight lags. The estimated VARs are then used to compute the related impulse response functions. Generalized impulse response functions are computed rather than the more common Cholesky decomposition to trace out the effects of shocks from CASE, DEATH, GTRENDS, VACC, and VIX.[2] To show both the initial response and any cumulative impact over time, the responses to each shock are accumulated and the resulting cumulative generalized impulse response functions are reported.[3]

3. Empirical Results

Before analyzing the results of the VARs and associated impulse response function analysis, it is worth discussing several features that present themselves in Figure 1. All six indices, the S&P 400, 500, and 600, along with their ESG counterparts, simultaneously reached their pandemic low on March 23, 2020. In the first week of that same month, Google Trends searches seeking pandemic related information hit their peak. However, while COVID-19 infections surged, they didn't hit their peak until January 18, 2022. Yet, even with the omicron variant of the virus producing the largest numbers of daily infections recorded in the US, the impact on the market indices, and pandemic information seeking as measured by Google Trends, was minimal. As the chart shows, the response of the market to the virus seems to be visually much more closely aligned with the behavioral impact of the virus as proxied by Google Trends.

Figure 2 shows the accumulated daily generalized impulse responses from a five equation VAR with the variables SP500ESG, SP500, CASE, GTRENDS, and VIX. The S&P 500 and the S&P 500 ESG indices exhibit a significant negative response to increases in COVID-19 infections, the Google Trends index, and the VIX. Specially, a one standard deviation shock to CASE reduces the daily return on each of these indices by -0.4 percent. Shocks to GTRENDS has a slightly smaller impact on the indices, but continues to grow over time, with an initial reduction in return of -0.3 percent, which grows to -0.9 percent by day 11. The largest impact comes from the VIX, with an initial response of -1.0 percent, growing to -1.1 percent by day 8.

In contrast, GTRENDS and VIX both show positive responses to an increase in COVID-19 infections, and it can also be seen that VIX responded quite significantly to a shock from GTRENDS. A shock to CASE increases GTRENDS by 0.1 percent on day one, and the response grows to 0.9 percent by day 12. VIX also increases in response to shocks from CASE, with an initial increase of 1.6 percent, which grows to 1.8 percent by day 4. Lastly, VIX responds to a shock from GTRENDS with an initial increase of 1.9 percent, which grows to 2.3 percent by day 4.

Overall, Figure 2 provides several insights. First, the market as proxied by the two S&P indices, responses negatively to COVID-19 infections. Further, and perhaps most important from the standpoint of the ESG literature, both the conventional S&P 500 index and its socially responsible counterpart, the S&P 500 ESG, exhibit nearly identical responses to all shocks, casting doubt on the claim that socially responsible investments have the ability to insulate investors from substantial loses during market crises. While COVID-19 infections directly impact the S&P 500 and the S&P 500 ESG, it also appears to impact these indices through a secondary channel. Specifically, the cumulative impulse response functions show that an increase in infections leads to increases in VIX and GTRENDS. The VIX is widely used as a measure of market volatility, and this analysis shows that increased infections lead to increased market volatility, which itself leads to lower market returns. GTRENDS could be considered a measure of public interest in or anxiety about the pandemic. Increased infections lead to increased searches on the pandemic and COVID-19, and this in turn increased market volatility and reduced market returns.

While the S&P 500 is an index of large capitalization stocks, the S&P 400 and S&P 600 are populated with mid-cap stocks and small-cap stocks, respectively. SP500ESG and SP500 are replaced with the SP600ESG and SP600 small-cap indices in the five equation VAR, with accumulated generalized impulse responses computed and presented in Figure 3. Likewise, the accumulated impulse responses for the five equation VAR with the mid-cap indices SP400ESG and SP400 is shown in Figure 4. Both small-cap and mid-cap indices show qualitatively similar responses to shocks from CASE, GTRENDS, and VIX.

Similar to the initial analysis using the S&P 500, the conventional small and mid-cap indices and their ESG counterparts respond the same to the various shocks. The only difference is that the mid-cap and small-cap indices, both conventional and ESG, show slightly greater impact from increases in CASE, GTRENDS, and VIX. For instance, a one standard deviation shock to CASE reduces daily returns on each of these indices by 0.5 percent. Shocks to

[2] The traditional orthogonalized impulse response employs a Cholesky decomposition from the covariance matrix, whereas the generalized version does not impose this restriction. Unlike the Cholesky decomposition, the generalized impulse responses do not depend on the ordering of the variables in the VAR.

[3] Impulse response standard errors are valid only if the VAR is stable. This requires all roots to have a modulus less than one, a result confirmed for each estimated VAR.

GTRENDS and VIX produce similar initial responses as were found with SP500ESG and SP500, though the cumulative impact is larger. The maximum loss to each index grows to -1.3 percent by day 11 from shocks to GTRENDS. Likewise, shocks to VIX produce initial responses similar to those with the large-cap indices, but continue to grow, reaching a cumulative loss of -1.5 percent by day 15. Broadly, the small and mid-cap indices are more negatively impacted from the pandemic, which is consistent with constituents of these indices being riskier investments relative to those in the large-cap stocks in the S&P500 indices. However, similar to the initial analysis with the S&P 500, both the conventional and ESG indices response identical to each other, which is inconsistent with the premise that ESG investments have lower downside risk.

A check of the VAR for robustness in the responses to COVID-19 infections is provided in Figure 5.[4] This analysis takes the VAR with the S&P 500 and S&P 500 ESG with CASE, GTRENDS, and VIX, and adds the growth rate in deaths from COVID-19 as reported by the CDC. The first COVID-19 related deaths in the U.S. were reported by the CDC on February 3, 2020, just ten days after the first reported infection. DEATH has a positive impact on the two indices, a negative impact on the VIX, and no impact on Google Trends, though none of these cumulative impacts are statistically significant. The addition of DEATH to the VAR has no effect on the earlier results, with the impact of CASE on the indices, GTRENDS, and VIX identical to that shown in Figure 2.

While the first infection was reported by the CDC on January 22, 2020, vaccinations didn't begin until mid-December of the same year. As a final test, the impact of the vaccine is assessed by adding the daily growth rate in vaccinations to the original VAR with the S&P 500 indices, GTRENDS, and VIX. While this allows for a test of the impact on the vaccine on financial markets, it isn't directly comparable to the prior results because the sample periods don't fully overlap.

Figure 6 shows the cumulative impulse responses for a VAR with the variables SP500ESG, SP500, CASE, VACC, GTRENDS, and VIX. Similar to prior results, the S&P 500 ESG and its conventional counterpart respond identically to all shocks. Beyond that, there are several notable differences between the results from this VAR and the previous VARs. First, both ESG and conventional indices exhibit a positive response to CASE and VACC. The response to shocks from CASE are small relative to prior results, though they become statistically significant by day 2 at +0.22 percent. Likewise, shocks from VACC become significant at +0.17 percent by day 2, and continue to grow to a peak of +0.24 percent by day 20. While not reported, the shocks from CASE and VACC never become significant in the daily generalized impulse response functions. Only the cumulative effect is significant. Noting that this analysis represents a later phase of the market's response to the pandemic, the impulse response function analysis suggests that the impact of the pandemic is substantially smaller and has reversed sign, producing positive shocks. Additionally, there is no market impact from news related to the pandemic as proxied by GTRENDS, nor is there a significant impact from the VIX. Further, by this stage neither GTRENDS nor VIX appear to be responsive to shocks related to the pandemic.

4. Concluding Remarks

Based upon an extended time frame spanning approximately two years from the start of the pandemic, this study finds that the growth rate of COVID-19 infections had a profound effect on the market during the early stages of the pandemic, but much less so by the time vaccines became available.

The VAR and impulse response function analysis shows that the impact of the pandemic on the market occurred through both direct and indirect channels. The direct impact of the pandemic was a reduction in the daily return on each index, though slightly less so for large-cap indices versus mid-cap and small-cap indices. This result is consistent with large-cap stocks being less risky than small-cap stocks. Indirectly, increases in infections led to heighted market volatility as measured by the VIX, and increased interest or concern about the virus as measured by Google Trends searches related to the pandemic. In turn, increases in the VIX and Google Trends correspond to reduced market index returns. Whereas COVID-19 infections had a negative impact on each index, and a positive impact on both Google Trends and the VIX, neither deaths nor vaccinations had any significant impact. In fact, even ignoring statistical significance, the impact of vaccinations was nearly zero on each index, both conventional and ESG, Google Trends, and the VIX.

A central question of this study was whether ESG outperformed conventional investments during the pandemic. A common claim, but with mixed results in the empirical literature, is that higher ESG investments have lower risk exposure versus low ESG investments. Consequently, higher ESG investments should experience lower losses relative to their more conventional counterparts during episodes of market crisis. The market response to the pandemic has

[4] Though not presented, robustness checks for the small-cap and mid-cap indices were conducted, with results qualitatively similar to those shown for the S&P 500 and S&P 500 ESG indices in Figure 5.

presented a means of investigating this question. In this study, while the market impact of the virus is substantial early on, ESG and conventional indices performed nearly identical, casting doubt on the claim ofperformance advantages of socially responsible funds made by ESG advocates.

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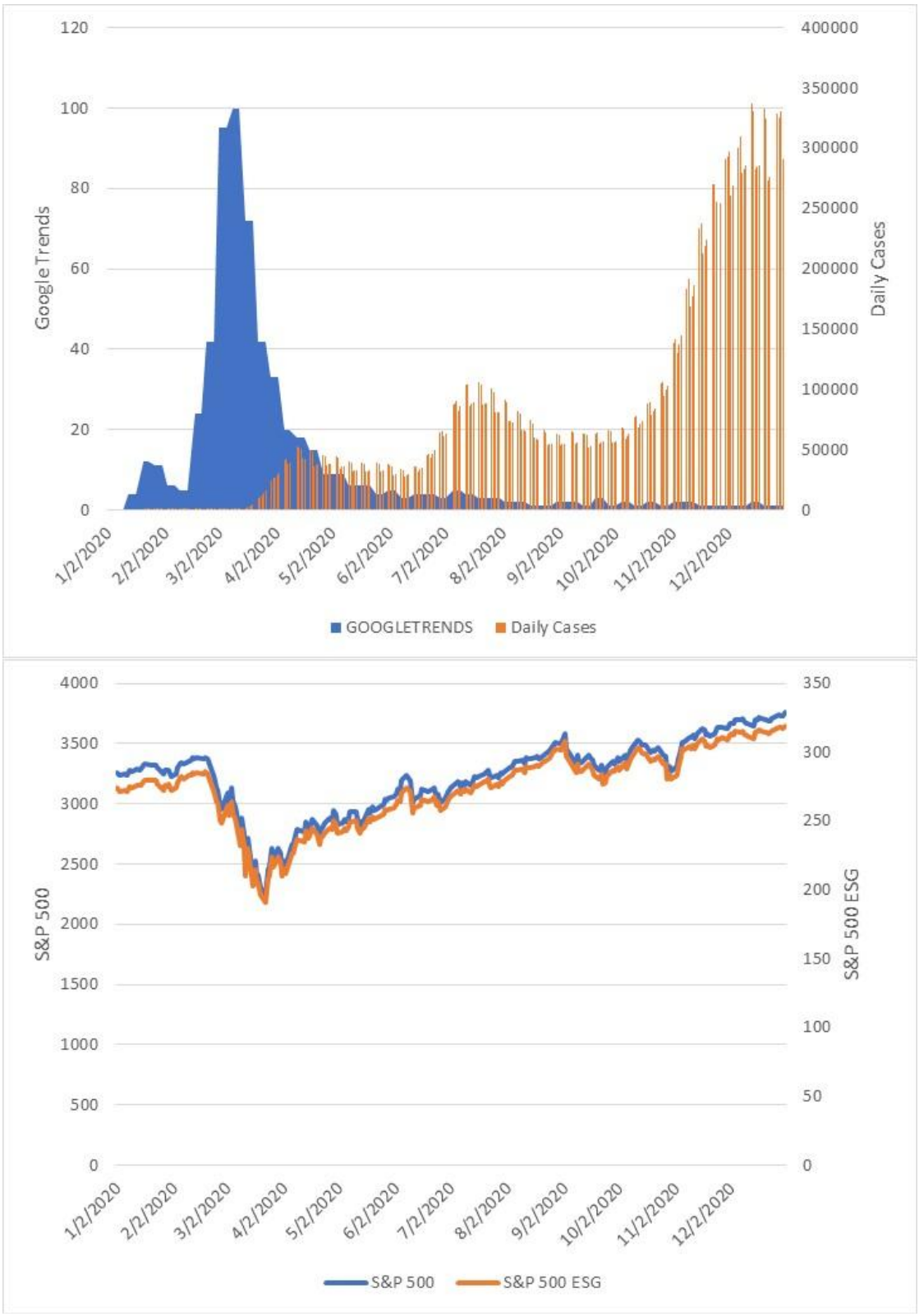


Figure 1. S&P 500, S&P 500 ESG, COVID Infections, Google Searches during 2020.

Table 1. Summary Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
SP400	0.00079	0.00121	0.10173	-0.14803	0.02080
SP400ESG	0.00084	0.00158	0.09791	-0.14795	0.02080
SP500	0.00080	0.00168	0.08968	-0.12765	0.01721
SP500ESG	0.00086	0.00190	0.09146	-0.12769	0.01729
SP600	0.00086	0.00159	0.08624	-0.14282	0.02301
SP600ESG	0.00094	0.00196	0.08589	-0.14236	0.02317
CASE	0.02665	0.00870	0.72920	0.00035	0.06751
DEATH	0.01869	0.00499	0.57248	0.00000	0.05559
VACC	0.04229	0.00623	1.13708	0.00152	0.12855
VIX	0.00390	-0.01200	0.61640	-0.23370	0.09349
GTRENDS	0.00816	0.00181	0.11672	0.00069	0.01852

NOTES: Summary statistics are reported for all variables used in the vector autoregressions. With the exception of the VIX, the first difference log transformation is taken for each variable. All data is daily. Observations for VACC span December 14, 2020 to February 28, 2022, while all other variables start in December 31, 2019.

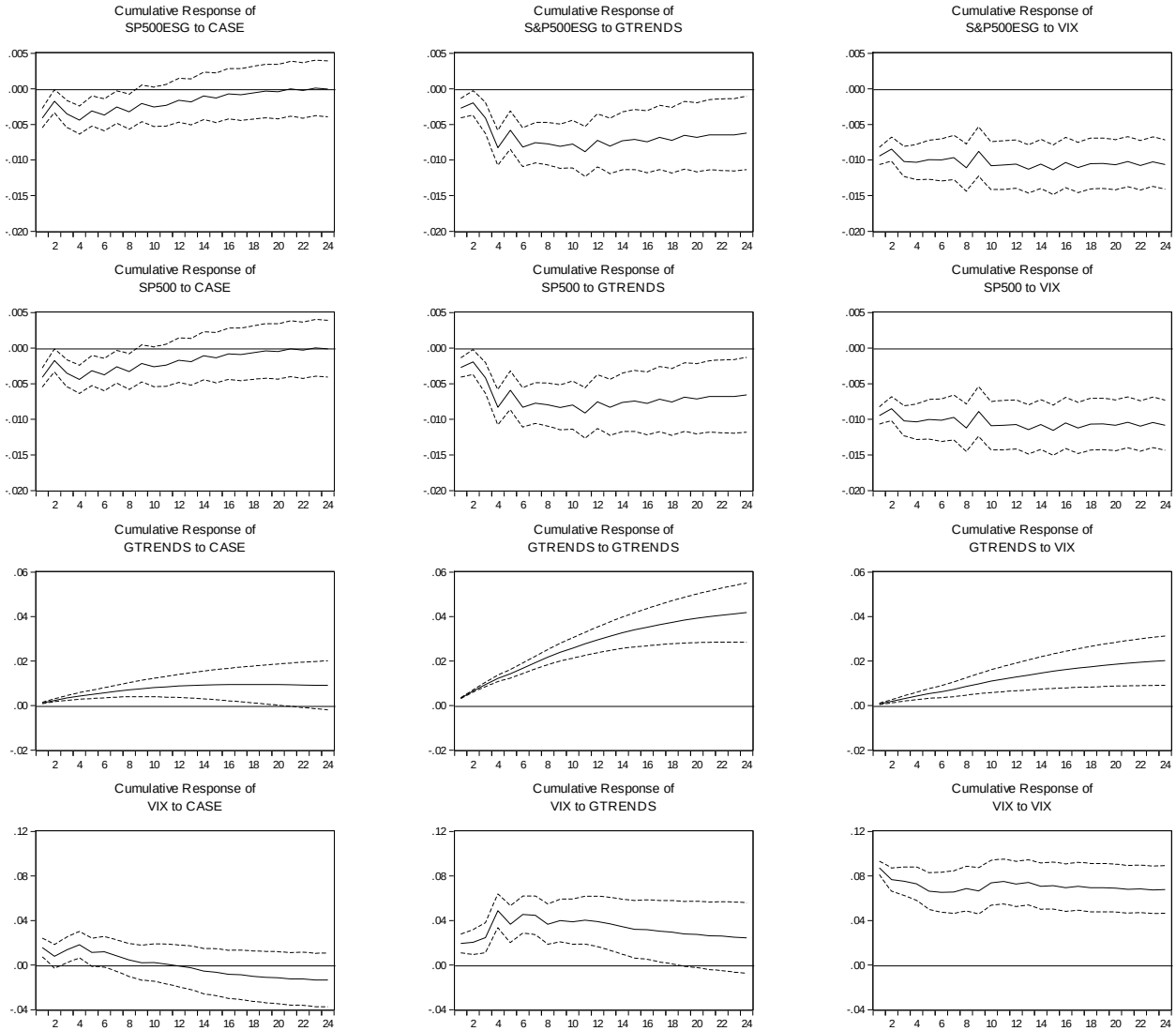
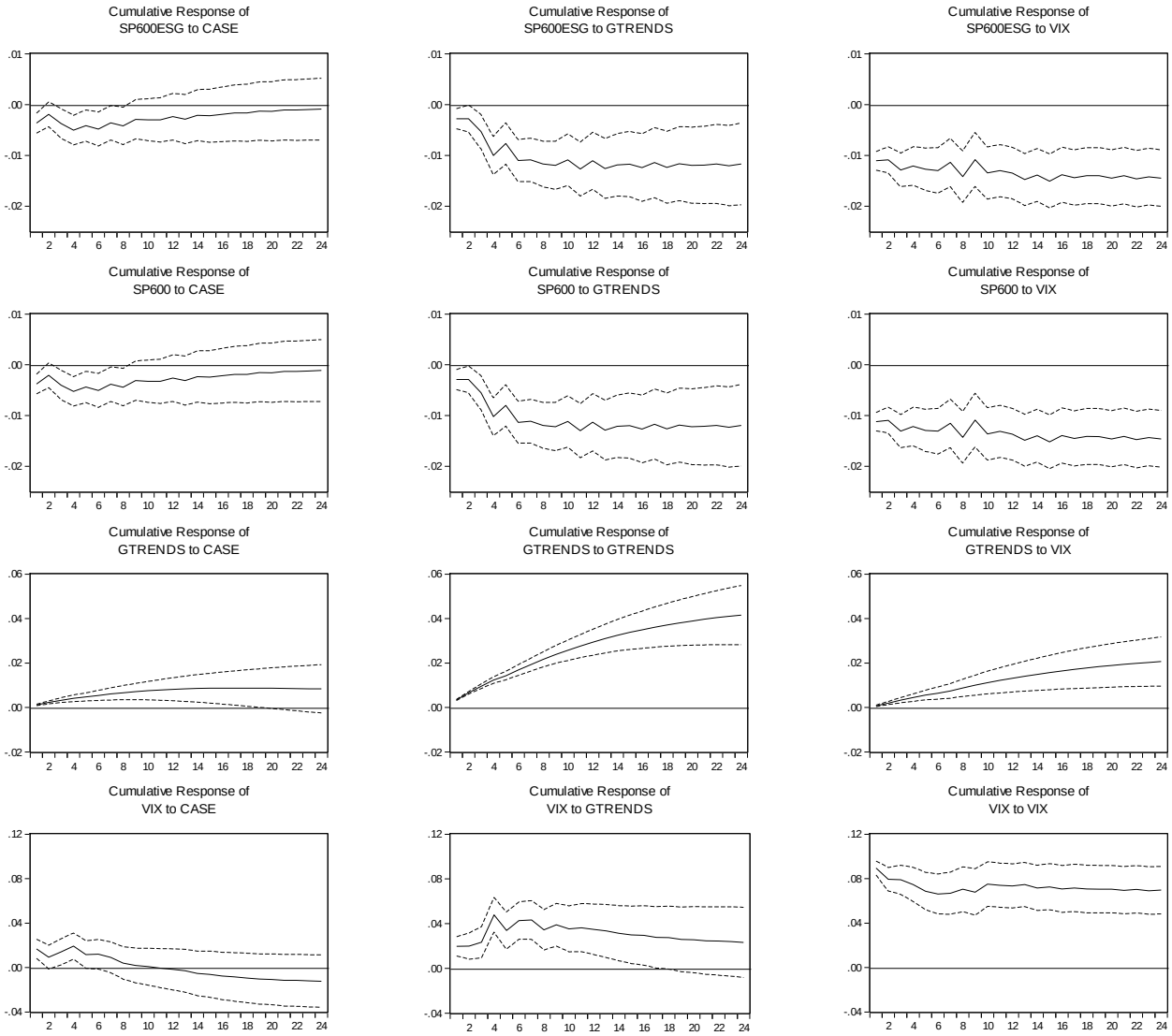


Figure 2. Cumulative impulse response functions from a five variable VAR with the variables SP500ESG, SP500, CASE, GTRENDS, and VIX. Each graph shows the cumulative effects of one standard deviation shock. 95% confidence interval represented by the dashed lines.



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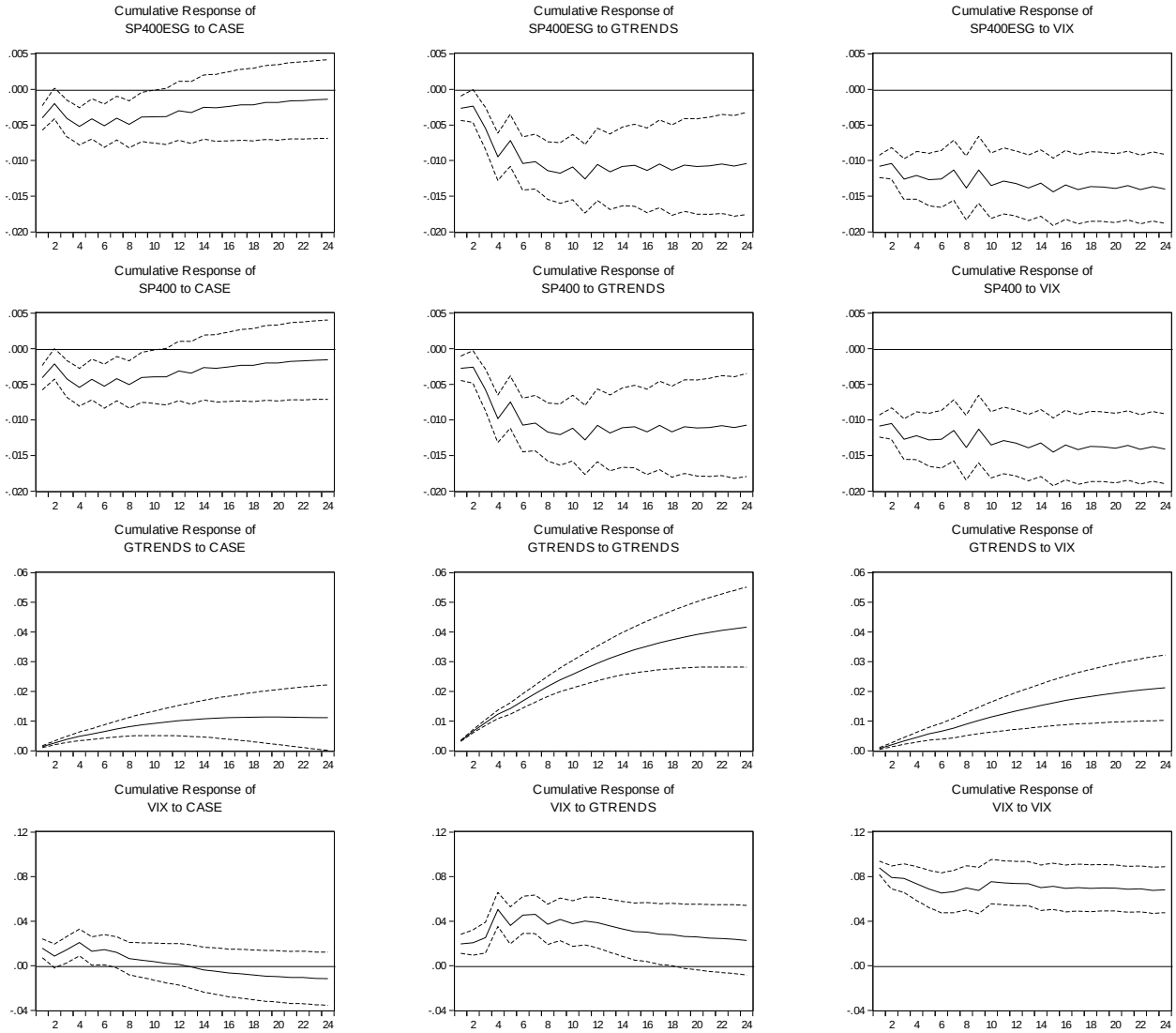


Figure 4: Cumulative impulse response functions from a five variable VAR with the variables SP400ESG, SP400, CASE, GTRENDS, and VIX. Each graph shows the cumulative effects of one standard deviation shock. 95% confidence interval represented by the dashed lines.

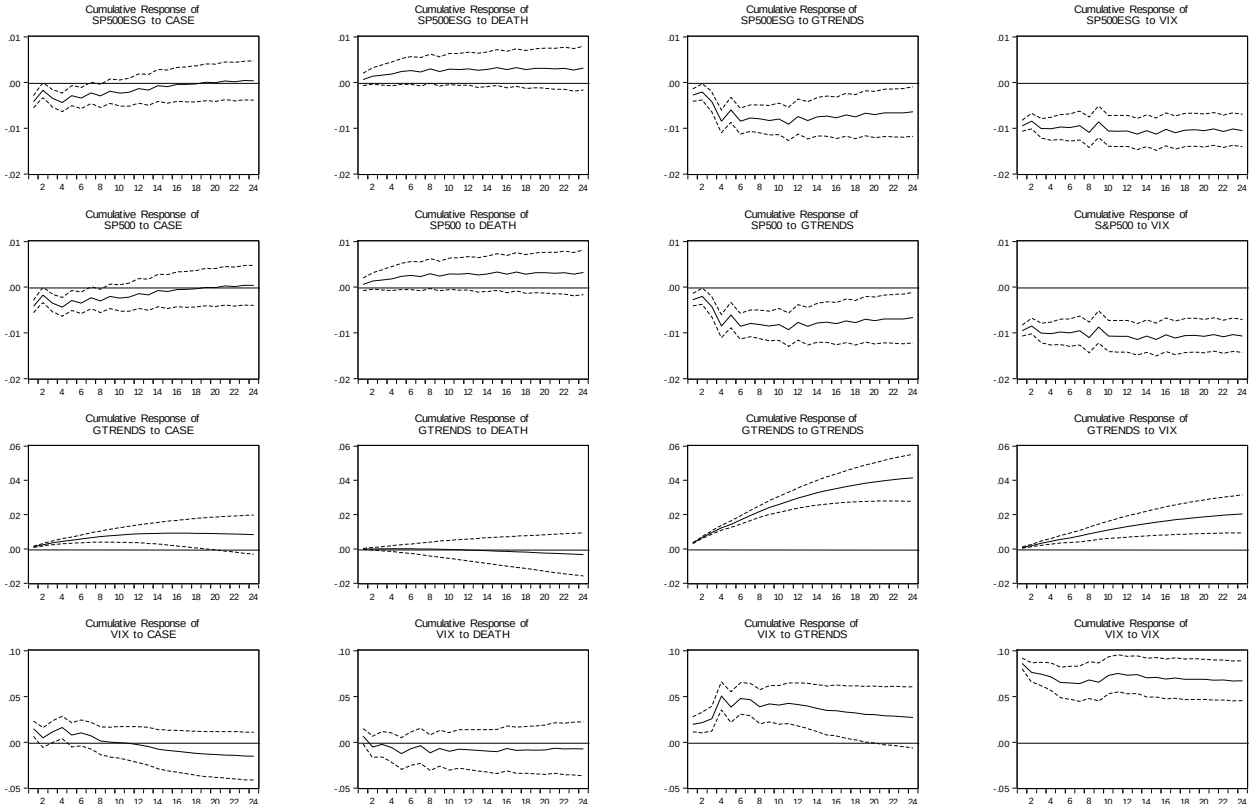
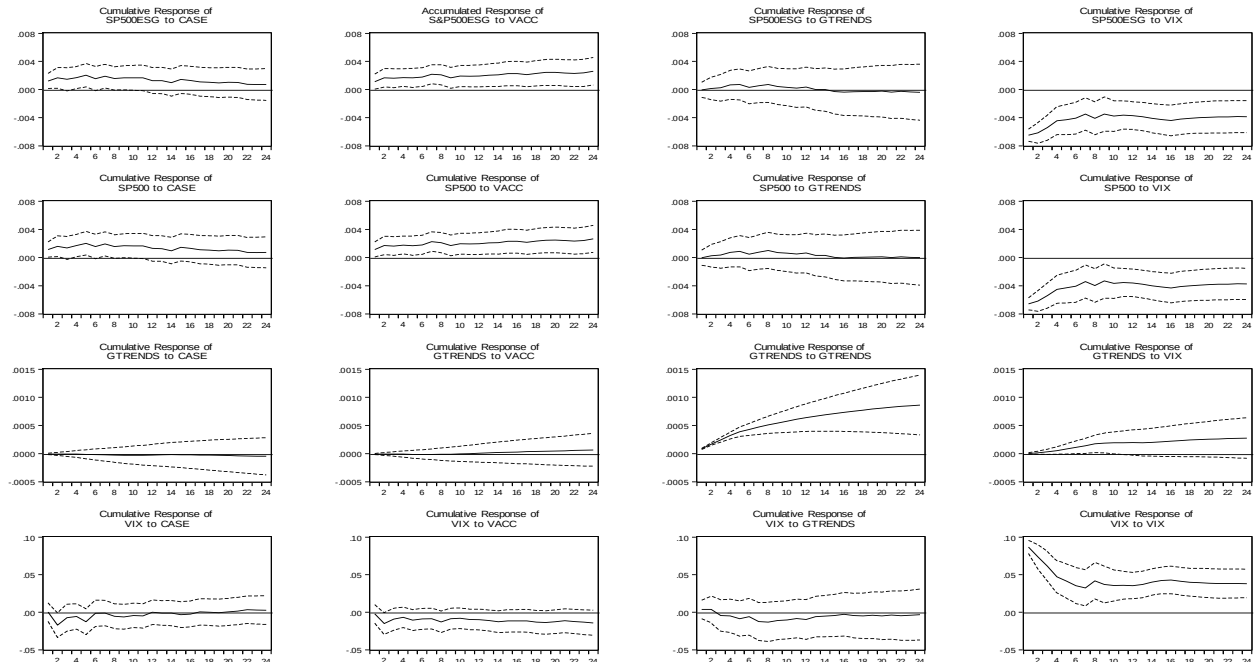


Figure 5: Cumulative impulse response functions from a six variable VAR with the variables SP500ESG, SP500, CASE, DEATH, GTRENDS, and VIX. Each graph shows the cumulative effects of one standard deviation shock. 95% confidence interval represented by the dashed lines.



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