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Phoebe Lei

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Bond Fund Performance and Flows  
During the COVID-19 Crisis

By

Zijin (Phoebe) Lei

Jeong Ho (John) Kim

Adviser

Economics

Jeong Ho (John) Kim

Adviser

Bree Ettinger

Committee Member

Miguel R. Rueda

Committee Member

2021

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By

Zijin (Phoebe) Lei

Jeong Ho (John) Kim

Adviser

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## Abstract

### Bond Fund Performance and Flows During the COVID-19 Crisis

By Zijin (Phoebe) Lei

We investigate the performance and flows of bond mutual funds during the COVID-19 Crisis period with a focus on their relationship with different measures of sustainability. Through the analysis of factor-adjusted returns, we find that bond mutual funds underperformed the market during the crisis period but outperformed both before and after the crisis. We also document that bond mutual funds with higher ESG ratings generated higher crisis-period returns compared to their lower-rated counterparts. Moreover, bond mutual funds with investment exclusions attracted more money before the COVID-19 crisis and performed better during the crisis. These results suggest that sustainable bond mutual funds are more resilient to large negative shocks. Furthermore, investors were able to exploit this advantage and invested in these sustainable funds as a hedging strategy before the crisis struck.

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# Bond Fund Performance and Flows

## During the COVID-19 Crisis

Zijin (Phoebe) Lei

April 2021

### 1 Introduction

The COVID-19 pandemic has triggered a cascade of unusual reactions in the financial market and directed the research spotlight onto the performance of various securities. In the equity market, we have seen an unprecedented drop in value of more than 30% followed by a bounce-back of comparable size within six weeks. Similarly, the bond market exhibits significant fluctuations and a loss of liquidity at the beginning of the financial market crash [13]. Moreover, while it is generally believed that actively managed mutual funds tend to outperform the market during times of financial distress, recent research has found that such a trend no longer persists during the COVID-19 pandemic [18]. In particular, the research found that active equity funds underperformed both market-level and fund-specific benchmarks substantially during the crisis. My research aims to add more insights into the

performance of mutual funds and the change in investors' investment strategies before and during the COVID-19 pandemic period by analyzing the returns and flows of bond mutual funds with respect to their Environmental, Social, and Governance (ESG) ratings.

The performance of mutual funds has been a popular and controversial topic in the world of finance. While past data have indicated that mutual funds tend to generate an average net return that is lower than the market-level benchmarks, the causes and ramifications of such underperformance are often intensively debated. Kosowski (2006) claimed that the underperformance of mutual funds during expansions is compensated by their positive risk-adjusted performance during periods of recession when the marginal utility of wealth is the highest to investors [14]. Glode (2011) incorporated this idea into a parsimonious state-specific model in which fund managers choose to focus more on how to realize an above-average performance during bad states of the economy when investors are willing to pay more for a given return [9]. Similarly, Kacperczyk et al. (2016) proposed an attention allocation model to characterize the time-varying skill of fund managers [12].

Among abundant and diverse empirical studies on the performance of mutual funds during recessions, one special type of funds — Environmental, Social, and Governance (ESG) funds — has stood out and attracted increasing attention over the past decades. ESG funds are funds with a commitment to invest in socially responsible securities. Although a high ESG rating is viewed as a positive attribute by most investors, research indicates that a fund's high expected returns and low expected riskiness do not necessarily lead to higher realized returns [11]. Therefore, it is interesting to see how much non-pecuniary value investors give to ESG funds. My research approaches this question by investigating the relationship

between ESG mutual fund flows and returns to see whether a change in ESG fund flows is associated with a parallel change in fund returns. We found that bond funds that employ investment exclusions, which is a measure of sustainability, attracted more money before the COVID-19 crisis and generated higher returns during the crisis. However, we see money stop flowing into ESG bond funds during the crisis, suggesting that investors either have already incorporated the positive value of sustainability into their investment decisions beforehand or they failed to give ESG bond funds the attention they deserve after the crisis struck.

The exact impact of sustainability on the performance of mutual funds remains ambiguous. Early research has shown that ESG funds tend to outperform the market and other funds during recessions by mitigating the downside risk and increasing investor confidence at a time when people are more concerned with negative corporate behaviors [16]. This idea is supported by evidence found from the Great Recession, where firms with high social capital experienced significantly higher stock returns and growth compared to those that are less socially responsible [15]. However, it is hard to infer direct causality between sustainability and returns using data from the 2008 financial crisis due to its special causes and complex development. In contrast, the COVID-19 crisis stemmed from a non-financial origin and hit the market by complete surprise. Therefore, data collected during this time period are an ideal source in analyzing the distinct effect of ESG ratings on funds' performance during recessions. In fact, many papers have already been working on related subjects, but the available results are contradictory. For example, Pastor and Vorsatz (2020) found that active equity funds with higher sustainability ratings outperformed their lower-rated counterpart during the COVID-19 pandemic by a significant percentage [17]. Garel and Petit (2020) have

attributed such outperformance to environmentally-related factors, especially those concerning climate change and energy conservation [8]. However, Demers et al. (2020) claimed that the relatively high return generated by ESG funds during the COVID-19 disappeared after controlling for various industry-, market-, and firm-level variables, and dismissed the idea that ESG provides better resiliency to funds during recessions altogether [5]. Therefore, the actual effect of ESG on fund returns needs to be further investigated.

Our research analyzes the performance of mutual funds during the COVID-19 crisis based on their ESG ratings. In particular, we investigate how the fund flows and returns vary between bond mutual funds with high ESG ratings and low ESG ratings. While the majority of interests previously has been on the equity funds performance during the COVID-19 crisis [18] [7], the unprecedented outflow of money out of the corporate bonds market and fixed-income mutual funds during the crisis [6] also deserves a closer look. So, for this research, we focus on the analysis of bond mutual funds and compare our results to those of equity mutual funds to see how they differ. Moreover, we want to see what roles do ESG ratings play in the bond mutual fund market. Specifically, we want to see whether funds with high ESG ratings are perceived as safer by investors, and if yes, how much weight does it carry in the determination of asset prices. Glossner et al. (2020) claimed that institutional investors care more about hard risks (e.g., high leverage and low cash) than soft risks (e.g., ESG ratings) during the COVID-19 crisis [10]. Nevertheless, research has found that funds that are considered more socially responsible have higher expected returns, lower volatility, and better resiliency to withstand large market shocks [3] [2] [7]. If this is true, risk-averse investors should allocate more of their assets into funds with higher sustainability ratings to

hedge against unexpected events. Our research shows that investors invested more in ESG bond funds before, but not during, the COVID-19 crisis, implying that these funds may be used as insurance device to limit the downside risks of a potential crisis before it happens.

Additionally, we break the ESG scores into different subcomponents, namely the environmental (E), social (S), and governance (G) components, to see which one matters the most to investors in a recession. Previous research attributed the impact of ESG scores on fund performance mainly to the environmental component [7] [8]. A higher level of environmental responsiveness is also generally associated with better financial performance and productivity growth [19] [4] [1]. Nevertheless, it is interesting to see how this trend evolves along the course of the crisis as various social movements and political campaigns unfold. Consistent with prior findings, our research shows that the relative weight attached to environment-related factors surpasses the other two for bond funds during the COVID-19 crisis period.

The data on mutual fund characteristics and returns come from the WRDS CRSP mutual funds database and the Morningstar database. Our research tracks the performance of mutual funds over an extended period from January 1st, 2019 to October 1st, 2020. We further divide the period into 6 subperiods when investigating the role of sustainability on fund performance. Our entire sample contains 14290 mutual funds, among them 3672 are bond mutual funds. We regress fund returns on market-level factors to obtain the factor-adjusted returns. Then, We calculate fund flows and regress both returns and flows for bond mutual funds on ESG ratings. Afterward, we separate the E, S, and G ratings into three distinct criteria and regress the same set of dependent variables on each criterion individually.

Our research is the first to compare the causal relationship between ESG ratings and mutual fund performance for bond mutual funds over the COVID-19 crisis period. By doing so, we hope to shed more light on the value different investor groups put on sustainability and its evolution during the crisis.

The rest of the paper is structured as follows: Section II introduces the data selection and variable determination process; Section III details the models and methodologies used in the research; Section IV presents the main findings of the paper and provides possible interpretations of the results; Section V discusses the significance of our research and offers directions for potential future research.

## **2 Data and Methodology**

### **2.1 Data**

Our data come from CRSP and Morningstar. We require that funds appear in both the CRSP and Morningstar databases, which allows us to identify mutual funds in the United States. We merge CRSP and Morningstar based on funds' tickers and CUSIPs. We then clean the data following Pastor and Vorsatz (2020). We refer the readers to the data appendix of that paper for the details. Our mutual fund data set contains 14,290 actively managed mutual funds in the United States between January 1, 2019, and October 1, 2020. We divide our sample into four non-overlapping periods:

1. the period from October 1, 2019, to January 31, 2020, before the first COVID-19 case

- in the US (i.e., “Pre-Pandemic”);
2. the period from February 20, 2020, to March 23, 2020, when the stock market crashed (i.e., “Crash”);
  3. the period from March 24, 2020, to April 30, 2020, when the stock market began its rebound and continued to grow back (i.e., “Recovery”);
  4. the period from May 1, 2020, to October 1, 2020, after the stock market recovery (i.e., “Post-Crisis”).

The Crash period and Recovery period together are called the Crisis period.

To focus our analysis on the actively-managed funds, we exclude all the index/passive funds using Morningstar’s index fund indicator. We also exclude those with expense ratios above 0.1% per year. A minimum fund size of 15 million dollars in total net asset value (TNA) as of January 31st, 2020 is also required to be included in the sample. Finally, we exclude funds without any net returns reported during our time of interest. The size of our final sample is 14290 with a TNA of 15.95 trillion dollars as of January 31st, 2020. We divide the mutual funds into non-exclusive categories based on the Morningstar Category variable which include bond funds, sector funds, real estate funds, international funds, target funds, other non-equity funds, and unclassified funds. We focus our analysis on bond mutual funds. The size of the bond mutual funds subsample is 3672 with a TNA of 4.76 trillion dollars as of January 31st, 2020.

### 2.1.1 Mutual Fund Returns

The daily net returns from January 1st, 2019 to October 1st, 2020 for each share are calculated using Morningstar's Net Return Index (RI):

$$R_{i,t} = \frac{RI_{i,t} - RI_{i,t-1}}{RI_{i,t-1}} \quad (1)$$

where  $R_{i,t}$  is the daily net return for share  $i$  at time  $t$ . Then, we aggregated the daily net returns from the share class level to the fund level to obtain the equal-weighted average returns and the value-weighted average returns weighted by the lagged total net asset. The excess net returns were then calculated by subtracting the risk-free rate from  $R_{i,t}$ .

### 2.1.2 Mutual Funds Flows

Daily net fund flows are calculated as follows:

$$FD_{i,t} = TNA_{i,t} - (1 + R_{i,t}) * TNA_{i,t-1} \quad (2)$$

where  $TNA_{i,t}$  and  $TNA_{i,t-1}$  are the total net asset value and lagged total net asset of fund  $i$  on date  $t$  and  $R_{i,t}$  is the daily net return of fund  $i$  on date  $t$ . The cumulative net fund flows are calculated by aggregating the net flows of all bond mutual funds over time.



## 2.2 Mutual Fund Returns

### 2.2.1 Different Measures of Returns

First, we normalize the net asset value of each fund to 100 as of February 19, 2020, and calculate the mutual fund price index,  $F_t$  using the equation below:

$$F_t = 100(1 + R_{i,1})(1 + R_{i,2})\hat{a}(1 + R_{i,t}) \quad (3)$$

where  $R_{i,t}$  is the net return for fund i on date t. Then, we compare how the bond mutual funds perform on average compared to the benchmark during the COVID-19 Crisis period.

We also calculate the cumulative return  $\log(C_t)$  for each time period where  $C_t$  is calculated using the following equation:

$$C_t = (1 + R_{i,1})(1 + R_{i,2})\hat{a}(1 + R_{i,t}) \quad (4)$$

We compute the equal-weighted daily excess net returns from January 1, 2019, to October 1, 2020, for all mutual funds and bond mutual funds to see how their performance compares both before and during the COVID-19 Crisis. Then, I repeat the same process for the value-weighted returns, weighed by fundsâ total net assets (TNA).

Next, we compare the factor-adjusted returns for all mutual funds and for bond mutual funds from January 1, 2019 to October 1, 2020 by calculating the fund alphas from the capital asset pricing model, the Fama-French three-factor Model (1993), and the four-factor Carhart

(1997) model for the entire time period and for each of the five subperiods as introduced in Section 3. All alphas are obtained through the regression on the daily net returns  $R_{i,t}$ . The alphas were then annualized to obtain the factor-adjusted returns. The sustainability score of each mutual fund is assigned by Morningstar on a scale of 1 to 5, with 1 being the least sustainable and 5 being the most sustainable. We group the equity and bond mutual funds based on their sustainability scores and compare their factor-adjusted net returns in each subperiod. However, this result may be subject to the impact of confounding variables and survivorship bias, therefore, we conduct cross-sectional regression analysis in the following section to obtain further evidence.

### **2.2.2 Fund Return vs Sustainability: Regression Analysis**

We first create a dummy variable for sustainable funds with 1 indicating a Morningstar ESG score of 4 or 5 and 0 indicating a score less than 4. Then, we regress factor-adjusted returns (CAPM and three-factor Fama and French model), value-weighted excess gross returns, and value-weighted excess net returns on the ESG indicator, the employs exclusions indicator, and Morningstar star ratings while controlling for various industry-level and fund-level control variables. The industry-level control variables consist of six fixed-income super sectors, including government, municipal, corporate, securitized, cash equivalent, and derivative sectors. Fund level control variables include the log of the age of the fund expressed in days, the log of the fund TNA as of January 31st, 2020, Morningstar medal ratings, turnover ratio as of January 2020, and net expense ratio as of January 2020. We also included Morningstar's Global Category in every regression as style fixed effects.

Furthermore, we divide overall sustainability ratings into environmental, social, and governance components. Then, we incorporate them into the regression models to analyze their individual effect on the fund returns and compare their relative importance.

## **2.3 Mutual Fund Flows**

### **2.3.1 Different Measures of Fund Flows**

We divide the cumulative net fund flows by the total net asset of all funds on the first day of our period of interest to obtain the percentage cumulative net flows. We further divided the bond mutual funds into different ESG and Exclusion categories and calculate the cumulative flows for each of them. The fund-level cumulative flows are calculated by aggregating the net flows of each mutual fund over time and divided the sum by the fund's net asset value on the first day of our period of interest. We then calculate the averages of these cumulative fund flows across various categories. All fund flow data are winsorized at the 2.5% and 97.5% levels to reduce the impact of potential outliers before calculating the average.

### **2.3.2 Fund Flow vs Sustainability: Regression Analysis**

We regress the percentage cumulative net flows on Morningstar sustainable ratings, Morningstar star ratings, Exclusions while explicitly control for a group of industry-level and fund-level controls same as those indicated for mutual fund return regressions. Then, we replace the sustainability rating with environmental scores, social scores, and governance

scores and rerun the regression model to investigate which component of sustainability has a larger effect on the flow of mutual funds. Specifically, we run the regression for both the Crisis and Pre-Crisis period to see how the relative impact of sustainability and its subcomponents on bond fund flows change before and during the COVID-19 pandemic.

## **3 Results**

### **3.1 Mutual Fund Returns**

#### **3.1.1 Different Measures of Returns**

Figure 1 compares the average value-weighted net returns for all mutual funds and bond mutual funds between January 1, 2019, and October 1, 2020, across multiple subperiods. The bond fund returns show less volatility compared to the returns for all mutual funds for each subperiod. Furthermore, there were significant fluctuations during the crisis period (February 20, 2020 to April 30, 2020) for both the bond mutual fund market and the entire mutual fund market. Although such volatility subsides during the post-Crisis period, it remains significant compared to before the crisis.

Figure 2 compares the bond fund price index to the SP 500 benchmark price index within each subperiod from January 1st, 2019 to October 1st, 2020. The 95% confidence interval for the average fund price index is plotted in red dashed lines. As shown in the figure, before the COVID-19 pandemic, the price index for bond mutual funds was stable around 100 and remained below that of the SP 500. However, during the COVID-19 crisis,

such relationship reversed, and the bond mutual funds consistently outperformed the SP 500 benchmark during the entire time period with less volatility. Nevertheless, both indices show significant decrease during the crisis period with a trough around March 23rd, which marks the end of the crash period and the beginning of the recovery period in this research. Finally, the post-crisis period is characterized by an increase in price indices for both bond mutual funds and the SP 500 benchmark, with the rate of recovery being higher for the latter. By the end of August, the price index for SP 500 has already surpassed that of bond mutual funds, although it dropped again shortly after. Overall, we can see that the performance of bond mutual funds is more stable compared to the SP 500, and both indices have recovered to their pre-crisis level by late August, although volatilities remain.

Next, we divide the bond mutual funds into two groups, the first is the low ESG group which contains all funds with an ESG rating of 1 or 2. The second group is the high ESG group which contains funds with an ESG rating of 4 or 5. Then, we plot the density functions of cumulative returns for the two groups separately. Figure 3 shows the distributions of the cumulative returns during the Crisis period and the Precrisis period. Specifically, cumulative returns of high ESG rating funds are more clustered towards 0, which suggests that those funds are more stable and robust towards shocks. On the other hand, cumulative returns of low ESG funds are more sensitive to changes in the financial market and have a wider spread. Interestingly, returns before the crisis have a right tail while returns during the crisis show a left tail, implying that low ESG funds tend to do better during normal times, but also suffer more severely during times of financial difficulties. Figure 4 shows the time-series graph of average cumulative returns for the two ESG groups along with their 95% intervals.

Again, low ESG funds tend to outperform during normal times and underperform during crisis and show more volatility compared to funds with high ESG ratings. When looking at the ESG scores on a scale of 1 to 5, we find that the relationship is almost monotonic for each time period. Specifically, funds with an ESG score of 2 performed the best and those with a score of 4 performed the worst during normal times. However, such order reversed as the crisis hit, providing further evidence that high ESG scores increase the resiliency of bond mutual funds towards unexpected shocks. Similarly, in figure 5, we see funds that employ exclusions generated lower average cumulative returns before the crisis but higher returns during the crisis, suggesting that investment exclusions are also associated with better fund performance under such high-risk environment.

Figure 6 shows the relationship between cumulative returns with the ESG risk and each component of the ESG risk, namely the Environmental risk, Social risk, and Governance risk. While the overall ESG risk shows a negative relationship with the cumulative returns, the social and governance risks display a slightly positive relationship with the returns. In other words, although more ESG risks lead to a lower return, more social or governance risks are actually associated with higher returns. Therefore, it is reasonable to conclude that the negative relationship between ESG risks and returns is mostly contributed by environmental factors. This conclusion is further supported by Figure 5b, which shows a downward slope when plotting cumulative returns against environmental risks.

Table 1 Panel A shows the average annualized alphas and their corresponding t statistics for the CAPM model, the Fama-French three-factor Model (1993), and the four-factor Carhart (1997) model for all mutual funds in each subperiod. While mutual funds gener-

ally outperformed the market after the COVID-19 crisis, they generally performed in line with the market both before and during the crisis period as shown by the statistically insignificant alphas. However, within the crisis period, mutual funds outperformed the market substantially during the recovery subperiod. In Table 1 Panel B, we used the value-weighted alphas in place of equal-weighted alphas and obtained similar results. Specifically, mutual funds outperformed the market during the Recovery and Post-Crisis period, but generated no significant performance deviations from the market returns for the other periods. As shown in Table 1 panel C, over 80% of mutual funds underperformed the market during the crash subperiod, while the percentage of underperformance decreased significantly during the recovery and post-crisis period.

Table 2 shows that bond mutual funds underperformed the market during the Crash subperiod within the Crisis period, but outperformed during the Pre-crisis, Recovery, and Post-crisis periods regardless of whether the equal-weighted alphas or the value-weighted alphas are used. All alphas are shown to be significant for each period mentioned above. The fraction of bond mutual funds that underperformed during the Crash period exceeds that for all mutual funds. However, the bond mutual funds market managed to recover rapidly after the crash and the percentage of funds underperformed dropped below 10% during the post-crisis period.

### **3.1.2 Fund Return vs Sustainability: Regression Analysis**

Table 3 shows the results of regressing Crisis-period excess gross returns, excess net returns, and CAPM alphas on various sustainability and past-performance measures while adding

different levels of industry and fund controls for bond mutual funds. When excess gross returns or excess net returns are used, coefficients on Sustainability, Employs Exclusions, and Star Ratings are all significantly positively (except for column 2) whether controls are included or not. After adjusting for risk factors and using CAPM alphas as the dependent variable, the general trend remains consistent. Specifically, except for column 2, all other coefficients on sustainability, Employs Exclusions, and Star Rating are significantly positive, suggesting they all have a positive impact on bond fund returns during the crisis.

Table 4 shows the corresponding regression results for the Pre-crisis period. When regressing using gross and net excess returns, coefficients on Sustainability and Employs Exclusions are mostly negative but insignificant at the 5% level (except for column 1) while coefficients on Morningstar star ratings are significantly positive for all control levels. Looking at the result for CAPM alphas, all coefficients are insignificant (the coefficient on sustainability in column 1 is marginally significant at the 5% level) except those for Morningstar star ratings, which appear to be positive.

After breaking the Sustainability measures into Environmental, Social, and Governance subcomponents, I analyze how each factor contributes to the returns of mutual funds. Looking at Table 5, the Environmental factor shows a positive relationship with the CAPM alphas while the Social and Governance factors are either negatively related or insignificant in determining the fund returns during the Crisis period. The Environmental factor remains to be significantly positive when excess returns are used in place of alphas, implying that funds that are more concerned with environmental issues outperformed during the Crisis period. In addition, the Social factor is significantly and negatively related to excess fund returns



when no controls are added while the Governance factor remains insignificant throughout.

In contrast to that of the Crisis period, the relationship between Environmental scores and CAPM alphas and excess returns turned insignificant during the Pre-crisis period (Table 6). This suggests that environmental factor no longer contributes to better bond mutual fund performance during normal times. Also, before the COVID-19 Crisis, Social factor is significantly and negatively related to fund performance when CAPM alphas are used as the dependent variable and insignificant otherwise. Moreover, the Governance factor remains to be insignificant across all three return measures, indicating that it does not play an important role in mutual fund performance. Overall, the regression results suggest that among the three subcomponents of ESG ratings, the Environmental factor plays the most important role in determining bond mutual fund performance.

To sum up, bond mutual funds experienced fewer fluctuations compared to other types of mutual funds in general. Nevertheless, their volatility surged during the Crisis period along with the overall mutual funds market. In contrast to the previous belief that mutual funds tend to do better during financial crises and worse during normal times (Glode, 2011; Kosowski, 2006; Kacperczyk et al., 2016), the results of my CAPM, Fama-French three-factor model, and four-factor Carhart model all indicate that bond mutual funds underperformed during the COVID-19 Crisis period but outperformed before and after. However, such underperformance during the COVID-19 crisis is consistent with the result obtained by Pastor and Vorsatz (2020), who focused on equity mutual funds. Together, we provide some evidence to support the hypothesis that a new trend might be evolving in the mutual funds market during this most recent financial crisis.

Furthermore, within the bond mutual fund market, those with higher ESG ratings and investment exclusions exhibit less volatility and higher returns compared to those with lower ESG ratings and without investment exclusions during the crisis period. The low-ESG rating funds performed better during normal times, but were also struck harder during the crisis period. This suggests that funds with higher ESG ratings are more resilient to shocks in the market. These results agree with Lins et al. (2017) and Albuquerque et al. (2020). Looking at the different components of sustainability, our analysis shows that environmental-related factors play a predominant role in comparison to the social- and governance-related factors in determining bond mutual fund performance during the COVID-19 crisis. This finding is consistent with those of Ferriani and Natoli (2020) and Garel and Petit-Romec (2020). However, such relationship between environmental scores and fund returns no longer persists during normal times.

## **3.2 Mutual Fund Flows**

### **3.2.1 Different Measures of Fund Flows**

Figure 7 shows the cumulative net fund flows both in billion of US dollars and in percentage terms. As shown in Panel B, bond mutual funds experienced consistent inflows since the beginning of 2019, all the way up till the COVID-19 Crisis (February, 2020). Afterward, bond mutual funds experienced rapid outflows, in which the cumulative net fund flows dropping more than 200 billion dollars or more than 8% of the total fund assets as of February 20th, 2020 within two months. This result contrasts with the equity fund market, in which the

funds experienced outflows both before and during the pandemic period (Pastor and Vorsatz, 2020). Interestingly, the decreasing trend quickly reversed after the Crisis period, and the resurge of capitals into the bond mutual funds market has increased the cumulative net fund flows to almost its pre-Crisis level as of October, 2020.

The net fund returns for each sustainability category during the Crisis period are shown in figure 8 and figure 9. There is no monotonic relationship between ESG globe ratings and fund flows (figure 8). During the Crash period, funds with higher ESG scores (4-Globe and 5-Globe) experienced less severe total cumulative outflows compared to those with low ESG scores (1-Globe and 2-Globe). However, such a trend no longer persists during the Recovery period. Mutual funds that employ exclusions experienced average cumulative inflows while those without experienced average cumulative outflows during most of the Crisis period (Figure 9).

After breaking the ESG scores apart into Environmental, Social, and Governance sub-components, I group the bottom 30% with the lowest E, S, and G risks as the ones with high E, S, and G sustainability scores, and the top 30% with the highest risks as those with low E, S, and G sustainability scores. Again, no monotonic relationship exists between Environmental scores and fund flows: high E score funds experienced less severe cumulative outflows during most of the Crash period (Figure 10). However, as the cumulative flows began to increase during the Recovery period for Low E score funds, those with high E continue to experience outflows (Figure 10). For Social factors, those with higher Social scores experienced more outflows over the entire Crisis period. The result for Governance factors is mixed as well, with high G funds experienced less severe outflows between March 18th â

April 8th, 2020 (Figure 10).

Table 7 Panel A shows the aggregated net bond mutual fund flows for each of the six periods, expressed as a percentage of all bond fundsâ TNA on the first day of each period. As shown in the first column, while the bond mutual funds show net inflow both before and after the crisis, they experience significant outflows during the crisis period. Furthermore, mutual funds with a 5-globe sustainability rating experienced larger outflows compared to those with a rating of 1-globe, and they are experiencing net outflows during the entire period of interest. On the other hand, funds with Investment Exclusions experienced less outflow during the crisis period and more inflows both before and after the Crisis period compared to those without. Table 7 Panel B shows the average fund-level net flows, weighted by each fundâs TNA on the first day of our period of interest. The patterns of the average net flows are similar to those for aggregated net flows. Specifically, more capitals flew out of the funds with higher ESG scores during the Crisis Period. In addition, funds with Investment exclusions experienced consistent money inflows in every period, even during the Crash period.

### **3.2.2 Fund Flow vs Sustainability: Regression Analysis**

Table 8 shows the results of regressions on cumulative net fund flows during the COVID-19 Crisis period. Employes Exclusions and Morningstar star ratings show positive correlations with net fund flows as expected, although most of the coefficients are not significant. Similarly, all coefficients of the 5-Globe Sustainability dummy variable appear to be insignificant. Furthermore, when breaking the Sustainability score into E, S, and G subcomponents, only

the coefficients for E in column 9 is significantly negative and those for other E and for all S and G appear to be statistically insignificant. This result suggests that investors did not view funds with high sustainability scores as safer alternatives to those with lower scores during times of financial crisis.

Table 9 is the regression output for the Pre-crisis period. Morningstar star ratings are positively related to cumulative net fund flows for all levels of controls. What is more noteworthy is the significance and magnitude of the coefficients for Employs Exclusions, which are positive and larger than 0.10 across almost all columns. For instance, in column 12, when all controls are added, bond mutual funds with investment exclusions attracted 21.99% more inflows compared to those without. The coefficients for 5-Globe Sustainability indicator remain to be statistically insignificant except in column 2 and 6, which are significantly negative. However, both coefficients are less than 0.04 in magnitude, which fail to convey much economic significance. Looking at the E, S, G scores individually, higher Environmental scores are associated with net outflows while Social and Governance scores do not play a significant role in determining the level of cumulative net flows. However, the magnitude of outflow associated with higher Environmental scores is too small to result in any economic significance. Therefore, while bond fund flows are positively related to the employment of exclusions, no clear conclusion can be drawn between the relationship of flows and other sustainability measures.

Overall, bond mutual funds experienced consistent inflow of money since the beginning of 2019 and until March, 2020, after which the fund flow suddenly plummeted by more than 200 billion dollars within two months. However, the fund inflow quickly resumed after the

Crisis period and has reached its pre-crisis level by October, 2020. Contrary to the results obtained by Pastor and Vorsatz (2020) on equity mutual funds, we did not find a consistent positive relationship between ESG and net flows with regard to bond mutual funds. While investment exclusions led to larger inflows before the COVID-19 crisis, other sustainability measures are generally shown to play no significant roles, suggesting that investors value some sustainability criteria more than others. Furthermore, even the connection between investment exclusions and fund flows disappeared during the crisis period, implying that investors view sustainability more as an insurance to hedge against potential shocks, but no longer consider it as a safe harbor after the crisis struck. This is more consistent with the findings of Glossner et al. (2020), which shows investors cared less about soft risks during the COVID-19 crisis, and therefore did not choose to transfer money from low-ESG bond funds into their higher-rated counterparts.

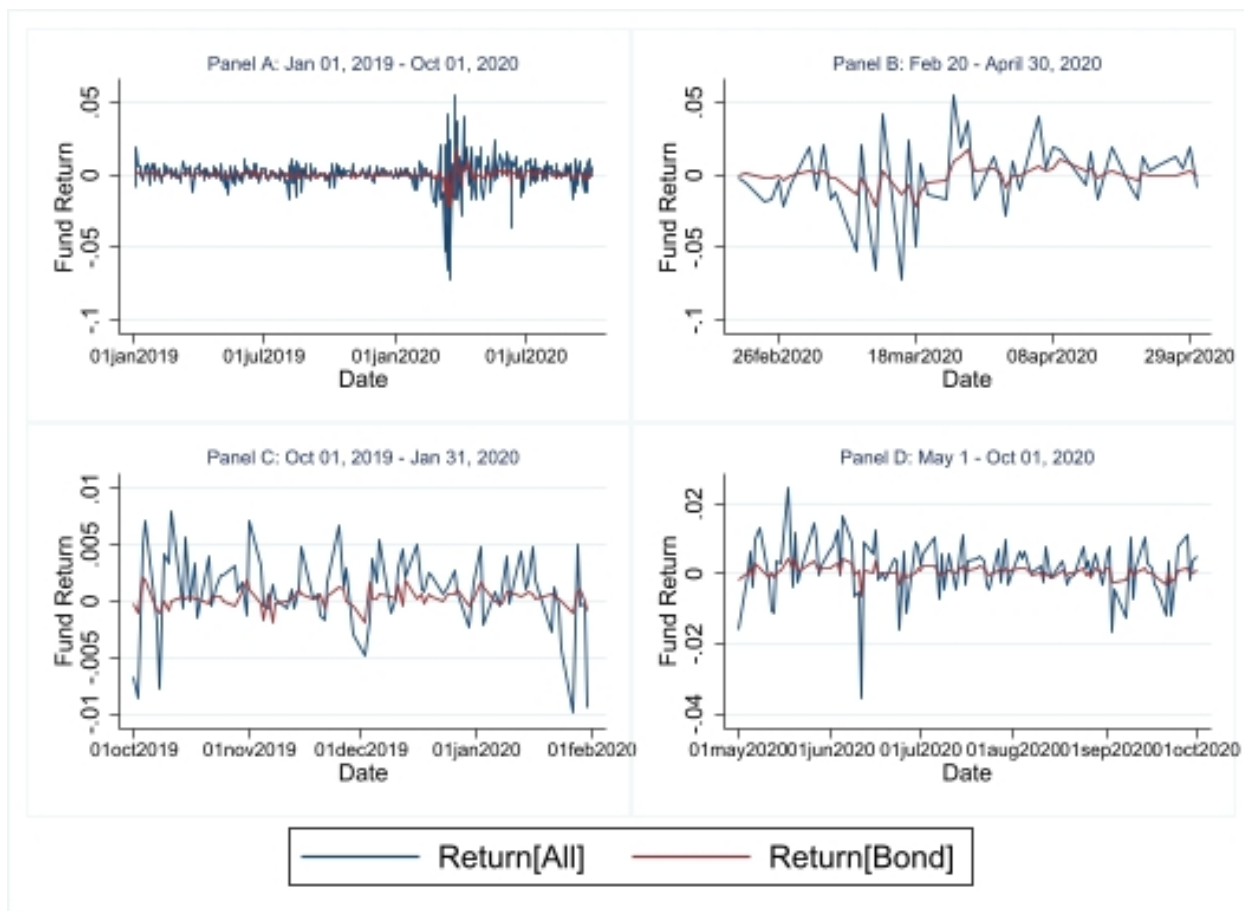
## 4 Conclusion

This research attempts to add more insight into how the COVID-19 Crisis affected the mutual funds market by analyzing returns and flows of bond mutual funds between January 2019 and October 2020. It focuses on investigating the relationship between sustainability and fund performance to see how investors value sustainability and how such valuation is incorporated into their pricing of the securities and investment decisions. Moreover, it looks at how such valuation changes during times of financial difficulties versus normal times.

Our research is the first to provide a comprehensive analysis on the performance of bond

mutual funds during the COVID-19 Crisis period with a focus on their sustainability features. Looking at the factor-adjusted returns, bond mutual funds outperformed the market during normal times but underperformed during the crisis period. Furthermore, bond mutual funds with higher ESG ratings and investment exclusions generated higher returns during the crisis period. However, we find inconsistent result about the relationship between fund flows and sustainability. Specifically, only investment exclusions contributed to more money inflows before the crisis and none of the sustainability measures mattered significantly during the crisis. This appears to be a confounding result that deserves further investigation. Why do investors consider one measure of sustainability (investment exclusions) as more important than the others? Do investors view ESG as a hedging device against future shocks rather than a shelter during the actual event? What are the incentives and reasoning behind bond investorsâ investment decisions, especially during financial crises? By delving deeper into these questions, we might be able to find creative ways to attract more investors to invest in green and clean energy and direct more resources into socially responsible firms, thereby helping facilitate the global transitioning toward a more sustainable society.

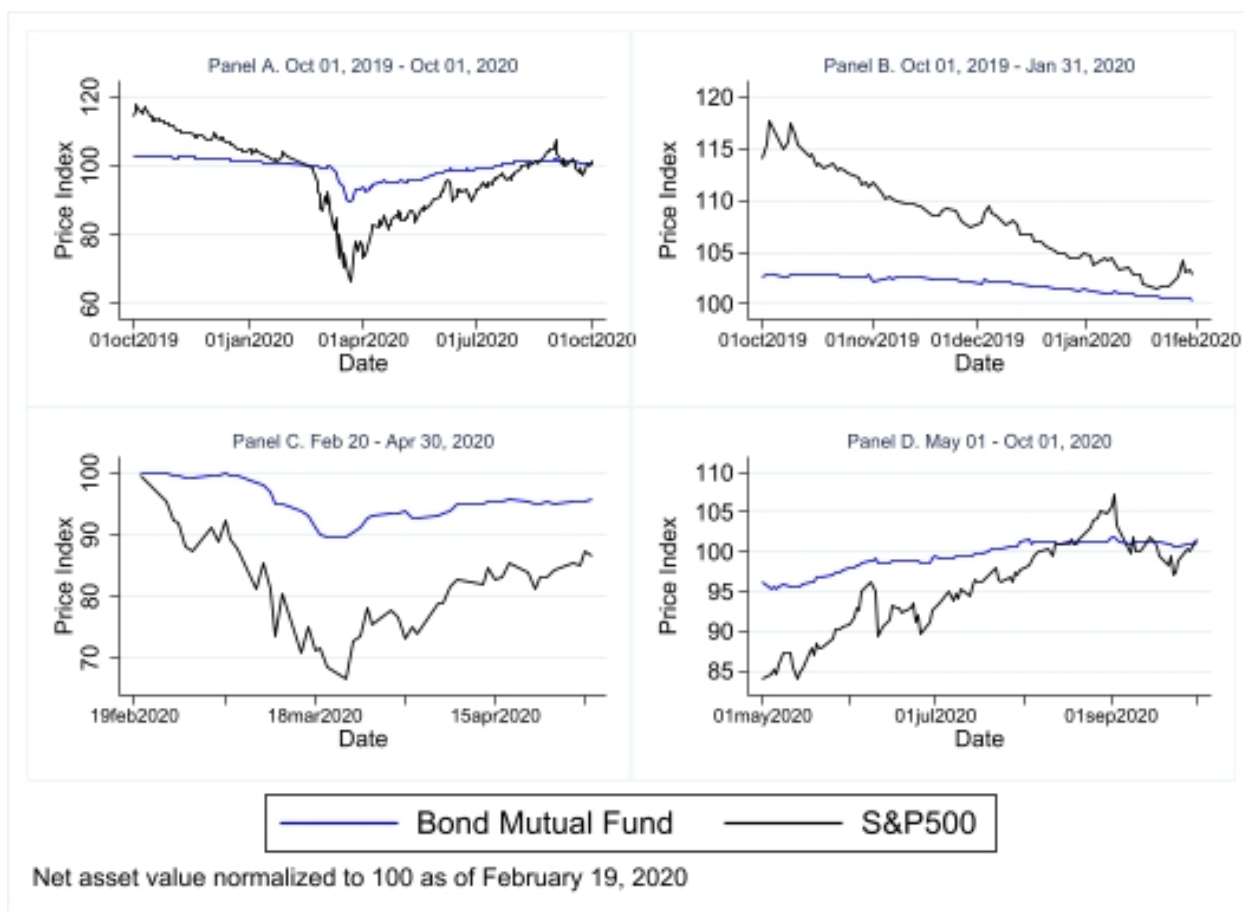
## 5 Figures and Graphs



**Figure 1: Average Net Fund Returns**

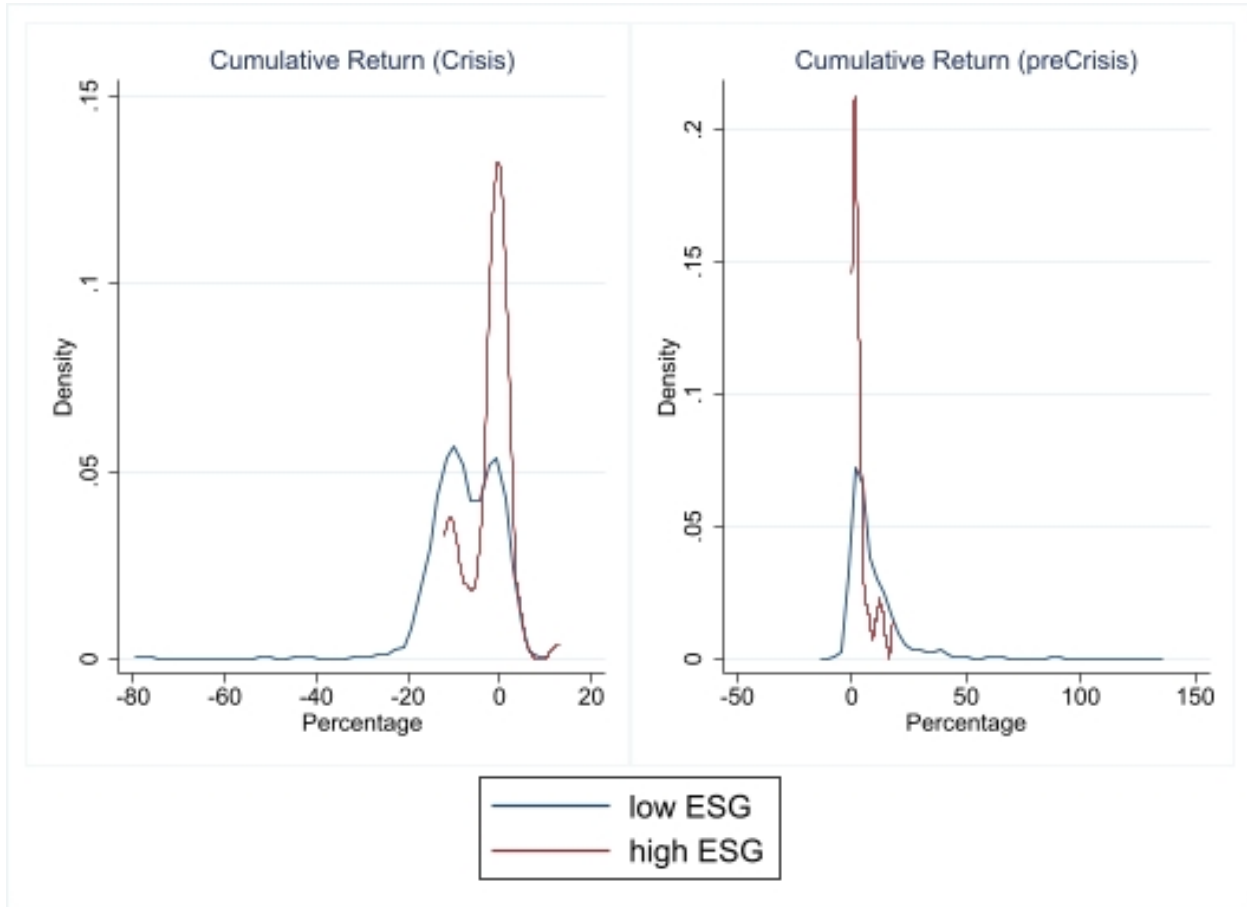
Plotted is the average daily net returns for all mutual funds and bond mutual funds during: 1. the entire period (Panel A); 2. the Crisis period (Panel B); 3. the Pre-crisis period (Panel C); and 4. the Post-crisis period (Panel D).





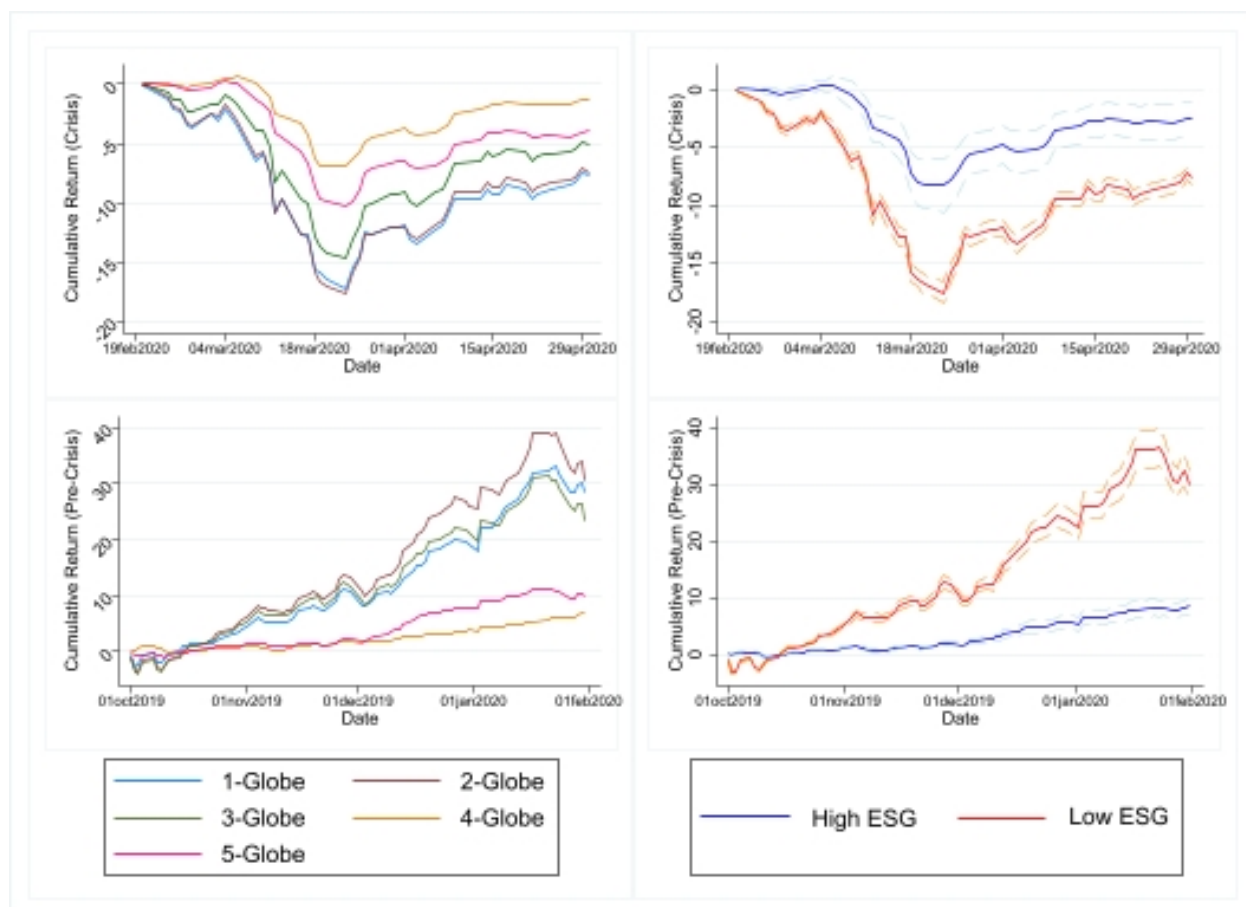
**Figure 2: Bond Fund Performance vs. the S&P 500**

Plotted is the cumulative performance of the average bond mutual funds and the S&P 500 during: 1. the entire period (Panel A); 2. the Pre-crisis period (Panel B); 3. the Crisis period (Panel C) and 4. the Post-crisis period (Panel D). Specifically, the cumulative performance is calculated by normalizing the price indices to 100 as of Feb 20, 2020 and compounding the daily returns over each time period.



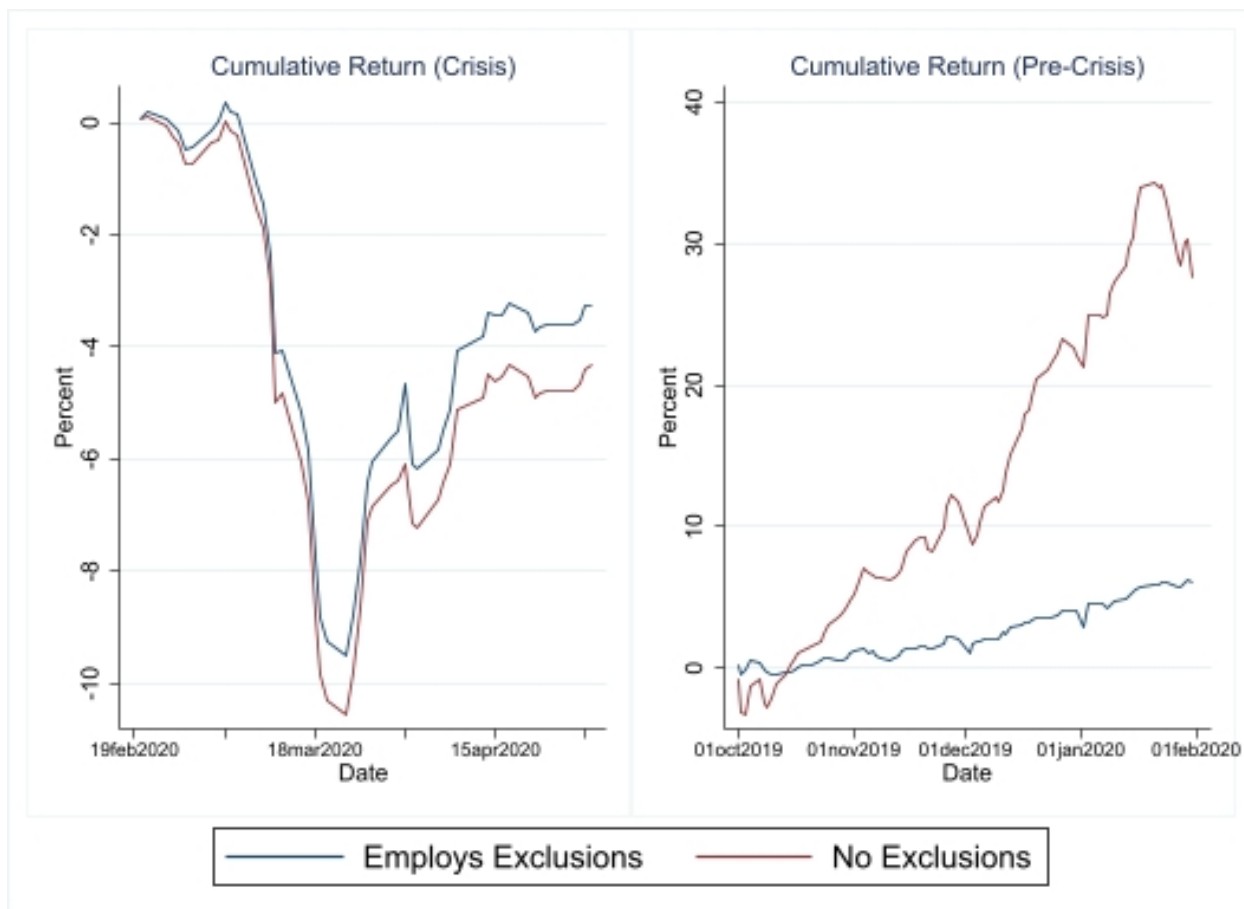
**Figure 3: Log Cumulative Return Densities for High and Low ESG Bond Funds**

Plotted is density functions of the log cumulative returns of bond mutual funds during the Crisis (Panel A) and Pre-crisis (Panel B) period across different sustainability groups. Specifically, a fund with an ESG Morningstar Globe rating of 1 or 2 is characterized as a low ESG fund, and a fund with an ESG Morningstar Globe rating of 4 or 5 is characterized as a high ESG fund. Log Cumulative returns are calculated by taking the log of the compounded daily returns for each period for each sustainability group.



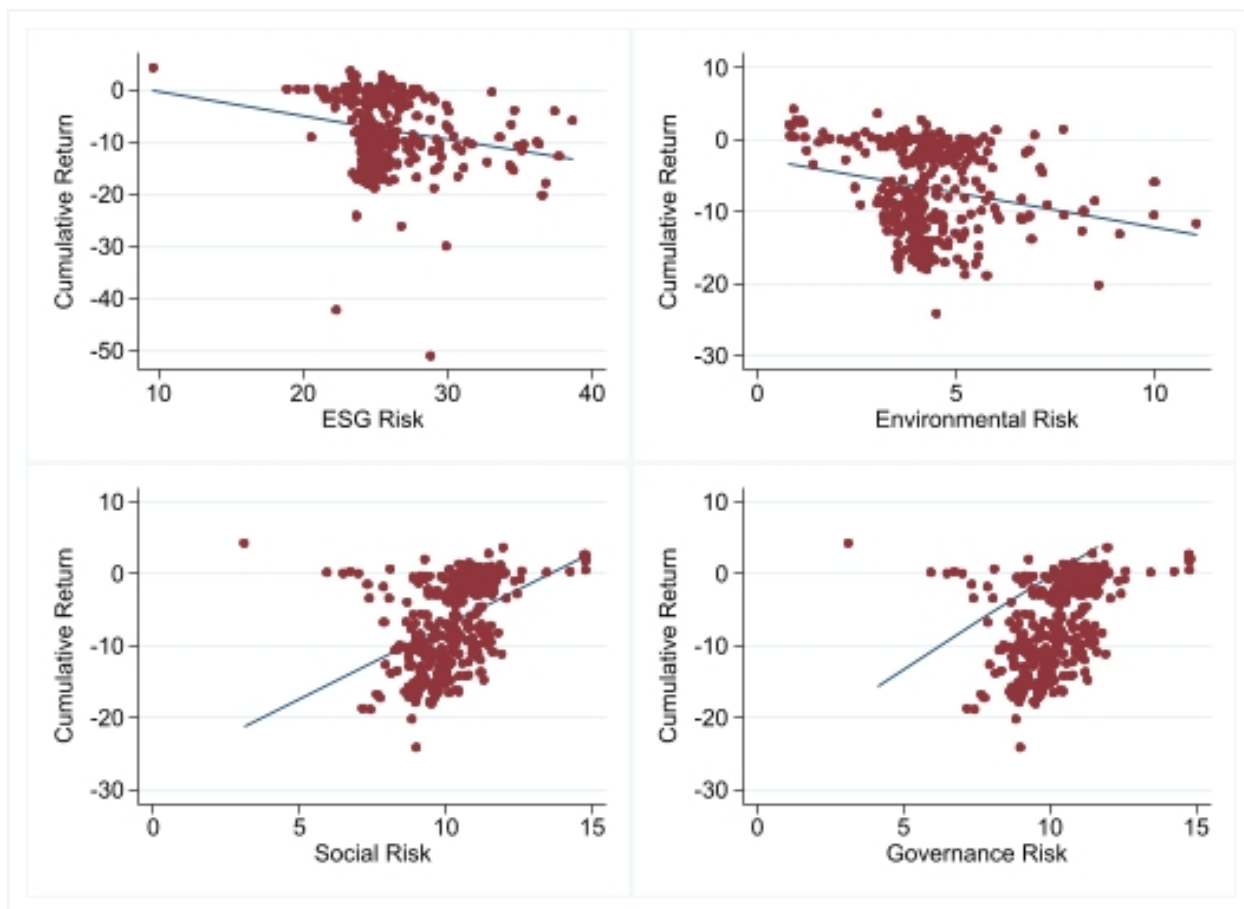
**Figure 4: Cumulative Return Across Sustainability Ratings**

Plotted is the cumulative returns of bond mutual funds during the Crisis and Pre-crisis periods across different sustainability ratings. The left panel is the cumulative returns across 5 different levels of Morningstar ESG Globe ratings. The right panel is the cumulative returns for two different sustainability groups. Specifically, a fund with a ESG Globe rating of 1 or 2 is characterized as a low ESG fund, and a fund with an ESG Globe rating of 4 or 5 is characterized as a high ESG fund. Cumulative returns are calculated by compounding daily returns for each period for each sustainability category. The 95% confidence intervals are shown in dashed lines in the right panel.



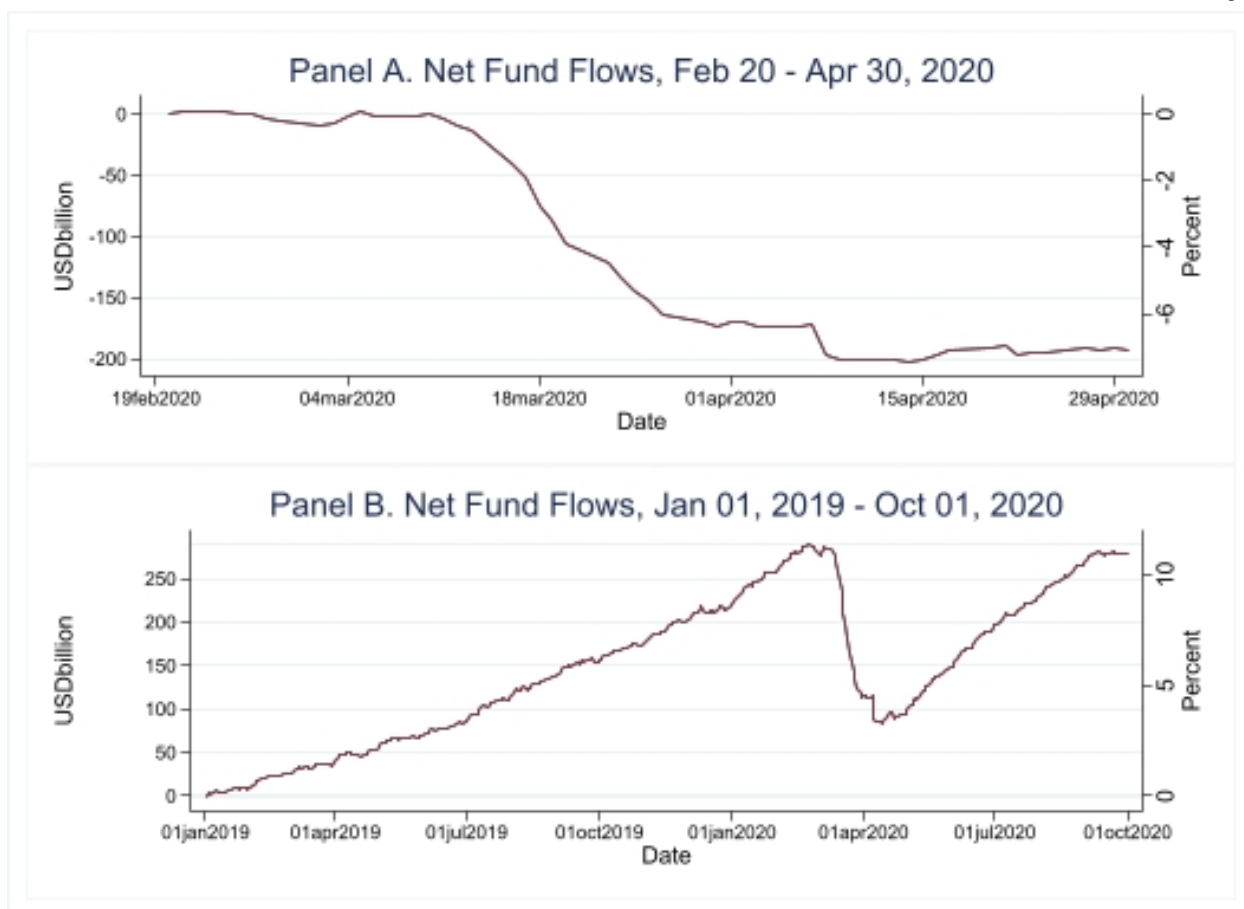
**Figure 5: Cumulative Return Across Exclusions Measures**

Plotted is the cumulative returns of bond mutual funds during the Crisis (Panel A) and the Pre-crisis (Panel B) periods based on whether funds employ investment exclusions or not. Cumulative returns are calculated by compounding daily returns over each period for each Exclusions category.



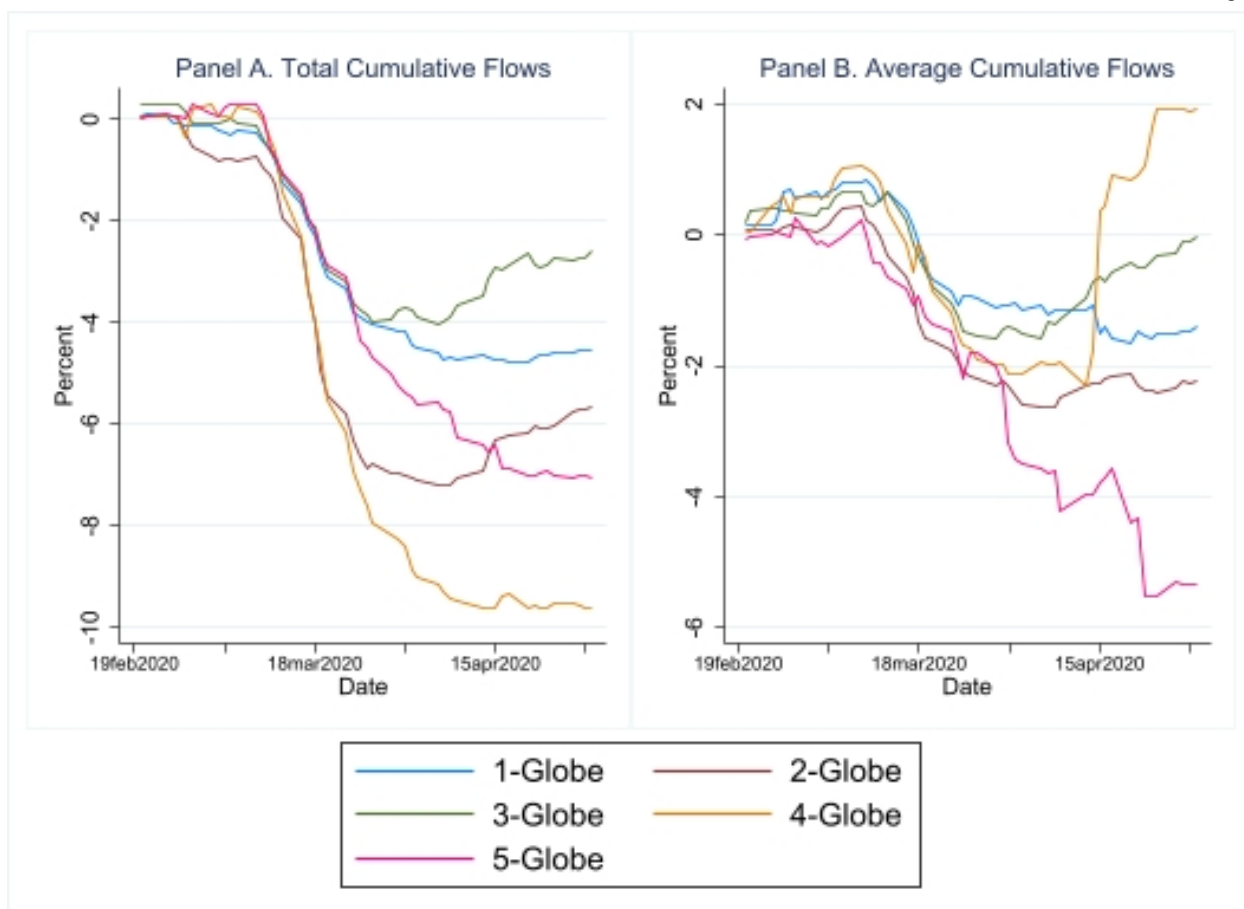
**Figure 6: Cumulative Return Across Components of ESG risk During the Crisis Period**

Plotted is the cumulative returns of bond mutual funds during the Crisis period across different components of ESG risk, namely the (E)nvironmental risk, the (S)ocial risk, and the (G)overnance risk. Funds with more risks have higher risk values. Cumulative returns are calculated by compounding daily returns for each period for each risk category.



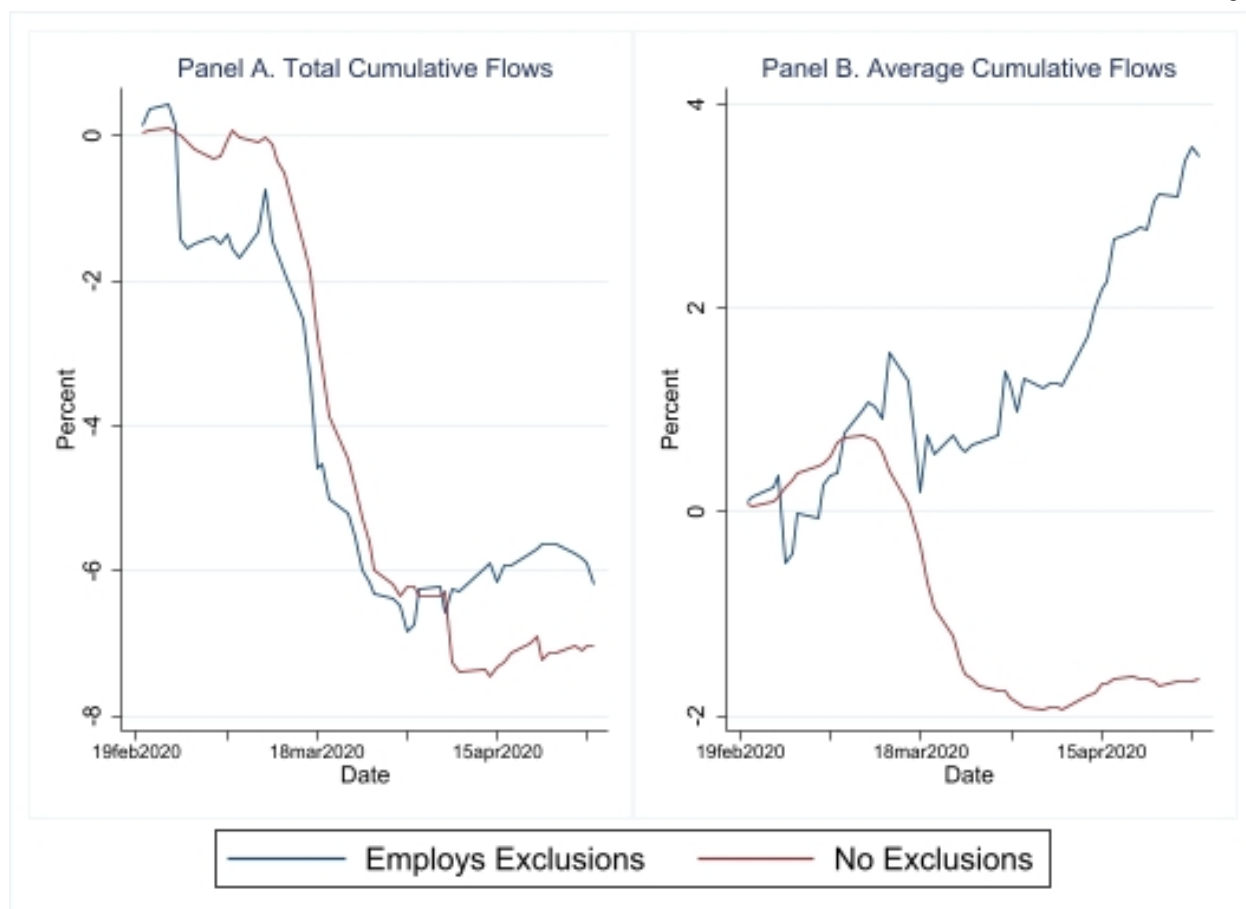
**Figure 7: Cumulative Net Fund Flows**

Plotted is the cumulative net flows for bond mutual funds both in billions of dollars and in percentage terms during: 1. the Crisis period (Panel A) and 2. the entire period (Panel B). Cumulative net flows are calculated by aggregating the daily net fund flows for all bond mutual funds over time. Percentage values are calculated by dividing the cumulative net fund flows by the total net asset of all funds on the first day of our period of interest.



**Figure 8: Fund Flows Across Sustainability Ratings**

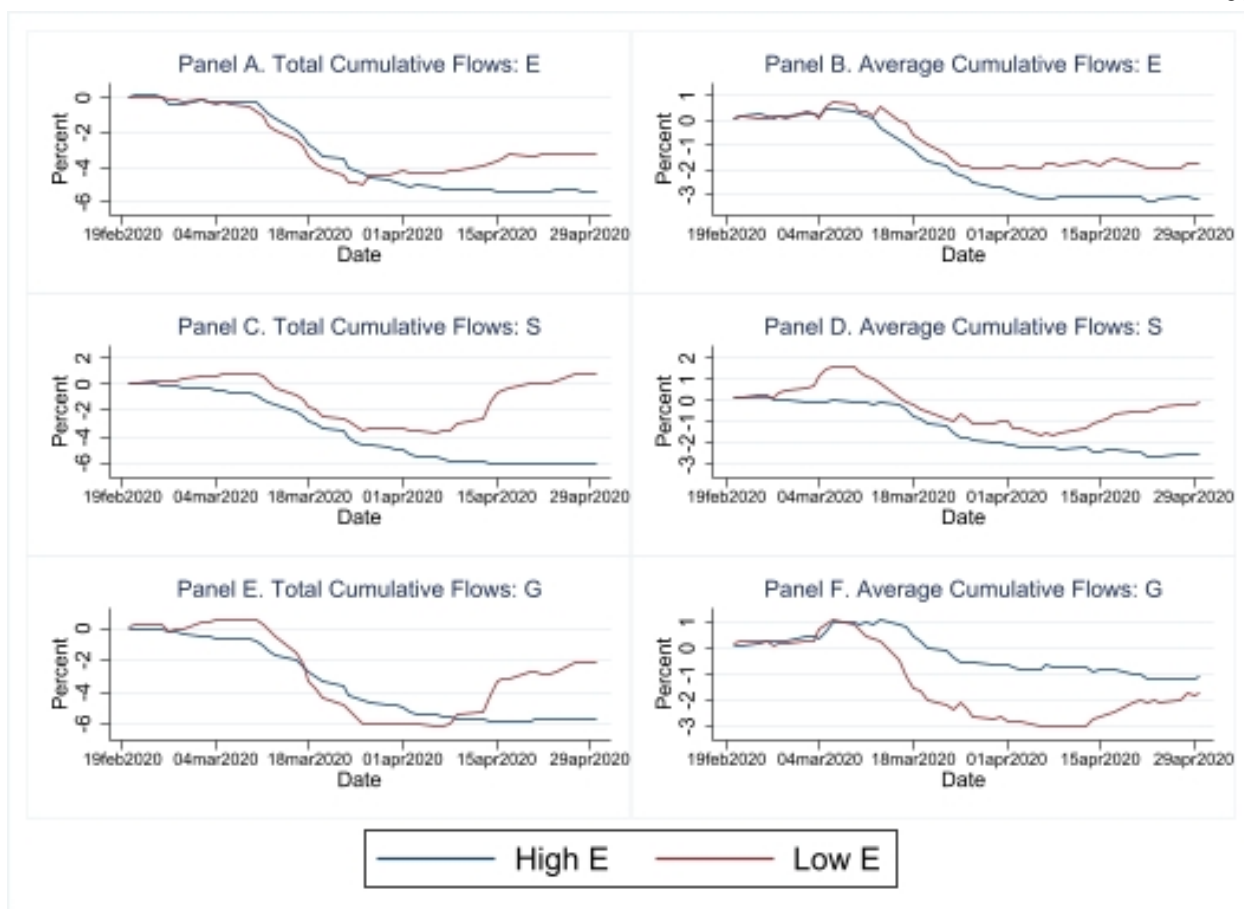
Plotted is the total cumulative net flows (Panel A) and average cumulative flows (Panel B) for bond mutual funds during the Crisis period across 5 different levels of Morningstar ESG Globe ratings. Total cumulative flows are calculated by aggregating the daily net fund flows for all bond mutual funds over time and dividing the result by the total net asset of all funds as of Feb 20, 2020 across each category. Average cumulative flows are calculated as the average of fund-level cumulative flows across each category. Fund-level cumulative flows are computed by aggregating the daily net fund flows for each bond mutual fund over time and dividing the result by the total net asset of the fund as of Feb 20, 2020. The flows are winsorized at the 2.5% and 97.5% levels.



**Figure 9: Fund Flows Across Exclusions Measures**

Plotted is the total cumulative net flows (Panel A) and average cumulative flows (Panel B) for bond mutual funds during the Crisis period based on whether the fund employs investment exclusions. Total cumulative flows are calculated by aggregating the daily net fund flows for all bond mutual funds over time and dividing the result by the total net asset of all funds as of Feb 20, 2020 across each category. Average cumulative flows are calculated as the average of fund-level cumulative flows across each category. Fund-level cumulative flows are computed by aggregating the daily net fund flows for each bond mutual fund over time and dividing the result by the total net asset of the fund as of Feb 20, 2020. The flows are winsorized at the 2.5% and 97.5% levels.





**Figure 10: Fund Flows Across Components of Sustainability**

Plotted is the total cumulative net flows (left panels) and average cumulative flows (right panels) for bond mutual funds during the Crisis period across different components of Morningstar Sustainability ratings, namely the the (E)nvironmental, (S)ocial, and (G)overnance components. Specifically, a fund is characterized as high E, S, or G if it is rated top 30% in the corresponding component, and is characterized as low E, S, or G if it is rated bottom 30% in the corresponding component. Total cumulative flows are calculated by aggregating the daily net fund flows for all bond mutual funds over time and dividing the result by the total net asset of all funds as of Feb 20, 2020 across each category. Average cumulative flows are calculated as the average of fund-level cumulative flows across each category. Fund-level cumulative flows are computed by aggregating the daily net fund flows for each bond mutual fund over time and dividing the result by the total net asset of the fund as of Feb 20, 2020. The flows are winsorized at the 2.5% and 97.5% levels.

**Table 1: All Mutual Fund Performance**

Plotted is the factor-adjusted performance of all mutual funds during different time periods, including All (01, 2019 to October 01, 2020), Crisis (February 20 to April 30, 2020), Crash (February 20 to March 23, 2020), Recovery (March 24 to April 30, 2020), Pre-crisis (October 1, 2019 to January 31, 2020), and Post-crisis (May 1 to October 01, 2020) periods. Panel A contains the annualized equal-weighted average fund alphas from the CAPM model, the Fama-French three factor Model, and the four-factor Carhart Model, all using the excess net fund return as the dependent variable. Panel B is the corresponding annualized value-weighted average fund alphas, weighted by each fund's TNA. Panel C is the fraction of funds that underperformed (i.e. funds with negative alphas) during each time period. Standard errors are clustered on the Morningstar Institutional Category and t-statistics are reported in brackets. A fund's alpha is included in the average only if it has at least 15 non-missing net returns for the time period of interest.

	$\alpha^{\text{CAPM}}$	$\alpha^{\text{FF3}}$	$\alpha^{\text{Car4}}$
<b>Panel A. Average Fund Performance</b>			
All	0.081 [1.17]	0.121 [1.76]	0.125 [1.80]
Crisis	-0.107 [-1.28]	0.013 [0.16]	0.059 [0.68]
Crash	-0.074 [-1.61]	0.001 [0.03]	0.036 [0.87]
Recovery	0.351 [3.10]	0.442 [3.82]	0.555 [4.49]
Pre-Crisis	0.102 [1.15]	0.108 [1.24]	0.109 [1.25]
Post-Crisis	0.145 [1.70]	0.179 [2.12]	0.176 [2.08]
<b>Panel B. Value-Weighted Average Fund Performance</b>			
All	0.032 [0.86]	0.050 [1.38]	0.056 [1.51]
Crisis	-0.039 [-2.22]	0.038 [-0.38]	0.072 [0.37]
Crash	-0.408 [-4.56]	-0.312 [-4.24]	-0.331 [-4.45]
Recovery	0.234 [3.47]	0.291 [4.03]	0.368 [4.37]
Pre-Crisis	0.074 [1.37]	0.069 [1.32]	0.071 [1.35]
Post-Crisis	0.064 [1.90]	0.085 [2.64]	0.082 [2.58]
<b>Panel C. Fraction of Funds Underperforming</b>			
All	0.54	0.44	0.40
Crisis	0.78	0.69	0.59
Crash	0.87	0.84	0.85
Recovery	0.35	0.26	0.23
Pre-Crisis	0.54	0.58	0.57
Post-Crisis	0.39	0.31	0.32

**Table 2: Bond Mutual Fund Performance**

Plotted is the factor-adjusted performance of bond mutual funds during different time periods, including All (01, 2019 to October 01, 2020), Crisis (February 20 to April 30, 2020), Crash (February 20 to March 23, 2020), Recovery (March 24 to April 30, 2020), Pre-crisis (October 1, 2019 to January 31, 2020), and Post-crisis (May 1 to October 01, 2020) periods. Panel A contains the annualized equal-weighted average bond fund alphas from the CAPM model, the Fama-French three factor Model, and the four-factor Carhart Model, all using the excess net fund return as the dependent variable. Panel B is the corresponding annualized value-weighted average fund alphas, weighted by each fund's TNA. Panel C is the fraction of bond funds that underperformed (i.e. funds with negative alphas) during each time period. Standard errors are clustered on the Morningstar Institutional Category and t-statistics are reported in brackets. A fund's alpha is included in the average only if it has at least 15 non-missing net returns for the time period of interest.

	$\alpha^{\text{CAPM}}$	$\alpha^{\text{FF3}}$	$\alpha^{\text{Car4}}$
<b>Panel A. Average Fund Performance</b>			
All	0.043 [1.76]	0.055 [2.16]	0.055 [2.11]
Crisis	-0.153 [-4.22]	-0.095 [-3.28]	-0.020 [-0.69]
Crash	-0.573 [-8.57]	-0.513 [-8.93]	-0.549 [-9.22]
Recovery	0.416 [7.42]	0.463 [7.99]	0.676 [8.71]
Pre-Crisis	0.042 [6.53]	0.025 [7.18]	0.027 [7.64]
Post-Crisis	0.096 [9.30]	0.101 [8.76]	0.100 [8.97]
<b>Panel B. Value-Weighted Average Fund Performance</b>			
All	-0.007 [-0.16]	-0.002 [-0.05]	0.008 [0.18]
Crisis	-0.112 [-3.23]	-0.065 [-2.26]	0.002 [0.08]
Crash	-0.527 [-7.13]	-0.464 [-6.85]	-0.502 [-7.07]
Recovery	0.406 [5.86]	0.438 [6.08]	0.608 [6.34]
Pre-Crisis	0.049 [5.78]	0.025 [6.19]	0.028 [6.36]
Post-Crisis	0.084 [5.55]	0.087 [5.54]	0.086 [5.56]
<b>Panel C. Fraction of Funds Underperforming</b>			
All	0.23	0.17	0.15
Crisis	0.74	0.66	0.49
Crash	0.95	0.93	0.93
Recovery	0.08	0.06	0.05
Pre-Crisis	0.15	0.18	0.17
Post-Crisis	0.08	0.06	0.06

**Table 3: Determinants of Bond Fund Performance During the COVID-19 Crisis (Sustainability Rating)**

Plotted is the estimated slope coefficients from the regressions of bond fund performance on Morningstar sustainability ratings and other features of bond mutual funds during the COVID-19 Crisis period. In Panel A and Panel B, the dependent variables are average excess gross return and average excess net return, respectively, both expressed in percentage terms. In Panel C, the dependent variable is the CAPM alpha, expressed in annualized percentage terms. Morningstar Global Category is included in every regression as style-fixed effects. The industry-level control variables consist of six fixed-income super sectors, including government, municipal, corporate, securitized, cash & equivalent, and derivative sectors. Fund level control variables include the log of the age of the fund expressed in days, the log of the fund TNA as of January 31, 2020, Morningstar medal ratings, turnover ratio as of January 2020, and net expense ratio as of January 2020. Standard errors are clustered on the Morningstar Institutional Category, and t-statistics for coefficients are reported in brackets. A fund's alpha is included in the average only if it has at least 15 non-missing net returns during the crisis period.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Excess Gross Return (%)						
Sustainability (4-5 Globes)	0.36 [2.68]			0.32 [2.31]	0.25 [1.91]	0.28 [2.39]
Employs Exclusions		0.08 [0.58]		0.43 [2.45]	0.53 [2.43]	0.58 [3.14]
Star Rating			0.21 [5.55]	0.38 [6.23]	0.39 [6.49]	0.40 [7.16]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	No	No	Yes	Yes
Industry Controls	No	No	No	No	No	Yes
Observations	685	3139	2466	545	475	475
Adjusted R2	0.13	0.13	0.19	0.25	0.29	0.31
Panel B. Excess Net Return (%)						
Sustainability (4-5 Globes)	0.38 [2.93]			0.33 [2.34]	0.26 [1.94]	0.28 [2.43]
Employs Exclusions		0.08 [0.59]		0.43 [2.41]	0.52 [2.4]	0.57 [3.1]
Star Rating			0.21 [5.71]	0.39 [6.31]	0.39 [6.54]	0.41 [7.22]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	No	No	Yes	Yes
Industry Controls	No	No	No	No	No	Yes
Observations	687	3,178	2,475	545	475	475
Adjusted R2	0.14	0.13	0.19	0.25	0.29	0.32
Panel C. CAPM Alpha (%)						
Sustainability (4-5 Globes)	7.73 [2.25]			6.17 [2.75]	5.27 [2.46]	5.25 [3.03]
Employs Exclusions		2.63 [1.31]		5.42 [1.79]	7.99 [2.18]	9.15 [3.11]
Star Rating			2.24 [4.21]	3.63 [3.81]	3.77 [3.22]	3.83 [3.62]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	No	No	Yes	Yes
Industry Controls	No	No	No	No	No	Yes
Observations	602	2,631	2,043	474	423	423
Adjusted R2	0.12	0.14	0.19	0.17	0.25	0.33

**Table 4: Determinants of Bond Fund Performance Before the COVID-19 Crisis (Sustainability Rating)**

Plotted is the estimated slope coefficients from the regressions of bond fund performance on Morningstar sustainability ratings and other features of bond mutual funds before the COVID-19 Crisis period. In Panel A and Panel B, the dependent variables are average excess gross return and average excess net return, respectively, both expressed in percentage terms. In Panel C, the dependent variable is the CAPM alpha, expressed in annualized percentage terms. Morningstar Global Category is included in every regression as style-fixed effects. The industry-level control variables consist of six fixed-income super sectors, including government, municipal, corporate, securitized, cash & equivalent, and derivative sectors. Fund level control variables include the log of the age of the fund expressed in days, the log of the fund TNA as of January 31, 2020, Morningstar medal ratings, turnover ratio as of January 2020, and net expense ratio as of January 2020. Standard errors are clustered on the Morningstar Institutional Category, and t-statistics for coefficients are reported in brackets. A fund's alpha is included in the average only if it has at least 15 non-missing net returns during the pre-crisis period.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Excess Gross Return (%)						
Sustainability (4-5 Globes)	-0.13 [-2.1]			-0.11 [-1.78]	-0.12 [-1.92]	-0.11 [-1.91]
Employs Exclusions		0.03 [0.96]		-0.03 [-0.45]	-0.01 [-0.08]	-0.02 [-0.33]
Star Rating			0.06 [6.63]	0.12 [5.49]	0.12 [6.09]	0.11 [5.50]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	No	No	Yes	Yes
Industry Controls	No	No	No	No	No	Yes
Observations	702	3,177	2,468	545	475	475
Adjusted R2	0.57	0.48	0.52	0.65	0.63	0.64
Panel B. Excess Net Return (%)						
Sustainability (4-5 Globes)	-0.09 [-1.44]			-0.10 [-1.65]	-0.11 [-1.84]	-0.11 [-1.83]
Employs Exclusions		0.04 [1.33]		-0.03 [-0.45]	-0.01 [-0.17]	-0.03 [-0.44]
Star Rating			0.06 [7.34]	0.13 [5.90]	0.12 [6.23]	0.12 [5.63]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	No	No	Yes	Yes
Industry Controls	No	No	No	No	No	Yes
Observations	704	3,202	2,475	545	475	475
Adjusted R2	0.55	0.48	0.54	0.66	0.64	0.65
Panel C. CAPM Alpha (%)						
Sustainability (4-5 Globes)	-1.78 [-1.96]			-1.64 [-1.47]	-1.83 [-1.64]	-1.66 [-1.50]
Employs Exclusions		0.22 [0.35]		0.32 [0.30]	0.74 [0.62]	0.56 [0.42]
Star Rating			0.85 [8.03]	1.53 [6.85]	1.36 [7.03]	1.33 [7.12]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	No	No	Yes	Yes
Industry Controls	No	No	No	No	No	Yes
Observations	620	2,669	2,043	474	423	423
Adjusted R2	0.41	0.22	0.34	0.47	0.48	0.49

**Table 5: Determinants of Bond Fund Performance During the COVID-19 Crisis (Components of Sustainability)**

Plotted is the estimated slope coefficients from the regressions of bond fund performance on the (E)nvironmental, (S)ocial, and (G)overnance components of Morningstar sustainability rating and other features of bond mutual funds during the COVID-19 Crisis period. In Panel A and Panel B, the dependent variables are average excess gross return and average excess net return, respectively, both expressed in percentage terms. In Panel C, the dependent variable is the CAPM alpha, expressed in annualized percentage terms. Morningstar Global Category is included in every regression as style-fixed effects. The industry-level control variables consist of six fixed-income super sectors, including government, municipal, corporate, securitized, cash & equivalent, and derivative sectors. Fund level control variables include the log of the age of the fund expressed in days, the log of the fund TNA as of January 31, 2020, Morningstar medal ratings, turnover ratio as of January 2020, and net expense ratio as of January 2020. Standard errors are clustered on the Morningstar Institutional Category, and t-statistics for coefficients are reported in brackets. A fund's alpha is included in the average only if it has at least 15 non-missing net returns during the crisis period.

	(1)	(2)	(3)	(4)
Panel A. Excess Gross Return (%)				
E (top 30%)	0.53 [4.61]	0.51 [4.71]	0.49 [4.49]	0.46 [4.23]
S (top 30%)	-0.36 [-2.63]	-0.30 [-1.84]	-0.31 [-1.77]	-0.31 [-1.77]
G (top 30%)	-0.26 [-1.54]	-0.22 [-1.25]	-0.17 [-0.96]	-0.23 [-1.26]
Employs Exclusions		0.43 [1.90]	0.39 [1.77]	0.50 [2.25]
Star Rating		0.23 [3.44]	0.26 [4.23]	0.25 [3.91]
Global Category FE	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes
Industry Controls	No	No	No	Yes
Observations	361	284	247	247
Adjusted R2	0.57	0.59	0.59	0.60
Panel B. Excess Net Return (%)				
E (top 30%)	0.53 [4.70]	0.51 [4.72]	0.49 [4.50]	0.46 [4.26]
S (top 30%)	-0.35 [-2.59]	-0.29 [-1.82]	-0.31 [-1.76]	-0.31 [-1.77]
G (top 30%)	-0.27 [-1.62]	-0.23 [-1.29]	-0.17 [-0.97]	-0.23 [-1.26]
Employs Exclusions		0.42 [1.81]	0.38 [1.72]	0.49 [2.19]
Star Rating		0.24 [3.53]	0.26 [4.23]	0.26 [3.92]
Global Category FE	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes
Industry Controls	No	No	No	Yes
Observations	363	284	247	247
Adjusted R2	0.58	0.59	0.59	0.59
Panel C. CAPM alpha (%)				
E (top 30%)	7.44 [4.44]	7.04 [3.39]	7.08 [3.79]	5.68 [3.02]
S (top 30%)	-6.06 [-2.99]	-5.22 [-1.99]	-4.35 [-1.52]	-3.60 [-1.47]
G (top 30%)	-5.80 [-2.15]	-5.78 [-1.96]	-6.52 [-2.32]	-7.58 [-2.91]
Employs Exclusions		7.53 [2.06]	7.28 [2.10]	9.39 [2.90]
Star Rating		1.99 [1.63]	2.74 [2.41]	2.49 [2.09]
Global Category FE	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes
Industry Controls	No	No	No	Yes
Observations	324	249	221	221
Adjusted R2	0.49	0.47	0.52	0.54

**Table 6: Determinants of Bond Fund Performance Before the COVID-19 Crisis (Components of Sustainability)**

Plotted is the estimated slope coefficients from the regressions of bond fund performance on the (E)nvironmental, (S)ocial, and (G)overnance components of Morningstar sustainability rating and other features of bond mutual funds before the COVID-19 Crisis period. In Panel A and Panel B, the dependent variables are average excess gross return and average excess net return, respectively, both expressed in percentage terms. In Panel C, the dependent variable is the CAPM alpha, expressed in annualized percentage terms. Morningstar Global Category is included in every regression as style-fixed effects. The industry-level control variables consist of six fixed-income super sectors, including government, municipal, corporate, securitized, cash & equivalent, and derivative sectors. Fund level control variables include the log of the age of the fund expressed in days, the log of the fund TNA as of January 31, 2020, Morningstar medal ratings, turnover ratio as of January 2020, and net expense ratio as of January 2020. Standard errors are clustered on the Morningstar Institutional Category, and t-statistics for coefficients are reported in brackets. A fund's alpha is included in the average only if it has at least 15 non-missing net returns during the pre-crisis period.

	(1)	(2)	(3)	(4)
Panel A. Excess Gross Return (%)				
E (top 30%)	0.015 [0.21]	-0.025 [-0.46]	-0.042 [-0.81]	0.004 [0.09]
S (top 30%)	-0.044 [-0.68]	-0.041 [-0.78]	-0.088 [-1.5]	-0.112 [-1.65]
G (top 30%)	-0.104 [-2.21]	-0.033 [-0.99]	-0.033 [-0.67]	-0.025 [-0.48]
Employs Exclusions		-0.177 [-1.66]	-0.154 [-1.48]	-0.173 [-1.52]
Star Rating		0.137 [5.04]	0.128 [5.06]	0.124 [5.09]
Global Category FE	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes
Industry Controls	No	No	No	Yes
Observations	367	284	247	247
Adjusted R2	0.64	0.71	0.69	0.71
Panel B. Excess Net Return (%)				
E (top 30%)	0.027 [0.4]	-0.026 [-0.51]	-0.044 [-0.85]	0.003 [0.05]
S (top 30%)	-0.041 [-0.64]	-0.038 [-0.74]	-0.089 [-1.52]	-0.113 [-1.65]
G (top 30%)	-0.123 [-2.56]	-0.044 [-1.4]	-0.035 [-0.72]	-0.028 [-0.52]
Employs Exclusions		-0.189 [-1.71]	-0.163 [-1.60]	-0.183 [-1.64]
Star Rating		0.141 [5.46]	0.128 [5.12]	0.126 [5.13]
Global Category FE	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes
Industry Controls	No	No	No	Yes
Observations	369	284	247	247
Adjusted R2	0.63	0.71	0.70	0.71
Panel C. CAPM Alpha (%)				
E (top 30%)	-0.50 [-0.57]	-1.14 [-1.53]	-1.51 [-1.92]	-0.72 [-0.93]
S (top 30%)	-2.27 [-3.24]	-2.56 [-3.66]	-2.79 [-4.58]	-2.80 [-4.89]
G (top 30%)	-0.48 [-0.72]	0.40 [0.62]	0.58 [0.99]	0.29 [0.55]
Employs Exclusions		-1.20 [-0.73]	-1.01 [-0.67]	-1.26 [-0.81]
Star Rating		1.61 [5.07]	1.55 [4.80]	1.46 [4.64]
Global Category FE	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes
Industry Controls	No	No	No	Yes
Observations	332	249	221	221
Adjusted R2	0.57	0.62	0.63	0.66

**Table 7: Bond Fund Flows**

Plotted is the fund flows of bond mutual funds during different time periods across different categories. The time periods include All (01, 2019 to October 01, 2020), Crisis (February 20 to April 30, 2020), Crash (February 20 to March 23, 2020), Recovery (March 24 to April 30, 2020), Pre-crisis (October 1, 2019 to January 31, 2020), and Post-crisis (May 1 to October 01, 2020) periods. The categories include the Morningstar ESG Globe rating and whether the fund uses investment exclusions. Panel A contains the aggregate daily net fund flows, expressed in percentage terms. The aggregate net flows are calculated by adding the net flows for all bond mutual funds during each period and dividing the sum by the TNA of all bond mutual funds on the first day of that period for each category. Panel B is the average net fund flows, expressed in percentage terms. The net fund flows are calculated by adding each fund's daily net fund flows within each period and dividing it by the fund's TNA on the first day of that period for each category. The flows are winsorized at the 2.5% and 97.5% levels before averaging. Standard errors are clustered on the Morningstar Institutional Category and t-statistics are reported in brackets.

	(1)	(2)	(3)	(4)	(5)
	All Funds	Sustainability Rating		Investment Exclusions	
		5 Globes	1 Globe	Present	Absent
Panel A. Aggregate Net Fund Flows (%)					
All	10.98	-9.08	-3.12	42.93	11.11
Crisis	-7.06	-7.05	-4.53	-6.18	-7.05
Crash	-4.47	-3.12	-3.32	-5.22	-4.46
Recovery	-2.65	-4.26	-1.49	-1.11	-2.66
Pre-Crisis	3.82	-0.74	0.45	8.21	3.78
Post-Crisis	6.80	-2.51	4.05	17.72	6.68
Panel B. Average Net Fund Flows (%)					
All	33.33	17.76	47.43	110.28	33.24
	[6.69]	[0.77]	[2.47]	[3.01]	[6.94]
Crisis	-0.88	-5.32	-0.20	7.33	-1.11
	[-1.52]	[-3.02]	[-0.13]	[1.42]	[-1.97]
Crash	-1.18	-1.46	-0.17	0.82	-1.22
	[-3.13]	[-1.20]	[-0.17]	[0.76]	[-3.23]
Recovery	-0.29	-4.44	-1.10	7.34	-0.50
	[-0.85]	[-5.12]	[-2.27]	[1.48]	[-1.63]
Pre-Crisis	4.08	5.86	5.83	21.15	3.67
	[6.20]	[1.56]	[3.03]	[3.53]	[6.11]
Post-Crisis	7.49	6.33	4.37	44.29	6.82
	[6.91]	[0.81]	[1.28]	[3.28]	[6.39]



**Table 8: Determinants of Bond Fund Flows During the COVID-19 Crisis**

Plotted is the estimated slope coefficients from the regressions of bond fund net fund flows on Morningstar ESG Globe ratings, different components of Sustainability (i.e. (E)nvironmental, (S)ocial, and (G)overnance components), and other features of bond mutual funds during the COVID-19 Crisis period. Fund-level net flows are calculated by adding each fund's daily net fund flows within the crisis period and dividing it by the fund's TNA on February 20, 2020. The flows are winsorized at the 2.5% and 97.5% levels. Morningstar Global Category is included in every regression as style-fixed effects. The industry-level control variables consist of six fixed-income super sectors, including government, municipal, corporate, securitized, cash & equivalent, and derivative sectors. Fund level control variables include the log of the age of the fund expressed in days, the log of the fund TNA as of January 31, 2020, Morningstar medal ratings, turnover ratio as of January 2020, and net expense ratio as of January 2020. Standard errors are clustered on the Morningstar Institutional Category, and t-statistics for coefficients are reported in brackets.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5-Globe Sustainability	-0.044	-0.032	-0.020	-0.018		-0.031	-0.019	-0.018				
	[-1.90]	[-1.51]	[-0.82]	[-0.70]		[-1.42]	[-0.80]	[-0.68]				
Employs Exclusions					0.055	0.026	0.013	0.010		0.012	0.010	0.008
					[2.50]	[1.20]	[0.73]	[0.56]		[0.36]	[0.28]	[0.22]
Greener E									-0.036	-0.020	-0.022	-0.013
									[-2.66]	[-1.29]	[-1.23]	[-0.70]
Greener S									-0.037	-0.030	-0.025	-0.024
									[-1.69]	[-1.39]	[-1.26]	[-1.28]
Greener G									0.031	0.002	-0.005	-0.005
									[1.25]	[0.11]	[-0.29]	[-0.33]
Star Rating		0.013	0.013	0.015		0.013	0.013	0.015		0.001	0.003	0.001
		[1.68]	[1.70]	[1.96]		[1.69]	[1.71]	[1.95]		[0.14]	[0.37]	[0.08]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Industry Controls	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes
Observations	524	413	411	411	2,218	413	411	411	279	212	212	212
Adjusted R2	0.02	0.04	0.11	0.11	0.04	0.03	0.11	0.11	0.04	0.01	0.10	0.12

**Table 9: Determinants of Bond Fund Flows Before the COVID-19 Crisis**

Plotted is the estimated slope coefficients from the regressions of bond fund net fund flows on Morningstar ESG Globe ratings, different components of Sustainability (i.e. (E)nvironmental, (S)ocial, and (G)overnance components), and other features of bond mutual funds before the COVID-19 Crisis period. Fund-level net flows are calculated by adding each fund's daily net fund flows within the pre-crisis period and dividing it by the fund's TNA on October 01, 2019. The flows are winsorized at the 2.5% and 97.5% levels. Morningstar Global Category is included in every regression as style-fixed effects. The industry-level control variables consist of six fixed-income super sectors, including government, municipal, corporate, securitized, cash & equivalent, and derivative sectors. Fund level control variables include the log of the age of the fund expressed in days, the log of the fund TNA as of January 31, 2020, Morningstar medal ratings, turnover ratio as of January 2020, and net expense ratio as of January 2020. Standard errors are clustered on the Morningstar Institutional Category, and t-statistics for coefficients are reported in brackets.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5-Globe Sustainability	-0.023	-0.036	-0.011	-0.014		-0.029	-0.006	-0.009				
	[-0.64]	[-2.80]	[-0.51]	[-0.64]		[-2.32]	[-0.27]	[-0.41]				
Employs Exclusions					0.126	0.127	0.112	0.107		0.227	0.219	0.220
					[2.95]	[1.67]	[1.61]	[1.52]		[2.00]	[2.07]	[2.05]
Greener E									-0.058	-0.038	-0.038	-0.048
									[-1.88]	[-2.58]	[-2.14]	[-3.34]
Greener S									0.013	0.023	0.012	0.013
									[0.50]	[0.74]	[0.45]	[0.47]
Greener G									0.016	-0.005	0.002	0.005
									[0.58]	[-0.14]	[0.07]	[0.16]
Star Rating		0.026	0.023	0.025		0.027	0.024	0.025		0.041	0.038	0.041
		[3.72]	[3.38]	[2.96]		[4.10]	[3.67]	[3.21]		[2.77]	[2.76]	[2.77]
Global Category FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-Level Controls	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Industry Controls	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes
Observations	540	420	417	417	2,305	420	417	417	286	216	216	216
Adjusted R2	0.04	0.05	0.20	0.20	0.03	0.07	0.22	0.21	0.10	0.19	0.27	0.25

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