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# The Impact of ESG Ratings on Exchange-Traded Fund Flows

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## Abstract

The aim of our paper is to examine the impact of environmental, social, and governance (ESG) ratings on investment decisions in the pre-pandemic US bond and equity exchange-traded fund (ETF) markets. We measure the attractiveness of investments in the ETF as net fund flows and estimate whether the attractiveness varies with the ESG score. For empirical estimations, we employ the regression analysis methodology; specifically, we use linear mixed-effect model to analyze time-series dataset and ordinary least squares to analyze the cross-section data. On the one hand, we found that, on average, ETFs which comply with ESG criteria attracted additional net assets per month as compared to conventional ETFs. Thus, the results of our study indicate that investors demonstrate collective preference towards ESG investments and pay attention to the information on whether the ETF complies with the ESG criteria. On the other hand, we found mixed evidence that higher ESG score always leads to larger investments: differences in scores could not explain the variation in net fund flows. Overall, our study shows that ETF market investments are not directed by the risk-return profile only, and investors also have non-pecuniary motives for their decisions. The results have several practical implications. First, our findings offer business entities useful insight into the fact that incorporation of ESG policy can increase the attractiveness of their business for potential investors. Second, it shows that the market participants would benefit from increasing transparency and unification of rating methodology.

**Keywords:** exchange-traded funds, sustainable finance innovation, ESG score, ESG compliance

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## Introduction

Since firms significantly increase expenses for environmental, social, and governance (ESG hereafter) activities, the financial market's assessment of the shift toward sustainability and social responsibility gains importance. The reallocation of fund flows to ESG assets has major implications for investment decisions [1], and several studies suggested the introduction of investor's personal tastes into the asset pricing model [2] – particularly, the inclusion of preferences for sustainable investment [3]. However, while some investors may have strong inclinations towards highly rated ESG assets because of non-pecuniary motives, others may consider the information on risk-return profiles as a framework for their decisions [4]. The overall reaction of market participants to ESG-related information remains a debatable issue and requires additional theoretical and empirical examination [e.g. 3; 5].

In this study, we attempt to assess the ESG preferences of investors and the impact of the ESG rating on the attractiveness of exchange-traded funds (ETF hereafter). ETFs are investment entities that track an index or a basket of assets [6]. For the past decade, the ETF industry has become a primary competitor for actively managed funds [7]. Since the shift of conventional wisdom in favor of passive investment strategies, the total net assets of ETFs have been growing rapidly [8]. The rise of the ETF market has been studied by numerous researchers, but relatively little attention has been heeded to the relationship between ESG policies and investments in the ETF market. Recently, several financial scholars examined the impact of the ESG rating on the financial performance and riskiness of ETF investments [1; 9–11]. The primary focus of our study is on fund flows as an indicator of ETF attractiveness for investors [e.g. 5]. We use two measures to capture the ESG-related information. First, the fact for an ETF of being compliant with ESG criteria is obtained from the MSCI ESG Score and the Morningstar's list of socially conscious funds. Second, the difference in MSCI ESG Score of ETFs measures the ability of underlying assets to manage risks and opportunities arising from ESG factors. These metrics are used to assess (1) whether ESG ETFs attract more investments as compared with the conventional ETFs, and (2) whether a higher level of ESG score is associated with the higher level of investments.

The main contribution of this paper is twofold. Firstly, the results indicate that ETFs that comply with ESG criteria attracted more investments in US bond and equity ETF markets from 2018 to 2020. Thus, our study provides evidence of nonfinancial incentives of investors in ETF: overall, the financial market rewards ESG ETFs with additional investment flows. Secondly, we could not find evidence that market participants consider the differences in the ESG score. The ESG score of ETFs does not explain the variation in the fund flows. Such investment behavior is consistent with previous findings that investors tend to react to basic sustainability metrics [e.g. 5] and often ignore complicated information in their decision-making process [e.g. 12].

The rest of the paper proceeds as follows. Second section offers a review of academic literature concerning ESG information in financial decision-making. In this section, we state the main hypotheses concerning the non-pecuniary motives of ETF investors and the role of the ESG score in decision-making. Sections three and four describe the methodology and data. Section five outlines the empirical results of the econometric analysis. Finally, Section six concludes with the discussion of results and its theoretical and practical implications as well as the limitations of our study and avenues for further research.

## Development of hypotheses

### Do investors in ETFs have non-pecuniary motives?

While ESG-compliant assets attract more funding, the important question concerns the reasons behind this tendency: whether it is a reflection of the attractiveness of related segments of the financial market, or a shift from conventional instruments to ESG-motivated investments. As the share of sustainable investments increases [13], a growing number of studies have examined the factors influencing the attractiveness of such financial instruments [14]. Several studies analyzed the market performance of ESG-compliant financial instruments. However, the evidence is mixed [e.g. 14]. Some empirical studies discovered that the ESG investing may reduce risk and provide superior returns. The attractiveness of investments in ESG assets was confirmed by T. Kanamura, A. Borgers et al., and T. Barko et al. [1; 15–16]. A. Amel-Zadeh and G. Serafeim showed that for investors the key motivation to use ESG information is its relevance to investment performance [17]. Other studies found evidence of low returns on socially responsible investments [18–23]: these authors suggest that ESG-motivated investors underperform in the market due to the non-pecuniary utility, which means sacrificing returns in order to invest responsibly.

To reconcile these contradictory empirical results, several studies explicitly incorporated non-financial incentives into modern portfolio theory. A prominent example of such theoretical research is E. Fama and K. French, who studied how the personal preferences of investors may affect asset prices in a real-world economy [2]. In a recent study L. Pedersen et al. developed an asset pricing model by including the ESG attitude of investors and proposed an ESG-adjusted asset pricing model [3]. Their model predicts that the proportion of different types of investors affect both the returns and resource allocation in the financial market.

Recent literature treats the attitude of investors toward ESG as an important factor that affects market resource allocation [e.g., 5]. In our study, we assume that ETF market investors are aware of ESG policy and pay attention to the general ESG-related information. The fact that an ETF complies with ESG criteria is important information in making investment decisions. Hence the first hypothesis states:

H1a: The compliance of a bond ETF with ESG criteria positively affects ETF flows.

H1b: The compliance of an equity ETF with ESG criteria positively affects ETF flows.

## Do investors pay attention to the ESG Score?

Despite the progress that companies have made in disclosing their ESG performance during the last decade, the assessment of ESG factors usually entails high costs [24–26]. Therefore, rating agencies play an important mediatory role between firms and investors, provide information influencing investors' decisions and may thus direct fund flows in the financial market [27–28].

Several studies emphasized various challenges that ranking agencies had to deal with [11; 29]. First, investors often do not behave as rational agents, and look for simpler signals while making a decision [e.g., 12]. For ESG performance, the literature suggests that investors tend to respond to the highly ranked assets and ignore the others [e.g., 5; 30]. Some researchers warn that naive use of primary information on ESG ranking may be misleading [31], since non-expert investors face difficulties in linking numerous sustainability concepts in a coherent way [32].

Second, the uncertainty of ESG-related information constitutes an additional obstacle in decision-making. There are no uniform standards in ESG information disclosure, and rating agencies provide various ESG scores using opaque methods; the variability of approaches to the ESG ratings of firms may lead to biased investors' decisions in cases of information abundance [33]. The lack of unified methodology for assigning company-specific ratings increases the gap between the ESG scores of different ESG rating providers [31; 34].

Thus, to test whether a high ESG score increases the attractiveness of ETFs for investors, we developed the second hypothesis as follows:

H2a: A ESG score positively affects flows to bond ETFs.

H2b: A ESG score positively affects flows to equity ETFs.

## Methodology

### Modeling the ESG compliance effect

We tested hypotheses H1a and H1b using linear mixed-effect model [e.g., 35]. In order to estimate the impact of ESG compliance on fund flows, we use the following model specification for ETF  $i$  and month  $t$ :

$$\begin{aligned} FlowTNA_{i,t} = & \beta_0 + \beta_1 ESG\ Compliance_{i,t} + \beta_2 ER_{i,t} + \\ & + \beta_3 Return_{i,t} + \beta_4 Log\ Holding_{i,t} + \beta_5 Price\ NAV_{i,t} + \\ & + \beta_6 Log\ Age_{i,t} + \beta_7 Spread\ Price_{i,t} + \\ & + \beta_8 Log\ Turnover_{i,t}. \quad (1) \end{aligned}$$

Table 1 provides the definition of variables. The dependent variable is the one-year fund flow to net total assets ratio ( $Flow\ TNA_{i,t}$ ), which is a proxy for the attractiveness

of the ETF. Since one of the major advantages of passive investments is low managerial fees, we control the model for expense ratio ( $ER_{i,t}$ ) and assume that even a small increase is associated with a fall of fund flows [36]. High returns ( $Return_{i,t}$ ) for the previous period, as one of the major motives to invest, positively affects the attractiveness of an ETF [1]. The number of underlying securities ( $Log\ Holding_{i,t}$ ) is assumed to have a positive effect, since investors may have concerns about small numbers of holdings [37]. The ratio of the fund's market price to its book value ( $Price\ NAV_{i,t}$ ) may represent the inflows to ETFs. The assets of the newly launched ETF are expected to grow faster in percentage terms, indicating the larger inflows. Thus, the age of the fund ( $Log\ Age_{i,t}$ ) is expected to have a negative impact on asset-weighted fund flows [36]. The turnover ( $Log\ Turnover_{i,t}$ ) controls for fund liquidity, which should have a positive effect [36]. Likewise, the bid-ask spread ( $Spread\ Price_{i,t}$ ) shows the fund's liquidity.

**Table 1.** List of variables (ESG compliance effect modelling)

Variable	Description
<b>Dependent variable</b>	
Flow TNA	The ratio of monthly fund flow divided by total net assets (TNA), %
<b>Independent variable</b>	
ESG compliance	Dummy variable, 1 – the fund complies with the ESG criteria, 0 – otherwise
<b>Control variables</b>	
ER	Expense ratio set by the fund, %
Return	Aggregated monthly return lagged for one month, %
Log Holdings	Natural logarithm of the number of securities owned by the fund
Price NAV	Price of the ETF to the fund's Net Asset Value, %
Log Age	Natural logarithm of the age of the fund, months
Spread Price	Ratio of the ETF's price spread to its price, %
Log Turnover	Natural logarithm of turnover divided by the total amount traded

We structure the panel data set of ESG-compliant ETFs and conventional ETFs using data provided by MSCI for March 2020 (available at ETF Database – ETFdb.com). Only ETFs included in both MSCI data and Morningstar's list were considered to be ESG compliant. To construct a

comparison subsample of conventional ETFs, we followed the procedure described below. First, we identified the list of issuers of ESG-compliant ETFs. Therefore, all conventional ETFs were combined in the pool of potential match-

$$Match_{i,j} = \frac{(FlowTNA_i - FlowTNA_j)^2}{\sigma_{TNA}^2} + \frac{(Age_i - Age_j)^2}{\sigma_{Age}^2} + \frac{(ER_i - ER_j)^2}{\sigma_{ER}^2} + \frac{(Holdings_i - Holdings_j)^2}{\sigma_{Holdings}^2}, \quad (2)$$

where,  $\sigma$  is the cross-sectional deviation.

Following L. Renneboog et al., we restricted potential matches among conventional ETFs to be no more than 2 years older or younger than the ESG-compliant ETF [39]. This prevents an estimation bias of life-cycle effects and macroeconomic time-series effects. To construct panel A, for each ESG compliant ETF, we added one conventional ETF using the matching measure. Similarly, we constructed panel B by matching one ESG-compliant ETF to two conventional ETFs. Since several ESG-compliant ETF providers had less than two conventional ETFs, some matches have different issuers. The final subsamples of ESG compliant bond ETFs and ESG compliant equity ETFs covers 15 and 42 funds respectively. The lists of conventional and ESG compliant funds are provided in Appendix A.

### Modeling the ESG score effect

In order to test the effect of ESG score, we estimate the following regression model using the ordinary least squares (OLS hereafter) method:

$$FlowTNA_i = \beta_0 + \beta_1 ESG\ Score_i + \beta_2 ER_i + \beta_3 Return_i + \beta_4 Log\ Volume_i + \beta_5 SD_i + \beta_6 Log\ Age_i + \beta_7 Volatility_i. \quad (3)$$

In the case of heteroscedasticity, we applied OLS with Huber-White robust standard errors (the results of heteroscedasticity testing are in the Appendix). Table 2 provides the definition of variables of the regression equation. As in the case of the time-series model, the dependent variable is the one-year fund flow to net total assets ratio ( $Flow\ TNA_i$ ). We considered five proxies of ESG measures for different model specifications. In Model 1, ETFs' ESG scores are provided by MSCI for March 2020 (available at ETF Database – ETFdb.com). The MSCI Inc. dominates the market of ESG ranking data providers, covering about 40% of the entire market [40]. In Model 2, the ESG score peer percentile ( $ESG\ Peer_i$ ) normalizes the ESG score to other ETFs in the same peer group. In model 3, the ESG score global percentile ( $ESG\ Global_i$ ) normalizes the ESG score to all funds in the MSCI ESG Fund Metrics coverage. In Model 4, SRI exclusion criteria ( $ESG\ Exclusion_i$ ) allows us to identify the level of funds' exposure to companies involving at least one SRI exclusion factor (e.g., alcohol, gambling, weapons, etc.). In Model 5, sustainable impact solutions ( $Sustainable\ Impact_i$ ) is the portfolio weighted average of each company's percentage of revenue generated by Sustainable Impact Solutions goods and services. In the cross-section model, we additionally control for a standard deviation of return ( $SD_i$ ) which is a measure of invest-

es for ESG ETFs. In the second step, we conducted further matching based on asset-adjusted fund flows, exploited age, expense ratio, and the number of holdings, following [38–39]:

ment riskiness that is expected to have a negative impact on fund flows [9]. The average traded volume of a fund ( $Log\ Volume_i$ ) demonstrates the overall activity [41]. It is expected to have a positive effect. Finally, we expect the positive relationship between adjusted fund flows and fund volatility ( $Volatility_i$ ) for the last 200 days, compared to its peer group in ETFdb.com [39].

**Table 2.** List of variables (ESG score effect modelling)

Variable	Description
<b>Dependent variable</b>	
Flow TNA	The ratio of one-year fund flow divided by total net assets (TNA), %
<b>Independent variable</b>	
ESG Score	MSCI ESG score, 1 to 10
ESG Score Peer Percentile	Measure of how the ESG score of ETF ranks relative to other funds in the same peer group, %
ESG Score Global Percentile	Measure of how the ESG score of ETF ranks relative to all funds in MSCI ESG Fund Metrics coverage, %
SRI Exclusion	ETF's exposure to companies flagged for at least one SRI exclusion factors (e.g., alcohol, gambling, weapons), %
Sustainable impact	Portfolio weighted average of each company's percent of revenue generated by Sustainable Impact Solutions goods and services, %
<b>Control variables</b>	
ER	Expense ratio set by the fund, %
Return	Aggregated annual return for the previous year, %
Log Volume	Logarithm of a fund's average traded volume, \$
SD	Standard deviation of a fund's returns, %
Log Age	Logarithm of Age of fund, months
Volatility	Volatility of the fund for last 200 days, compared to its peer group in ETFdb.com, %

## Data

For the purposes of empirical testing, we collected 2 data samples for each model. The first sample covers the period from March 2018 to March 2020. A significant part of ESG-compliant ETFs were founded in 2015 and later, thus, it is impossible to collect earlier data appropriate for empirical study in the case

of ESG ETFs [42]. According to Statista, the value of Global ESG ETF assets started growing rapidly in 2017–2018 [43]. Besides, the sample is limited to the beginning of 2020, due to the Covid-19 pandemic's harsh impact on the economy and financial markets [11].

We use balanced panel data with financial information from the Bloomberg database. We employ the fund flow to the net total assets ratio as a dependent variable. Return of the funds, age and expense ratio are also included as independent variables. Additionally, we control for the number of securities owned by

the ETFs, the ratios of the ETF's price to net assets, the ETF's price spread to its price, and the turnover ratio of the funds. Table 3 presents the descriptive statistics for bond ETFs based on panel data. For the majority of variables, both panels have similar results.

**Table 3.** Descriptive statistics of bond ETFs based on panel data

Panel A: Bond ETFs 1-1												
	Variables	Mean	St.Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Flow TNA	0.017	0.128	1								
(2)	ESG compliance	0.500	0.500	0.180***	1							
(3)	ER	0.003	0.002	-0.014	-0.038	1						
(4)	Return	0.369	1.269	0.049	0.063*	-0.047	1					
(5)	Log Holdings	5.347	1.837	0.057	0.230***	-0.230***	0.005	1				
(6)	Price NAV	1.000	0.003	0.120***	0.200***	0.080**	0.078**	-0.049	1			
(7)	Log Age	3.541	0.903	-0.130***	-0.130***	0.021	0.070*	-0.180***	-0.170***	1		
(8)	Spread Price	0.304	8.140	-0.005	-0.037	0.014	-0.012	-0.085**	-0.013	0.020	1	
(9)	Log Turnover	15.597	2.428	0.150***	0.280***	0.080**	0.073**	0.270***	0.059	0.090**	-0.036	1

No of obs: 750. \* indicates significance at 10%, \*\* indicates significance at 5%, \*\*\* indicates significance at 1%.

Panel B: Bond ETFs 1-2												
	Variables	Mean	St.Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Flow TNA	0.019	0.110	1								
(2)	ESG compliance	0.333	0.472	0.140***	1							
(3)	ER	0.002	0.003	-0.013	0.110***	1						
(4)	Return	0.337	1.243	0.083***	0.064**	-0.043	1					
(5)	Log Holdings	5.339	1.612	0.062**	0.190***	-0.140***	-0.0003	1				
(6)	Price NAV	1.000	0.003	0.140***	0.110***	0.009	0.078***	-0.045	1			
(7)	Log Age	3.708	0.852	-0.077***	-0.230***	-0.084***	0.075**	-0.097***	-0.086***	1		
(8)	Spread Price	0.203	6.646	-0.005	-0.021	0.017	-0.009	-0.079***	-0.013	0.012	1	
(9)	Log Turnover	16.594	2.645	0.100***	-0.085***	-0.180***	0.041	0.180***	0.033	0.260***	-0.039	1

No of obs: 1125. \* indicates significance at 10%, \*\* indicates significance at 5%, \*\*\* indicates significance at 1%.

Table 4 shows the descriptive statistics for equity ETFs. In comparison, bond ETFs demonstrated a higher average return than equity ETFs. The spread price difference was also higher for bond ETFs.

**Table 4.** Descriptive statistics of equity ETFs based on panel data

Panel A: Equity ETFs 1-1												
	Variables	Mean	St.Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Flow TNA	0.003	0.164	1								
(2)	ESG compliance	0.500	0.500	0.074***	1							
(3)	ER	0.004	0.002	-0.150***	0.085***	1						
(4)	Return	-0.308	5.908	0.058***	0.021	0.007	1					
(5)	Log Holdings	4.460	1.410	0.160***	0.020	-0.480***	-0.008	1				
(6)	Price NAV	1.000	0.003	0.067***	0.053**	-0.097***	0.160***	0.064***	1			
(7)	Log Age	4.259	0.701	-0.081***	-0.240***	0.420***	-0.001	-0.330***	-0.140***	1		
(8)	Spread Price	0.054	1.044	0.045**	0.031	-0.006	0.027	-0.012	0.025	-0.030	1	
(9)	Log Turnover	16.766	1.861	0.030	-0.310***	-0.210***	-0.110***	0.140***	-0.055**	0.350***	-0.066***	1

No of obs: 2100. \* indicates significance at 10%, \*\* indicates significance at 5%, \*\*\* indicates significance at 1%.

Panel B: Equity ETFs 1-2												
	Variables	Mean	St.Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Flow TNA	0.002	0.149	1								
(2)	ESG compliance	0.333	0.471	0.062***	1							
(3)	ER	0.005	0.002	-0.150***	0.052***	1						
(4)	Return	-0.333	6.059	0.086***	0.017	0.006	1					
(5)	Log Holdings	4.566	1.363	0.130***	-0.041**	-0.480***	-0.013	1				
(6)	Price NAV	1.000	0.003	0.075***	0.067***	-0.095***	0.160***	0.044**	1			
(7)	Log Age	4.400	0.681	-0.081***	-0.320***	0.380***	-0.010	-0.220***	-0.120***	1		
(8)	Spread Price	0.049	1.098	0.039**	0.024	0.019	0.016	-0.010	0.019	-0.017	1	
(9)	Log Turnover	17.283	1.905	0.015	-0.410***	-0.210***	-0.110***	0.160***	-0.053***	0.420***	-0.051***	1

No of obs: 3150. \* indicates significance at 10%, \*\* indicates significance at 5%, \*\*\* indicates significance at 1%.

The second data sample is obtained from ETFdb.com on the US ETF market. The sample does not cover inverse and leveraged ETFs because of the differences in investment strategies. The overall sample consists of 206 bonds and 1,095 equity ESG ETFs. Table 5 presents the descriptive statistics for cross-sectional data. The average ESG score for bond ETFs is 4.914, while for equity ETFs this score is 5.185. ESG Score Peer Percentile and ESG Score Global Percentile variables do not differentiate substantially between bond and equity funds.

**Table 5.** Descriptive statistics of ESG ETFs based on cross-sectional data

ESG Bond ETFs															
	Variables	Mean	St.Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Flow TNA	0.186	0.340	1											
(2)	ER	0.002	0.002	-0.180**	1										
(3)	Return	0.044	0.087	0.052	-0.570***	1									
(4)	Log Volume	11.862	2.409	-0.031	-0.330***	0.180***	1								
(5)	SD	0.016	0.017	-0.160**	-0.030	0.530***	0.180***	1							
(6)	Log Age	4.201	0.701	-0.440***	-0.140**	0.220***	0.620***	0.330***	1						
(7)	Volatility	0.161	0.090	-0.052	0.290***	0.015	-0.002	0.490***	0.056	1					
(8)	ESG_Score	4.914	1.265	-0.026	-0.550***	0.600***	0.180***	0.024	0.260***	-0.450***	1				
(9)	ESG-Peer	0.557	0.302	0.0002	-0.230***	0.340***	0.075	0.130*	0.200***	-0.170**	0.640***	1			
(10)	ESG-Global	0.419	0.252	-0.030	-0.520***	0.580***	0.190***	0.055	0.270***	-0.440***	0.980***	0.680***	1		
(11)	ESG-Exclusion	0.049	0.040	0.150**	-0.100	0.062	-0.190***	-0.069	-0.240***	0.210***	-0.200***	-0.370***	-0.280***	1	
(12)	Sustainable-Impact	0.022	0.020	0.092	0.072	-0.066	-0.180**	-0.083	-0.260***	0.250***	-0.260***	-0.320***	-0.320***	0.640***	1

No of obs: 206. \* indicates significance at 10%, \*\* indicates significance at 5%, \*\*\* indicates significance at 1%.

ESG Equity ETFs															
	Variables	Mean	St.Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Flow TNA	-0.025	0.550	1											
(2)	ER	0.004	0.002	-0.160***	1										
(3)	Return	-0.145	0.136	0.180***	-0.110***	1									
(4)	Volume	10.959	2.440	0.088***	-0.260***	0.038	1								
(5)	SD	0.043	0.036	-0.046	-0.310***	0.023	0.260***	1							
(6)	Log Age	4.348	0.805	-0.260***	-0.035	-0.095***	0.540***	0.460***	1						
(7)	Volatility	0.485	0.099	-0.019	-0.011	-0.460***	0.220***	0.210***	0.210***	1					
(8)	ESG_Score	5.185	1.408	0.094***	-0.190***	0.290***	0.075**	-0.064**	0.001	-0.230***	1				
(9)	ESG-Peer	0.428	0.287	0.066**	-0.170***	0.220***	0.079***	0.032	0.013	-0.150***	0.670***	1			
(10)	ESG-Global	0.466	0.269	0.100***	-0.180***	0.300***	0.068**	-0.087***	-0.007	-0.250***	0.980***	0.670***	1		
(11)	ESG-Exclusion	0.076	0.096	0.019	-0.082***	0.088***	0.031	0.026	0.046	-0.094***	0.330***	0.160***	0.330***	1	
(12)	Sustainable-Impact	0.062	0.067	0.064**	0.059**	0.270***	-0.066**	-0.054*	-0.001	-0.180***	0.200***	0.170***	0.200***	-0.074**	1

No of obs: 1095. \* indicates significance at 10%, \*\* indicates significance at 5%, \*\*\* indicates significance at 1%.

## Empirical results

### ESG compliance and fund flows.

The time-series model addresses the hypothesis that the ESG compliance criteria affect the flows of the ETF positively and significantly. Tables 6 and 7 show the results of econometric analysis. To check whether the results are robust, we estimated two panels (A and B) with pooled OLS models.

Table 6 shows that the bond ESG ETFs attracted more investments than conventional ETFs: the dummy variable for ESG is statistically significant. Thus, H1a (compliance of a bond ETF with ESG criteria significantly and positively affects ETF flows) cannot be rejected at a 1% level of significance. This result is consistent: both panels confirmed a positive and significant relationship between ESG compliance and fund flows. Moreover, the robustness test also confirms the positive effect of ESG compliance on fund flows.

**Table 6.** ESG compliance and fund flows of bond ETFs: econometric analysis results

Dependent Variable	Panel A: Bond ETF 1-1		Panel B: Bond ETF 1-2	
	Fund flow to TNA			
Independent Variables	Pooled OLS	Mixed model	Pooled OLS	Mixed model
Intercept	-2.347*	-2.331	-3.983***	-3.028***
ESG Compliance	0.031***	0.029**	0.028***	0.029***
ER	-2.149	-2.206	-0.453	0.167
Return	0.003	0.008**	0.006**	0.009***
Log Holdings	-0.002	-0.002	0.001	0.0005
Price NAV	2.320	2.274	3.936***	2.960***
Log Age	-0.017***	-0.013*	-0.010**	-0.008
Spread Price	0.00008	0.00006	0.0001	0.00003
Log Turnover	0.007***	0.008***	0.005***	0.007***
ETF effects	No	Yes	No	Yes
Time effects	No	Yes	No	Yes
No of obs.	750	750	1 125	1 125
R <sup>2</sup>	0.063	0.129	0.058	0.133
F-test	6.232***		8.535***	

*Note:* The table shows the results of panel regression models created to identify the impact of ESG compliance on US bond ETFs. The dependent variable is the fund flows to total net assets ratio. R<sup>2</sup> for mixed linear models are conditional.

\* Indicates significance at 10%.

\*\* Indicates significance at 5%.

\*\*\* Indicates significance at 1%.

Table 7 reports the results of the H1b hypothesis' tests. According to the regression analysis, equity ESG ETFs, on average, attracted more investments than conventional ETFs. Both A and B panels confirmed a positive and significant relationship between ESG compliance and equity ETF flows.

Additional analysis using pooled OLS methodology indicates that the results are robust. As in the case of the bond ETF market, tests confirm that H1b (compliance of an equity ETF with ESG criteria significantly and positively affects ETF flows) cannot be rejected at a 1% level of significance.



**Table 7.** ESG compliance and fund flows of equity ETFs: econometric analysis results

Dependent Variable	Panel A: Equity ETF 1-1		Panel B: Equity ETF 1-2	
	Flow to TNA			
Independent Variables	Pooled OLS	Mixed model	Pooled OLS	Mixed model
Intercept	-2.023*	-2.005*	-2.033**	-1.926**
ESG Compliance	0.029***	0.031***	0.023***	0.025***
ER	-7.831***	-7.966***	-6.76***	-6.904***
Return	0.001**	-0.002*	0.002***	0.0004
Log Holdings	0.013***	0.013***	0.009***	0.009***
Price NAV	1.933*	1.904*	1.988**	1.881**
Log Age	0.005	0.007	-0.002	-0.00005
Spread Price	0.007**	0.007**	0.005**	0.005**
Log Turnover	0.002	0.002	0.002	0.002
ETF effects	No	Yes	No	Yes
Time effects	No	Yes	No	Yes
No of obs.	2100	2100	3150	3150
R2	0.048	0.084	0.042	0.078
F-test	13.11***		17.40***	

Note: The table shows the results of panel regression models created to identify the impact of ESG compliance on US equity funds. The dependent variable is the fund flows to total net assets ratio. R2 for mixed linear models are conditional.

\* Indicates significance at 10%.

\*\* Indicates significance at 5%.

\*\*\* Indicates significance at 1%.

The overall evidence strongly confirms the positive link between the ETFs flows and the compliance with ESG criteria.

### ESG score and fund flows

Tables 8 and 9 present the results for bond and equity ETF markets, respectively. We used five proxies of ESG perfor-

mance to estimate the impact on fund flows. The overall MSCI ESG score has no significant impact on fund flows on equity and bond markets. Moreover, two additional measures of ESG performance – ESG score peer percentile and ESG exclusion criteria – also have no influence on ETF flows.

**Table 8.** ESG score and bond ETFs' flows: econometric analysis results

Dependent Variable	Flow_Assets				
	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	1.042***	0.955***	1.000***	0.974***	1.022***
ER	-22.108	-20.988	-21.588	-20.330	-21.575
Return	0.600	0.409	0.541	0.489	0.515
Log Volume	0.048***	0.050***	0.048***	0.049***	0.0048***
SD	-2.334	-2.217	-2.219	-2.045	-2.380

Dependent Variable	Flow_Assets				
	Independent Variables	Model 1	Model 2	Model 3	Model 4
Log Age	-0.319***	-0.332***	-0.322***	-0.322***	-0.328***
Volatility	0.200	0.316	0.230	0.221	0.317
ESG_Score	-0.011				
ESG-Peer		0.092			
ESG-Global			-0.025		
ESG-Exclusion				0.185	
Sustainable-Impact					-0.678
No of obs.	206	206	206	206	206
R2	0.325	0.330	0.324	0.325	0.326
Robust st.error	No	No	No	No	Yes
F-test	13.60***	13.90***	13.57***	13.59***	15.95***
Ramsey RESET	0.078	0.035	0.092	0.100	0.074
p-value	0.780	0.853	0.761	0.752	0.785

Note: This table reports the regression analysis of the ESG score on the fund flow of US bond ETFs. The dependent variable is the ratio of one-year fund flow divided by total net assets.

\* Indicates significance at 10%.

\*\* Indicates significance at 5%.

\*\*\* Indicates significance at 1%.

On the equity ETF market, sustainable impact solutions and ESG-Global Percentile have a significant and positive effect on fund flows. We additionally tested our regression models for specification errors, and the Ramsey test indicated the absence of omitted variables. Moreover, robust standard errors are used when the assumption of homoscedasticity is violated. The results for heteroscedasticity are provided in Appendix B.

**Table 9.** ESG score and equity ETFs' flows: econometric analysis results

Dependent Variable	Flow_Assets				
	Independent Variables	Model 1	Model 2	Model 3	Model 4
Intercept	0.426***	0.508***	0.450***	0.515***	0.480***
ER	-16.190*	-17.686**	-15.695**	-17.880**	-18.917**
Return	0.589***	0.615***	0.577***	0.622***	0.553***
Log Volume	0.060***	0.059***	0.059***	0.059***	0.061***
SD	0.652	0.559	0.698*	0.559	0.619
Log Age	-0.289***	-0.287***	-0.290***	-0.288***	-0.292***
Volatility	0.425**	0.404**	0.439**	0.405**	0.413**
ESG_Score	0.016				
ESG-Peer		0.028			

Dependent Variable	Flow_Assets				
Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
ESG-Global			0.108*		
ESG-Exclusion				0.092	
Sustainable-Impact					0.533**
No of obs.	1095	1095	1095	1095	1095
R2	0.17	0.1688	0.171	0.1689	0.1724
Robust st.error	Yes	Yes	Yes	Yes	Yes
F-test	34.81***	35.03***	35.04***	35.06***	36.17***
Ramsey RESET	2.096	1.939	1.867	2.227	2.184
p-value	0.148	0.164	0.171	0.136	0.140

Note: This table reports the regression analysis of ESG score on fund flow of US equity ETFs. The dependent variable is the ratio of one-year fund flow divided by total net assets.

\* Indicates significance at 10%.

\*\* Indicates significance at 5%.

\*\*\* Indicates significance at 1%.

Thus, empirical models provide mixed results. The majority of ESG performance measures do not explain the variation in the ETF flows. The sustainable impact index and ESG-Global Percentile positively affect only equity ETF flows. Overall, empirical results do not confirm hypotheses H2a and H2b, which postulate the positive effects of ESG scores on the flows of bond and equity ETFs.

## Conclusion and Discussion

The financial market plays a crucial intermediary role in the saving-investment process, and the determination of factors directing investors' resources is highly relevant for both academic discussion and practical implication. In this study, we focus on ESG preferences of ETF market investors and assess the impact of ESG ranking on the attractiveness of exchange-traded funds.

We found that, on average, ETFs that comply with ESG criteria attracted additional net assets per month as compared to conventional ETFs. Thus, our results may indicate that investors pay attention to ESG-related information and have strong preferences toward ESG investing. We also found mixed evidence that ESG ranking measures affect the allocation of resources in the financial market. Our analysis suggests that a higher ESG score is not a prerequisite of the larger investments: differences in scores could not explain the variation in fund flows. Taken together, our findings confirm that ETF market fund flows are not limited by the risk-return profile, and that investors have non-pecuniary motives for their decisions. At the same time, the decision-making process largely ignores ESG scores and follows a simpler behavioral pattern, which is consistent with the previous findings [5; 30].

Since investors have ESG preferences, social and environmental responsibility is one of the factors that should steer companies in allocating their limited resources. Thus, it is of high importance for a firm's management to incorporate ESG policy and increase the attractiveness of their business for potential investors. Ignoring ESG factors may have a negative impact on a firm's performance. Our evidence also emphasizes the need for additional control of ESG information flows. Generally, investors have limited capacities in processing ESG-related information and are looking for a simple signal as to whether the ETF is compliant with ESG criteria or not. However, even though the ESG objective is becoming one of the key factors for asset allocation, the average investor makes decisions in the absence of a unique and transparent methodology behind ESG measurement. The ESG score value may be biased because firms still make misleading ESG disclosures [e.g. 44]. Moreover, most non-institutional investors may not be familiar with the internal procedures behind the ESG rating approach [45]. Thus, market participants would benefit from increasing transparency and unification of rating methodology [46].

Our research has several limitations. First of all, we did not distinguish between professional investors (e.g., institutional investors) and less sophisticated, household investors. Since we focused on the ETF market dominated by household investors, our results may mostly describe the behavior of non-professional investors in ESG assets. The way experts incorporate ESG compliance in their decision-making process may differ significantly, since institutional investors have the capacity to develop their own ESG-related goals and to avoid externally assigned scores.

Secondly, we restricted our sample to the beginning of the Covid-19 pandemic, because of its harsh effect on financial markets and the global economy. Our research revealed the pre-pandemic patterns of decision-making, while the pandemic could have caused dramatic changes in the preferences and behavior of household investors. These limitations suggest avenues for further research.

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## Appendix A: Issuers of ETFs

**Table A1.** Issuers of bond ETFs (panels A and B)

Issuer	ESG ETFs (Panels A and B)	Non-ESG ETFs (Panel A)	Non-ESG ETFs (Panel B)
Inspire Investing	1	0	0
IShares	2	3	8
Sage Advisory	1	0	0
J.P. Morgan	3	0	0
Nuveen	1	1	1
Hartford Funds	2	0	0
Vaneck	1	2	2
Invesco	3	3	13
DWS	1	6	6
Total	15	15	30

**Table A2.** Issuers of equity ETFs (panels A and B)

Issuer	ESG ETFs (Panels A and B)	Non-ESG ETFs (Panel A)	Non-ESG ETFs (Panel B)
Columbia Threadneedle Investments	4	1	1
IShares	7	9	21
State Street SPDR	5	7	15
FlexShares	1	4	4
Inspire Investing	2	0	0
Global X	2	3	6
Nuveen	5	0	0
ETF Managers Group	1	1	1
VanEck	2	0	0
First Trust	4	5	12
Invesco	7	10	22
Strategy Shares	1	1	1
Tortoise Capital	1	1	1
Total	42	42	84

## Appendix B: Results of Breusch–Pagan tests for Heteroscedasticity

**Table B1.** Breusch–Pagan tests ESG ETFs based on cross-sectional data

<b>Bond ETFs</b>					
	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
BP	10.75	11.053	10.761	10.894	13.067*
p-value	(0.1499)	(0.1363)	(0.1494)	(0.1433)	(0.0705)
<b>Equity ETFs</b>					
	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
BP	42.417***	39.774***	41.378***	39.936***	39.305***
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

\* Indicates significance at 10%. \*\* Indicates significance at 5%. \*\*\* Indicates significance at 1%.

We reject the null hypothesis and conclude that all regression models for Equity ETFs and Model 5 for Bond ETFs violate the homoscedasticity assumption. Therefore, for these models we apply robust standard error to obtain unbiased standard errors of OLS coefficients under heteroscedasticity.

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