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Retail Investors and Sustainable Finance:
Exploring ESG Investment Preferences on Robinhood
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Abstract

This thesis explores the interest of retail investors in sustainable investments, explicitly focusing on ESG-rated stocks traded on Robinhood. By combining historical user data from Robinhood with ESG ratings, the study analyzes whether retail investors exhibit significant activity changes following these ratings' shifts. The research aims to determine if Robinhood users are responsive to sustainability metrics by examining their behavioral patterns after negative changes in ESG ratings. Through this analysis, the study seeks to provide insights into whether retail investors in Robinhood react to declines in ESG ratings or if they remain indifferent to such changes.

Keywords: Retail investors, ESG investments, sustainable finance, stocks, Robinhood

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1.0 Introduction

The rise of fintech platforms like Robinhood has revolutionized the retail investment landscape, providing individual investors with unprecedented access to financial markets at minimal cost (van der Beck and Jaunin 2023; Barber et al. 2022). These platforms utilize technological advancements to provide intuitive interfaces, real-time market data, and seamless transaction capabilities, reducing entry barriers for retail investors previously discouraged by high fees and complex trading processes (van der Beck and Jaunin 2023; Barber et al. 2022). This democratization of investing has empowered retail investors to diversify their portfolios, engaging with a wide range of securities, including individual stocks and exchange-traded funds (ETFs) (Guy Birken and Katzeff 2024). Moreover, the social aspect of these platforms facilitated through features like shared watchlists and community forums, has fostered a collaborative environment where investors can exchange ideas and strategies (Reith, Fischer, and Lis 2019; Reichenbach and Walther 2023). This shift has made it easier for everyday investors to participate in markets traditionally dominated by institutions, broadening the scope of investment opportunities available to the general public (Hayes 2024).

Simultaneously, the growing awareness of global environmental and social challenges has catalyzed the rise of sustainable investing. Investors increasingly focus on companies that meet environmental, social, and governance (ESG) criteria, aligning their portfolios with ethical, long-term sustainability goals (Uzsoki 2020). This trend is driven by moral considerations and the recognition that ESG factors can materially impact a company's financial performance and risk profile (Friede, Busch, and Bassen 2015). Institutional investors have been the primary drivers of this trend, partly due to regulations and the capacity to accurately assess and quantify ESG risk (Uzsoki 2020). However, due to differences in resources and information accessibility (Hayes 2024), the level of interest among retail investors in sustainable investing remains less explored, mainly since they historically have been more

motivated by short-term gains and influence by the media (Barber and Odean 2011). Furthermore, while institutional investors often have access to detailed ESG research and resources, retail investors may face challenges accessing precise, standardized ESG data, potentially influencing their perception and adoption of sustainable investment practices (Global Scan 2021).

Retail investors on platforms like Robinhood may approach ESG investments differently, given their unique priorities and the ease with which they can execute trades. It is unclear whether the factors influencing institutional decision-making – such as long-term sustainability and corporate responsibility – are equally compelling for retail investors. Furthermore, the information asymmetry and potential lack of ESG knowledge among retail investors might affect their ability to evaluate such factors effectively (Sahin et al. 2021). This thesis explores this by examining the extent to which retail investors engage with sustainable investments, specifically through their holdings of ESG-rated stocks.

The core research question guiding this thesis is: **Are retail investors on Robinhood sensitive to changes in ESG ratings when making trading decisions?** It investigates whether a decrease in ESG ratings motivates these investors to sell off stocks, potentially reflecting an underlying interest in aligning their portfolios with sustainability principles. By exploring this question, the study aims to shed light on whether retail investors take sustainability considerations into account, mainly in response to negative ESG shifts. Understanding this behavior is crucial, as it could influence how companies approach ESG disclosures and how financial platforms cater to the growing demand for sustainable investment options (Kölbel et al. 2020).

By analyzing Robinhood's historical trading data alongside ESG rating fluctuations, this research seeks to uncover any notable patterns in investor behavior related to sustainability. The findings will contribute to understanding retail investor priorities and the potential

influence of ESG factors on their trading actions, providing valuable insights into the evolving role of sustainability in investment choices.

This thesis will build a comprehensive understanding of retail investors and their relationship with ESG investing in the following sections. Section 2 begins with a literature review highlighting the fundamental aspects of retail investors and ESG investing. Section 3 then describes the empirical methodology to examine retail investors' interest in ESG investments. Section 4 follows with a detailed discussion of the results and study limitations. Finally, the thesis concludes by summarizing the findings and their broader implications.

2.0 Literature Review

2.1 Understanding Retail Investor Behavior

Retail or individual investors are non-professional market participants who invest their personal funds in various financial instruments such as stocks, bonds, cryptocurrencies, or ETFs (Hayes 2024). The emergence of user-friendly, commission-free trading platforms has significantly increased retail investor participation in financial markets (Guy Birken and Katzeff 2024; Barber et al. 2022). This surge was notably exemplified during the GameStop saga in early 2021, where a collective of retail investors, primarily through platforms like Robinhood, drove unprecedented stock price volatility (Gara 2021). This event highlighted the profound impact that coordinated retail trading can have on market dynamics.

Recent studies have observed a notable rise in trading activities among individual investors, linking this trend to the enhanced accessibility and affordability provided by these digital platforms (van der Beck and Jaunin 2023; Münster, Reichenbach, and Walther 2024). Historically, retail investors have differed significantly from institutional investors in motivations, risk tolerance, and decision-making processes (Palmer 2024). They tend to engage in higher turnover, are often less informed, and are influenced more by behavioral biases than



professional investors, leading to behaviors that can significantly impact market dynamics (Barber and Odean 2011). One such behavior is "noise trading," where decisions based on limited information or media attention lead to price volatility (Downey 2022). This tendency is often driven by attention-induced decision-making, where retail investors are drawn to stocks that have recently garnered media coverage or exhibited extreme short-term performance (Barber et al. 2022). Another notable behavior is the "disposition effect," where investors are inclined to sell winning stocks prematurely while holding onto losing stocks for too long, negatively impacting their overall returns (Loos, Meyer, and Pagel 2020; Shefrin and Statman 1985; Barber and Odean 2011).

Cognitive biases, such as overconfidence and herding behavior, also significantly influence retail investor decisions (Singh, Malik, and Jha 2024). Overconfidence can lead investors to overestimate their ability to predict market movements, resulting in excessive trading and suboptimal returns (Barber and Odean 2001). Herding behavior, where investors follow the actions of a larger group, can amplify market trends and contribute to asset bubbles or crashes (Spyrou 2013). Understanding these behavioral patterns is essential for analyzing how retail investors might respond to changes in ESG ratings, as their decisions may sometimes align with traditional financial theories that assume rational behavior.

2.2 Insight into Robinhood and its Users

Robinhood's launch as a commission-free trading platform marked a shift in the financial landscape, making investing more accessible to young, tech-savvy individuals who may lack prior investing experience (Welch 2020; Curry 2024). This disruption challenged traditional brokerage models by removing entry barriers, allowing millions of new investors to enter the market without incurring fees (Divine 2019).

Robinhood users have distinct demographic profiles. Studies reveal they are predominantly younger, new to investing, and more likely to be influenced by platform-specific



features that encourage frequent trading (Barber et al. 2022; Kuo Siong Tan 2021). Unlike traditional investors who might rely on financial advisors or take a more strategic, long-term view, Robinhood users are often driven by social media trends and a desire for immediate gains (Barber et al. 2022).

Research suggests Robinhood's app design, including push notifications and gamified elements, may contribute to higher trading frequencies and impulsive decisions (Barber et al. 2022; Gallo 2024). These design features highlight daily “top movers” and offer rewards like digital confetti for trades linked to attention-driven buying, increasing short-term speculation rather than long-term investing (Barber et al. 2022). The platform’s emphasis on instant feedback and visual rewards has raised concerns among researchers and financial professionals about its potential to encourage gambling-like behavior, as users may become more focused on the excitement of trading than on fundamentals or long-term goals (Gallo 2024).

Additionally, the social dynamics of trading on Robinhood are amplified by online communities like Reddit’s WallStreetBets, where investors exchange stock tips and rally behind trending stocks, often without consideration of company fundamentals (Münster, Reichenbach, and Walther 2024). This environment cultivates a “herd mentality,” where retail investors are more vulnerable to momentum-driven buying and selling, reinforcing impulsive, short-term decisions that diverge from traditional, research-based investing (Reichenbach and Walther 2023). The collective behavior observed in these online communities can lead to significant market distortions, as seen in the dramatic price swings of certain “meme stocks” (Ortmann, Pelster, and Wengerek 2020). Furthermore, the influence of social media on investment decisions raises questions about information reliability and the potential for market manipulation (Liu, Shen, and Bradley 2021).



2.3 ESG Investment Trends and Retail Investor Interest

The rapid rise of ESG investing has been attributed to various motivations beyond pure financial returns. Research indicates that institutional investors have been significant drivers of ESG adoption, often viewing these investments as a hedge against long-term risks, especially climate change and regulatory pressures (Uzsoki 2020; Döttling and Kim 2021). Döttling and Kim (2021) emphasize that while traditional investing focuses on financial returns alone, ESG investments offer an additional layer of risk mitigation, especially against environmental and governance-related risks. For instance, ESG-compliant companies have shown greater resilience to market shocks, such as those seen during the COVID-19 pandemic, where firms with strong ESG practices experienced smaller declines in stock value compared to their non-ESG counterparts (Gianfrate et al. 2024). This resilience is attributed to a reputation of corporate responsibility and ethical governance, which fosters consumer and employee loyalty during crises (Döttling and Kim 2021).

Despite the dominance of institutional investors in the ESG space, interest among retail investors is growing, driven by generational shifts and social awareness. According to a study by Hartzmark and Sussman (2019), younger investors are particularly drawn to ESG funds, motivated not only by potential financial gains but also by the non-pecuniary benefits associated with supporting sustainable and ethical practices. Millennial and Gen Z investors increasingly prioritize investments that align with their values, seeking to make a positive impact through their financial decisions (Morgan Stanley 2019). However, retail investors face unique challenges in ESG adoption, such as a lack of standardized ESG ratings, which can confuse the authenticity of "green" investments (Gibson Brandon, Krueger, and Steffen Schmidt 2021). As a result, while interest among retail investors is increasing, the complexity of ESG criteria and concerns about greenwashing remain potential barriers, highlighting the need for greater transparency in ESG disclosures. Educational initiatives and improved access to ESG



information could empower retail investors to make more informed decisions regarding sustainable investments (Amel-Zadeh and Serafeim 2018).

3.0 Empirical Study

3.1 Hypotheses

This empirical study aims to investigate the behavior of retail investors on the Robinhood platform in relation to fluctuations in ESG ratings. As sustainable investing gains prominence, there is a notable shift in investor attitudes, particularly among younger demographics who comprise a significant portion of Robinhood's user base (Barber et al. 2022). This study posits that retail investors are increasingly influenced by ESG considerations when making investment decisions.

The analysis centers on the hypothesis that retail investors are more inclined to divest from stocks following a decline in ESG ratings. This expectation is rooted in the growing awareness of sustainable practices and the potential financial repercussions that may arise from negative ESG news (Hill 2020). By examining this phenomenon, we aim to understand how ESG factors resonate with retail investors and the implications of these factors on their trading behaviors in an evolving investment landscape.

3.2 Data

This thesis employs a multi-source dataset to investigate the impact of ESG ratings on retail investor behavior on the Robinhood platform. The primary data sources consist of Robinhood user holdings information, ESG scores from LSEG, and key financial metrics from Yahoo Finance. These datasets provide a well-rounded foundation for analyzing the interactions between ESG changes and investor responses in retail trading.



3.2.1 Robinhood Data

The dataset for Robinhood user holdings originates from Robintrack.net, which provides an aggregated, timestamped view of the number of Robinhood users holding specific stocks over time (Primožic and Jensen 2024). The data spans from June 2018 to August 2020 and includes a broad universe of stocks traded on Robinhood, encompassing companies across various sectors and market capitalizations. However, for the purposes of this analysis, the focus is narrowed to S&P 500 companies, as this subset provides a consistent and representative sample of large, established firms in the U.S. market.

The decision to focus on the S&P 500 companies within the Robinhood dataset is motivated by several factors. The S&P 500 Index includes diversified, blue-chip companies that are often well-known to retail investors and tend to be frequently traded. This focus allows the study to capture trading behavior trends among retail investors in response to ESG changes for widely recognized companies. Analyzing trading behavior for S&P 500 stocks can provide a clearer view of patterns that might be more complex or harder to interpret across a broader, more varied dataset.

This study aims to uncover potential correlations between changes in ESG ratings and retail investor activity by examining Robinhood user holdings data for S&P 500 stocks alongside ESG rating information. Initially containing hourly user holdings, the Robinhood data is transformed to a weekly frequency by aligning each week's last value with the weekly ESG scores.

After aggregation, the data is filtered using ESG dataset tickers to include only companies with available sustainability scores. This allows for merging Robinhood popularity data with ESG scores, enabling exploration of whether decreases in ESG ratings influence retail investors on Robinhood to sell those stocks.



3.2.2 LSEG Data

LSEG is the primary source for ESG ratings and a trusted and comprehensive financial market data and analytics provider. Its ESG database covers over 90% of the global market capitalization, with historical data extending back to 2002 (LSEG Data & Analytics 2023). The database includes overall ESG ratings, specific scores for each ESG pillar, and ESG Controversies (ESGC) scores.

LSEG's ESG rating process relies on publicly available information from annual reports, company websites, stock exchange filings, news sources, and NGO and CSR reports. The ESG scores are calculated using more than 630 individual measures, with a subset of 186 metrics used to derive pillar scores. The metrics are tailored to each industry, allowing for meaningful comparisons across sectors. The three pillar scores (Environmental, Social, and Governance) assess a company's performance in resource use, emissions, labor standards, and corporate governance structures. The specific ESG category scores are then rolled into an overall ESG score, benchmarked against industry and regional standards (LSEG Data & Analytics 2023).

LSEG assigns ESG scores on a percentile scale from 0 to 100, then converted into letter grades ranging from D- to A+. These scores facilitate a clear and transparent assessment of a company's ESG performance. To streamline the analysis, the ESG scores are divided into quartiles, each representing a specific range of performance levels. This quartile-based approach allows for categorizing companies into groups: top performers, above average, below average, and low performers. The table below summarizes the score ranges and their corresponding grades.

Table 1: ESG Scores Description (LSEG 2024)

Score range	Grade	Description
0.00 – 0.25	D	'D' score indicates poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly.
0.25 – 0.50	C	'C' score indicates satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly.

0.50 – 0.75	B	'B' score indicates good relative ESG performance and above-average degree of transparent in reporting material ESG data publicly.
0.75 – 1.00	A	'A' score indicates excellent relative ESG performance and high degree of transparency in reporting material ESG data publicly

Table 1 shows the categorization of ESG scores into four grades (A, B, C, D) and descriptions of each grade.

3.2.3 Stock market data and factors

Historical stock performance data is included in the analysis to control for market influences on investor behavior. This data from Yahoo Finance consists of returns, volatility, and other relevant performance indicators for each S&P 500 company during the selected timeframe. Including this stock performance data allows the study to account for the effects of general market trends and price movements on trading decisions. By incorporating these variables, the analysis can control each company's financial health and operational performance, helping to distinguish the effects of ESG changes from those driven by fundamental financial indicators. This approach ensures that observed trading patterns are not merely reactions to shifts in financial metrics, thus supporting a more accurate assessment of ESG-driven trading behaviors.

3.2.4 Data collection

The data collection process utilizes the Refinitiv Workspace Lite Add-in, a tool provided by LSEG, to programmatically retrieve ESG ratings and financial data. The API enables efficient and accurate data extraction, with the added benefit of ensuring consistency in updates and record-keeping. Stock performance data is collected using the *yfinance* library in Python, which provides reliable access to Yahoo Finance's financial information. The gathered datasets are aligned on a weekly basis, matching Robinhood holdings data and ESG ratings to allow for meaningful temporal analysis of their relationship. Standard data preparation methods, including addressing missing values and ensuring uniform data formats, are applied to maintain data integrity and enhance comparability across sources.

The integration of these datasets creates a comprehensive foundation for analyzing the relationship between ESG ratings and retail investor behavior on Robinhood. By combining investor holdings, ESG ratings, and financial metrics, this study explores a nuanced view of how retail investors may react to ESG factors within the broader framework of market and economic influences. This approach aims to yield robust and reflective findings of the various elements influencing trading decisions in the context of ESG considerations.

3.3 Descriptive Statistics

The summary statistics provide essential insights into the behavior of retail investors in the S&P 500, focusing on 460 unique stocks after data cleaning.

Table 2 presents the descriptive statistics for user holdings and ESG scores. It reveals that the average user holding is approximately 10,414, with significant variability, ranging from 0 to 941,568 users holding. This considerable spread reflects the diverse popularity of different stocks among retail investors. The median number of users holding a stock is much lower, at about 1,210, indicating that while a few stocks are extremely popular, most stocks have a more moderate level of retail engagement. This pattern is consistent with the S&P 500, where well-known brands attract more retail attention than others.

Meanwhile, ESG scores range from 10.9 to 93.2, with a mean of 59.6, corresponding to a B grade, according to LSEG. This indicates that the average firm has a moderate level of ESG performance, with some companies excelling in sustainability and others falling short. The relatively high third quartile value of 72.4 suggests that many companies are seen as having strong ESG performance, which could influence retail investor interest.

Table 2: Summary Statistics

	Count	Mean	Min	25%	Median	75%	Max
Users holdings	51 621	10 414	0	410.6	1 210.4	4 067	941 568
ESG Scores	51 621	59.6	10.9	47.5	61.8	72.4	93.2

Table 2: Provides summary statistics for user holdings and ESG scores, including count, mean, minimum, and quartiles (25%, median, 75%), as well as maximum values.

Table 3 further breaks down the data by considering the last recorded value for each stock. Here, the median number of user holdings per stock is 3,308, while the average is 29,646. This suggests that a few highly popular stocks skew the average, which is noticeably higher than the median. It is also important to note that the number of Robinhood users increased from about 6 million to 13 million from 2018 to 2020, which may have influenced the increasing popularity of specific stocks. The ESG scores per stock also show moderate variance, with a median of 63.8 and an average of 61.6. These statistics suggest that while most companies have a satisfactory ESG rating, there is a considerable range in ESG performance across the sample.

Table 3: Summary Statistics – Based on Last Value for Each Stock

	Count	Mean	Min	25%	Median	75%	Max
Users holdings	460	29 646	0	1 040.2	3 308.2	11 671.9	923 791
ESG Scores	460	61.6	18.5	51.4	63.8	73.7	93.2

Table 3: Provides a summary statistic based on the last value for each ticker. It shows the user's holdings and ESG scores, including count, mean, minimum, quartiles (25%, median, 75%), and maximum values.

Table 4 provides insight into the ten most popular stocks among Robinhood users. It is notable that companies with high ESG ratings, like Ford (F), General Electric (GE), and Microsoft (MSFT), are among the most widely held stocks. This may suggest a positive association between high ESG performance and popularity among retail investors, although other factors likely drive these investment decisions. Interestingly, Norwegian Cruise Line Holdings (NCLH), which has a relatively lower ESG score of 49.6, still appears in the top ten, indicating that user holding decisions may not solely be influenced by ESG factors but also by other considerations such as industry trends or potential returns.

Table 4: Top Ten Stocks by Users Holdings

Ticker	Company	Date	Users Holding	ESG Score	ESG Grade
F	Ford Motor Company	2020/08/09	923 791	82.7	A
GE	GE Aerospace	2020/08/09	860 686	82.6	A
AAPL	Apple Inc.	2020/08/09	663 545	71.1	B
MSFT	Microsoft Corporation	2020/08/09	631 927	93.2	A
DIS	The Walt Disney Company	2020/08/09	606 751	77.0	A
DAL	Delta Air Lines, Inc.	2020/08/09	578 267	71.2	B

TSLA	Tesla, Inc.	2020/08/09	538 423	57.5	B
CCL	Carnival Corporation & plc	2020/08/09	486 385	82.7	A
AMZN	Amazon.com, Inc.	2020/08/09	418 130	84.6	A
NCLH	Norwegian Cruise Line Holdings Ltd.	2020/08/09	358 631	49.6	C

Table 4: Based on the last values for each stock from June 2018 until August 2020, the table provides an overview of the top ten stocks ranked by the number of users holdings.

Figure 1 below visually represents the data, illustrating the relationship between ESG scores and users' holdings. The scatter plot reveals that stocks with higher ESG scores tend to attract more users, particularly as scores approach 80 or above. However, there is considerable variability, and some stocks with lower ESG scores still have significant user holdings, indicating that ESG performance is not the sole factor influencing retail investor behavior.

Figure 1: Relationship Between ESG Scores and Users Holding

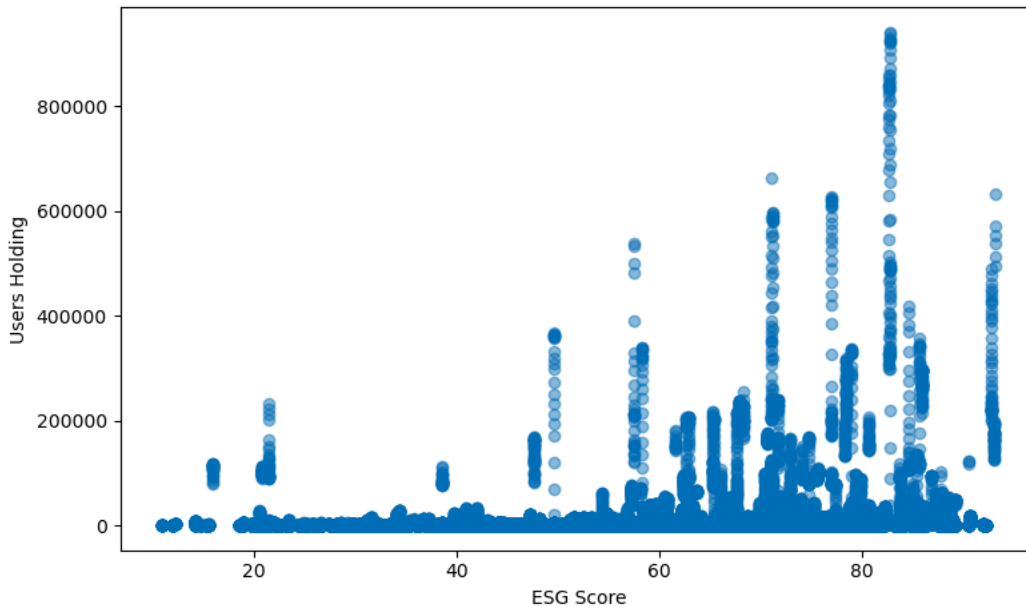


Figure 1: Scatter plot showing the relationship between ESG scores and the number of users holding each stock. Though significant variability exists, higher ESG scores generally correlate with greater user holdings.

3.4 Regression Analysis

Regression analysis is chosen for this study because it allows for the identification of relationships between ESG scores and user holdings, providing insights into whether changes in sustainability ratings significantly influence retail investor behavior. This method is particularly well-suited for analyzing large datasets with repeated measures, as it enables us to quantify the effect of independent variables (ESG scores) on dependent variables (user

holdings) while controlling for other factors. In the context of this thesis, regression analysis helps to isolate the specific impact of ESG performance on Robinhood user holdings and identify any significant patterns of response to sustainability-related changes. By using both Ordinary Least Squares (OLS) and panel regression models with fixed effects, the analysis accounts for both cross-sectional and temporal variations, providing a robust framework to evaluate investor behavior.

In this section, I aim to investigate whether changes in ESG scores significantly impact the holdings of Robinhood users. The analysis attempts to determine if a decline in ESG ratings leads to a decrease in user holdings, suggesting that retail investors on Robinhood respond negatively to deteriorating ESG performance. I use clustered standard errors for all regressions to account for the non-independence of observations across time for the same stock. This approach helps ensure that the standard errors are accurate by adjusting for the correlation within stocks over time, which makes the inference more reliable. The basic regression models used in this analysis can be represented as follows:

$$\Delta users_holding_{it} = \beta_0 + \beta_1 \Delta esg_score_{it} + \epsilon_{it}$$

$$users_holding_{it} = \beta_0 + \beta_1 esg_score_{it} + \epsilon_{it}$$

Where $\Delta users_holding_it$ represents the weekly change in Robinhood user holdings for stock i at time t , $users_holding_it$ represents the level of Robinhood user holdings for stock i at time t , and Δesg_score_it represents the weekly change in ESG scores for stock i at time t . The coefficient β_1 captures the effect of ESG scores or changes in ESG scores on user holdings.

I begin the analysis with an Ordinary Least Squares (OLS) regression using two models. In the first model, the dependent variable is the absolute user holdings level ("users_holding") with ESG score level ("esg_score"). The results are presented in Table 5. The coefficient for "esg_score" is positive and statistically significant ($\beta = 406.25$, $\rho = 0.000$), indicating that higher ESG scores are associated with greater user holdings. Specifically, a one-point increase



in ESG score is related to an increase of approximately 406 users. While still low, the R-squared value of 0.026 suggests that the ESG score level explains a slightly higher portion of the variation in user holdings compared to the model with ESG score changes.

Table 5: OLS Regression Results Using esg_score as the independent variable

OLS Regression Results						
Dep. Variable:	users_holding	R-squared:	0.026			
Model:	OLS	Adj. R-squared:	0.026			
Method:	Least Squares	F-statistic:	1366.			
No. Observations:	51161	AIC:	1.236e+06			
Df Residuals:	51159	BIC:	1.236e+06			
Df Model:	1					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
const	-1.377e+04	682.404	-20.185	0.000	-1.51e+04	-1.24e+04
esg_score	406.2506	10.991	36.961	0.000	384.707	427.794
Omnibus:	78772.460	Durbin-Watson:	0.055			
Prob(Omnibus):	0.000	Jarque-Bera (JB):	40146515.061			
Skew:	9.833	Prob(JB):	0.00			
Kurtosis:	138.817	Cond. No.	224.			

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Table 5: The regression displays the regression analysis results examining the impact of esg_score as the independent variable when users_holding is the dependent variable.

From a behavioral perspective, the significant positive coefficient implies that Robinhood users may prefer stocks with higher ESG ratings. This aligns with the growing trend among younger investors, who are more likely to consider sustainability factors in their investment decisions. Although the economic significance of the effect – 406 additional users per one-point increase in ESG score – may not seem substantial in the context of large stocks with numerous investors, it does indicate a discernible pattern of behavior among retail investors. Given the increased awareness and emphasis on sustainability, particularly among younger demographics, this result suggests that ESG scores are a factor in shaping retail investor preferences.

In the second model, I analyze the weekly change in Robinhood user holdings ("users_holding_change") with the weekly change in ESG scores ("esg_score_change"). The results are shown in Table 6. The constant in the regression is 221.81, indicating that without a change in ESG scores, user holdings would increase by approximately 222 users on average per week. The coefficient for "esg_score_change" is -9.59, but it is not statistically significant ($p = 0.362$), suggesting no significant relationship between weekly ESG changes and user holdings in this basic specification. The R-squared value is extremely low, indicating that ESG changes explain only a tiny portion of the variation in user holdings.

Table 6: Regression Results using esg_score_change as independent variable

OLS Regression Results						
Dep. Variable:	users_holding_change		R-squared:		0.000	
Model:	OLS		Adj. R-squared:		-0.000	
Method:	Least Squares		F-statistic:		0.8326	
No. Observations:	51161		AIC:		9.297e+05	
Df Residuals:	51159		BIC:		9.297e+05	
Df Model:	1					
Covariance Type:	nonrobust					
	coef	std err	t	P> t	[0.025	0.975]
const	221.8128	9.454	23.462	0.000	203.282	240.343
esg_score_change	-9.5915	10.512	-0.912	0.362	-30.194	11.012
Omnibus:	109327.488		Durbin-Watson:		0.443	
Prob(Omnibus):	0.000		Jarque-Bera (JB):		546168774.154	
Skew:	19.019		Prob(JB):		0.00	
Kurtosis:	507.742		Cond. No.		1.12	

Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Table 6: The regression displays the regression analysis results examining the impact of esg_score_change as the independent variable when users_holding_change is the dependent variable.

The lack of statistical significance for ESG score changes could imply that short-term changes in ESG ratings are not immediately reflected in retail investor behavior. This may be due to the nature of ESG scores, which are typically viewed as long-term indicators of a company's sustainability and risk profile. Retail investors, particularly those using Robinhood, might only react quickly to such changes if other market signals or news events accompany them.



To analyze this relationship further, I perform a panel regression using entity-fixed effects. This allows me to control for unobserved, time-invariant factors specific to each stock that may influence user holdings. The results from the PanelOLS model are presented in Table 7.

Table 7: Panel Regression with Fixed Effects

PanelOLS Estimation Summary						
Dep. Variable:	users_holding_change	R-squared:	0.0508			
Estimator:	PanelOLS	R-squared (Between):	0.0355			
No. Observations:	51161	R-squared (Within):	0.0508			
Cov. Estimator:	Clustered	F-statistic:	904.20			
Entities:	460	P-value	0.0000			
Avg Obs:	111.22	Distribution:	F(3,50698)			
Min Obs:	18.000	F-statistic (robust):	8.6785			
Max Obs:	143.00	P-value	0.0000			
Time periods:	113	Distribution:	F(3,50698)			
Avg Obs:	452.75					
Min Obs:	445.00					
Max Obs:	463.00					
Parameter Estimates						
	Parameter	Std. Err.	T-stat	P-value	Lower CI	Upper CI
const	-269.88	100.89	-2.6750	0.0075	-467.63	-72.131
esg_score_change	-8.9171	3.6845	-2.4201	0.0155	-16.139	-1.6954
weekly_return	86.033	143.09	0.6013	0.5477	-194.42	366.48
weekly_volatility	2.591e+04	5317.2	4.8728	0.0000	1.549e+04	3.633e+04

F-test for Poolability: 16.762
P-value: 0.0000
Distribution: F(459,50698)

Included effects: Entity

Table 7: Presents the results from the panel regression with fixed effects examining the impact of *esg_score_change*, *weekly_returns*, and *weekly_volatility* as the independent variable when *users_holding_change* is the dependent variable.

The coefficient for "esg_score_change" is -8.92, and it is statistically significant at the 5% level ($\rho = 0.015$). This finding suggests that a decrease in ESG scores is associated with a substantial reduction in Robinhood user holdings when controlling for stock-specific factors. The magnitude of this effect indicates that for every one-point decrease in ESG score, user holdings decline by roughly nine users. Additionally, weekly volatility appears to have a statistically significant positive impact on user holdings, potentially suggesting that retail investors on Robinhood tend to buy during more volatile weeks.

Furthermore, I extend the analysis by including entity and time-fixed effects in the regression model (Table 8). This specification allows for controlling stock-specific characteristics and general market conditions over time. The coefficient for "esg_score_change" remains negative (-2.91), but it is no longer statistically significant ($\rho = 0.416$). This implies that the observed effect of ESG score changes on user holdings might be influenced by general market trends rather than ESG changes alone. Weekly volatility, however, remains significant, indicating that investors may respond to other factors that cause market fluctuations.

Table 8: Panel Regression with Entity and Time Fixed Effects

PanelOLS Estimation Summary						
Dep. Variable:	users_holding_change		R-squared:			0.0206
Estimator:	PanelOLS		R-squared (Between):			0.0357
No. Observations:	51161		R-squared (Within):			0.0506
Cov. Estimator:	Clustered		F-statistic:			354.26
Entities:	460		P-value			0.0000
Avg Obs:	111.22		Distribution:			F(3,50586)
Min Obs:	18.000		F-statistic (robust):			5.1731
Max Obs:	143.00		P-value			0.0014
Time periods:	113		Distribution:			F(3,50586)
Avg Obs:	452.75					
Min Obs:	445.00					
Max Obs:	463.00					
Parameter Estimates						
	Parameter	Std. Err.	T-stat	P-value	Lower CI	Upper CI
const	-280.59	150.68	-1.8621	0.0626	-575.92	14.746
esg_score_change	-2.9126	3.5818	-0.8132	0.4161	-9.9329	4.1077
weekly_return	-305.14	214.32	-1.4238	0.1545	-725.21	114.93
weekly_volatility	2.652e+04	7945.1	3.3380	0.0008	1.095e+04	4.209e+04
F-test for Poolability: 14.415						
P-value: 0.0000						
Distribution: F(571,50586)						
Included effects: Entity, Time						

Table 8: Presents the results from the panel regression with entity and fixed effects examining the impact of esg_score_change, weekly_returns, and weekly_volatility as the independent variable when users_holding_change is the dependent variable.

The loss of statistical significance when time effects are introduced suggests that broader market conditions and macroeconomic factors may overshadow the impact of ESG changes. Retail investors, especially on platforms like Robinhood, may be more influenced by market-wide trends and sentiment rather than company-specific ESG changes. This points to the idea that while ESG scores can influence behavior, their effect is nuanced and likely



contingent on the broader market environment. The fact that weekly volatility remains significant also underscores the opportunistic behavior of retail investors, who might be more active during periods of heightened market activity, regardless of ESG considerations.

A condition index analysis was conducted to assess the presence of multicollinearity among the independent variables. This method involves computing condition indices from the independent variable matrix's singular value decomposition (SVD). Condition indices provide insight into the degree of multicollinearity in the dataset, and high condition indices (typically above 10 or 30) indicate potential multicollinearity issues. In this study, the calculated condition indices were as follows: [1.0, 1.007, 1.014]. These values are all very close to 1, suggesting no significant multicollinearity is present in the dataset. In this case, the results imply that the model is stable, and the estimated coefficients for each independent variable can be interpreted with greater confidence, as they are not biased by linear dependencies between the predictors. This is important for ensuring that the regression estimates are reliable and that the independent variables (`esg_score_change`, `weekly_return`, and `weekly_volatility`) are relatively correlated.

These findings provide mixed evidence regarding the influence of ESG changes on retail investor behavior. The significant negative effect in the entity fixed effects model suggests that retail investors may respond to deteriorating ESG performance by reducing their holdings. This could reflect a growing awareness among retail investors of the risks associated with poor ESG performance, such as potential regulatory issues, reputational damage, or long-term financial instability. However, the loss of significance when incorporating time effects indicates that broader market trends could overshadow the impact of ESG scores. The low R-squared values across all models suggest that ESG changes alone do not explain much of the variability in Robinhood user holdings, suggesting that other factors are also crucial drivers of retail investor behavior.



4.0 Discussion

This section discusses the main findings, addresses limitations, and suggestions for future research.

4.1 Discussion

The findings of this study indicate that ESG scores have a limited but observable impact on retail investor behavior in Robinhood. Specifically, the results from the panel regression with entity fixed effects show that a decline in ESG scores is associated with a statistically significant decrease in user holdings. This suggests that a subset of retail investors may be responsive to deteriorations in ESG performance, potentially due to concerns about these companies' long-term sustainability and risk profile. However, the relationship between ESG scores and user holdings appears nuanced. When time-fixed effects are included, the significance of the ESG impact diminishes, indicating that broader market trends may overshadow the effect of ESG changes on investor behavior. This points to the possibility that, while ESG considerations matter, other factors, such as general market sentiment or social media influence, are likely more potent drivers of trading activity on Robinhood.

The economic significance of the findings should also be considered. The coefficients for ESG score changes and the corresponding effect on user holdings are relatively small. Although some models respond to declining ESG scores, the effect size suggests that ESG is not the primary determinant of retail investor decisions. Instead, it is likely one of several factors investors consider when deciding whether to hold or sell a stock. These findings support the idea that younger retail investors value sustainability, as evidenced by their reaction to adverse changes in ESG performance. However, the consistency of the results across different models indicates that this behavior may be uniform. It is possible that only a segment of



investors actively considers ESG criteria when making investment decisions, while others may be driven by more traditional financial metrics or react to broader market influences.

4.2 Limitations

While this study aims to provide valuable insights into the ESG preferences of retail investors on the Robinhood platform, several limitations should be acknowledged. First, the analysis relies on Robinhood user holding data, which is limited in capturing individual investors' motivations or detailed characteristics. While significant, the platform's user base may only represent some retail investors, potentially introducing bias. The unique interface and gamification elements may also influence trading behavior in ways that differ from other platforms, potentially skewing the findings. Additionally, the Robinhood data does not show users' specific buy and sell transactions, meaning we cannot accurately determine whether users are selling their stocks when ESG scores decline.

Second, ESG scores are inherently subjective, and different ESG rating providers may produce varying assessments of a company's sustainability performance. This study's ESG data is sourced from LSEG, which uses proprietary methodologies that may only partially capture the evolving nuances of sustainability in some sectors. Using a single ESG data source could limit the applicability of the findings. Additionally, the low R-squared values in the regression models suggest that a significant portion of the variation in user holdings remains unexplained, indicating the need for more comprehensive models that include other factors such as social media activity or major company announcements.

Finally, the data is limited to 2018 to 2020. This may restrict the findings' applicability to more recent trends, particularly as ESG investing has continued to evolve and gain awareness in subsequent years. Given these limitations, the conclusions drawn from this study should be interpreted with caution, acknowledging that they may not fully capture the complexities of retail investor behavior or the diversity of perspectives on sustainable investing.



4.3 Directions for Future Research

Future research could address some of the limitations encountered in this study, broadening our understanding of retail investors' ESG preferences and responses to sustainability information. A promising direction would be to examine individual-level data, where available, to capture a more granular view of retail investor behavior and allow for analysis by demographic factors such as age, experience, and investment goals. This approach could reveal whether specific subgroups of retail investors (e.g., younger, more values-driven investors) are more responsive to ESG factors than others, providing a clearer picture of the motivations that drive sustainable investing decisions. Another helpful extension would examine data from multiple trading platforms to assess whether user demographics and platform features influence ESG-related behavior. Robinhood's unique gamified design may shape trading activity differently from more traditional brokerage platforms.

Additionally, with the rapid evolution of ESG standards and heightened attention to real-time sustainability issues, future research could incorporate real-time data on ESG news events, controversies, or regulatory changes to observe how immediate information impacts investor behavior. Finally, expanding the analysis timeframe beyond 2020 to capture more recent trends would provide insight into how the growing emphasis on sustainability among the general public might influence retail investors, particularly in the wake of increased regulatory focus on sustainable finance. These directions would deepen the academic understanding of retail investors' ESG preferences and offer practical implications for fintech platforms, regulators, and financial advisors seeking to encourage more sustainable investing among retail audiences.

5.0 Conclusion

This study set out to investigate whether retail investors on Robinhood significantly reduce their holdings in response to declines in ESG scores. The analysis provides mixed evidence on the



impact of ESG ratings on investor behavior. The panel regression with entity fixed effects indicates that declining ESG scores are associated with reducing user holdings, suggesting that ESG considerations play a role in shaping retail investor decisions. However, this relationship is only robust across some model specifications, and including time-fixed effects diminishes the significance of ESG scores, indicating that broader market conditions may exert a more substantial influence.

From an economic perspective, the effect size of ESG score changes on user holdings is relatively modest, implying that while ESG factors are relevant, they are not the dominant driver of retail trading decisions. The findings align with the notion that retail investors, particularly those on platforms like Robinhood, are influenced by various factors, including market volatility, recent news, and possibly social media trends. ESG scores act as a supplementary consideration rather than a primary criterion for decision-making.

The results suggest that some retail investors value sustainability and respond negatively to deteriorating ESG performance, which may reflect a growing awareness of sustainability issues among younger investors. However, the findings must be more consistent within the retail investor base. While some investors may prioritize ESG considerations, others may be more opportunistic or influenced by different factors.

The study's limitations, such as the reliance on a single ESG rating source and the relatively low explanatory power of the models, highlight areas for further research. Future studies could benefit from incorporating additional data sources better to understand the multifaceted drivers of retail investor behavior. Expanding the scope of ESG ratings to include multiple providers also helps validate the robustness of the observed relationships. Additionally, having access to detailed buy and sell data could provide a clearer picture of investor reactions, mainly whether users are actively selling their holdings in response to ESG declines.



In conclusion, while ESG scores influence retail investor behavior somewhat, their impact is nuanced and contingent on broader market dynamics. Retail investors on Robinhood may consider ESG factors when making investment decisions, but these considerations are likely weighed alongside other, perhaps more immediate, influences. Understanding the interplay between sustainability preferences and other market forces remains crucial for comprehending retail investor behavior in an increasingly complex and dynamic market environment.



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