Impact of ESG Performance on Stock Returns and Herding Behavior: An Analysis of the US Stock Market

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Abstract: This study examines the impact of Environmental, Social, and Governance (ESG) performance on stock returns and herding behavior in the stocks that comprise the S&P 500 market index. We analyze the period from May 1, 2014, to May 1, 2024, with a particular focus on the COVID-19 pandemic. We employ multiple regression analysis to assess the relationship between stock returns and key financial indicators: market capitalization, price-to-book value (P/BV) ratio, Sharpe ratio, and ESG scores. Our findings reveal that higher Sharpe ratios are strongly associated with higher annualized returns, whereas ESG scores have an economically small but statistically significant negative impact on returns. To investigate herding behavior, we apply the cross-sectional absolute deviation (CSAD) methodology. The results indicate significant herding behavior and suggest that ESG score performance motivates herding in the S&P 500 market index. However, during the COVID-19 pandemic, we observe a significant anti-herding behavior. Overall, our study contributes to the understanding of how ESG performance influences stock returns and herding behavior, highlighting the complexities of investor behavior during periods of market stress.

Keywords: COVID-19 Pandemic, ESG Performance, Herding Behavior, Investor Behavior, Stock Returns, S&P 500 index, Sharpe ratio.

1. INTRODUCTION

In recent years, the focus on Environmental, Social, and Governance (ESG) criteria has significantly increased within academia, business circles, and political arenas. ESG criteria involve evaluating companies based on their sustainability practices, which include environmental impact, social responsibility, and governance structures. According to Deloitte reports (Deloitte.com), the projection of ESG assets under management (AUM) will reach a total value of 35 trillion $ by the year 2025, which can be explained by a highly growing interest in firms that are adopting sustainable approaches by integrating the ESG factors. If the ESG world market is mainly developed in Europe, which comes in first place by a proportion of 82%, the US ESG market rank at second position and counts only 12% of the global world ESG market (Global Sustainable Fund Flows Q2, 2022).

Also, behavioral finance has gained prominence since the work of Tversky and Kahneman (1974), easing the rigorous requirement of convergence between price and value and acknowledging the existence of phenomena associated with decision-making by economic agents outside the rational model defined by Von Neumann and Morgenstern in their groundbreaking book, "Theory of Games and Economic Behavior." Two significant papers that have profoundly influenced this field are "Prospect Theory: "Judgment under

Uncertainty: Heuristics and Biases" (Tversky & Kahneman, 1974), which explored the heuristics and biases that affect human judgment and decision-making, and "An Analysis of Decision under Risk" (Kahneman & Tversky 1979), which introduced the concept of prospect theory. These works have been instrumental in understanding the psychological underpinnings of economic decisions, challenging traditional economic theories that assume rational behavior.

Addressing the decision-making mechanisms of diverse market participants has become a significant challenge for financial researchers. Notably, in recent years, several authors have presented direct empirical findings demonstrating that investors' trading behavior is influenced by their individual personality traits and psychological biases; such as overconfidence, aversion to loss, and herd mentality (Kahneman and Tversky, 1979; Bikhchandani, 2001). This later phenomenon arises when investors disregard their own information and instead follows the collective, uninformed behavior or groupthink, regardless of whether this behavior is supported or justified by relevant information. Consequently, financial markets may struggle to effectively incorporate private information, leading to price inefficiencies (Baker & Wurgler, 2007; Youssef & Waked, 2022).

In contrast to stock market, for which several research results are available, the literature about the investor's behavior in ESG stock market is very limited. In a recent study, Gavrilakis and Floros (2023) conducted on a panel of six European countries (Portugal, Italy, Greece, France, Spain, and Germany) investigate how financial performance indica-

tors and combined ESG score with herding impact on stock return. Their results show that, concerning European companies, price to book value and Sharpe ratio have a significant impact on stock returns. The outcome of this work also show that investors in five out of six countries do not sacrifice their return by investing in firms with high ESG scores. Additionally, evidence of ESG herding behavior was reported in Portugal, Italy, and Greece but not in France, Italy, and Germany (Gavrilakis and Floros, 2023).

This paper examines the influence of ESG performance on stock returns and herding behavior within the S&P 500 market index from 2014 to 2024. The S&P 500, comprising 500 of the largest companies listed on stock exchanges in the US, serves as a prominent benchmark for the performance of the US stock market.

To our knowledge, this is the first research work dealing with ESG performance and herding behavior in the US Stock Market. This combined analysis is aiming to seek evidence of herding behavior concerning investment decisions. It investigates herding behavior in ESG investments, where investors might follow the actions of their peers rather than their own analysis, potentially leading to market inefficiencies. Additionally, this study also aims to examine how market capitalization, price-to-book value, Sharpe ratio, and ESG performance influence stock returns in the New York market exchange.

Therefore, the first motive of the present study is to analyze the importance of this shift into ESG strategies operated by fund manager and investors in the US stock market, by integrating a Socially Responsible Investing (SRI), as defined by Cicereti et al. (2021). By examining the interactions between ESG performance, financial indicators, and herding tendencies, our second motive is to enhance the understanding of how sustainability considerations influence market dynamics and portfolio diversification and performance. This contribution is vital for investors, portfolio managers, and policymakers as they strive to promote sustainable investment practices and improve market efficiency and stability.

This paper is organized as follows. Section 2 reviews the existing literature on herd behavior and ESG in financial markets, highlighting key studies and findings that provide context for our research. Section 3 describes the methodology employed, including data sources, variable definitions, and the analytical framework used for our regression models. Section 4 presents the results of the empirical study. Section 5 concludes.

2. LITERATURE REVIEW

The topic of herd behavior in financial markets has received thorough exploration in existing literature. The first empirical study examining market-wide herd behavior was conducted by Christie and Huang (1995). Their study reveals indications of herd behavior during panic market situations in Taiwan and South Korea. According to the authors, during periods of significant disruption, individual returns tend to align closely with market returns, suggesting diminished access to private information and a shift towards collective decision-making. Similarly, different studies conducted by Chang et al. (2000) and Cipriani and Guarino (2008) noted

that financial agents tend to abandon the use of private information during such times, opting instead to follow crowd behavior. This phenomenon has the potential to influence asset price formation, resulting in prices that may not accurately reflect the true value of assets.

Chiang and Zheng (2010), employed a modified version of CSAD, conducted on herding effects across 18 global markets spanning from 1998 to 2009 has shown instances of herd behavior in Asian and developed markets. Additionally, during times of crisis, herd behavior was observed in Latin markets as well as in the United States. Similarly, Chong et al. (2017) also identified herd behavior in China's fluctuating stock market using the CSAD method. They attributed herding to various factors, including risk, investors' short-term investment tendencies, and analyst recommendations.

Moreover, several recent research works have reported instances of herding in different regions. Economou (2019) examined herd behavior in the Balkan Stock Exchanges (Slovenia, Romania, Croatia, and Bulgaria) from 2000 to 2016, focusing primarily on the Eurozone crisis and the global financial crisis. Herd behavior was observed across the Balkan region as a whole, with the Romanian stock market displaying the most significant effect compared to other markets. Additionally, according to Nait-bouzid et al. (2020), the observed empirical evidence suggests that herding is more prevalent in downward markets, with no signs of herding during upward market trends at the overall market level. Also, Ferrouhi (2020) did an investigation on herding behavior in the Moroccan Stock Exchange from 2007 to 2017 and proved a positive relationship between liquidity, volatility, and investors' herding behavior across both the portfolios and the overall market. These findings indicate that investors tend to exhibit herding behavior more during bearish market conditions, possibly due to a "flight to safety" mentality

On the other hand, Mertzanis and Allam (2018) examined daily and monthly data from the Egyptian stock market under both bear and bull market conditions, but failed to identify any instances of herd behavior whereas Stavroyiannis and Babalos (2019) noted negative herding in the Eurozone stock markets from 2000 to 2016 using a CAPM-based procedure. Additionally, Shantha (2019) investigated the evolutionary nature of herd behavior in the Colombo stock market from 2000 to 2008 using quantile regression and the CSAD model, and showed that herd behavior exhibited a complex pattern. Furthermore, a study conducted by Ukpong et al. (2021) on herding based on market returns, volatility, and trading volume using daily data from 1990 to 2020 did not reveal herd behavior in the overall US stock market.

On another side, in recent years, the focus on Environmental, Social, and Governance (ESG) criteria has significantly increased within academia, business circles, and political arenas. ESG criteria involve evaluating companies based on their sustainability practices, which include environmental impact, social responsibility, and governance structures. Numerous studies have explored how ESG performance affects a company's stock returns, but the findings have been varied. Some research indicates that ESG initiatives lead to better financial performance, while other studies suggest the opposite or find no clear relationship. This inconsistency points to a gap in understanding that this study aims to fill by

examining USA data, which could provide valuable insights for investors, companies, and society.

In their research work, Clark et al. (2015) found that companies with sustainable strategies often achieve higher financial returns, and investors who consider sustainability can also enhance their investment performance. Nagy et al. (2016) showed that portfolios with ESG-rated stocks by MSCI outperformed the broader MSCI World index from 2007 to 2015. Similarly, El Ghoul and Karoui (2017) noted a positive relationship between ESG performance and firm value, particularly in regions with weaker market-supporting institutions, while Velte (2017) observed that ESG factors boost return on assets (ROA) for German companies, although they do not significantly impact overall firm value. Dalal and Thaker (2019) reported that Indian companies with strong ESG practices perform better financially, suggesting that investors prefer companies committed to social responsibility.

Other research works have tried to investigate on how important it is for businesses to focus on Environmental, Social, and Governance (ESG) factors during challenging times such as the COVID 19 pandemic. Borokova and Wu (2020) found that companies that scored higher in ESG ratings proved to be more resilient, attract more investors and performed better on the stock market than those with lower ratings. It was found that companies faced fewer financial problems and bounced back faster during the pandemic. This strength is due to their forward-thinking risk management and commitment to sustainable practices, which are vital for handling crises.

Furthermore, the COVID-19 outbreak also triggered noticeable herding behavior in ESG investments, especially in countries like Portugal, Italy, and Greece. According to Gavrilakis and Floros (2023), investors in these countries were more likely to follow the crowd during the pandemic, driven by uncertainty and market volatility. This tendency to mimic others can lead to market inefficiencies, underscoring the need for better investor education and strategies that promote independent thinking. Additionally, the pandemic has accelerated the emphasis on ESG issues, proving that sustainable investing is not just a passing trend but a key component of resilient financial markets.

Conversely, some studies report a negative impact of ESG on stock returns. Fisher-Vanden and Thorburn (2011) found that companies joining the Environmental Protection Agency's climate leadership programs experienced significant negative stock returns. Also, Sahut and Pasquini-Descomps (2015) and Fatemi et al. (2015) documented negative financial impacts associated with ESG actions in various contexts. Moreover, several studies, such as those by Revelli and Viviani (2015) and Halbritter and Dorfleitner (2015), found no significant relationship between ESG ratings and financial performance, suggesting that the returns of high and low ESG-rated portfolios are similar. On the other hand, research by Bitetto and Cerchiello (2023) indicates that cryptocurrency projects adhering to ESG principles attract more investment, highlighting the growing investor preference for sustainable and responsible investment options. These findings highlight the complexity and sometimes contradictory nature of ESG's financial impacts.

Based on our literature review, we identify the following hypothesis regarding the relationship between ESG performance and stock returns, the relationship between ESG performance and herding behavior, and the impact of the COVID-19 pandemic on herding behavior:

H1: There is a significant impact of ESG performance on stock returns in the S&P 500 market index.

H2: ESG performance has a significant impact on herding behavior in the S&P 500 market index.

H3: There is a significant change in herding behavior during the COVID-19 period compared to the pre-COVID period in the S&P 500 market index.

3. METHODOLOGY

3.1. Data Collection and Procedures

First, we gathered the necessary data. We used the Finnhub API to get market capitalization and PBV data, and we pulled historical price data from Yahoo Finance using the yfinance library. We also obtained ESG scores for each stock from the Refinitiv Eikon database. Next, we prepared the data for analysis. We started by processing the historical price data to calculate daily returns, which then allowed us to determine annualized returns. To assess risk and performance, we calculated Sharpe ratios based on the average daily return and the standard deviation of those returns, adjusted for the annual risk-free rate. Additionally, we measured herding behavior by calculating CSAD values, considering both the entire period under study and, specifically, the COVID-19 period.

The dependent variables in this study are the annualized return (Rit) and the Cross-Sectional Absolute Deviation (CSAD). The annualized return (Rit) is retrieved from the Finnhub API, while the CSAD is used to measure herding behavior among investors. The independent variables include market capitalization (Mcap), retrieved from the Finnhub API, and the Price-to-Book Value (PBV), which is calculated using market capitalization and current share prices. The Sharpe Ratio is computed using historical price data and the annual risk-free rate. Additionally, ESG scores are provided directly for each stock from Refinitiv Eikon. Control variables include market return (Rm), obtained from the S&P 500 index, and ESG scores. These variables are also provided directly for each stock from Refinitiv Eikon.

3.2. Analytical Framework

The analysis was conducted using Ordinary Least Squares (OLS) regression models to examine the relationships between ESG scores, financial performance, and herding behavior. Three regression models were specified:

$$R_{It} = \alpha + \beta_1(Mcap) + \beta_2\left(P/_{BV}\right) +$$

$$\beta_3(Sharpe) + \beta_4(ESG_{t-1}) + \varepsilon_{it} \ (1)$$

where R_{it} is the stock return of stock i in year t, α is the constant, β is the regression coefficient and ε_{it} is the error term. *Mcap* is the market capitalization of asset, *P/BV* is the

price to book value ratio, *Sharpe* is the sharpe ratio and ESG_{t-1} is the yearly ESG performance.

To assess the influence of ESG performance on herding, an extended model incorporating ESG scores was used:

$$CSAD_t = \alpha + \beta_1|R_{m,t}| + \beta_2 R_{m,t}^2$$
$$+\beta_3 ESG(R_{m,t}^2) + \varepsilon_t \quad (2)$$

where $CSAD_t$ is the cross-sectional absolute deviation of return on year *t*, $R_{m,t}$ is the market return on the same year, and *ESG* is the main average performance of ESG score, α is the constant, and β_1, β_2 and β_3 are the regression coefficients.

According to Chang et al. (2020), when markets exhibit herding behavior, the relationship between CSAD and the average market returns should be nonlinear, which is captured by $R_{m,t}^2$. Therefore, significant negative values of β_2 reveals the existence of herding in market *m*. Also, significant negative values of β_3 indicates that herding in market *m* is related to the presence of the *ESG score*. When no significant herding effect is detected, the β_1 coefficient will be significantly positive, whereas β_2 and β_3 coefficients will be no significantly different from zero.

3.3 Herding Behavior and Covid-19 Model

To examine herding behavior during the COVID-19 pandemic, a dummy variable D_{cov} was introduced into the model:

$$CSAD_{Covid} = \alpha + \beta_1|R_{m,t}| +$$
$$\beta_2 R_{m,t}^2 + \beta_3 D_{cov}(R_{m,t}^2) + \varepsilon_t \quad (3)$$

where $CSAD_{Covid}$ is the cross-sectional absolute deviation of return during Covid 19 pandemic, $R_{m,t}$ is the market return on the same year, and D_{cov} is a dummy variable associated to Covid-19, with a value of 1 during the pandemic period and 0 otherwise. score α is the constant, and β_1, β_2 and β_3 are the regression coefficients.

As explained for equation (2), in the absenteeism of any herding effects, the β_1 coefficient will be positive, whereas β_2 and β_3 coefficients will be no significantly different from zero. On the other hand, significant negative values of β_2 indicates the existence of herding in market m whereas, significant negative values of β_3 reveals herding effect due to Covid 19 pandemic (Chang et al. 2020, Gavrilakis and Floros, 2023).

4. RESULTS AND DISCUSSION

In this section, we present and interpret the results of the OLS regression analyses conducted to examine the impact of various factors on annualized returns and cross-sectional absolute deviation (CSAD) among S&P 500 stocks, including the Covid-19 period. First, we analyze the OLS regression results for annualized returns, focusing on the signifi-

cance of market capitalization, price to book value (P/BV), Sharpe ratio, and ESG scores. Then we explore the regression results for CSAD to understand the presence of herding behavior in the market, particularly during periods of high market returns. Lastly, we discuss the regression outcomes for CSAD during the Covid-19 pandemic to evaluate how investor behavior may have shifted under the stress of the pandemic

Table 1. OLS Regression Results for the Return.

Model Summary				
Model	**R^2**	**Adjusted R^2**	**F**	**Sig**
-	0.790	0.788	464.1	0.000
Coefficients				
-	Coeff	SD	T-ratio	Sig
Const	0.1061	0.037	2.869	0.004**
Mcap	-7.909e-15	8.03e-15	-0.985	0.325
PB/V	-0,0508	0.036	-1.397	0.163
Sharpe	0.3567	0.009	39.532	0.000***
ESG t-1	-0.0004	0.000	-2,176	0.030**
Dependent Variable: Ri/Predictors: Mcap, P/BV, Sharpe Ratio, ESGt-1, N=500				

Table **1** reports estimated coefficients for the following model:

$$R_{It} = \alpha + \beta_1(Mcap) + \beta_2\left(\frac{P}{BV}\right) + \beta_3(Sharpe) +$$
$$\beta_4(ESG_{t-1}) + \varepsilon_{it}$$

Where: R_{it} is the stock return, α is the constant, β is the regression coefficient and ε_{it} is the error term. Mcap is the market capitalization of asset, P/BV is the price to book value ratio, Sharpe is the Sharpe ratio and ESG_{t-1} is the yearly ESG performance. *** Significant at 1%, **Significant at 5% and * Significant at 10%.

The constant α was is statistically significant (***), with a p-value equal to 0.004. This, indicates that when all predictors variables in the regression model are zero, the annualized return is significantly positive (0.106). According to this estimated equation, the *Market Capitalization:* coefficient β_1 is negative but very small (-7.909e-15) and not statistically significant (p-value = 0.325). This result suggests that market capitalization does not significantly impact the returns in the S&P 500 stocks, although the negative value may traduce an investors preference for smaller companies in their portfolios selection. With regard to the *Price to Book Value (P/BV), th*e β_2 coefficient is also negative (-0.0508) but not statistically significant (p-value = 0.163). This indicates a potential negative relationship between P/BV and annualized returns, but the effect is not statistically significant. These results are not similar to those reported by Gavrilakis and Floros (2023) who identified significant correlations between Stock return and *Market* Capitalization as well as with *Sharpe ratio* in Euronext 100 index.

On the other hand, both regression coefficients β_2 *and* β_3 for Sharpe ratio and ESG score were found to be statistically significant with p values of 0.000$^{(***)}$ and 0.030 $^{(**)}$ respectively.

The *Sharpe Ratio* coefficient reveals a positive and highly significant value (0.3567), indicating that higher Sharpe ratios are associated with higher annualized returns. This aligns with the expectation that better risk-adjusted returns (higher Sharpe ratios) are preferred by investors. Moreover, the *ESG Scores* coefficient has a significant negative value of (-0.0004), meaning that a 1unit change in ESG score impacts -0004-unit change in return. This suggests that US investors sacrifice *Stock Return* for companies with higher *ESG* scores, and traduces a possible growing interest in the socially responsible investment among the US investors. This finding is in accordance with the results reported by Shahut and Psquini-Descomps (2015), who found a negative relationship between ESG score and financial performance. Our results are also similar to the finding of Gavrilakis and Floros (2023), who reported a negative regression coefficient (-0095) between ESG score and t Stock's return in Euronext100 index. Their work revealed also a positive and significant relationship between *Return* and *Sharpe Ratio*. However, our results are not in accordance with those reported by La Torre et al. (2020) who found no impact of ESG score on financial performance in *Eurotoxx50 Companies*

Results from the second analysis conducted in this study are reported on Table **2**. By applying the cross-sectional absolute deviation returns model detail in Equation 2, as used by Chang *et al.* (2000), we examine the influence of ESG performance on herding behavior in the S&P 500 stocks index market.

Table 2. OLS Regression Results for CSAD.

Model Summary				
Model	**R^2**	**Adjusted R^2**	**F**	**Sig**
-	0.022	0.020	11.29	0.000
Coefficients				
-	Coeff	SD	T-ratio	Sig
Market Return	2.2307	0.123	18.184	0.000***
(Market Return)2	0.0384	0.002	18.184	0.000***
ESG*(Market Return)2	-0,3513	0.105	-3.360	0.000***

Table **2** reports estimated coefficients for the following model: $CSAD_t = \alpha + \beta_1|R_{m,t}| + \beta_2 R_{m,t}^2 + \beta_3 ESG(R_{m,t}^2) + \varepsilon_t$, Where: $CSAD_t$ is the cross-sectional absolute deviation of return $R_{m,t}$. ESG is the main average performance of ESG score. *** Significant at the 1% level. All estimations use the West (1987) heteroscedastic and autocorrelation corrected standard errors.

The outcome of this study shows that the return market ($|R_{m,t}|$) β_1 coefficient has a positive and highly significant value estimated at 2.2307, (p-value < 0.001). This indicates that higher market returns are associated with higher cross-sectional absolute deviations. The $R_{m,t}^2$ coefficient β_2 was also estimated at a positive and highly significant value of 0.0384, indicating that higher market returns are associated with greater return dispersion.

On the other hand, the β_3 coefficient was found to have a negative value estimated at -0.3513 with a highly significant p-value (0.001). According to Chang et al. 2020, since there is a negative relationship between dispersion and market return, a β_3 coefficient negative value indicates the existence of herding behavior. Therefore, the outcome of our study indicates that ESG score performance motivates herding in the S&P 500 market index. This finding is on the line of the results reported by Benz et al. (2020), who found evidence of herding behavior on green meadows. Additionally, our results are in accordance with those reported by Gavrilakis and Floros (2023) who found that herding behavior was motivated by ESG scores in France and Greece. However, in the same study, these authors have indicated that no significant ESG herding effect was found in Portugal, Spain, Germany nor Italy. Furthermore, our finding does not support the result of Yarovaya et al. (2021) who found no evidence of herding in cryptocurrencies during Covid-19.

With regard to the Covid-19 pandemic crisis, results of the CSAD used to examine the herding behavior in the S&P 500 index market are shown on Table 3. The β_3 coefficient of $D_{cov}(R_{m,t}^2)$ has a positive and highly significant value of 1.1875 (p-value < 0.001). This result indicates a significant increase in return dispersion during the Covid-19 period compared to the pre-Covid and suggests the presence of an anti-herding behavior during the pandemic.

Furthermore, the β_2 coefficient of the squared Market Return $(R_{m,t}^2)$ was also found highly significant (p-value < 0.001) with a positive value of 1.2391, indicating increased return dispersion during high market returns and is consistent with anti-herding behavior during this pandemic period. Finally, the $|R_{m,t}|$ coefficient is also positive (1.2391) and highly significant (p-value < 0.001), indicating increased return dispersion during high market returns. This outcome can possibly be explained by a more professional attitude of investors in constructing their portfolios during the Covid19 period in the S&P 500 market index, rather than a non-rational decision. This anti-herding might also indicate that stocks with high ESG scores could lead to more market efficiency and reduce financial bubble occurrence.

Table 3. OLS Regression Results for CSAD during Covid-19.

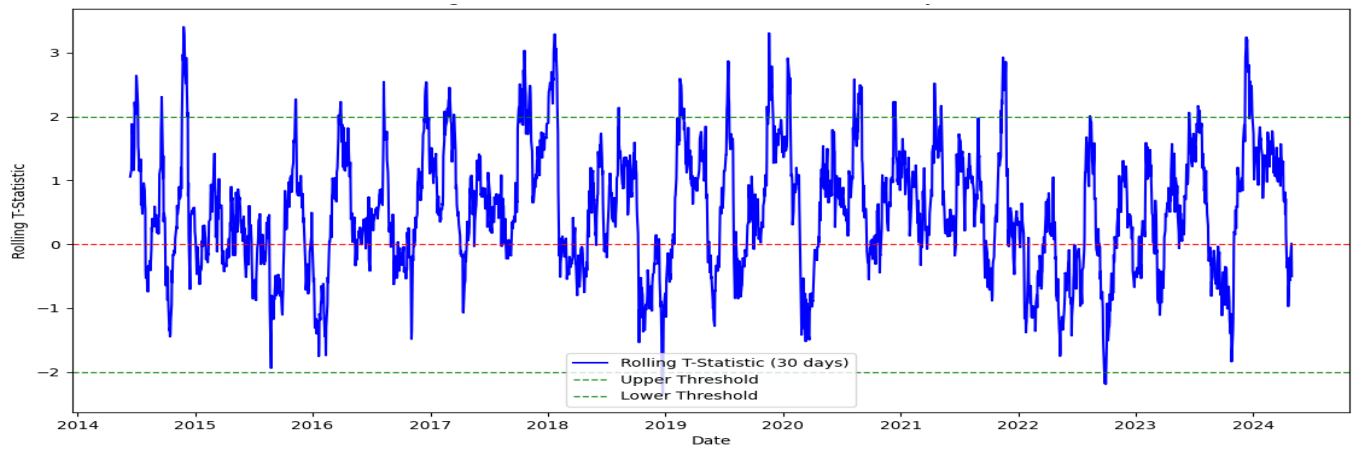| Model Summary				
Model	**R^2**	**Adjusted R^2**	**F**	**Sig**
	0.891	0.891	4040	0.000

Fig. (1). Rolling t-statistic for S&P 500 market returns over a 30 day Window.

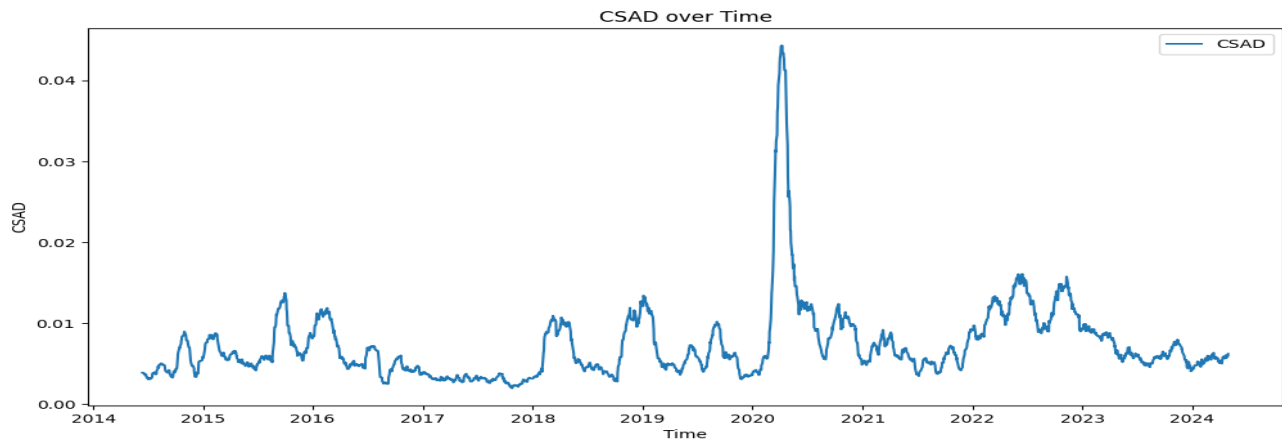**Fig. (2).** Over time Cross-Sectional Absolute Deviation for S&P 500 market returns.

Coefficients				
	Coeff	SD	T-ratio	Sig
Market Return	1.2391	0.057	21.839	0.000***
Market Return2-Covid	0.1986	0.009	21.839	0.000***
Dcov (Market Return)2	1.1857	0.019	0.019	0.000***

Table **3** reports estimated coefficients for the following model:

$$CSAD_{Covid} = \alpha + \beta_1 |R_{m,t}| + \beta_2 R_{m,t}^2 + \beta_3 D_{cov}(R_{m,t}^2) + \varepsilon_t \, ,$$

where $CSAD_{Covid}$ is the cross-sectional absolute deviation of return during Covid 19 pandemic, $R_{m,t}$ is the market return on the same year, and D_{cov} is a dummy variable associated to Covid-19, with a value of 1 during the pandemic period and 0 otherwise. *** Significant at 1%, **Significant at 5% and * Significant at 10%. All estimations use the West (1987) heteroscedastic and autocorrelation corrected standards errors.

These results are in accordance with the research work reported by Ciciretti et al. (2021) who detect an anti-herding behavior in the ESG funds. They are also partly in accordance with the work of Chang et al. 2000 who found no evidence of herding in a sample of energy markets from Asia and US. However, different other studies have reported evidence of herding behavior. Wu et al. (2020) have found significant herding during the Covid-19 pandemic period in Chinese stocks. Also, during this same pandemic crisis, Gavrilakis and Floros (2023) have identified significant herding behavior in Portugal, Greece and Italy.

Finally, additional statistical analysis can be shown in the next figures. Fig. (**1**) illustrates the rolling t-statistic for the S&P 500 market returns over a 30-day window, capturing the market's ups and downs from 2014 to 2024. Throughout this period, the t-statistic frequently fluctuates around zero, with significant peaks and valleys. These swings indicate moments when market returns deviate sharply, possibly due to inefficiencies or reactions to major events. The thresholds, marked by dashed lines at +2 and -2, help identify these extreme deviations. Notably, there is an important increase in volatility around early 2020, reflecting the market turmoil brought on by the COVID-19 pandemic.

Fig. (**2**) shows the Cross-Sectional Absolute Deviation (CSAD) over time, offering insight into investor behavior. The CSAD measures how much individual stock returns differ from the overall market return, effectively highlighting periods of herding behavior. The graph reveals several

peaks, with the most dramatic spike in early 2020, coinciding with the pandemic's peak impact.

The spike observed in Fig. (**2**) suggests that investors were more likely to follow the crowd during this period of high uncertainty. Generally, higher CSAD values appear during times of market stress, indicating increased herding behavior. Even after 2020, the CSAD levels remain somewhat elevated compared to pre-pandemic times, suggesting a lingering effect on how investors make decisions, possibly driven by ongoing uncertainty or other factors.

5. CONCLUSION

This paper investigates the influence of ESG performance on stock returns and herding behavior within the S&P 500 market index from 2014 to 2024. The S&P 500, comprising 500 of the largest companies listed on stock exchanges in the US, serves as a prominent benchmark for the performance of the US stock market. We analyzed the relationship between stock returns and key financial indicators; market capitalization, price to book value (P/BV) ratio, Sharpe ratio, and ESG scores.

With regard to stock returns and financial indicators, our analysis shows that stocks with higher Sharpe ratios tend to have higher annualized returns, emphasizing the importance of risk-adjusted performance. However, market capitalization and price-to-book value (PBV) ratio did not significantly affect returns, suggesting that traditional financial metrics might not fully capture what drives stock performance today. Interestingly, we found that higher ESG scores slightly but significantly decreased stock returns, indicating that investors might be willing to accept lower returns for companies that score well on sustainability. This suggests a nuanced relationship between sustainability performance and financial returns, where higher ESG performance might not directly translate to higher returns in the short term. This outcome could also traduce a possible growing interest in the socially responsible investment among the US investors.

Additionally, our results, indicate that that ESG score performance motivates herding in the S&P 500 market index, as a highly significant and negative regression coefficient was found. This finding is on the line of the results reported by Gavrilakis and Floros (2023) who found that herding behavior was motivated by ESG scores in France and Greece. Higher ESG performance appears to motivate herding behavior, as higher ESG scores were associated with reduced return dispersion during periods of high market returns.

During the COVID-19, anti-herding behavior increased notably, reflected in higher return dispersion. This rise in independent behavior likely stemmed from the heightened uncertainty and stress of the pandemic, causing investors to make more individualized decisions rather than following the crowd. Interestingly, the increased return dispersion suggests that investors adopted a more professional approach to portfolio construction during the pandemic, rather than making irrational decisions. This anti-herding behavior indicates also that stocks with highly ESG scoring could improve market efficiency and reduce financial bubble occurrence.

Overall, this research underscores the significant role of ESG performance in shaping investor behavior and market dynamics. It offers vital insights into how sustainability considerations influence financial markets, particularly during crises like the COVID-19 pandemic. The findings support strategies that integrate ESG factors to achieve both financial stability and sustainable growth in financial markets.

CONFLICTS OF INTEREST

The authors report that there are no relevant conflicts of interest.

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