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Abstract

In this study, we examine the valuation effect of ESG performance using a sample of 895 European companies. The misvaluation of the company is determined by the ratio of its market price to its true value. A true value calculation is based on two measures: first, on the analysts' forecasted price, and second, on residual income. We find that improvements in ESG profiles increase market prices in relation to their true value. An analysis of overvalued and undervalued stocks separately revealed that ESG performance further enhances the existing level of overvaluation. Conversely, it restores undervalued stocks to their true value for residual income measures of misvaluation. Alternatively, mispricing measured by analysts' forecasted price is significant only for undervalued stocks and the entire sample. Our analysis suggests that information asymmetry and market sentiment play a moderating role in the ESG-misvaluation nexus, suggesting that ESG is a friction to market efficiency. ESG-related misvaluations further impact capital structure through market timing practices, and the increased stability of CSR can be attributed to a marginal increase in equity issuance. We attribute this valuation effect to the demand effect associated with ESG investments. The findings are robust to alternative measures of estimation.

JEL classification: G1 G3 M21 G12

Keywords: ESG performance, overvaluation, undervaluation, capital structure

1. Introduction

The sustainable performance of European companies is not just a theoretical commitment but also a tangible and growing reality, supported by reliable industry data and market trends. European businesses are aiming for a combination of responsible business practices, resource efficiency and financial success, contributing to a more sustainable and resilient business landscape. Notably, In the principal European markets, ESG metrics are currently integrated into the incentive structures of 90% of companies, marking an elevation of 11 percentage points from the preceding year (Schoenthal & Summers, 2023). This signifies the earnest commitment of companies to the principles of Environmental, Social, and Governance (ESG).

A growing number of European companies are investing in renewable energy initiatives. Countries like Germany and Denmark are leading the way in wind energy production, with wind constituting a large percentage of their energy mix (Duffy et al., 2020). The European auto industry is also making significant advances in converting to electric vehicles, allowing carbon emissions to be reduced (European Enviromental Agency, 2016). Companies with robust sustainability practices in Europe are attracting substantial investments. In a notable example, Unilever, a British-Dutch consumer goods company renowned for its commitment to sustainability, has consistently outperformed industry benchmarks. Its sustainable living brands, including those focused on environmental and social impact, have demonstrated a growth rate over 50% faster than the rest of the business (Unilever, 2020).

On the other hand, investors are now actively factor in ESG considerations when making decisions, seeking alignment with sustainability objectives. Over the last decade, the European Securities and Markets Authority (ESMA) has seen an increase in funds incorporating ESG-related language, which will account for 14% of EU assets under management (€974 billion out of a total of €6.8 trillion) in 2023, compared to 3% in 2013. The surge accelerated after the 2015 Paris Agreement, peaking from 2018 to 2022, though

the creation of new ESG products slowed in 2023. Notably, 1,356 funds, representing 4.6% of EU-based actively managed funds, have added ESG terms to their names since 2018, with a notable increase in 2021 and 2022, emphasizing the growing integration of sustainability language in the financial sector(Mark, 2023).

Globally, more than a third of the estimated $140.5 trillion will be invested in environmental, social, and governance (ESG) assets by 2025, with Europe accounting for more than half of those assets (Hamrouni et al., 2020). In addition, regulatory initiatives, coupled with economic transitions towards sustainability, increase the demand for companies with high ESG ratings. In contrast, ESG-based screening limits investment opportunities by screening investments that do not meet certain criteria (Borgers et al., 2015). The confluence of a growing interest in sustainable business practices and a restricted investment pool can have an effect on the stock market price efficiency of these businesses. As a result of the current "demand effect" of sustainability, we believe that share prices have soared highlighting ESG as a friction to market efficiency. Therefore, this article aims to evaluate whether the hegemonic "demand effect" of sustainability has any bearings for the pricing mechanism of the companies. Moreover, companies with strong ESG ratings are less leveraged, indicating a potential impact on their capital structure.

This study offers a two-fold contribution. First, we contribute evidence from a European context to the existing literature on the relationship between ESG and pricing efficiency. Furthermore, we extend the work of Bofinger et al. (2022) by evaluating the entire sample of firms using dummy variables rather than analyzing only the top 20% and bottom 20% as overvalued and undervalued firms, respectively. Mispricing is defined as the ratio of market price to fair value, where overvalued firms have a mispricing ratio over one, and vice versa. Using the Refinitiv database, we collected data on our sample firms from 2008 to 2019. Our findings suggest that ESG factors play a significant role in the mispricing of EU companies. The sustainability of a company enhances its market value in relation to its intrinsic value. Moreover, our findings indicate that ESG promotes overvaluation and reduces undervaluation among segmented samples of overvalued and undervalued stocks. Furthermore, we demonstrate that market sentiment and information asymmetry moderate the relationship between ESG and mispricing, illuminating ESG's role as a market friction.

Additionally, we extend the scope of the investigation by examining the impact of ESG performance on capital structure through the mispricing channel. A market overvaluation provides financial managers with an opportunity to time the market. Our results indicate that, in general, European companies adhere to the pecking order theory of capital structure but high-ESG enterprises anticipate the overvaluation of equity markets caused by enhanced ESG performance and issue equity. Alternatively, it also shows that companies typically use equity financing for CSR projects instead of debt in order to match cashflow timings that can be one of the determinants of enhanced financial stability of high-ESG firms.

The paper's structure is as follows: Chapter 2 presents the literature review and hypotheses, Section 3 discusses the data and methodology, Section 4 presents the analysis results, and Section 5 provides the conclusion.

Review of the literature and development of hypotheses

2.1 ESG and misvaluation

Corporate social responsibility (CSR) commitments and investments are widely studied; however, scholars have differing opinions about how they affect shareholder and stakeholder wealth. On the one hand, Friedman (2007) contends that CSR initiatives in financial management should prioritize maximizing shareholder profits. However, some investors are skeptical that a firm's ESG investments, which may not have a direct impact on financial performance, could adversely affect profits and value (Friedman, 1970; Fuadah & Kalsum, 2021).

In contrast, Freeman (1984) argued that corporations must consider the interests of all stakeholders. From a resource dependence perspective, a company's success depends on its ability to satisfy key stakeholders since resource extraction is reliant on a wide range of stakeholders. Therefore, CSR activities should lead to value-added outcomes. Enterprises that prioritize stakeholder concerns receive support and resources (Deng et al., 2013). For instance, a CSR initiative targeting primary stakeholders generates exchange capital, such as brand and employee loyalty, and reduces idiosyncratic risk, thus affecting valuation. Conversely, a CSR initiative aimed at secondary shareholders generates moral capital, such as social consent and leniency, which prevent stakeholders from imposing punitive sanctions in the event of a negative occurrence (Lin & Dong, 2018).

CSR initiatives have been studied from the perspective of cost of capital in recent research (Bae et al., 2019). Furthermore, according to stakeholder theory, several researches contend that companies engaged in CSR create long-term shareholder value (Nguyen et al., 2020) even though stock markets undervalue CSR in the short term (Fernández-Guadaño & Sarria-Pedroza, 2018). A company disregarding its social responsibilities may negatively affect its long-term shareholder value due to potential reputational damages or litigation costs (Renneboog et al., 2008). Based on the analysis of 1000+ studies on ESG and financial performance, Aybars et al. (2018) concluded that no consensus exists regarding causality and whether CSR is priced on capital markets, despite many studies suggesting that CSR positively impacts financial performance.

In addition, little research has been conducted on the effect of CSR activities on market efficiency. Environmental, social, and governance preferences may be associated with market inefficiency. According to Renneboog et al. (2008), socially responsible institutions (SRIs) are less likely to buy or sell undervalued or overvalued stocks. Since SRIs are concerned with ESG performance, they pay more attention to it and ignore direct signals of firm value. From the perspective of investment behavior, Sangiorgi & Schopohl (2021) and Starks et al.(2017) examined corporate social responsibility. In their study, they found that institutional investors with longer time horizons prefer companies with high ESG ratings. The companies they hold in their portfolios are typically more patiently handled by these types of investors. They are less likely to sell their stocks when they receive bad news or when the stocks in their portfolios perform poorly. It is possible to explain these patterns of behavior by investors' expectations that long-term wealth generation will compensate for short-term losses. Sustainable investors do not necessarily consider short-term valuation signals that are negative for companies with high ESG ratings. According to research, socially responsible investors gain additional benefits in addition to financial returns (Qiu et al., 2021). According to Ho et al. (2021) and Bofinger et al. (2022) socially responsible stocks tend to be overvalued. The level of CSR of the companies may determine the extent to which this mispricing leads to market inefficiency. Based on these findings, we suggest a link between ESG performance and stock price misvaluation.

Hypothesis 1: ESG performance affect the stock price misevaluation

There are several ways that a CSR program can contribute to a company's financial success. For instance, Min and Galle (1997) have demonstrated that CSR has a direct impact on customer evaluations of products and brands. It has also been shown that CSR influences non-related customer decisions, such as the appraisal of upcoming products (Klein & Dawar, 2004). Because of the "hallo effect" of CSR, consumers assume a company's value and quality products will be enhanced by its environmental concern (Hong Inessa Liskovich et al., 2015). Depending on the situation, it might even be possible to observe the halo effect in courtrooms. A halo effect causes prosecutors to extrapolate from CSR to reduce penalties for companies that practice good CSR. Due to this prejudice that already impacts consumers and prosecutors, investors may interpret a company's CSR commitment as exceptional value.

Capital markets investors may attach a much higher value to CSR participation than to the actual value of the company. Investors have increasingly expressed concerns about ESG in recent decades, resulting in a marked rise in socially responsible investments worldwide (Renneboog et al., 2008). It is now more relevant than ever for investors to engage in sustainable investment. ESG funds attracted more inflows than comparable products without ESG designations, according to Biakowski & Starks (2016). Hartzmark & Sussman (2019) found that low-sustainability funds were experiencing net outflows, while high-sustainability funds were experiencing net inflows. Customers who value sustainability and avoid assets with low ESG ratings might expect their asset manager to act on their behalf. Ultimately, sustainable investing leads to inefficient pricing (Starks et al., 2017).

Although we have already argued that ESG can influence mispricing, such mispricing may take either the form of overvaluation (market value is greater than true value) or undervaluation. For this reason, the real impact of ESG on valuation needs to be distinguished in both situations. As sustainable investing becomes more relevant, investors will likely direct capital to investments with high ESG ratings, resulting in higher misvaluation ratios regardless of current misvaluation levels. This would exacerbate existing overvaluations if the market price continues to diverge from the true worth of the firm. ESG participation and higher capital attraction are expected to increase market valuations of undervalued stocks. Consequently, the deviation from the true value will decrease, leading to a decreasing undervaluation. This led us to hypothesize:

Hypothesis 2(a): ESG performances further escalates the existing level of overvaluation

Hypothesis 2(b): ESG performance recede the existing level of undervaluation

The lack of information asymmetry in the market may also contribute to ESG misvaluation. A company's ESG disclosures in annual reports increase capital markets' access to all of its information and transparency (Luo et al., 2015). ESG information, on the other hand, has already been shown to mitigate information asymmetry (Cui et al., 2018). Scholtens & Kang (2013) report a reduction in earnings prediction bias when corporate social responsibility (CSR) is improved. This research suggests that CSR involvement improves market efficiency by reducing information imbalances. In contrast to hypotheses 2(a) and 2(b), this would lead to a different outcome, where an increase in CSR would cause a convergence between market and real value. In addition, it is examined whether information asymmetry affects the CSR effect on value. Consequently, we estimate that if information asymmetry is reduced, CSR involvement will reduce misvaluations of both overvalued and undervalued enterprises. As a result, we hypothesized that information asymmetry between ESG performance and valuation plays a moderating role:

Hypothesis 3: Information asymmetry moderates the ESG-valuation nexus.

Companies and investors are becoming increasingly interested in ESG factors. There is increased attention being paid to sustainability over the long term, as evidenced by research from previous years (Cao et al., 2021; Hartzmark & Sussman, 2019). Therefore, we expect the impact of ESG on misvaluation to continue to grow over the next few years. The degree of public knowledge of sustainability issues can also be taken into account when assessing a company's long-term viability. There is evidence that the general public's awareness of this has affected the price of securities (Coelho, 2015; Shu & Chang, 2015). Public perception of sustainability efforts of a company impacts a company's value, as demonstrated by Serafeim (2020). He showed that firms with high sustainability performance have benefited from an increased value premium over time. It is therefore expected to have a moderating effect on the ESG-misvaluation link, as evidenced by the rising importance of ESG. As a result, we hypothesize that

Hypothesis 4: Increasing market awareness of sustainability moderates the ESG-valuation link

2.2 ESG and capital Structure

There are several theories that attempt to explain why a certain type of funding is chosen by a company. But trade off theory, pecking order theory, and market timing theory is more practical and applied theory that explains the rationale for capital structure design of the companies in real world (Kaldor, 2015). Trade-off Theory claims that target debt levels are dependent on other elements that are typical of the company. This implies that while a specific debt ratio may be appropriate for one company, it may not be optimal for another. For example, firms with substantial taxable revenue to shield and solid, tangible assets should choose a larger debt ratio, whereas less lucrative firms with riskier, intangible assets should choose a lower debt ratio and depend more on equity financing (Brealey et al., 2020).

Whereas, the Pecking Order Theory suggest a hieratical approach to financing: management must first turn to their own resources, usually retained earnings , followed by external resources, such as new loan issues, and finally, stock issues as a last resort (Brealey et al., 2020). This theory highlights the importance of asymmetry of information, which refers to the fact that managers know more about their firms than investors do. As issuing equity may transmit a signal into the market, the potential investor may believe either the company's stock is overvalued, or the company is having financial difficulties. This opinion will become stronger if dividend payments suddenly decrease or increase (Brealey et al., 2020). Another important theory that is relevant in this regard is the theory of market timing. Baker and Wurgler (2002) proposed a more rational explanation for capital structure design that says that capital structure is the cumulative attempts of managers to time the equity market. This further implies that firm issue equity when their stock is overvalued to benefit the long-term investor on the cost of new short-term investor that may exit any time.

One way to minimize the cost of funding is through the use of CSR practices. According to Verwijmeren and Derwall (2010), strong employee well-being is linked to reduced equity costs, which results in significantly more equity financing for the business than for enterprises with lower employee well-being. Companies that care about their employees are willing to go to significant lengths to avoid bankruptcy, contrary to

conventional wisdom. According to Kling et al. (2021), investments in employee relations, environmental policies, and product strategies CSR make equity less expensive. Maama & Marimuthu (2021) further explains that as ESG performances removes information asymmetry, reduces information costs and enhances analysts' following and investor trust, which in turn reduces cost of equity capital. The ESG performance and its impact on the cast of equity capital may vary with type of industry: for example, food and beverage companies should collect and disseminate ESG performance data on food and drink quality, health, and product safety, according to Raimo et al. (2021). For sensitive industries, environmental performance is material to hedge reputational risk (Garcia et al., 2017). Investors place a high value on this type of information since it cannot be gleaned from public filings.

whereas another stream of literature suggests that CSR performance might increase the cost of financing (debt and equity) if the investor believes that the disclosed ESG performance is exploited by insiders to serve their own interest (Johnson, 2020; Wang et al., 2021).

We already discussed in detail the valuation effect of ESG performances in section (2.1). we believe that superior ESG performances boost the overvaluation which in term provide an opportunity to the financial management to time the equity market and issue equity if they need financing for their positive NPV projects. Therefore, we postulated the following hypothesis:

Hypothesis 5: Firms with higher ESG performances issue equity if they have a financing deficit.

3. Sample description and Research Methodolgy

3.1 Description of data and variables

3.1.1 Independent Variable – ESG Performance

This study aimed to assess the effect of ESG performance on the valuation of European firms, as well as how it relates to their capital structure. The study utilized a sample of 895 European companies and examined their ESG data extracted from the Asset 4 database provided by Refinitiv from 2008 to 2019 for all available sectors. Please see table 1 for the list of countries. It is noteworthy that Asset4 ESG scores have been widely accepted as a reliable proxy for sustainability performance, as demonstrated by ample empirical evidence in the literature (Chiaramonte et al., 2020; Iannello, 2020). The Refinitiv ESG score assesses

a company's relative performance, commitment, and effectiveness on issues related to environmental, social, and governance (ESG). Approximately 12,000 companies have been rated, and time series data date back to 2002. In the publicly available reports, more than 500 ESG data points are extracted, of which 186 are comparable. Resource use, emissions, and innovation make up the environmental pillar; workers, human rights, communities, and product responsibility make up the social pillar; and management, shareholders, and social responsibility make up the governance pillar. Pillar scores are rolled back to ESG scores which indicate a company's ESG performance and transparency in reporting ESG data. Scores between 0 and 25 indicate insufficient transparency and poor ESG performance. Scores between 26 and 50 indicate satisfactory ESG performance and moderate transparency; 51 to 75 indicate good ESG performance and above average transparency; 75 to 100 indicate excellent ESG performance (Refinitiv, 2021).

Table I :Geographical Distribution of the data

Region	Countries	Noumber of Firms
Souther Europe	Gibraltar	1
	Greece	17
	Italy	37
	Malta	2
	Portugal	8
	Spain	45
Western Europe	Austria	15
	Belgium	25
	France	83
	Germany	84
	Luxembourg	12
	Netherlands	42
	Switzerland	65
Eastern Europe	Czech Republic	6
	Hungary	3

	Poland	25
	Romania	11
	Russia	4
	Slovakia	11
	Slovakia	3
Nothern Europe	Denmark	24
	Finland	25
	Ireland	37
	Norway	18
	Sweden	58
UK		234
Total Number of Firms		895

Dependent Variables-misevaluation measure

Inferences about the association between ESG performance and the misvaluation hypothesis depend on the quality of our misvaluation proxies. In order to estimate the misvaluation of firms, we use two distinct measures that have been extensively documented in the literature. Among these measures is the fair price estimated by the residual income model which discounts back the abnormal earnings (Ohlson, 1995). Following Bofinger et al. (2022), we calculated the true price using the residual income model as follows:

$$V_i(t) = B_i(t) + \frac{\left[f_i^{ROE}(t+1) - ke_i(t)\right] * B_i(t)}{1 + ke_i(t)} + \frac{\left[f_i^{ROE}(t+2) - ke_i(t)\right] * B_i(t+1)}{[(1 + ke_i(t+1)]^2} + \frac{\left[f_i^{ROE}(t+3) - ke_i(t)\right] * B_i(t+2)}{[(1 + ke_i(t+1)]^2 * ke_i(t)} \quad (1)$$

Where $V_i(t)$ is the true stock price, $B_i(t)$ is the book value of the equity, ke_i is the cost of equity and $f_i^{ROE}(t+n)$ is the forecasted return on equity. We followed Bofinger et al.(2022), Elliott et al. (2007) and Dong et al., (2006) and discounted back next three-year

abnormal earnings as perpetuity by assuming that residual earnings remain constant after three year.

Finally, we computed the misvaluation by the ratio of market price to true value as follows.

$$MV_{i,t}^{RES} = \frac{P_{i,t}}{V_{i,t}} \quad (2)$$

Where $MV_{i,t}^{RES}$ is the misvaluation, $P_{i,t}$ is the market price of a stock i at time t and $V_{i,t}$ is the true price of stock i at time t estimated by the residual income model. A ratio greater than one indicates that market price is higher than true price, and the stock is overvalued. On the contrary, a ratio less than one indicates that the stock is undervalued.

In spite of the fact that residual income model is a forward-looking approach to misvaluation, it computes a value too low because it ignores growth opportunities and does not anticipate future risks. Therefore, as a measure of robustness, target price is also used as a proxy for true price, which is an analyst's projection of a stock's future price. Despite not being a fundamental value, the target price is a more direct measure of true price since it anticipates all growth opportunities and forward-looking systematic risk components (Da & Schaumburg, 2011). Similarly, we measure misvaluation by the following equation.

$$MV_{i,t}^{TP} = \frac{P_{i,t}}{V_{i,t}} \quad (3)$$

Where $MV_{i,t}^{TP}$ is misvaluation measured through the ratio of market price to target price. The validity of our hypothesis does not require that either the residual income model or the price target be a superior proxy; what matters is that both measures provide significant additional information about the true price fluctuation beyond the market price (Dong et al., 2011). By using these two valuation measures, we increase the reliability and robustness of our analysis. We extracted the data for the aforementioned residual income model and target price from the Refinitiv database.

Dependent Variable-Capital Structure

In order to test our hypothesis about the impact of misvaluation on capital structure due to ESG performance, we regressed debt change against ESG performance. The change in debt represents net changes in cash flow due to the changes in the level of debt of a company. To ensure further robustness, we repeated the same regression with the changes in the level of equity.

Moderator Variables

In our study, we hypothesized that information asymmetry and market sentiment moderate the relationship between corporate ESG performance and market valuation. Google trend is used as a proxy for market sentiment, which has been well documented in the literature estimates that Google dominates the search engine industry with a market share of 85.55 percent. This is the first publicly accessible big data platform that offers users the ability to see how popular specific keywords are? Google Trends is an effective tool for tracking stock market sentiment. It is strongly correlated with stock returns and abnormal trading volumes and can be used for future stock market forecasting (Simionescu & Raišienė, 2021; Johnson, 2012). We therefore extracted data from Google Trends' SVI between 2008 and 2019 to assess the moderating role of market sentiments.

Our initial search for the term "ESG investing" turned up relatively few observations for most sample countries and no data for Malta. We then searched the topic “Sustainability” and averaged out the monthly data in order to arrive at an annualized value.

Information asymmetry is the second moderating variable. To measure information asymmetry, we use bid-ask spreads (Bofinger et al., 2022). This measure represents the daily averages of the bid-ask spreads. We followed Bofinger et al. (2022) and calculated information asymmetry through the following formula:

$$Information\ asymetry = (\text{Ask} - \text{Bid})/((\text{Ask} + \text{Bid})/2) \qquad (4)$$

In general, the larger the information asymmetry, the wider the bid-ask spread in the underlying stock. Shareholders with broad bid-ask spreads are likely to possess divergent levels of information.

Control variables

Following a careful review of the literature, this study includes several control variables that have been identified as relevant to the misvaluation. Earnings per share represents the income available to common stockholders and is relevant for misvaluation since reported earnings carry information that the market uses to determine the company's value (Kormendi & Lipe, 1987). The leverage ratio, defined as the total liabilities divided by the total asset, analysts' coverage (Cheng & Tzeng, 2011) and the size, calculated as the log of the total asset. We also used capital expenditures (Karim et al, 2021) and the market-to-book ratio as control variables to account for growth opportunities (Chen & Zhao, 2006).

3.2 Empirical Methodology

We employed a fixed effect model with lagged dependent variables to control country heterogeneity in the relation between misvaluation and ESG performance, which may be the result of differences in unobservable characteristics across firms or reverse causality (Manita et al., 2018). For instance, overvalued firms are more profitable and may have more funds for CSR investments. This is why the inclusion of lagged values of dependent variables will account for the possibility that misvaluation may depend on historical events. Therefore, we estimated the following fixed-effect model, with lagged-dependent variable:

$$Y_{i,t} = \beta_1 Y_{i,t-1} + \beta_2 ESG_{i,t-1} + \beta_3 X_{i.t} + \epsilon_{i,t} \qquad (5)$$

Where $Y_{i,t}$ represents the depended variable, which is misvaluaion measures, $Y_{i,t-1}$ is the lagged value of depended variable [1] included to incorporate the fluctuation in misvaluation because of the past event. The $ESG_{i,t-1}$ is the lagged value of ESG, So β_2 will estimate the impact of ESG performance on the company misvaluation. The vector $X_{i.t}$ captures the effect of control variables on misvaluation and $\epsilon_{i,t}$ is the error term. Equation (5) is estimated for three models: first, all sample companies to capture the overall behavior, second, overvalued firms to determine whether ESG performance pushes overvalued firms

[1] We have replicated the results without the inclusion of the lagged dependent variables in order to address concerns that might arise because of the inclusion of lagged dependent variables. The results will be provided by authors upon request.

further from their true value, and third, undervalued firms to ascertain whether ESG performance moves undervalued firms closer to their true value. Because the misvaluation measure in this study is the ratio of the market price to the true price, firms with a misvaluation value greater than one is overvalued. In contrast, firms with a misvaluation value less than one are undervalued firms.

In the second step, we estimated the relationship between the valuation effect of ESG and the capital structure. Following Elliott et al. (2007), we calculated the direct measure of misvaluation. This involves two steps: first, we calculated the firm deficit by using the following equation:

$$DEF_{i,t} = DIV_{i,t} + I_{i,t} + \Delta W_{i,t} - C_{i,t} = \Delta D_{i,t} + \Delta E_{i,t} \qquad (6)$$

Where DEF is the firm financing deficit, $DIV_{i,t}$ is the cash dividend, $I_{i,t}$ is the net investment, $\Delta W_{i,t}$ is the change in working capital, $C_{i,t}$ is the cash flow after interest and taxes, $\Delta D_{i,t}$ is the net debt issued during the year t by firm i and $\Delta E_{i,t}$ is the equity issued during the year t by firm i. A positive DEF value indicates a cash surplus, while a negative value indicates a cash deficit. Second, we followed the Elliott et al. (2007) approach and calculated market timing variable as follows:

$$Mk\_T_{i,t} = DEF_{i,t} * MV_{i,t} \qquad (7)$$

This market timing variable captures what happens when firms are misvalued and in need of financing. According to market timing theory (Baker & Wurgler, 2002), capital structure is the cumulative result of the attempt of financial management to time the equity market. If the stock is over-valued then it provides the managers an opportunity to time the equity market and benefits the long term investors on the cost of entering and exiting ones. If the coefficient of market timing is negative and significant, it shows that when market is misvalued, then firm time the equity market and issue equity rather than debt. We further regressed the same equation for the over-valued and undervalued firms separately. We then estimated the following equations:

$$\Delta D_{i,t} = \beta_0 + \beta_1 DEF_{i,t} + \beta_2 Mk\_T_{i,t} + \epsilon_{i,t} \qquad (8)$$

$$\Delta D_{i,t} = \beta_0 + \beta_1 DEF_{i,t} + \beta_2 Mk_{T_{i,t}} + \beta_3 LESG_{i,t} + \beta_4 LESG_{i,t} * Mk_{T_{i,t}} + \beta_5 X_{i,t} + \epsilon_{i,t} \quad (9)$$

Where $\Delta D_{i,t}$ is change in debt, $DEF_{i,t}$ is firm deficit, and $LESG_{i,t} * Mk_{T_{i,t}}$ is the interaction term of ESG and market timing, and $X_{i,t}$ is the vector of control variable. According to Shayam-Sunder & C. Mayers (1999), if β_1=1, then there is a one-to-one relationship between deficit and change in debt and it supports the pecking order theory of capital structure suggested by Myers (1984) and Myers and Majluf (1984). They found a value of 0.75 and interpreted it as strong evidence for the pecking order theory, whereas Frank and Goyal (2004) estimated the same model by using net equity issue as a dependent variable and found a coefficient of 0.20. They interpreted this value as strong evidence for the pecking-order theory.

We do not aim to test the theories of capital structure but to analyze whether financial management time the equity market, so we are expecting a negative coefficient for the interaction term. In equation (9), the negative coeffects of the interaction term will illustrate that if the equity prices are overpriced and the firm needs funding, then the firm will issue equity and reduce debt in their capital structure.

4. Results and Discussion

4.1 Descriptive statistics

Table II presents the results of summary statistics of the sample. In Panel A, the mean value of "$MV_{i,t}^{RES}$" indicates that the market value exceeds the fundamental value and on average stock is overvalued, but when we examine the mean value of "$MV_{i,t}^{TP}$", the market price is lower than the analysts' forecasted price, which reveals that analysts over-reacted to ESG metrics and on average stocks are undervalued relative to fair price forecasted by analysts. In panel B, we have depended variables for the capital structure that shows how

much debt and equity is issued or retired during the sample period. Both variables are scaled by total assets and indicate that, on average, debt issuance is approximately .044% of total assets, while stock issuance is approximately .09%. This means that European firms issued more debt than stock during the sample period.

Panel C represents the average values of the explanatory variable that is ESG performance. We used ESG score as main independent variable whereas we additionally replicated the analysis for each component of ESG for are robustness check to disaggregated analysis. The values of ESG scores and pillar score are around 50 that shows on average European firms exhibited satisfactory ESG performance. Panel D lists the control variables: firms in our samples have on average an earnings per share of.045, leverage is 61% of total asset, capital expenditure is 4.3 percent of total asset and dividend payout ratio is 0.94. whereas PTBR, market-to-book ratio, signals that market prices are 3.6 times higher than the book value of equity. Lastly, panel E delineates information asymmetry and market sentiment variables. The bid-ask spread value is.0058 percent and the average search trend for sustainability topics is 39. As this number is relative to all searches in EU, so it shows that Sustainability is approximately half popular in EU market.

Table II: Dascriptive Statistics

	Variable	Obs	Mean	Std.dev	Min	Max
Panel A: Dependent Variable Misvaluation Measure	MV^{Res}	10,526	2.0950	2.5828	-1.269	9
	MV^{Ptm}	9,638	0.8422	0.2497	0.204	1
	Capital Structure					
Panel B: Dependent Variable Capital Structure	ΔD	10,331	0.0045	0.0724	-1.131	1.0161
	ΔE	10,331	0.0009	0.0787	-1.783	1.1297
	Corporate Social Responsibility Variables					
Panel: Independent variables	ESG	9,806	49.7092	21.240	0.472	94.519
	ESCORE	9,804	48.5149	28.328	0.000	98.931
	SScore	9,804	51.6008	24.204	0.121	98.628
	GScore	9,804	48.9265	23.218	0.572	99.246
	Market Timing Variables					
	DEF	10,331	0.0054	0.1008	-1.8071	1.1297
	Mk_T	9,510	-0.0008	0.0290	-1.0000	0.0000
Panel D: Control Variables	NA	10,140	0.2111	0.9380	0.000	14.00

	PTBR	8,838	3.5822	16.904	0.001	895.23
	lTA	10,331	22.5976	1.9392	13.163	28.92
	Lev	10,331	0.6142	0.2605	-0.643	3.95
	Prof.	10,331	0.0459	0.1644	-8.236	2.51
	CE	10,331	0.0434	0.0470	0.000	0.78
	DPR	9,121	0.9413	10.614	0.000	843.92
Panel E: Moderating Variables	Bidask_Sprd	10,386	0.0058	0.0510	-2.0000	1.3299
	Sustainability	10,716	38.8180	11.931	6.0000	77.583

All variables are summarized in Table II. Panel A contains the list of dependent variables containing MVRES and MVTP, which serve as misevaluation proxy measures that are determined by a ratio of market price to intrinsic value calculated by the residual income model and price target calculated by analysts. There is also a second list of dependent variables for capital structure impacts resulting from ESG performance, namely (1)D and (1)E, which refer to changes in debt and equity. While in Panel B, ESG score refers to corporate social responsibility, while E, S, and G refer to environmental, social, and governance scores. Panel C contains the list of control variables. NA is the number of analysts following the company, PTBR is Price to book ratio, LTA is the log of total asset, LEV is the leverage, Prof is the profitability, CE is capital expenditure and DPR is the dividend payout ratio. Panel D includes moderating variables containing bid-ask spread which represents information asymmetry and sustainability is the keyword used to extract the data of market sentiments from google trends.

4.2 ESG and Firm Misvaluation

The primary hypothesis of this study is that we expect that ESG performances affect firm misvaluation. Table III reports the results of the direct impact of firm's ESG activities on the respective firm's valuation. Based on the adoptive market hypothesis [2], we used lagged value of ESG score as market participants needs some time to establish a link between ESG performance and financial performance (Usman et al., 2020). Results have been categorized into three models: model I reports the results for the entire sample. Since misvaluation is constructed by comparing market price to fair value, where a value of more than 1 indicates overvalued firms and a value of less than 1 indicates undervalued firms, the overall effect cannot be generalized across both overvalued and undervalued firms. ESG performance can have a positive impact on misvaluation by both augmenting over-valuations for overvalued firms as well as decreasing under-valuations for undervalued firms. Therefore, we estimated the primary model separately for overvalued and undervalued firms, and the results are reported in models II and III. We can see that misvaluation based on the residual income model has a significant and positive association with the lagged value of ESG. This affect remains consistent for overvalued and undervalued firms in models II and III,

[2] According to Adoptive hypothesis, markets gets more efficient as market participant gets more information and learn how to interpret it.

respectively. The results indicate that an increase in the ESG score by one unit will increase the misvaluation by 0.0138 for the entire sample, 0.0171 for overvalued firms, and 0.0119 for undervalued firms. Alternatively, if the true value is maintained at $10 billion dollars, the market value will increase by $138 million for the overall sample, $171 million for overvalued firms and $119 million for undervalued firms. For the overvalued firms, the magnitude of the impact is greater, which can be attributed to their higher legitimacy.

In table III, Panel B presents the results of regression between ESG performance and a firm's misvaluation measured by the analyst target price. For the entire sample and for undervalued companies, the coefficient is significant and positive, however, it is not significant for overvalued companies. Similarly, if the true value is kept constant at $10 billion, one unit increase in ESG performance increases the market price by 19 million for the entire sample and 16 million for undervalued firms. Besides the fact that the MV^{TP} has a lower mean value, the smaller magnitude effect compared to the MV^{RES} measure can be attributed to the following factors: Despite the fact that both ratios represent the same market value, their underlying value is captured through a distinct temporal lens. The residual income model is a forward-looking approach to estimating true prices but does not anticipate future risks and growth opportunities. Thus, the fundamental value obtained from this model is understated, and that is the reason we observed greater average misvaluation values and higher coefficients of misvaluation. On the other hand, true prices forecasted by analysts incorporate all the expected risk and growth opportunities and also ESG reporting improves the information environment, which helps for a more accurate guess of the true price of a company stock and that is why average value of misvaluation estimated through price target is closer to one.

In summary, we accept our hypothesis that ESG performance moves market prices above their true values. This gives financial management the opportunity to time equity markets if they need financing for their positive NPV projects. Moreover, CSR investments further increase the market prices of already overvalued stocks relative to their fair values, and they also encourage undervalued stocks to reach their fair value. Our results are in consistent with (Bofinger et al., 2022) that says the higher ESG scores provide a competitive advantage to the firms as investor think this compliance as a value driver irrespective of its current level of misvaluation.

Table III: Regression Analysis

	Panel A	**MV^{RES}**		**Panel B**	**MV^{TP}**	
Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Lag-Misevaluation	0.1453***	0.1838***	0.1374***	0.0239**	-0.007	0.0958***
	(0.0126)	(0.0321)	(0.0139)	-0.0112	-0.0196	-0.0084
LESG	0.0143***	0.0171***	0.0119***	0.0019***	0.0001	0.0016***
	(0.0024)	(0.0067)	(0.0026)	-0.0003	-0.0007	-0.0002
Prof.	4.9628***	3.5830***	5.9504***	-0.1442	-0.264	-0.0833
	(0.5511)	(1.1188)	(0.6701)	-0.06727	0.1552	0.0459
Lev	2.2540***	1.9050***	2.2942***	0.0912**	0.3346***	-0.0880**
	(0.3348)	(0.8049)	(0.3864)	-0.04297	-0.0964	-0.0294
lTA	-0.2507***	0.2134	-0.1038	-0.1469***	-0.1193***	-0.0447***
	(0.0865)	(0.2247)	(0.1029)	-0.0115	-0.0264	-0.0079
CEA	1.2688	1.3114	0.782	-0.5117***	0.0814	-0.3249***
	(1.0004)	(2.6740)	(1.094)	-0.1245	-0.2893	-0.0833
DPR	0.00	0.0005	0.0030	0.00	0.0004	0.0002
	(0.0019)	(0.0270)	(0.0019)	-0.0002	-0.0029	-0.0001
NA	-0.0029	-0.0555	0.0095	-0.0129***	0.004	-0.0101***
	(0.0218)	(0.0926)	(0.0219)	-0.00266	-0.0095	-0.0017
PTBR	-0.0054***	0.0144**	-0.0097***	0.0002***	0.0001	0.0001
	(0.0021)	(0.0071)	(0.0022)	-0.00025	-0.0007	-0.0002
_cons	5.4371	-4.2248	1.9105	4.1111***	3.6518***	1.7421***
	1.9696	(4.9573)	(2.3636)	-0.2633	-0.5874	-0.1818
R-squared:						
Within	0.05	0.06	0.058	0.0423	0.0396	0.0723
Between	0.45	0.10	0.440	0.0028	0.0618	0.0000
Overall,	0.31	0.11	0.275	0.009	0.0399	0.005
Number of obs	6,394	1,535	4,859	6272	1,438	4834
Prob>F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

A regression analysis of the impact of corporate social responsibility on firm misvaluation is presented in Table II using a fixed affect model with a lagged dependent variable. The results are presented in two panels. Panel A shows the results for MV^{RES} as a dependent variable. This is calculated by the ratio of market price to intrinsic value whereas intrinsic value is calculated through the residual income model. Panel B represents the results for MV^{TP} where intrinsic value is proxied by the price target forecasted by analysts'. Whereas Model I contains the regression results for the overall sample size and models II and III contain the regression results for overvalued and undervalued stocks respectively. Whereas Lag-Misvaluation is lagged value of dependent variable, LESG is lagged value of ESG score, Prof. is profitability, LEV is the Leverage, ITA is the log of total asset, CEA is the capital expenditure, DPR is the dividend payout ratio, NA is the analysts' coverage and PTBR is the price to book ratio.

The data for all the variable is extracted from Refinitiv database for the period of 2008 to 2019

The values in brackets are the standard error of regression.

***, **, and * represent 99%, 95% and 90% significance levels, respectively.

4.3 Moderating Effect of Information Asymmetry Between ESG-Misvaluation Nexus

We provide evidence in section 4.2 supporting our hypothesis H1, H2 and H3 that sustainability performance is positively related to misvaluation. We emphasize ESG performance as a key value driver. Previous research has shown that information asymmetry in the valuation process complements the valuation effect of ESG performance. In part, the information gap between insiders and outsiders can be attributed to impression management practices and the fallacy of transpiracy in ESG disclosures. It can further complicate the information environment of the firm and exacerbate misvaluation. We therefore hypothesize that information asymmetry moderates the relationship between ESG performances and misvaluation.

To assess the moderating effect of information asymmetry in the ESG and the misvaluation nexus, we used bid-ask spread as a proxy for information asymmetry and introduced an interaction term between bid-ask spread and lagged ESG score. This interaction term quantifies the effect of ESG, which is primarily related to the effects of information asymmetry. Furthermore, we examine the potential effects on overvalued and undervalued companies separately in Models II and III of Table 3. Asymmetry of information could have opposing effects on these relationships. A decrease in information asymmetry could, therefore, positively impact undervalued firms' misvaluation and negatively impact overvalued ones.

Table IV provides the results of the regression with the information asymmetry variable included as a moderator. Panel A reports the results of the MV^{RES} misvaluation calculated based on the residual income model, and panel B presents the results of the MV^{TP} misvaluation based on the analyst target prices. While models I, II, and III report the results for the entire sample, the overvalued companies, and the undervalued companies, respectively.

We find that the interaction between ESG and bid ask spread has a significant effect on the entire sample and the undervalued firms. However, the interaction is not significant

for over-valued firms. In addition to this, the individual impact of bid ask spread is also significant, which confirms the importance of information asymmetry as a moderator between ESGs and misvaluation.

The coefficient of interaction between sustainability and the lag value of ESG is greater than each ESG coefficient individually. Additionally, the average value of MV^{TP} in table 1 is less than one, which indicates that analysts' target prices are on average greater than current market prices. In contrast, a value greater than 2 of MV^{RES} indicates that market prices are almost two times the fundamental value, and investor also appreciates ESG performance.

If we read these findings in connection, it illustrates that ESG performances affect the information environment of the company and make the investor and analysts' opinions more optimistic about the future prospects of the company. Moreover, analysts, who act as an information intermediary, assign a higher expected future price, which also deepens the valuation effect of ESG and increases the gap between fundamental value market prices.

In summary, ESG performance leads to higher information asymmetry as investors and analysts adopt a more optimistic viewpoint. However, this effect is only significant for firms that are undervalued and for the entire sample.

Table IV: Regression Analysis- Information Asymmetry

Variables	Panel A: MV^{RES}			Panel B: MV^{TP}		
	Model I	**Model II**	**Model III**	**Model I**	**Model II**	**Model III**
lMPRes_w	0.1438***	0.1803***	0.134***	0.0156	-0.0172	0.08918***
	(0.01)	(0.03)	(0.01)	(0.0112)	(0.0185)	(0.0084)
LESG	0.0138***	0.017**	0.012***	0.0018***	-0.0005	0.0015***
	(0.0024)	(0.01)	(0.00)	(-0.0003)	(0.0007)	(0.0002)
bidasks	-7.607***	1.405	(9.325777***	0.1249	1.8908***	1.1418***
	(2.98)	(6.69)	(3.53)	(0.3665)	(0.6711)	(0.2657)
Bidasks*lesg	0.2858***	0.0146	0.3217***	0.0343***	-0.0059	0.0277***
	(0.12)	(0.27)	(0.13)	(0.0144)	(0.0270)	0.0099
Prof.	4.9935***	3.557***	6.0239***	0.1503**	-0.3468***	-0.0821*
	(0.55)	(1.12)	(0.67)	(0.0669)	(0.1470)	(0.0458)
Lev	2.343***	1.802**	2.3672***	0.0743*	0.1845**	-0.0757***
	(0.34)	(0.81)	(0.39)	(0.0429)	0.0926	(0.0293)
lTA	-0.276***	0.264	-0.1271	-0.1465***	-0.0566**	(0.0514169***
	(0.09)	(0.23)	(0.10)	0.0115	(0.0257)	(0.0079)

CEA	1.247	1.278	0.7090	-0.5038***	0.0461	-0.3462***
	(1.00)	(2.68)	(1.10)	(0.1236)	(0.2737)	(0.0828)
DPR	0.0013	0.000	0.0031	0.0000	-0.0002	0.0002
	(0.0019)	(0.027)	(0.0020)	(0.0002)	(0.0028)	(0.0001)
NA	-0.0010	-0.056	0.0111	-0.0126***	0.0021	-0.0097***
	(0.022)	(0.093)	(0.022)	0.0026	(0.0089)	(0.0017)
PTBR	-0.0054**	0.014**	-0.0098***	0.0002	-0.0001	0.0001
	(0.002)	(0.007)	(0.002)	(0.0002)	(0.0007)	(0.0002)
_cons	6.0272***	-5.277	2.466	4.1247***	2.373201***	1.905***
	(1.985)	(5.068)	(2.378)	(0.2632)	(0.5687)	(0.1815)
R-squared:						
Within	0.05	0.07	0.060	0.05	0.14	0.075
Between	0.45	0.08	0.441	0.00	0.10	0.000
Overall,	0.31	0.09	0.278	0.01	0.14	0.003
Number of obs	6382	1535	4,847	6,260	1438	4822
Prob>F	0.00	0.00	0.00	0.00	0.00	0.00

In Table III, the regression results are presented for the impact of corporate social responsibility performance on firm misvaluation with the information asymmetry variable as the moderating variable. To estimate these findings, we used a fixed affect model with a lagged dependent variable. The results are presented in two panels. Panel A shows the results for MV^{RES} as a dependent variable. This is calculated by the ratio of market price to intrinsic value whereas intrinsic value is calculated through the residual income model. Panel B represents the results for MV^{TP} where intrinsic value is proxied by the price target forecasted by analysts. Whereas Model I contain the regression results for the overall sample size and models II and III contain the regression results for overvalued and undervalued stocks respectively. Whereas Lag-Misvaluation is lagged value of dependent variable, bidasks is the bid ask spread and the interaction term of LESG and bid-ask spread estimate the combine affect of LESG and bid ask spread. Whereas LESG is lagged value of ESG score, Prof. is profitability, LEV is the Leverage, lTA is the log of total asset, CEA is the capital expenditure, DPR is the dividend payout ratio, NA is the analysts' coverage and PTBR is the price to book ratio.
The data for all the variable is extracted from Refinitiv database for the period of 2008 to 2019
The values in brackets are the standard error of regression.
***, **, and * represent 99%, 95% and 90% significance levels, respectively.

4.4 Market sentiment and ESG-misvaluation nexus

ESG criteria have become increasingly relevant to corporate business models in recent years. Additionally, investors are becoming more aware of sustainable investment and expanding their investment horizons. Our findings in section 4.2 that attribute a positive association between ESG and misvaluation may have been influenced by the increased interest in corporate sustainability. As a result, we propose hypothesis 5 that market sentiments towards sustainability moderate the relationship between ESG and misvaluation. The more positive the market sentiment, the wider the deviation from the true price will be. A number of studies have previously investigated the role of sentiments in corporate finance (Elliott et al 2007; Baker & Wurgler, 2002).

In order to emphasize the role of social awareness in the transition to a sustainable economy, we included a market sentiment variable. Google trend data on 'sustainability' is used as a proxy for market sentiment. In order to determine whether market sentiments act as a moderating factor for sustainability and misvaluation, we use the interaction term between sustainability and the ESG lag value. Table 5 provides the results of the regression analysis of market sentiments. For all regression models, the interaction term between sustainability and lagged ESG is positive. This acclaim that a higher sentiment toward sustainability will increase the misvaluation ratios incented by ESG. We can conclude that ESG and misvaluation are moderated by the general sentiment towards sustainability. Consequently, these results support Hypothesis 5's argument that sustainability topics moderate the relationship between ESG and misvaluation.

Table V: Market sentiments

	Panel A: Dependent Variable MV^{RES}			**Panel B: Dependent Variable MV^{TP}**		-
	Model I	Model II	Model II	Model I	Model II	Model II
lMPRes_w	0.1476***	0.1788***	0.0015	0.0299***	-0.0064	0.1038***
	(0.0125)	(0.032)	(0.0010)	0.0111	(0.0196)	(0.0082)
LESG	-0.0066	-0.0076	-0.0099	-0.0002	0.0018	-0.00096**
	(0.0056)	(0.0179)	(0.0061)	0.0007	(0.0019)	(0.0004)
Sustainability	-0.05054***	-0.057***	-0.050***	-0.0071***	0.0020	-0.0070***
	(0.0075)	(0.021)	(0.0083)	(0.0009)	(0.0023)	(0.0006)
S*ESG	0.0005***	0.0005	0.0006***	0.00004***	0.0000	0.0000576***
	(0.0001)	(0.0004)	(0.0001)	(0.0000)	(0.0000)	(0.0000)
Prof.	4.9840***	3.582***	6.844***	-0.1435**	-0.2667*	-0.0892**
	(0.5478)	(1.114)	(0.669)	(0.0665)	(0.1553)	(0.0446)
Lev	2.4493***	2.003***	2.647***	0.1297***	0.3408***	-0.054**
	(0.3334)	(0.805)	(0.3892)	(0.0426)	(0.0970)	(0.0286)
lTA	-0.331***	0.0413	-0.1070	-0.1583***	-0.1169***	-0.0529***
	(0.0865)	(0.230)	(0.1038)	(0.0114)	(0.0270)	(0.0077)
CEA	1.3061	0.9663	1.3457	-0.4770***	0.1014	-0.2980***
	(0.995)	(2.668)	(1.1015)	(0.1233)	(0.2902)	(0.0810)
DPR	0.0015	0.0004	0.0027	0.0000	0.0004	0.0002
	(0.0019)	(0.027)	(0.0020)	(0.0002)	(0.0029)	(0.0001)
NA	0.0355	-0.00066	0.0389*	-0.0042	0.0048	-0.0037**
	(0.0229)	(0.0958)	(0.0235)	(0.0028)	(0.0099)	(0.0017)
PTBR	-0.0059***	0.0137**	-0.0111***	0.0001	0.0001	0.0000
	(0.0022)	(0.0071)	(0.0022)	(0.0002)	(0.0007)	(0.0002)
_cons	9.1512***	1.845	3.8879	4.630478***	3.516213***	2.1853***

	(2.008)	(5.29)	(2.4179)	(0.2656)	(0.6209)	(0.1795)
R-squared:						
Within	0.07	0.0739	0.05	0.0677	0.0406	0.1292
Between	0.38	0.1707	0.09	0.0023	0.0621	0.003
Overall,	0.27	0.1609	0.06	0.0103	0.0399	0.0029
Number of obs	6,379	1,534	4,845	6257	1437	4820
Prob>F	0.00	0.00	0.00	0.00	0.00	0.00

In Table IV, the regression results are presented for the impact of corporate social responsibility performance on firm misvaluation with the market sentiments variable as the moderating variable. To estimate these findings, we used a fixed affect model with a lagged dependent variable. The results are presented in two panels. Panel A shows the results for MV^{RES} as a dependent variable. This is calculated by the ratio of market price to intrinsic value whereas intrinsic value is calculated through the residual income model. Panel B represents the results for MV^{TP} where intrinsic value is proxied by the price target forecasted by analysts. Whereas Model I contain the regression results for the overall sample size and models II and III contain the regression results for overvalued and undervalued stocks respectively. Whereas Lag-Misvaluation is lagged value of dependent variable Sustainability is the is the keyword trend showing the market sentiments about sustainability and the interaction term of S*LESG estimate the combine effect of LESG and market sentiments about sustainability. Whereas LESG is lagged value of ESG score, Prof. is profitability, LEV is the Leverage, lTA is the log of total asset, CEA is the capital expenditure, DPR is the dividend payout ratio, NA is the analysts' coverage and PTBR is the price to book ratio.
The data for all the variable is extracted from Refinitiv database for the period of 2008 to 2019 whereas the data for market sentiments is extracted from google trends search volume.
The values in brackets are the standard error of regression.
***, **, and * represent 99%, 95% and 90% significance levels, respectively.

4.5 ESG and capital structure

In this section, we estimated the impact of ESG-triggered misvaluation on the financial mix of the companies. Previously, we showed that ESG performance boosts stock overvaluation and helps undervalued stocks return to their fair value. Table VI reports the results of the model specified in Eqs. (8) and (9). In panel A, we used change in debt as a dependent variable, whereas in panel B we replicated the same model for the change in equity as a dependent variable for robustness. We can see that in Panel (A) and model 1, the coefficient of the deficit is 0.69 implying that 69 percent of the deficit is financed by the debt issuance whereas in panel B model (3) the coefficient is .3056 which shows that around 31 % of the deficit is financed by issuing equity. These findings are in line with Shyam-Sunder & C. Myers (1999), who found the coefficient of deficit equal to 0.75 and reported it as strong evidence for pecking order theory, while Frank & Goyal (2003) found the deficit coefficient equal to 0.20 and also argued that it is strong evidence against the pecking order theory. The second variable in table 6 is an interaction term of financing deficit and misevaluation measure (where MP>1 for overvalued firms and MP<1 for undervalued firms). The

coefficient of market timing variable is negative for model (1) and (2) indicating that as firm becomes more overvalued the market timing variable coefficient becomes lower and firm issue more equity than debt. Model (3) and (4) replicate the analysis with change in equity as dependent variable and we can see that coefficient of the market timing variable (interaction of deficit and misevaluation) is positive here, indicating that when the firms become overvalued, the coefficient of market timing becomes higher. In other words, overvalued firms issue more equity to finance their deficit.

In Table 6, the coefficient of interaction term of market timing and ESG is negative for models (1) and (2), indicating that higher ESG performance increases the overvaluation of stocks, and this overvaluation of the stock reduces the level of debt in capital structure. On the other hand, we can see that the coefficient of interaction term of ESG and market timing in models (3) and (4) is positive, indicating when the ESG performance increases it makes stock overvalued and firm issue equity to finance their deficit to time the equity market and benefits the long run shareholders on the cost of investors with short run investment horizon.

In summary, our findings support the studies (Shyam-Sunder & C. Myers, 1999) and (Frank & Goyal, 2003) that European firms follow the pecking order theory of capital structure while designing their financial mix. Second, financial management also time the equity market when stocks are overvalued in order to exploit the equity market and benefits the long-term shareholder at the cost of entering and exiting. These findings provide support to the findings of (Baker & Wurgler, 2002) and (Elliott et al., 2007).

Thirdly, ESG performance create an opportunity to time the equity market by boosting the stock overvaluation phenomenon and financial management time this opportunity by issuing equity to finance their financing deficit.

Table VI: ESG and capital structure

	Panel A: Change in Debt		Panel B: Change in Stock	
Variable	(1)	(2)	(3)	(4)
DEFA	0.6944***	0.7623***	0.3056***	0.2377***
	(0.0062)	(0.0070)	(0.0062)	(0.0070)
mkt	-0.6346***	-18.58***	0.6346**	18.58***
	(0.0234)	(2.9365)	(0.0234)	(2.9365)
LESG		-0.0001*		0.0001*
		(0.0000)		(0.0000)
Mkt*LESG		-0.0066**		0.0066**

		(0.0029)		(0.0029)
Prof.		-0.0007		0.0007
		(0.0077)		(0.0077)
Mkt* Prof		-0.3993***		0.3993***
		(0.0812)		(0.0812)
lTA		0.0081***		-0.0081***
		(0.0016)		(0.0016)
Mkt*lTA		0.8676***		-0.8676***
		(0.1362)		(0.1362)
CEA		0.0898***		-0.0898***
		(0.0188)		(0.0188)
Mkt* CEA		-8.2364***		8.2364***
		(2.8156)		(2.8156)
DPR		0.0000		0.0000
		(0.0000)		(0.0000)
Mkt* DPR		9.4518		-9.4518
		(1.3559)		(1.3559)
_cons	0.0013***	-0.1824***	-0.0013***	0.1824***
	(0.0005)	(0.0364)	(0.0005)	(0.0364)
R-squared:				
Within	0.5918	0.6733	0.3295	0.3728
Between	0.2654	0.3590	0.7568	0.6466
Overall	0.5061	0.5306	0.5449	0.5680
Number of Observations	9510	7,313	9510	7313
Prob of F	0.0000	0.0000	0.0000	0.0000

Table V illustrates the results of regression analysis of misevaluation induced by sustainability performance on the capital structure. Panel A presents the results with change in debt as a dependent variable. Model I illustrates the regression findings of capital structure and misvaluation and model II presents the regression results with the inclusion of the control variable. In panel B we used change in equity as a dependent variable.
Data for all variables is taken from the Refinitiv database for the period 2008 to 2019.
The values in brackets are the standard error of regression.
***, **, and * represent 99%, 95% and 90% significance levels, respectively.

4.6 Additional analysis

4.6.1 Endogeneity Issue

Previous analysis shows a strong link between ESG performance and misvaluation. However, an endogeneity bias could lead to incorrect conclusions. Previous literature extensively reported that the ESG-misvaluation relationship raises the possibility of problems of simultaneity and reverse causality. We addressed the simultaneity issue by including the

lag value of ESG as it takes time to translate ESG performance into value implication. Whereas, we included the lag dependent variable to eliminate the reverse causality concern. This is because it reduces the possibility of reverse causality bias, which is a typical issue in CSR regression analysis. Another issue that needs to be addressed is the omission of variables. This occurs when factors that are not readily evident influence the explanatory and/or dependent variables. We further repeated the main analysis by using 2SLS model. At first stage, we regreased ESG against profitability and at the second stage we used fitted values of lag ESG against misevaluation.

In summary, 2SLS estimations where ESG is instrumented by profitability rule out endogeneity concerns do not contradict but rather corroborate our findings. Therefore, we can confirm the existence of a significant association between ESG and misvaluation.

Table VII : 2SLS regression analysis to address potential endogeneity concerns.

	Panel A: Dependent variable MV^{TP}			**Panel B: Dependent variable MV^{RES}**		
VARIABLES	Model I	Model II	Model III	Model I	Model II	Model III
LESG	0.00190***	0.000171	0.00157***	0.0132***	0.0164**	0.0106***
	(0.000303)	(0.000710)	(0.000206)	(0.00244)	(0.00680)	(0.00267)
Lev	0.107**	0.366***	-0.0788***	1.699***	1.503*	1.700***
	(0.0423)	(0.0948)	(0.0290)	(0.331)	(0.793)	(0.384)
lTA	-0.145***	-0.114***	-0.0438***	-0.342***	0.0557	-0.155
	(0.0115)	(0.0263)	(0.00790)	(0.0866)	(0.222)	(0.104)
CEA	-0.543***	0.0101	-0.343***	2.186**	2.218	1.850*
	(0.124)	(0.287)	(0.0828)	(1.002)	(2.661)	(1.099)
DPR	6.91e-06	0.00109	0.000207	0.00116	-0.0119	0.00297
	(0.000237)	(0.00291)	(0.000150)	(0.00196)	(0.0268)	(0.00200)
NA	-0.0130***	0.00401	-0.0101***	-0.000137	-0.0596	0.0128
	(0.00266)	(0.00949)	(0.00167)	(0.0219)	(0.0927)	(0.0222)
PTBR	-9.29e-06	-0.000104	2.68e-05	-0.000715	0.0171**	-0.00400*
	(0.000232)	(0.000717)	(0.000147)	(0.00209)	(0.00708)	(0.00214)
LMPResw						
Constant	4.061***	3.507***	1.716***	8.144***	-0.271	3.768
	(0.262)	(0.582)	(0.181)	(1.960)	(4.856)	(2.378)
Observations	6,272	1,433	4,828	6,394	1,530	4,853
Number of ID	737	511	734	738	527	732

A regression analysis of the impact of corporate social responsibility on firm misvaluation is presented in Table VI using a 2SLS where ESG is instrumented by profitability at first stage and the fitted values are used at second

stage.The results are presented in two panels. Panel A shows the results for MV^{RES} as a dependent variable. This is calculated by the ratio of market price to intrinsic value whereas intrinsic value is calculated through the residual income model. Panel B represents the results for MV^{TP} where intrinsic value is proxied by the price target forecasted by analysts'. Whereas Model I contains the regression results for the overall sample size and models II and III contain the regression results for overvalued and undervalued stocks respectively. Whereas LESG is lagged value of ESG score, Prof. is profitability, LEV is the Leverage, ITA is the log of total asset, CEA is the capital expenditure, DPR is the dividend payout ratio, NA is the analysts' coverage and PTBR is the price to book ratio.
The data for all the variable is extracted from Refinitiv database for the period of 2008 to 2019
The values in brackets are the standard error of regression.
***, **, and * represent 99%, 95% and 90% significance levels, respectively.

4.6.2 Pillar Score Analysis

The results of our study indicate a positive association between a company's ESG performance and its mispricing. ESG is a composite score that incorporates three pillars: environmental, social, and governance. Multiple studies analyzing these pillars individually conclude that a single pillar is mostly responsible for their relationship. For example, the environmental pillar score is relevant for sensitive industries (Garcia et al., 2017; Miralles-Quirós et al., 2018) , whereas (Luffarelli & Awaysheh, 2018) provide evidence that corporate social performance is also an important value driver. Therefore we re-examine our main analysis of section 4.2 by using each of the pillar score as explanatory variable. In Table 8 models 1 to 3 are for misevaluation measured through analysts forecasted price, whereas models 4 to 6 are for misevaluation calculated by residual income model. We can see in table 8 that only environmental pillar score has significant coefficients for the entire sample and undervalued firms. The social and governance pillar score is statistically insignificant. This finding indicates that environment performance is the key value driver for the European firms.

Table VIII: Pillar Score and Mis-Valuation

	Panel A:	MV^{TP}		Panel B:	MV^{RES}	
VARIABLES	VARIABLES	Model I	Model II	Model III	Model I	Model II
LMPPtm	0.0221*	-0.0055	0.0948***	0.144***	0.193***	0.137***
	(0.0113)	(0.0197)	(0.00843)	(0.0126)	(0.0322)	(0.014)
LESCORE	0.00114***	-0.000935	0.000843***	0.00388**	-0.0084	0.00365*
	(.000257)	(0.000583)	(0.000175)	(0.00208)	(0.00556)	(0.00229)
LSScore	0.000534*	0.00081	0.000483**	0.00833***	0.0186***	0.00610**
	(0.000285)	(0.00063)	(0.000194)	(0.00232)	(0.00607)	(0.00255)
LGScore	0.000108	5.09E-05	0.000189	0.00259	0.00582	0.00267

	(0.000212)	(0.000468)	(0.000144)	(0.00172)	(0.00446)	(0.00199
Prof.	-0.142**	-0.262*	-0.0799*	4.956***	3.631***	5.961***
	(0.0673)	(0.155)	(0.0459)	(0.551)	(1.113)	(0.671)
Lev	0.0971**	0.331***	-0.0838***	2.271***	1.951**	2.313***
	(0.043)	(0.0968)	(0.0294)	(0.335)	(0.802)	(0.387)
lTA	-0.148***	-0.116***	-0.0451***	-0.260***	0.226	-0.111
	(0.0115)	(0.0267)	(0.0079)	(0.0867)	(0.225)	(0.103)
CEA	-0.505***	0.0705	-0.324***	1.364	1.149	0.811
	(0.125)	(0.291)	(0.0833)	(1.002)	(2.672)	(1.096)
DPR	-2.67E-06	0.000539	0.000204	0.00136	0.00289	0.00307
	(0.000236)	(0.00294)	(0.00015)	(0.00194)	(0.0269)	(0.00198)
NA	-0.0129***	0.00385	-0.0100***	-0.00653	-0.0579	0.0072
	(0.00267)	(0.00949)	(0.00168)	(0.0219)	(0.0923)	(0.0222)
PTBR	0.000203	3.81E-05	0.000149	-0.00532**	0.0142**	-0.00969***
	(0.000252)	(0.000723)	(0.000162)	(0.00214)	(0.00709)	(0.00221)
Constant	4.136***	3.589***	1.754***	5.609***	-4.532	2.033
	-0.264	-0.592	-0.182	-1.971	-4.958	-2.366
Observations	6,272	1,433	4,828	6,394	1,530	4,853
R-squared	0.043	0.043	0.074	0.054	0.074	0.059
Number of ID	737	511	734	738	527	732

A regression analysis of the impact of corporate social responsibility on firm misvaluation is presented in Table VII using a fixed affect model with a lagged dependent variable. The results are presented in two panels. Panel A shows the results for MV^{TP} as a dependent variable. This is calculated by the ratio of market price to intrinsic value whereas intrinsic value is calculated through the residual income model. Panel B represents the results for MV^{RES} where intrinsic value is proxied by the price target forecasted by analysts'. Whereas Model I contains the regression results for the overall sample size and models II and III contain the regression results for overvalued and undervalued stocks respectively. Whereas Lag-Misvaluation is lagged value of dependent variable, L-ESCORE is lagged value of Environmental score, L-SSCORE is lagged value of Social score, L-GSCORE is lagged value of Governance score, Prof. is profitability, LEV is the Leverage, lTA is the log of total asset, CEA is the capital expenditure, DPR is the dividend payout ratio, NA is the analysts' coverage and PTBR is the price to book ratio.
The data for all the variable is extracted from Refinitiv database for the period of 2008 to 2019
The values in brackets are the standard error of regression.
***, **, and * represent 99%, 95% and 90% significance levels, respectively

5.Conclusion

Since the demand for corporate environmental, social and governance (ESG) reporting has grown exponentially over the past few decades, businesses have adapted sustainable and socially responsible practices and reported them as a means of maintaining their competitiveness. The dominance of ESG investments in the financial market has contributed to the inefficiency of the inefficiency of the inefficiency of the inefficiency of the

inefficiency of the inefficiency of the inefficiency of the stock market (Becchett et al., 2012). Due to this market inefficiency, superior ESG performance affect can increase the stock process relative to their intrinsic value. This study aims to examine whether CSR affects the gap between intrinsic and market value of firms in Europe. Our study demonstrates that a firm's involvement in ESG influences its misvaluation by increasing its market value relative to its intrinsic value. We estimated the link between ESG and stock misevaluation by using pooled fixed effect model with lag-dependent variable and replicated the main analysis by using 2SLS where we instrumented ESG performance by profitability and at second stage we regressed as a measure the robustness to estimation. We also used two different measure of misevaluation: one is calculated by using intrinsic value measured residual income model and the second misevaluation measure used analysts estimated true price in order to take into account the growth opportunities and unanticipated potential risk. Our main findings are robust to estimation technique and also to the measure of estimation. Further disaggregated analysis revealed the environmental performance is the most relevant determinant of stock value appreciation.

Second, we also conducted the analysis for overvalued and undervalued stocks separately. We find that ESG performance further expands the overvaluation and pulls back the already undervalued stock. We further find that information asymmetry and market sentiment moderate the relationship between the ESG-misevaluation nexus. Therefore, we maintain that superior ESG performance and its disclosure create friction to market efficiency and lead to valuation effects (Becchett et al., 2012; Mynhardt et al., 2017). This information asymmetry is attributed to strong sustainability trends channeling ESG-rating-based capital flows (Fatemi et al., 2018; Renneboog et al., 2008; Starks et al., 2017) This valuation effect, which exceeds the intrinsic value, corroborates the implications of the stakeholder theory (Freeman, 1984)) which places CSR engagement well beyond shareholder value theory (Friedman, 1970). The significance of the moderating role also implies that the effect of ESG on mispricing is exacerbated by a greater focus on ESG related topics. In other words, media and societal attention can change investors' perspectives on sustainability issues, which ultimately increases the relevance ESG norms in terms of valuation. It will also help the market to internalize ESG indicators in pricing mechanism. Our findings suggest that sustainable investors may behave somewhat irrationally because they attribute relatively

higher values to an enhanced sustainability profile rather than to financial information. Alternatively, sustainable investors may receive psychic return along with financial returns from their monitory investments (Beal et al., 2005).

Our finding also reveals that ESG performance also affects the capital structure, as overvaluation provides an opportunity to time the equity market. We find that although European firms follow pecking order theory but ESG induced misvaluation also has marginal effect on firm capital structure. CSR firms issue equity when their stock is overvalued, and they need financing for their positive NPV projects. These findings are in line with the (Baker & Wurgler, 2002; Elliott et al., 2007). It can also be contented from our findings that enhanced stability of CSR can also be attributed to the marginal increment in equity issuance rather than the social legitimacy effect of ESG itself.

The study has several implications for corporations. Firstly, ESG practices should be strategically embraced and strengthened by organizations. Proactive engagement with ESG factors not only enhances stock valuation but also positively shapes investor perception. There is a need for companies to be vigilant when it comes to monitoring potential overvaluation, especially when it is driven by superior ESG performance. It is imperative to implement robust monitoring mechanisms to identify cases of overvaluation and inform strategic decisions, particularly when it comes to financing. Recognizing the link between ESG-backed stock overvaluation and capital structure decisions, financial managers should strategically time equity issuances in response to ESG-related overvaluation, optimizing the overall capital structure. Transparent communication of ESG initiatives is crucial for fostering positive investor perceptions and contributing to sustained stock overvaluation. Lastly, the integration of ESG considerations into financial planning processes provides a holistic view of the financial landscape, enabling informed decision-making and strategic planning.

The study is subject to certain limitations. Specifically, the analysis was conducted at the aggregate EU level. Future research endeavors could extend the investigation to encompass individual regional territories, particularly in emerging economies. Furthermore, the replication of the study through a comparative analysis across diverse sectors may offer valuable insights. Investigating the long-term sustainability of ESG-backed stock overvaluation and its implications for corporate resilience would provide valuable insights.

Further research could delve into the dynamics of investor preferences and how they shape the relationship between ESG and stock valuation. Investigating the long-term sustainability of ESG-backed stock overvaluation and its implications for corporate resilience would provide valuable insights. Additionally, examining the effectiveness of various communication strategies for ESG initiatives and their influence on investor behavior could contribute to refining corporate communication practices.

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