Impact of split ESG rating on Corporate Value*

Bonha Koo†

Abstract

Purpose- We examine the effect of Split ESG Rating on information asymmetry, corporate value, and trading behavior.

Design/methodology/approach- The Split ESG is the signal of a lack of information. Regarding the relationship between the disagreement opinion and future stock prices, there are two main controversial hypotheses in finance: the risk-based hypothesis and the optimism-bias hypothesis. To test the optimism-bias hypothesis, we test the impact of Split ESG on corporate value when it has short-selling constraints.

Findings- Our results show that the Split ESG is positively related to idiosyncratic volatility, an alternative measure for information asymmetry. Also, the negative effect of Splits on cumulative abnormal return in short-selling constraints is consistent with the optimism bias hypothesis. Moreover, we find a negative relationship between ESG disagreement and the net purchase ratio of pension funds. Considering that the net purchase ratio is a direct measure of net demand, the ESG disagreement may hinder socially responsible investing toward the firm.

Originality/value- The contribution of this study is directly providing the negative effect of ESG disagreement on firm value and attraction of investment by *NPS*. It provides valuable pointers for policymakers that resolve the Split ESG urgently needed to expand the SRI.

Keywords Split ESG Rating; Socially Responsible Investment; Information asymmetry.
JEL Classification: G14, G24, M14

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† Assistant Professor of Finance, School of Business, Chungnam National University; 99, Daehak-ro, Yuseong-gu, Daejeon, 34134 Korea; E-mail: koobonha@cnu.ac.kr; Tel: +82-42-821-5520.

1 Introduction

Socially responsible investing (SRI) is an investing strategy that aims to generate both social change and financial returns for an investor. As global capital movement accelerates due to financial investment, companies confront greater pressures to be Socially Responsible (Shrivastava and Hart, 1995). One of the biggest pressures on companies is the mandatory ESG disclosure requirements. ESG rating stands for the non-financial performance of companies related to environmental, social, and governance. In Korea, all the KOSPI-listed companies should disclose ESG ratings by 2030. Furthermore, the National Pension Fund (*NPS*), the world's third-largest fund with $800 billion in assets, started SRI in 2006, continuously expanding the volume of SRI. They also announce that they will use the ESG integration approach to asset management. Considering that ESG plays an important role in investment decisions, financial analysts' valuation, and even in raising capital, it is essential for companies to manage ESG ratings.

However, in the short term, the cost of a company's ESG transition is higher than the profit. For companies to effectively convert ESG management, evaluation transparency and comparability of ESG ratings must be prioritized. Currently, there are five ESG evaluation agencies for Korean companies, including Morgan Stanley Capital International (*MSCI*), Korea Corporate Governance Service (*KCGS*), and *Refinitiv*, but there is a discrepancy in the ESG ratings between agencies for the same company. According to the Federation of Korean Industries' report regarding ESG evaluation trends, the ESG rating gap between *MSCI*, *KCGS*, and *Refinitiv* is an average of 1.4 and a max of 5, among 7 ranks. More than 40% of companies face an ESG rating gap of 3 or higher between agencies. Our sample also shows that the average value of ESG from *the MSCI* agency is lower than that of *KCGS*. This suggests the possibility that foreign institutions tend to undervalue domestic companies due to a lack of information.

These Split ratings can be caused by an absence of a uniform requirement for ESG evaluation (Ho, 2020). Based on the self-imposed score from the target firm, agencies evaluate ESG rating using independent assumptions, combined with different interpretations of scope, measure, and weighting factors, which leads to high inconsistencies (Berg et al., 2019). Chatterji et al. (2016) argued that the lack of a common theory and the lack of comparability resulted in rating discrepancies. According to Christensen et al. (2022), the more rating agencies publish ESG ratings, the greater the ESG rating discrepancy between agencies. Comparing ESG data between agencies in these circumstances is difficult (Amel-Zadeh and Serafeim, 2018).

Even though the disclosure of ESG rating alleviates information asymmetry by providing a non-financial source for SRI investing, the ESG disagreement can be interpreted as the lack of information about the target firm between the evaluation agency, the target firm, and the investor. In this case, the ESG disagreement may cause undermine SRI, decrease investor participation, and potentially harm economic well-being.

To examine the impact of Split ESG ratings on market, we analyze the Korean firm listed on the KOSPI and KOSDAQ from 2018 to 2021. Considering that Split ESG occurs when the firm is rated differently by multiple agencies, we exclude the firms with a single ESG rating. For analysis, we set our sample as the firms with ESG ratings from both agencies, *KCGS* and *MSCI,* each year. For comparison, the 7 levels of *MSCI* and *KCGS* ESG rating are inverted to the numeric score. Then, we define the absolute value of the difference between two scores

toward the same firm as a proxy for the ESG disagreement for each year. Then, we try to show how Split ESG ratings affect the information asymmetry, corporate value, trading volume, and the trading behavior of investors.

Our findings are summarized as follows. First, idiosyncratic volatility, an alternative measure for information asymmetry, is positively related to the level of Split ESG ratings. These results support the argument that the Split ESG leads to greater Information asymmetry. Second, we find that the Split ESG has a negative and significant impact on the CAR within 180 days, suggesting ESG disagreement toward firms lower the corporate value. This is consistent with Miller (1977), by providing the empirical results that divergences in ESG among agencies are more likely to create higher volatility and lower stock returns. Miller (1977) explains this phenomenon with an optimism-bias hypothesis, which theorized that disagreement in opinion leads to stock overvaluation where there are short-sales constraints. In this model, the stock prices are biased upward because pessimists are restricted to owning zero shares even when they wish to hold a negative quantity. Thereby, the stock price is set by the beliefs of the most optimistic investors. To support the optimism-bias hypothesis, there are two necessary and sufficient conditions: disagreement opinion toward the firm and short-sale constraints. In our sample, there is a period when short-sale was restricted. The financial regulatory authorities in Korea prohibit short-sale from March 2020 to March 2021 due to the COVID-19 pandemic. Our empirical results with short-selling constraint are consistent with the optimism-bias hypothesis, by showing that the ESG disagreement toward firms leads to lower expected returns if there are restrictions on short selling. Finally, we find that not only does ESG Split increase the trading volume, but it also has different effects depending on the investor group. In specific, we examine the net purchase ratio (NPR) for a different group of investors to measure the net demand. Split ESG has a positive relationship with individual investors, but negative relations with *NPS* funds. Our result suggests that Split ESG hinder the SRI investment from public pension funds with the largest assets in Korea due to the information asymmetry.

While previous literature focuses on ESG disclosure, we examine how ESG rating disagreement affects corporate value, in terms of information asymmetry. To the best of our knowledge, this study is the first attempt to directly show the relationship between Split ESG and the net demand of institutions toward firms. In doing so the study contributes to enriching the academic discussion of ESG rating disagreement. It also provides valuable pointers for policymakers by showing that lack of transparency and comparability in the ESG evaluation system hinders the SRI investment.

The remainder of the paper proceeds as follows. Section 2 provides a literature review related to ESG rating. Section 3 discusses the data and methodology. Section 4 presents the empirical results, and Section 5 concludes the article.

2 Literature Review

2.1 ESG rating disclosure and information asymmetry

Considering that the ultimate corporate goal is the maximization of stock value, CSR activities do not coincide with their goal. Previous literature argues that CSR activity and

corporate value have a negative relationship because the cost of CSR activity is higher than the profit (Pava and Krausz, 1996). However, the recent literature conversely shows that CSR activities can improve corporate value by reducing conflicts of interest between managers and stakeholders, and gaining reputation (Godfrey, 2005; Jo and Harjoto, 2012). Non-financial performance related to ESG increases the sustainability of a company (Ben-Amar et al., 2017).

In particular, the disclosure of information reduces the expectation of heterogeneity of corporate value by alleviating information asymmetry and reducing stock price volatility by stabilizing stock trading volume (Diamond and Verrecchia, 1991). Jo and Kim (2007, 2008) argued that frequent voluntary disclosure improves corporate transparency, which leads to a decrease in information asymmetry between insiders and outsiders, suppresses managers' self-transactions, and increases corporate value. In this respect, ESG information disclosure can have a positive effect on reducing information asymmetry, reducing stock price volatility, and increasing long-term corporate value. Previous literature shows a positive (+) relationship between CSR activities and information asymmetry mitigation (Dhaliwal et al., 2011).

Many recent works of literature support the argument that ESG disclosure has a positive impact on the market. For example, Grewal et al. (2019) argue that firms with high ESG disclosure have a less negative market reaction by examining the ESG disclosure mandate event in the E.U. Naughton et al. (2019) find that ESG disclosure generates positive abnormal returns during periods when investors place a valuation premium on ESG performance. The market reacts positively to successful ESG engagements by investors (Dimson et al., 2015), or the announcement of eco-friendly initiatives (Flammer, 2013). Capelle-Blancard and Petit (2019) find a negative market reaction to negative ESG news. Previous literature in the Korean market also shows that an increase in ESG activity is linked to alleviating information asymmetry. Voluntary disclosure of ESG rating firms reduces the company's capital cost, thereby reducing the risk of corporate insolvency (Yeo, 2017). The ESG disclosure may harm short-term financial performance in short term due to expenditure and investment in ESG-related activities, it has a positive relationship with long-term corporate value (Na and Leem, 2011). Min and Kim (2019) also show that the positive relationship between ESG performance and corporate value is prominent in companies with high profitability or high foreigner equity, which indicates that ESG activities of companies are either supported by profitability or advanced normative investors. This is interpreted as the reason for the transparency of ESG disclosure (Kang and Jung, 2020). Na and Leem (2011) analyzed whether the information effect on ESG ratings affects the stock trading volume and cumulative excess return. They find that ESG information is undervalued in the short term and mainly leads the selling transactions. Also, Do and Kim (2022) show that the increase in ESG rating decrease the volatility of stock return in the short-term, while the volatility increases when the ESG rating decreases.

2.2 Split ESG rating

In general, analysts act as information intermediaries by providing information to investors. Therefore, the number of analysts has a positive impact on corporate value. However, a larger number of analysts can lead to more divergency opinions toward the firm. Regarding the relationship between the disagreement opinion and future stock prices, there is considerable controversy in finance. The two main hypotheses are the risk-based hypothesis and the

optimism-bias hypothesis.

Fundamentally, investors should take a risk in their position when they confront this divergence in opinions. This divergence in opinions, the information asymmetry, leads to a positive risk premium (Livingston et al., 2010), and it will lead to a positive effect on future stock prices (Billingsley et al., 1985). This hypothesized that investors should be compensated for bearing trading risk due to adverse selection caused by divergency opinion (David, 2008; Varian, 1985, 1989). Carlin et al. (2014) argue that the disagreement level among Wall Street mortgage dealers about prepayment speeds is positively related to the expected return, return volatility, and trading volume, which supports the risk-based hypothesis.

On the other hand, other literature argues that differences of opinion in the market lead to lower expected returns when they confront short-sale constraints. This occurs because pessimists sit out of the market and asset prices reflect only the valuation of optimists due to information asymmetry (Chen et al., 2002; Diether et al., 2002; Miller, 1977). In this case, the divergence of opinions among investors is more likely to create higher risk (stock return volatility) and more likely to have lower stock returns (Miller, 1977). Other studies also show the empirical results that disagreements among security analysts reduce the future stock return and firm value (Diether et al., 2002).

The literature related to the Split ESG Rating and stock firm value (Avramov et al., 2020) shows that the average ESG rating is negatively associated with future stock performance only for low-ESG-disagreement stocks. (Gibson Brandon et al., 2021) document stock returns are positively linked to environmental ESG (E-ESG) rating disagreement, suggesting a risk premium for firms with higher ESG rating disagreement. Rating disagreement leads to higher effective risk aversion, higher market premium, and lower demand for stocks. Also, they show that the greater the social-ESG rating disagreement linked the greater the total volatility and idiosyncratic volatility. Atmaz and Basak (2018) find that disagreements are associated with higher stock volatility, trading volume, and a positive relation between the two.

Furthermore, the information asymmetry caused by Split ESG has a different effect on informed and uninformed investors. Grossman and Stiglitz (1980) argue that the information asymmetry between informed and uninformed investors affects the information retrieval cost, the quality of information, the noise of investing in risky assets, and the proportion of informed investors.

3 Data and Methodology

3.1 Data

3.1.1 Split ESG Rating

We analyze the Split ESG rating of common stocks listed on the KOSPI and KOSDAQ from 2018 to 2021. Considering that Split ESG rating occurs when the firm is rated differently by multiple agencies, we exclude the firms with a single ESG rating. We use ESG rating data from two different agencies, with seven-level grades. As an ESG rating agency, we choose the Korea institute of corporate governance and sustainability (*KCGS*) and Morgan Stanley Capital International (*MSCI*). ESG rating data is obtained from the *MSCI* (https://www.msci.com) and *KCGS* (http://www.cgs.or.kr) websites.

For empirical analysis, the seven-level *MSCI* and *KCGS* ESG rating (grade) convert to a numeric score as shown in Table 1. Table 1 presents the frequency table. The ESG rating frequency by grade is shown in Panel A. The higher the ESG score, the worse the ESG grade. The *KCGS* ESG rating is officially composed of seven grades, but they disclose the grade under B (B, C, D) as the 'Under B' until 2019. In this case, the actual *KCGS* rating has 5 levels. Therefore, we set all the grades under B from *KCGS* and under BB from *MSCI* as the lowest score 5, for comparison between the two agencies' grades. Accordingly, we define AAA (S)=1, AA (A+)=2, A (A)=3, BBB (B+)=4 scores, and all other scores were converted into 5. Also, we match the ESG ratings and financial statements data based on the ESG evaluation year. After matching the year, we exclude firms without financial data from the previous year.

Next, we define the *Splits* as the difference in scores between *MSCI* and *KCGS*. To capture the impact of Split ESG we use two measures: First, we use the indicator variable (*D_Split*) that equals 1 if *Splits* occur, and 0 otherwise and we also consider the level of Split (*Abs_Split*), which is calculated by the absolute value of *Splits*.

Among domestic companies with a market capitalization of more than 2 trillion won, 77 companies were rated by both *MSCI* and *KCGS* agencies, resulting in a total of 298 firm-year samples. Panel B of Table 1 presents the ESG rating frequency by year. There are 69 observations in 2018, with an increase to 77 observations in 2021. Panel C presents the ESG rating frequency by Korea Standard Industry Code (KSIC).

[Table 1]

3.1.2 Control variables

We include control variables that are related to Split ratings and firm characteristics as shown in previous literature. The control variables include average ESG score (Rating), firm size (Size), leverage (LEV), market to book value (MB), return on assets (ROA), majority shareholder ownership (Own), foreigner ownership (For), and free cash flow (FCF)

The average ESG score (Rating) is the average value of the *MSCI* and *KCGS* ESG scores. Firm size (Size) is the natural log of total assets. Leverage (LEV) is total liabilities divided by total assets. Market to book value (MB) is equity value (share price times the number of shares outstanding after deduction of the number of treasury stock) divided by book value (net income minus Preferred stock cash dividend). Return on assets (ROA) is operating income divided by total assets. Majority shareholder ownership (Own) is the percentage of the firm's shares owned by the majority shareholder. Foreigner ownership (For) is the percentage of the firm's shares owned by the foreigner. Free cash flow (FCF) is operating cash flow minus Capital Expenditures (CAPEX) divided by total assets. We winsorize all continuous variables at the top and bottom 1% to mitigate any undue influence from outliers.

Table 2 presents the descriptive statistics. Our total sample includes 298 unique firm-year observations with ESG ratings between 2018 and 2021. Among 298 full samples, the observation of the equal ESG rating is 156 (in Column 2) and ESG rating disagreement is 142 (in Column 3) In full sample, Split level (*Abs_Split*) has a mean of 0.966, and the maximum split levels are 3 grades. The average ESG score (Rating), which ranges from 0 (most positive) to 5 (most negative), has a mean of 3.866, suggesting that the ESG rating is slightly towards the negative side. The average value of the ESG score from *MSCI* (*Rating_m*) is higher than

the ESG score from *KCGS* (*Rating_k*), which implies that *MSCI* is more pessimistic about the domestic firm's ESG ratings. Column (4) shows the results from t-test procedures on differences between the firms without Split ESG (Column 2) and firms with Split ESG (Column 3). As for firm-level characteristics, the Split ESG firms have relatively negative ESG score (Rating), lower return on asset (ROA), higher debt (LEV), higher majority ownership (Own), and lower foreigner ownership (For), compared to the firms without split.

[Table 2]

Table 3 reports the Pearson correlations matrix. The correlation coefficient between the Split level and average Ratings is 0.746. Also, the correlation coefficient between *the MSCI* score and the *KCGS* score is 0.355, which is consistent with Berg et al. (2020) that ESG ratings are not highly intercorrelated.

[Table 3]

3.2 Methodology

3.2.1 Split ESG rating and Information asymmetry

A split ESG rating is the signal of a lack of information about the target firm between the evaluation agency, the target firm, and the investor. To test whether the Split ESG leads to Information asymmetry, we use the total volatility and the idiosyncratic volatility as a proxy for information asymmetry. Idiosyncratic volatility denotes the amount of price variability due to firm-specific information. Thereby, the idiosyncratic volatility is directly related to the level of informed trading in the market, and it can be an alternative measure of the information asymmetry level.

We estimate the total volatility (Vola) as the standard deviation of the firm's daily returns for the year. A larger Vola means higher information asymmetry, following (Jang and Jung, 2014). Also, we measure the idiosyncratic volatility (iVol4) as the standard deviation of residuals from the Fama-French four-factor model (FF4), fitted to the daily data for each year. Beta loadings ($\widehat{\beta_{i,t}^{MKT}}, \widehat{\beta_{i,t}^{SMB}}, \widehat{\beta_{i,t}^{HML}}, \widehat{\beta_{i,t}^{MOM}}$) are estimated for the period $t = -260$ business days up to $t = -10$ business days, with a minimum observation of 100. The residuals ($\widetilde{\varepsilon_{i,t}}$) are calculated using equation (1).

$$\widetilde{\epsilon_{i,t}} = \left(R_{i,t} - R_{f,t}\right) - \widehat{\beta_{i,t}^{MKT}} * Mkt_{rf\ t} - \widehat{\beta_{i,t}^{SMB}} * SMB_t - \widehat{\beta_{i,t}^{HML}} * HML_t - \widehat{\beta_{i,t}^{MOM}} * MOM_t \quad (1)$$

where $\widetilde{\epsilon_{i,t}}$ indicates the t-day residual of i stocks, which indicates the returns not explained by the FF4 risk factor. $R_{i,t}$ is the return of stock i for day t. We use the KOSPI return and the CD91 interest rate as the proxy for market return and risk-free return, respectively. The standard deviation of residuals is fitted to the daily data for each year. For robustness checks, we also include the idiosyncratic volatility measured by using the CAPM model (iVol2) and the Fama-French three-factor (FF3) model (iVol3).

Using these four alternative measures of Information asymmetry, we examine the

impact of Split ESG rating by conducting the following empirical model:

$$Dep_{i,t} = \beta_0 + \beta_1 * Spts_{i,t} + \sum_m \gamma_m * Control_{i,t}^m + u_{i,t} \quad (2)$$

where the dependent variables ($Dep_{i,t}$) are Vola, iVol1, iVol2, and iVol3, which denotes the (1) total volatility and the idiosyncratic volatility from (2) CAPM (iVol2), (3) FF3 (iVol3), and (4) FF4 model (iVol4). The independent variable ($Spts$) is tested in two ways: indicator variable (*D_Split*) and Split level (*Abs_Split*). *D_Split* equals 1 if firms have different ESG rating scores, and 0 otherwise. *Abs_Split* is the absolute value of differences in ESG rating score. A set of control variables ($\text{Control}_{i,t}^m$) includes average ESG score (Rating), firm size (Size), leverage (LEV), market to book value (MB), return on assets (ROA), majority shareholder ownership (Own), foreigner ownership (For), and free cash flow (FCF). All continuous variables are winsorized at the 1st and 99th percentiles. We use the fixed effects regression model using panel data set. All the models include industry-fixed and year-fixed effects, and standard errors are clustered by firm to mitigate the effect of heteroscedasticity or serial autocorrelation. Considering our relatively short sample period and various Split ESG among the industry sector, we control at the industry level. For robustness checks, we also test with year fixed and the firm fixed effect, instead of industry effect, to examine the within-firm variation in Split ESG.

3.2.2 Split ESG rating and corporate value

Next, we examine the impact of Split ESG rating on corporate value using an event study methodology. The event date is set as the Split occurrence date. Considering that the announcement date of two agencies is different, we select the event date to be the ESG rating announcement by an agency that disclose the ESG rating later in that year. The positive relationship between Split ESG and future stock returns supports the risk-based hypothesis, while the negative relationship between Split ESG and future stock returns supports the optimism-bias hypothesis. For this analysis, we use the cumulative abnormal return (CAR) for each stock as our dependent variable. The CAR is calculated as follows:

$$CAR_i(0,\tau) = \sum_{t=0}^{\tau} AR_{i,t} \quad (3)$$

Daily abnormal returns ($AR_{i,t}$) are calculated using the FF4 model. Beta loadings are estimated using each model for the period $t = -260$ days up to $t = -10$ days with a minimum of 100 observations. Regressions are conducted separately for each period using equation (1). The firm's CAR is a cumulative sum of abnormal returns from 0 to τ days. According to previous studies, ESG disclosure has a negative (-) relationship with short-term corporate value but has a positive (+) relationship with long-term corporate value in previous literature with the Korean market (Kang and Jung, 2020; Min and Kim, 2019; Na and Leem, 2011). We focus on the post-split cumulative abnormal returns and consist of CARs with $\tau 1 = 0$ to $\tau 1 = 250$.

We run a regression with different dependent variables using equation (2). Dependent variables are CAR (0,60), CAR (0,90), CAR (0,120), CAR (0,180), and CAR (0,250), which

denotes the cumulative abnormal return from the FF4 model. We also include the cumulative raw return, the cumulative abnormal return from the CAPM model, and the FF3 model for robustness checks. The independent variable ($Split_{i,t}$) is tested in two ways: indicator variable (*D_Split*) and Split level (*Abs_Split*). *D_Split* equals 1 if firms have different ESG rating scores, and 0 otherwise. *Abs_Split* is the absolute value of differences in ESG rating score. A set of control variables ($Control_{i,t}^{m}$) includes Size, LEV, MB, ROA, Own, For, and FCF and all models include industry fixed and year fixed effect, and standard errors are clustered by firm.

3.2.3 Split ESG rating and trading behavior

The SRI investment decisions are inevitably affected by ESG rating disagreement on ESG rating may have a negative effect on the trading volume. Moreover, the information asymmetry caused by Split ESG will lead to a different effect on informed and uninformed investors (Grossman and Stiglitz, 1980). Considering that Individual investors are typically classified as uninformed traders whereas institutional investors are informed traders, we test the trading activity for a certain group of investors.

As a measure of trading volume, we use trading volume (TV), measured by the natural log of trading volume amount, and the Standardized trading volume (STV), measured by the percentage of the number of shares traded divided by the number of outstanding shares, following (Campbell and Wasley, 1996). Also, we measure the trading behavior using the Net purchase ratio (NPR). The NPR is the net amount of buying investors divided by their total transaction amounts over a particular period (Kumar and Lee, 2006):

$$NPR_{i,t} = \sum_{j=1}^{D_t}(Buy_{it} - Sell_{it}) \; / \; \sum_{j=1}^{D_t}(Buy_{it} + Sell_{it}) \qquad (4)$$

where D_t is the number of days in year t; Buy_{it} ($Sell_{it}$) is the buy (sell) trading volume (amount) of stocks for investor group i in year t; i are individual, institutional, and foreign investors. We obtain the *NPR*-related data from the Korea Exchange (www.krx.co.kr). If $NPR_{i,t}$ is positive (negative), then investor group i is a net buyer (seller) for the entire group over year t. In other words, the NPR is a directional indicator of net demand for given conditions.

We run an empirical model for each group using equation (2). Dependent variables are (1) TV, (2) STV, and NPR of (3) individuals, (4) institutions, and (5) foreign investors. The independent variable ($Split_{i,t}$) is tested in two ways: indicator variable (*D_Split*) and Split level (*Abs_Split*). *D_Split* equals 1 if firms have different ESG rating scores, and 0 otherwise. *Abs_Split* is the absolute value of differences in ESG rating score. A set of control variables ($Control_{i,t}^{m}$) includes Size, LEV, MB, ROA, Own, For, and FCF and all models include industry fixed and year fixed effect, and standard errors are clustered by firm.

4 Empirical Results

Panel A of Table 4 shows the effect of Split ESG Ratings on volatility. We find that the presence of Split ratings and the magnitude of split ratings are both positively related to idiosyncratic volatility. For example, the columns (2) and column (6), which measure the idiosyncratic volatility using the CAPM model, the coefficient of *D_Split* and *Abs_Split* are

0.1046 and 0.9998 and both are significant at the 5% levels. The positive relationship between *Splits* and volatility implies that the Split ESG will lead to greater Information asymmetry. These results are consistent with Atmaz and Basak (2018), which show the disagreement in the stock market linked to greater total volatility and idiosyncratic volatility. While the Gibson Brandon et al. (2021) only show that environmental ESG (E-ESG) rating disagreement is linked to volatility, we find a significantly positive relationship between consolidated Split ESG and volatility. It is also consistent with the Jung and Park (2018) who show the Split bond rating increase the bond yield spreads in the Korean market.

Our results are robust with models estimated with firm and year fixed in Panel B. Both the sign of coefficients and significance are robust.

[Table 4]

The relationship between Split ESG and the CAR is shown in Table 5. Across all firms in our sample, the coefficient of Split ESG is negatively associated with CAR (0,90), CAR (0,120), and CAR (0,180), and all are significant at the 5% levels, as shown in columns (2) to (4) and column (7) to (9). The coefficient of *D_Split* and *Abs_Split* is negatively related to the cumulative abnormal return for the event window 0 to 180 of -5.885% and 5.375%, respectively. These results are consistent with Do and Kim (2022) that the asymmetric information effects of ESG reduce the stock price in the short term.

However, we do not observe a significant relation with CAR (0,250). it might be caused by resolved Split due to the new ESG rating which comes out every year (nearly 250 trading days). Also, in case of insignificant relation with CAR (0, 60) suggests that the impact of ESG factors may not be fully recognized in a short period, and the investors may need a longer time to take the opposite position. Our results are robust with models estimated in Table 6 which measure cumulative raw return (Panel A) and CAR using different asset pricing models; CAPM model (Panel B) and FF3 model (Panel C).

[Table 5]

[Table 6]

Overall, Our findings that Split ESG among agencies is more likely to create higher volatility and lower stock returns can be interpreted as the optimism-bias hypothesis (Miller, 1977). Two necessary and sufficient conditions for the optimism-bias hypothesis are Split opinion toward the firm and the short-sale constraints. To provide evidence of the optimism-bias hypothesis, we control the short-sale constraints. Considering that the financial regulatory authorities in Korea ban short-selling in stock exchanges from March 16, 2020, to March 15, 2021, in response to the COVID-19 pandemic, we use the dummy variable (*D_Short*) that equals 1 when it has a short-sell constraint, and 0 otherwise. Also, we add the two-interaction term: the interaction term between *D_Split* and *D_Short (D*Short*) and the interaction term between *Abs_Split* and *D_Short (Abs*Short*). The sign and significance of these interaction terms show how the effect of ESG Split on corporate value is different according to the short-sale constraint. Table 7 displays the results with short-sell constraints. Unlike the previous results, *Abs_Split* and *D_Split* have no significant relationship in any CAR. However, both interaction term *(D*Short* and *Abs*Short*) has negative and significant relations with the CAR (0,60), CAR (0,90), CAR (0,120), and CAR (0,180), respectively. For example, the coefficient

of *D*Short* and *Abs*Short* on CAR (0,90) in Column (7) are -11.496% and -12.311%, which is statistically significant at the 1% level. It shows that Split ESG has a significant effect on the firm value in the short sale constraint. Our results imply that ESG disagreement toward firms leads to lower expected returns if there are restrictions on short selling, which supports the optimism-bias hypothesis.

[Table 7]

Table 8 reports the relationship between *Splits* and trading behavior. The results from Column (1), (2), (6) and (7) using the two measure of trading volume confirms that the increase in *Splits* is positively related to the increase in trading volume of firms.

Regarding the NPR, we find that the NPRs of individuals in Columns (3) and (8) have a significantly positive relationship, whereas the institutions in Columns (1) and (9) have a negative relationship with *Splits*.

Moreover, considering that previous literature shows the relations between institutions and ESG rating (Dyck et al., 2019), we classified the institutional investors into eight groups. (1) *NPS*, (2) securities companies, (3) insurance companies, (4) investment trust companies, (5) banks, (6) pension funds including *NPS* and nation, (7) private equity funds, and (8) others. Interestingly, the *NPS* funds, the public pension fund leading SRI investment with the world's third-largest fund with $800 billion in assets, have negative relations with the presence of Split (Column 4 in Panel B) and the magnitude of split ratings (Column 4 in Panel C). Our results suggest that Split ESG ratings hinder institutional investors' ESG investment by increasing the SRI investment risk.

[Table 8]

5 Conclusions

For the expansion of SRI, the Korean government introduces a new regulation that all the KOSPI-listed companies should disclose ESG ratings by 2030, which is a critical determinant of SRI. It means the era has come when the firm's investment decision, valuation from financial analysts, or even the cost of capital are affected by ESG rating. The transparency and comparability of ESG ratings can prevent confusion in the ESG transition. However, there is still a lack of guidelines on how firms should prepare for ESG management. There exists a discrepancy in the ESG ratings between agencies. Following the Federation of Korean Industries' report in 2021, more than 40% of companies have more than 3 gaps in ESG rating, out of 7 ratings. In our sample, the ESG ratings of foreign evaluators for domestic companies were also undervalued compared to the ESG ratings of domestic evaluators.

To examine the impact of ESG rating disagreement on firms, we examine the relations between Split ESG ratings and information asymmetry, corporate value, and trading behavior. From the perspective of information asymmetry, we find evidence that the Split ESG undermines the corporate value. In our empirical analysis, the increases in Split ESG are related to the increase in volatility and decrease in future stock price, which supports the optimism bias hypothesis (Miller, 1977). Moreover, we find that divergences in ESG decrease the net demand for that corporate from institution investors, especially the pension fund including *NPS*.

Our findings enrich the academic and policy discussion of ESG rating disagreement.

We hope that our study raises the concern that the Split ESG rating increases the risk and hinders investment. To expand SRI by institutional investors and induce companies to effectively participate in ESG management, political efforts to resolve the Split ESG are urgently needed. Furthermore, considering that firms with more informative disclosure tend to have less disagreement among analyst forecasts (Lang and Lundholm, 1996) or the credit rating agencies in Korea (Kim and An, 2021), active voluntary disclosure by firms can also be one way to reduce Split ESG.

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Table 1. ESG Rating frequency

This table presents ESG Rating frequency by grade, year, and industry sector by Korea Standard Industry Code (KSIC). SCORE is the conversion of the KCGS and MSCI grade to a single numeric scale: AAA (S) = 1, AA (A+)=2, ..., Under BB (Under B)=5; Score is the criteria for calculating Split. Our sample consists of 298 observations from 77 firms.

Panel A. ESG Rating frequency by grade

	MSCI				KCGS			
Score	grade	All	Kospi	Kosdaq	grade	All	Kospi	Kosdaq
1	AAA	1	1	0	S	0	0	0
2	AA	17	17	0	A+	21	21	0
3	A	51	51	0	A	142	141	1
4	BBB	73	72	1	B+	99	98	1
5	BB	64	62	2	Under B	36	32	4
5	B	67	64	3	C	.	.	.
5	CCC	25	25	0	D	.	.	.
	Sum	298	292	6	Sum	298	292	6

Panel B. ESG by year

Year	KCGS ∩ MSCI		
	All	Kospi	Kosdaq
2018	69	69	0
2019	77	75	2
2020	75	73	2
2021	77	75	2
Sum	298	292	6

Panel C. ESG by Industry Sector

Industry sector (KSIC)	KCGS ∩ MSCI		
	All	Kospi	Kosdaq
Construction	8	8	0
Financial and insurance activities	44	44	0
Wholesale and retail trade	18	15	3
Arts, sports, and recreation-related services	4	4	0
Transportation	16	16	0
Electricity, gas, steam, and water supply	4	4	0
Professional, scientific and technical activities	23	23	0
Information and communications	30	27	3
Manufacturing	147	147	0
Membership organizations, etc	4	4	0
Sum	298	292	6

Table 2. Descriptive statistics

This table presents the characteristics of firms with ESG ratings from both MSCI and KCGS agencies. *D_Split* is an indicator variable that equals 1 if two agencies report different ESG ratings, and 0 otherwise; *Abs_Split* is the absolute value of the difference in ESG Rating score; The average ESG score (Rating) is the average value of the MSCI and KCGS ESG score. Rating_M and Rating_K is the ESG score of MSCI and KCGS, respectively. Return (Ret) and Total volatility (Vola) is annual return and the standard deviation of the firm's daily returns for the year, respectively. Trading volume (TV) is the natural log of trading volume amount, and net purchase ratio for investor types i on year for a certain group of stocks, where i are individual (NPR_ind), institution (NPR_ins), foreign investors (NPR_for), and national pension (NPR_nps). Firm size (Size) is the natural log of total assets. Leverage (LEV) is total liabilities divided by total assets. Market to book value (MB) is equity value (share price times the number of shares outstanding after deduction of the number of treasury stock) divided by book value (net income minus Preferred stock cash dividend). Return on assets (ROA) is operating income divided by total assets. Majority shareholder ownership (Own) is the percentage of the firm's shares owned by the majority shareholder. Foreigner ownership (For) is the percentage of the firm's shares owned by the foreigner. Free cash flow (FCF) is operating cash flow minus Capital Expenditures (CAPEX) divided by the total asset. Column (4) shows the results from t-test procedures on differences between the firms without Split ESG rating (Column 2) and firms with Split ESG rating (Column 3). The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1) Full sample (Obs =298)				(2) D Split=0 (Obs =142)		(3) D Split=1 (Obs =156)		(4) T-test	
Variables	Mean	Std. Dev.	Min	Max	Mean	SD	Mean	SD	Diff	T-stat
D_Split	0.523	0.500	0	1	0	0	1	0		
abs_Split	0.966	0.769	0	3	0.366	0.483	1.513	0.539	-1.147***	-19.365
Rating	3.866	0.720	1.500	5	3.676	0.808	4.038	0.581	-0.362***	-4.407
Rating_m	4.228	0.951	1	5	3.775	0.845	4.641	0.850	-0.866***	-8.814
Rating_k	3.503	0.797	2	5	3.577	0.870	3.436	0.720	0.142	1.522
Ret	9.879	38.319	-43.568	156.901	12.675	39.041	7.334	37.593	5.341	1.201
Vola	2.293	0.730	1.007	5.200	2.201	0.668	2.376	0.775	-0.175**	-2.092
TV	12.865	1.231	10.302	15.966	12.674	1.212	13.039	1.227	-0.365**	-2.580
Size	23.644	1.434	21.117	27.038	23.683	1.480	23.607	1.395	0.076	0.456
MB	20.641	40.593	-90.222	224.142	23.602	40.327	17.946	40.776	5.656	1.203
LEV	53.049	22.637	13.249	93.095	49.603	24.257	56.186	20.636	-6.583**	-2.511
ROA	5.552	5.535	-6.770	22.910	6.603	5.524	4.595	5.386	2.008***	3.172
Own	35.021	15.213	9.380	75.040	31.172	14.298	38.524	15.218	-7.352***	-4.299
For	31.085	15.651	7.227	76.305	35.344	14.838	27.207	15.407	8.137***	4.643
FCF	3.612	5.875	-16.067	16.236	4.060	6.072	3.205	5.679	0.855	1.251
Number of firms: 77										
Number of Industry:10										

Table 3. Pearson Correlation

This table reports the Pearson correlations of variables. The second row in each cell represents the p-value. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) D_Split	1.000														
(2) abs_Split	0.746***	1.000													
	(0.000)														
(3) Rating	0.252***	0.034	1.000												
	(0.000)	(0.554)													
(4) Rating_m	0.456***	0.370***	0.856***	1.000											
	(0.000)	(0.000)	(0.000)												
(5) Rating_k	-0.089	-0.379***	0.787***	0.355***	1.000										
	(0.126)	(0.000)	(0.000)	(0.000)											
(6) Ret	-0.070	-0.071	-0.027	-0.041	-0.001	1.000									
	(0.230)	(0.219)	(0.641)	(0.484)	(0.993)										
(7) Vola	0.120**	0.112*	0.050	0.092	-0.020	0.300***	1.000								
	(0.039)	(0.054)	(0.392)	(0.114)	(0.737)	(0.000)									
(8) TV	0.148**	0.111*	0.010	0.024	-0.011	0.198***	0.302***	1.000							
	(0.010)	(0.057)	(0.860)	(0.676)	(0.857)	(0.001)	(0.000)								
(9) Size	-0.027	-0.013	-0.303***	-0.228***	-0.275***	-0.102*	-0.260***	0.304***	1.000						
	(0.648)	(0.824)	(0.000)	(0.000)	(0.000)	(0.078)	(0.000)	(0.000)							
(10) MB	-0.070	-0.080	0.061	0.024	0.081	0.145**	0.152***	-0.041	-0.269***	1.000					
	(0.230)	(0.166)	(0.294)	(0.675)	(0.162)	(0.012)	(0.009)	(0.484)	(0.000)						
(11) LEV	0.145**	0.122**	-0.036	0.067	-0.145**	-0.094*	-0.044	0.231***	0.501***	-0.227***	1.000				
	(0.012)	(0.035)	(0.540)	(0.247)	(0.012)	(0.104)	(0.453)	(0.000)	(0.000)	(0.000)					
(12) ROA	-0.182***	-0.141**	-0.063	-0.169***	0.087	0.135**	-0.090	-0.237***	-0.396***	0.068	-0.499***	1.000			
	(0.002)	(0.015)	(0.276)	(0.003)	(0.134)	(0.020)	(0.121)	(0.000)	(0.000)	(0.241)	(0.000)				
(13) Own	0.242***	0.192***	0.245***	0.246***	0.150***	-0.078	0.097*	-0.207***	-0.217***	0.152***	-0.164***	-0.054	1.000		
	(0.000)	(0.001)	(0.000)	(0.000)	(0.009)	(0.177)	(0.096)	(0.000)	(0.000)	(0.009)	(0.005)	(0.357)			
(14) For	-0.260***	-0.124**	-0.419***	-0.377***	-0.308***	0.003	-0.270***	-0.008	0.302***	-0.029	0.001	0.259***	-0.490***	1.000	
	(0.000)	(0.033)	(0.000)	(0.000)	(0.000)	(0.958)	(0.000)	(0.891)	(0.000)	(0.618)	(0.991)	(0.000)	(0.000)		
(15) FCF	-0.073	-0.051	-0.110*	-0.152***	-0.018	0.056	0.002	-0.192***	-0.216***	-0.035	-0.347***	0.550***	-0.081	0.117**	1.000
	(0.210)	(0.381)	(0.058)	(0.009)	(0.758)	(0.333)	(0.978)	(0.001)	(0.000)	(0.548)	(0.000)	(0.000)	(0.161)	(0.044)	

Table 4. The Effect of Split ESG Rating on Volatility

This table reports the effect of Split Ratings on volatility. We define *D_Split* as the indicator variable that equals 1 if two ESG Rating agencies report different ratings, and 0 otherwise; *Abs_Split is the absolute* value of differences in ESG Rating score from MSCI and KCGS. Total volatility (Vola) is the standard deviation of the firm's daily returns for the year. Idiosyncratic volatility (iVol) is the standard deviation of residuals from the asset pricing model, (1) CAPM (iVol2), (2) Fama-French three-factor model (iVol3), and (3) Carhart four-factor model (iVol4), respectively. Beta loadings are estimated using each model for the period $t = -260$ days up to $t = -10$ days with a minimum of 100 observations. IVOL is fitted to the daily data for each year. The set of control variables consists of the following firm characteristics: the average value of the ESG score (Rating); the natural log of total assets (Size), leverage (LEV), market to book value (MB); return on assets (ROA); equity ownership held by largest shareholder (Own); the percentage of the firm's shares owned by a foreigner (For); and the free cash flow (FCF). Panel A includes the industry and year fixed effect and Panel B includes the firm and year fixed effect. All standard errors are clustered by firm, and all continuous variables are winsorized at the 1st and 99th percentiles. T-statistics are in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Industry and Year-Fixed effect

	(1) Vola	(2) IVol2	(3) IVol3	(4) IVol4	(5) Vola	(6) IVol2	(7) IVol3	(8) IVol4
D_Split	0.0977	0.1046**	0.0952*	0.0995**				
	(1.57)	(1.99)	(1.88)	(1.98)				
Abs_Split					0.0977*	0.0998**	0.0860*	0.0903*
					(1.66)	(2.00)	(1.79)	(1.89)
Rating	0.0026	-0.0248	-0.0258	-0.0182	0.0018	-0.0254	-0.0258	-0.0183
	(0.04)	(-0.49)	(-0.53)	(-0.37)	(0.03)	(-0.50)	(-0.53)	(-0.38)
Size	-0.1440***	-0.1736***	-0.1799***	-0.1846***	-0.1440***	-0.1431***	-0.1791***	-0.1837***
	(-4.41)	(-5.89)	(-6.17)	(-6.38)	(-4.39)	(-5.83)	(-6.09)	(-6.30)
MB	0.0001	0.0002	-0.0001	-0.0003	0.0001	0.0001	-0.0002	-0.0003
	(0.08)	(0.19)	(-0.18)	(-0.36)	(0.07)	(0.16)	(-0.20)	(-0.39)
LEV	0.0010	0.0015	0.0019	0.0021	0.0009	0.0014	0.0019	0.0021
	(0.31)	(0.54)	(0.75)	(0.83)	(0.28)	(0.51)	(0.73)	(0.81)
ROA	-0.0145	-0.0111	-0.0154**	-0.0154**	-0.0140	-0.0106	-0.0150*	-0.0150*
	(-1.63)	(-1.39)	(-1.97)	(-1.97)	(-1.57)	(-1.32)	(-1.89)	(-1.89)
Own	-0.0026	-0.0016	-0.0010	-0.0009	-0.0028	-0.0018	-0.0011	-0.0010
	(-0.82)	(-0.56)	(-0.40)	(-0.36)	(-0.87)	(-0.61)	(-0.45)	(-0.41)
For	-0.0064***	-0.0044**	-0.0034*	-0.0031*	-0.0067***	-0.0047**	-0.0037*	-0.0035*
	(-3.23)	(-2.16)	(-1.87)	(-1.72)	(-3.36)	(-2.24)	(-1.95)	(-1.80)
FCF	0.0039	0.0049	0.0070	0.0064	0.0036	0.0047	0.0069	0.0062
	(0.74)	(0.98)	(1.51)	(1.38)	(0.69)	(0.93)	(1.47)	(1.33)
Constant	5.7254***	6.2899***	6.3665***	6.3854***	5.7256***	6.2908***	6.3661***	6.3849***
	(5.66)	(7.18)	(7.39)	(7.50)	(5.64)	(7.13)	(7.34)	(7.45)
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.6745	0.4401	0.4242	0.4140	0.6752	0.4408	0.4239	0.4137
N	298	298	298	298	298.0000	298	298	298

Panel B. Firm and Year Fixed effect

	(1) Vola	(2) IVol2	(3) IVol3	(4) IVol4	(5) Vola	(6) IVol2	(7) IVol3	(8) IVol4
D_Split	0.1326**	0.1288**	0.1308**	0.1340**				
	(2.04)	(2.36)	(2.50)	(2.56)				
Abs_Split					0.1319**	0.1267**	0.1226**	0.1263***
					(2.21)	(2.57)	(2.58)	(2.65)
Constant	14.4008	2.4015	1.9619	3.0215	14.1276	2.1683	1.8664	2.9089
	(1.65)	(0.29)	(0.24)	(0.36)	(1.61)	(0.26)	(0.23)	(0.35)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.6904	0.4643	0.4436	0.4364	0.6907	0.4648	0.4432	0.4361
N	298	298	298	298	298.0000	298	298	298

Table 5. Split ESG Rating and cumulative abnormal return

This table reports the cumulative abnormal return for a particular event period related to the ESG Rating Split. The firm's cumulative abnormal returns are aggregated from event period 0 to τ . The event period is set as the Split occurrence date (ESG Rating release date). *D_Split* is the indicator variable that equals 1 if two ESG Rating agencies report different ratings, and 0 otherwise; *Abs_Split is the absolute* value of the difference in ESG Rating score. Daily abnormal returns are calculated using the Carhart four-factor (FF4) model. Beta loadings are estimated using the FF4 model for the period $t = -260$ days up to $t = -10$ days with a minimum of 100 observations. Regressions are conducted separately for each period. The set of control variables consists of the following firm characteristics: the average value of the ESG score (Rating); the natural log of total assets (Size), leverage (LEV), market to book value (MB); return on assets (ROA); equity ownership held by largest shareholder (Own); the percentage of the firm's shares owned by a foreigner (For); and the free cash flow (FCF). All models include industry and year fixed effect, and standard errors are clustered by firm. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics are in parentheses. The symbols *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1) CAR (0,60)	(2) CAR (0,90)	(3) CAR (0,120)	(4) CAR (0,180)	(5) CAR (0,250)	(6) CAR (0,60)	(7) CAR (0,90)	(8) CAR (0,120)	(9) CAR (0,180)	(10) CAR (0,250)
D_Split	-2.3256	-4.1623**	-4.2064**	-5.8850**	-4.5305					
	(-1.24)	(-2.18)	(-2.24)	(-2.55)	(-1.52)					
Abs_Split						-2.1113	-3.7941**	-4.0282**	-5.3715**	-4.0986
						(-1.19)	(-2.10)	(-2.18)	(-2.38)	(-1.43)
Rating	0.9478	1.5280	1.0360	2.3653**	1.6393	0.9453	1.5264	1.0581	2.3639**	1.6337
	(0.61)	(0.97)	(0.71)	(2.03)	(1.11)	(0.61)	(0.97)	(0.72)	(2.01)	(1.10)
Size	0.9247	0.6531	0.9009	0.9598	0.1445	0.9027	0.6132	0.8609	0.9034	0.1011
	(1.04)	(0.73)	(1.03)	(0.91)	(0.11)	(1.01)	(0.68)	(0.98)	(0.84)	(0.08)
MB	0.0494*	0.0357	0.0455	0.0383	-0.0230	0.0499*	0.0365	0.0461	0.0394	-0.0221
	(1.68)	(1.11)	(1.43)	(1.22)	(-0.58)	(1.70)	(1.14)	(1.45)	(1.28)	(-0.56)
LEV	-0.0182	-0.1019	-0.1864***	-0.0420	-0.0499	-0.0175	-0.1006	-0.1838***	-0.0401	-0.0487
	(-0.25)	(-1.33)	(-2.74)	(-0.56)	(-0.48)	(-0.24)	(-1.31)	(-2.69)	(-0.54)	(-0.47)
ROA	-0.4543*	-0.6634***	-0.8642***	-0.6893*	-1.0970**	-0.4629*	-0.6793***	-0.8827***	-0.7119*	-1.1139**
	(-1.73)	(-2.79)	(-3.12)	(-1.71)	(-2.38)	(-1.76)	(-2.79)	(-3.13)	(-1.73)	(-2.36)
Own	-0.0505	-0.0249	0.0002	-0.1247	-0.0128	-0.0470	-0.0185	0.0081	-0.1156	-0.0061
	(-0.88)	(-0.40)	(0.00)	(-1.57)	(-0.13)	(-0.81)	(-0.29)	(0.13)	(-1.40)	(-0.06)
For	-0.0801	-0.0287	-0.0098	-0.0946	-0.0386	-0.0724	-0.0149	0.0044	-0.0750	-0.0236
	(-1.23)	(-0.41)	(-0.15)	(-0.88)	(-0.28)	(-1.15)	(-0.22)	(0.07)	(-0.66)	(-0.17)
FCF	0.4563**	0.3618	0.5628**	0.3986	0.5830	0.4584**	0.3661	0.5684**	0.4047	0.5875
	(2.03)	(1.41)	(2.00)	(1.26)	(1.56)	(2.04)	(1.41)	(2.01)	(1.26)	(1.56)
Constant	-14.4103	-10.2128	-11.8980	-20.3579	-2.1725	-14.3238	-10.0592	-11.8865	-20.1461	-1.9823
	(-0.58)	(-0.44)	(-0.51)	(-0.86)	(-0.07)	(-0.57)	(-0.43)	(-0.51)	(-0.84)	(-0.06)
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.1200	0.0938	0.0695	0.0545	0.0527	0.1192	0.0918	0.0690	0.0538	0.0519
N	298	298	298	298	298	298	298	298	298	298

Table 6. Split ESG Rating and other risk-adjusted returns.

This table relates the cumulative abnormal return for a particular event period related to the ESG Rating Split. The firm's cumulative abnormal returns are aggregated from event period 0 to τ. The event period is set as the Split occurrence date (ESG Rating release date). Cumulative returns are calculated using daily (1) Raw return, (2) CAPM-adjusted return, and (3) Fama-French three-factor-adjusted returns. Beta loadings are estimated using each model for the period $t = -260$ days up to $t = -10$ days with a minimum of 100 observations. Regressions are conducted separately for each period. *D_Split* is the indicator variable that equals 1 if two ESG Rating agencies report different ratings, and 0 otherwise; *Abs_Split is the absolute* value of the difference in ESG Rating score. The set of control variables consists of the following firm characteristics: the average value of the ESG score (Rating); the natural log of total assets (Size), leverage (LEV), market to book value (MB); return on assets (ROA); equity ownership held by largest shareholder (Own); the percentage of the firm's shares owned by a foreigner (For); and the free cash flow (FCF). All models include industry and year fixed effect, and standard errors are clustered by firm. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics are in parentheses. The symbols *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively

Panel A. Dependent Variable= Cumulative raw return

	(1) CAR (0,60)	(2) CAR (0,90)	(3) CAR (0,120)	(4) CAR (0,180)	(5) CAR (0,250)	(6) CAR (0,60)	(7) CAR (0,90)	(8) CAR (0,120)	(9) CAR (0,180)	(10) CAR (0,250)
D_Split	-2.2482	-4.0685*	-3.7401	-6.5184**	-5.8087					
	(-0.90)	(-1.74)	(-1.42)	(-2.25)	(-1.49)					
Abs_Split						-1.6072	-3.1344	-3.1285	-5.5856*	-4.9074
						(-0.62)	(-1.28)	(-1.21)	(-1.94)	(-1.27)
Constant	0.7757	28.5877	48.8418	63.7084	64.3097	1.1485	29.0837	49.1878	64.5151	64.9112
	(0.02)	(0.96)	(1.41)	(1.42)	(1.15)	(0.04)	(0.97)	(1.41)	(1.43)	(1.16)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.4457	0.6276	0.5520	0.4504	0.3014	0.4454	0.6265	0.5518	0.4506	0.3010
N	298	298	298	298	298	298	298	298	298	298

Panel B. Dependent Variable=CAPM-adjusted cumulative return

	(1) CAR (0,60)	(2) CAR (0,90)	(3) CAR (0,120)	(4) CAR (0,180)	(5) CAR (0,250)	(6) CAR (0,60)	(7) CAR (0,90)	(8) CAR (0,120)	(9) CAR (0,180)	(10) CAR (0,250)
D_Split	-2.3430	-4.2223**	-3.7750**	-4.7195**	-3.0282					
	(-1.32)	(-2.44)	(-1.99)	(-2.10)	(-1.15)					
Abs_Split						-1.8662	-3.4880**	-3.2743*	-4.0682*	-2.5443
						(-1.05)	(-2.02)	(-1.77)	(-1.86)	(-1.01)
Constant	-6.1471	19.0038	31.8339	29.8402	14.4904	-5.8609	19.4268	32.0966	30.1876	14.7622
	(-0.27)	(0.84)	(1.27)	(1.21)	(0.45)	(-0.26)	(0.86)	(1.28)	(1.21)	(0.45)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.1199	0.1005	0.0898	0.0731	0.0571	0.1172	0.0961	0.0879	0.0726	0.0560
N	298	298	298	298	298	298	298	298	298	298

Panel C. Dependent Variable=FF3-adjusted cumulative return

	(1) CAR (0,60)	(2) CAR (0,90)	(3) CAR (0,120)	(4) CAR (0,180)	(5) CAR (0,250)	(6) CAR (0,60)	(7) CAR (0,90)	(8) CAR (0,120)	(9) CAR (0,180)	(10) CAR (0,250)
D_Split	-2.3237	-4.1300**	-4.2228**	-5.6043***	-4.4824*					
	(-1.28)	(-2.15)	(-2.33)	(-2.62)	(-1.73)					
Abs_Split						-2.0930	-3.7329**	-4.0268**	-5.1474**	-4.0786*
						(-1.19)	(-2.00)	(-2.25)	(-2.44)	(-1.65)
Constant	-16.8368	-14.0608	-16.9749	-12.0927	1.3821	-16.7324	-13.8849	-16.9506	-11.9147	1.5528
	(-0.70)	(-0.67)	(-0.79)	(-0.56)	(0.05)	(-0.69)	(-0.66)	(-0.78)	(-0.55)	(0.05)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.0972	0.0682	0.0548	0.0484	0.0469	0.0964	0.0665	0.0545	0.0482	0.0464
N	298	298	298	298	298	298	298	298	298	298

Table 7. Split ESG Rating with Short-sell constraint

This table relates the cumulative abnormal return for a particular event period related to the ESG Rating Split. The firm's cumulative returns are aggregated from event period 0 to τ. Regressions are conducted separately for each period. *D_Split* is the indicator variable that equals 1 if two ESG Rating agencies report different ratings, and 0 otherwise; *Abs_Split is the absolute* value of the difference in ESG Rating score; *D_Short* is the dummy variable that equals 1 when has a short-sell constraint, and 0 otherwise; *D*Short* is the interaction term between *D_Split* and *D_Short*; *Abs*Short* is the interaction term between *Abs_Split* and *D_Short*. The set of control variables consists of the following firm characteristics: the average value of the ESG score (Rating); the natural log of total assets (Size), leverage (LEV), market to book value (MB); return on assets (ROA); equity ownership held by largest shareholder (Own); the percentage of the firm's shares owned by a foreigner (For); and the free cash flow (FCF). All models include industry and year fixed effect, and standard errors are clustered by firm. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics are in parentheses. The symbols *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively

	(1) CAR (0,60)	(2) CAR (0,90)	(3) CAR (0,120)	(4) CAR (0,180)	(5) CAR (0,250)	(6) CAR (0,60)	(7) CAR (0,90)	(8) CAR (0,120)	(9) CAR (0,180)	(10) CAR (0,250)
D_Split	-0.311	-1.263	-0.949	-2.158	-2.127					
	(-0.10)	(-0.44)	(-0.29)	(-0.68)	(-0.63)					
D*Short	-7.931**	-11.496***	-11.518*	-17.719**	-15.169					
	(-2.23)	(-2.61)	(-1.92)	(-2.03)	(-1.34)					
Abs_Split						0.573	-0.051	-0.269	-0.799	-0.489
						(0.19)	(-0.02)	(-0.09)	(-0.25)	(-0.14)
Abs*Short						-8.710**	-12.311***	-11.515**	-18.980**	-17.761
						(-2.54)	(-2.93)	(-2.07)	(-2.32)	(-1.64)
D_Short	-7.224**	-16.576***	-7.685	14.327**	32.868***	-6.737**	-16.028***	-7.574	15.171**	34.387***
	(-2.27)	(-4.43)	(-1.60)	(2.02)	(3.68)	(-2.10)	(-4.35)	(-1.62)	(2.18)	(3.89)
Rating	1.150	1.606	1.067	2.505	2.820	1.099	1.539	1.026	2.437	2.746
	(0.53)	(0.84)	(0.49)	(1.07)	(1.02)	(0.50)	(0.81)	(0.47)	(1.04)	(1.00)
Size	0.269	-1.325	-1.854	-3.241**	-3.895*	0.238	-1.376	-1.897	-3.347**	-4.009*
	(0.24)	(-1.21)	(-1.50)	(-1.99)	(-1.88)	(0.21)	(-1.25)	(-1.53)	(-2.05)	(-1.92)
MB	0.040	0.016	0.026	0.040	-0.007	0.043	0.021	0.030	0.045	-0.002
	(0.99)	(0.35)	(0.50)	(0.94)	(-0.14)	(1.05)	(0.45)	(0.57)	(1.11)	(-0.04)
LEV	0.048	-0.052	-0.107	0.081	0.183	0.049	-0.050	-0.104	0.088	0.189
	(0.51)	(-0.49)	(-1.02)	(0.74)	(1.39)	(0.52)	(-0.47)	(-0.98)	(0.80)	(1.43)
ROA	-0.259	-0.413	-0.767**	-0.747	-1.058*	-0.253	-0.410	-0.772**	-0.762	-1.064*
	(-0.68)	(-1.42)	(-1.99)	(-1.40)	(-1.81)	(-0.67)	(-1.41)	(-2.00)	(-1.42)	(-1.81)
Own	-0.153**	-0.112	-0.130	-0.243**	-0.215*	-0.149**	-0.105	-0.122	-0.228**	-0.200
	(-2.17)	(-1.61)	(-1.50)	(-2.30)	(-1.70)	(-2.07)	(-1.47)	(-1.38)	(-2.09)	(-1.52)
For	-0.155**	-0.044	-0.088	-0.097	-0.048	-0.143*	-0.023	-0.069	-0.064	-0.017
	(-2.11)	(-0.54)	(-1.07)	(-0.98)	(-0.37)	(-1.94)	(-0.29)	(-0.85)	(-0.60)	(-0.12)
FCF	0.493*	0.372	0.566	0.428	0.542	0.484*	0.362	0.561	0.423	0.532
	(1.81)	(1.26)	(1.60)	(0.90)	(1.01)	(1.78)	(1.23)	(1.59)	(0.89)	(1.00)
Constant	6.837	37.102	56.104	75.624	77.932	6.675	36.913	55.943	75.922	78.341
	(0.22)	(1.28)	(1.63)	(1.64)	(1.37)	(0.21)	(1.27)	(1.62)	(1.64)	(1.37)
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.450	0.635	0.558	0.467	0.311	0.451	0.635	0.557	0.470	0.315
N	298	298	298	298	298	298	298	298	298	298

Table 8. The Effect of Split Ratings on trading behavior

This table links the Split ESG Rating to trading behavior. Dependent variables of Panel A are (1) the natural log of trading volume (TV), (2) standardized trading volume (STV), and net purchase ratio (NPR, %) for three investor types i on year t for a certain group of stocks, where i are (3) individual, (4) institution, and (5) foreign investors. Panel B and Panel C focuses on institutional investors. The institutional investors are classified into eight groups (1) NPS, (2) securities companies, (3) insurance companies, (4) investment trust companies, (5) banks, (6) pension funds including NPS and nation, (7) private equity funds, and (8) others. The independent variable of Panel A is the *D_Splits* and *Abs_Splits*, while Panel B uses the *D_Split* and Panel C uses the *Abs_Split*. We define *D_Split* as the indicator variable that equals 1 if two ESG Rating agencies report different ratings, and 0 otherwise; *Abs_Split* is the absolute value of the difference in ESG Rating score. A set of control consists of the following firm characteristics: the average value of the ESG score (Rating); the natural log of total assets (Size), leverage (LEV), market to book value (MB); return on assets (ROA); equity ownership held by largest shareholder (Own); the percentage of the firm's shares owned by a foreigner (For); and the free cash flow (FCF). All models include industry and year fixed effect, and standard errors are clustered by firm. All continuous variables are winsorized at the 1st and 99th percentiles. T-statistics are in parentheses. The symbols *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively

Panel A. Trading activities

	(1) TV	(2) STV	(3) Individual	(4) Institution	(5) Foreign	(6) TV	(7) STV	(8) Individual	(9) Institution	(10) Foreign
D_Split	0.151***	0.061**	1.581*	-2.400*	-0.731					
	(4.07)	(2.14)	(1.93)	(-1.75)	(-0.73)					
Abs_Split						0.144***	0.060**	1.721**	-2.251*	-0.905
						(4.25)	(2.21)	(2.20)	(-1.72)	(-0.93)
Rating	-0.007	-0.019	-0.552	0.356	0.544	-0.007	-0.019	-0.585	0.363	0.573
	(-0.09)	(-0.84)	(-1.05)	(0.46)	(0.87)	(-0.09)	(-0.86)	(-1.10)	(0.46)	(0.92)
Size	0.252*	-0.063***	0.616**	-0.953**	0.428	0.253*	-0.063***	0.631**	-0.975**	0.421
	(1.95)	(-2.91)	(2.04)	(-2.47)	(1.46)	(1.96)	(-2.90)	(2.07)	(-2.55)	(1.43)
MB	-0.001	-0.000	0.004	-0.005	0.026*	-0.001	-0.000	0.004	-0.005	0.026*
	(-0.96)	(-0.33)	(0.34)	(-0.33)	(1.71)	(-1.01)	(-0.36)	(0.33)	(-0.30)	(1.71)
LEV	0.002	0.005**	0.002	-0.042	0.012	0.002	0.005**	0.000	-0.041	0.014
	(0.34)	(2.54)	(0.14)	(-1.41)	(0.48)	(0.32)	(2.53)	(0.00)	(-1.37)	(0.53)
ROA	-0.017	-0.001	0.124	-0.027	-0.097	-0.016	-0.001	0.134	-0.037	-0.102
	(-1.38)	(-0.21)	(1.20)	(-0.21)	(-0.74)	(-1.31)	(-0.14)	(1.28)	(-0.28)	(-0.79)
Own	-0.012	-0.010***	0.004	0.025	-0.015	-0.013	-0.010***	-0.000	0.029	-0.012
	(-1.46)	(-4.32)	(0.28)	(0.58)	(-0.53)	(-1.49)	(-4.42)	(-0.00)	(0.67)	(-0.39)
For	-0.017***	-0.008***	0.022	0.035	-0.017	-0.017***	-0.008***	0.016	0.043	-0.014
	(-2.62)	(-3.56)	(1.10)	(0.84)	(-0.57)	(-2.68)	(-3.76)	(0.73)	(1.07)	(-0.45)
FCF	0.005	-0.000	-0.042	-0.135	0.303***	0.004	-0.000	-0.046	-0.132	0.305***
	(0.90)	(-0.03)	(-0.59)	(-1.04)	(2.59)	(0.76)	(-0.08)	(-0.64)	(-1.00)	(2.65)
Constant	8.085***	2.506***	-13.622*	22.422**	-13.245	8.079***	2.506***	-13.511	22.484**	-13.366
	(2.59)	(4.83)	(-1.66)	(2.17)	(-1.62)	(2.60)	(4.83)	(-1.63)	(2.19)	(-1.64)
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.496	0.463	0.078	0.039	0.095	0.495	0.462	0.082	0.038	0.098
N	298	298	298	298	298	298	298	298	298	298

Panel B. The independent variables=D_Split

Institution	(1) NPS	(2) Securities	(3) Insurance	(4) Trust	(5) Bank	(6) Pension	(7) Private	(8) Others
D_Split	-4.574**	-0.237	-2.668	-2.315	-0.514	-4.700**	-0.161	-0.971
	(-2.47)	(-0.20)	(-1.33)	(-1.11)	(-0.18)	(-2.55)	(-0.12)	(-0.29)
Constant	28.774	-3.636	50.726***	41.145**	42.723*	30.986*	37.956***	58.697**
	(1.64)	(-0.35)	(2.61)	(2.30)	(1.87)	(1.82)	(3.38)	(2.45)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.042	0.306	0.045	0.067	0.006	0.043	0.040	0.065
N	298	298	298	298	298	298	298	298

Panel C. The independent variables=Abs_Split

Institution	(1) NPS	(2) Securities	(3) Insurance	(4) Trust	(5) Bank	(6) Pension	(7) Private	(8) Others
Abs_Split	-4.332**	-0.246	-2.249	-1.975	-0.553	-4.456**	-0.073	-1.113
	(-2.48)	(-0.21)	(-1.14)	(-1.01)	(-0.21)	(-2.57)	(-0.06)	(-0.35)
Constant	28.863*	-3.645	50.955***	41.329**	42.691*	31.075*	38.009***	58.593**
	(1.65)	(-0.35)	(2.63)	(2.31)	(1.87)	(1.84)	(3.38)	(2.46)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R2	0.041	0.306	0.044	0.066	0.006	0.042	0.041	0.065
N	298	298	298	298	298	298	298	298

Appendix 1. Variable definition

Variable	Operationalization
D_Split	Indicator variable that equals 1 if two ESG Rating agencies (KCGS and MSCI), report different rating scores, and 0 otherwise;
Abs_Split	The absolute value of the difference in ESG Rating score when firm receives multiple ratings
Rating	Average ESG score, the average value of the MSCI and KCGS ESG score
VOLA	Total volatility; the standard deviation of the firm's daily returns for the year.
IVOL	Idiosyncratic volatility; the standard deviation of residuals from the Carhart four-factor model (FF4), fitted to the daily data for each year. Beta loadings are estimated using the Carhart four-factor model for the period $t = -260$ days up to $t = -10$ days, with a minimum observation of 100.
CAR(0,τ)	Firm's cumulative abnormal return, aggregated from event day 0 to τ days. Beta loadings are estimated using the FF4 model for the period $t = -260$ days up to $t = -10$ days with a minimum of 100 observations. CAR is calculated using daily abnormal returns.
TV	The natural log of trading volume
STV	Standardized trading volume, is the percentage of the number of shares traded divided by the number of outstanding shares
NPR_i	Net purchase ratio (%) for three investor types i on year t for a certain group of stocks, where i are an individual, institution, and foreign; Net purchase amount of i divided by total purchase amount of i. The institutions are classified into 8 groups; (1) securities companies, (2) insurance companies, (3) investment trust companies, (4) banks, (5) pension funds, (6) private equity funds, (7) national institution, and (8) others.
Size	Firm size, the natural log of total assets
LEV	Leverage, total liabilities divided by total assets
MB	Market to book value, equity value (share price times the number of shares outstanding after deduction of the number of treasury stock) divided by book value (net income minus Preferred stock cash dividend)
ROA	Return on assets, operating income divided by total assets
Own	Majority shareholder ownership is the percentage of the firm's shares owned by the majority shareholder
For	Foreigner ownership is the percentage of the firm's shares owned by a foreigner
FCF	Free cash flow, operating cash flow minus Capital Expenditures (CAPEX) divided by total asset
Ind	Industry indicators, Korea Standard Industry Code (KSIC) industry sector.

Appendix 2. KCGS and MSCI ESG Rating frequency

This table presents the full sample of ESG Ratings from MSCI and KCGS, from 2018 to 2021.

Panel A. ESG Frequency by year

Year	MSCI			KCGS			KCGS ∩ MSCI		
	All	Kospi	Kosdaq	All	Kospi	Kosdaq	All	Kospi	Kosdaq
2018	78	76	2	704	704	0	69	69	0
2019	79	77	2	857	739	118	77	75	2
2020	77	75	2	896	757	139	75	73	2
2021	79	77	2	939	760	179	77	75	2
Sum	313	305	8	3396	2960	436	298	292	6

Panel B. ESG Frequency by Industry Sector

Industry sector (KSIC)	MSCI			KCGS			KCGS ∩ MSCI		
	All	Kospi	Kosdaq	All	Kospi	Kosdaq	All	Kospi	Kosdaq
Construction	8	8	0	114	104	10	8	8	0
Mining and quarrying	0	0	0	4	4	0	0	0	0
Education	0	0	0	12	8	4	0	0	0
Financial and insurance activities	48	48	0	229	209	20	44	44	0
Agriculture, forestry, and fishing	0	0	0	19	16	3	0	0	0
Wholesale and retail trade	23	19	4	263	242	21	18	15	3
Real estate activities and renting and leasing	0	0	0	9	9	0	0	0	0
Business facilities management and business support services	0	0	0	33	30	3	0	0	0
Sewerage, waste management, materials recovery and remediation activities	0	0	0	6	0	6	0	0	0
Accommodation and food service activities	0	0	0	13	8	5	0	0	0
Arts, sports, and recreation-related services	4	4	0	15	12	3	4	4	0
Transportation	16	16	0	95	95	0	16	16	0
Electricity, gas, steam, and water supply	4	4	0	39	39	0	4	4	0
Professional, scientific and technical activities	24	24	0	282	233	49	23	23	0
Information and communications	32	28	4	209	136	73	30	27	3
Manufacturing	150	150	0	2050	1811	239	147	147	0
Membership organizations, etc	4	4	0	4	4	0	4	4	0
Sum	313	305	8	3396	2960	436	298	292	6