The impact of ESG rating disagreement on corporate value

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Abstract

The authors examine the effect of split environmental, social and governance (ESG) ratings on information asymmetry, corporate value and trading behavior. The authors test the risk-based hypothesis and the optimism-bias hypothesis on the relationship between diverging opinions and future stock prices. The authors results show that split ESG ratings is positively related to idiosyncratic volatility, an alternative measure for information asymmetry. Further, the negative effect of split ESG ratings on cumulative abnormal return under short-selling constraints is consistent with the optimism bias hypothesis. The authors find a negative relationship between split ESG ratings and the net purchase ratio (NPR) of pension funds. Considering that the NPR is a direct measure of net demand, ESG disagreement may hinder socially responsible investing (SRI) in a firm. This study directly demonstrates the negative effect of ESG disagreement on firm value and investment by Korea's National Pension Service (NPS). The results offer valuable insights into policymakers, as the wide divergence in ESG ratings requires urgent attention to expand SRI.

Keywords Split ESG rating, Socially responsible investment, Information asymmetry

Paper type Research paper

1. Introduction

Socially responsible investing (SRI) is an investing strategy that aims to generate both social change and financial returns for an investor. As financial investment is accelerating global capital movement, companies face greater pressure to be socially responsible (Shrivastava and Hart, 1995), especially through the mandatory disclosure of environmental, social and governance (ESG) ratings as a measure of non-financial performance. In Korea, all Korea Composite Stock Price Index (KOSPI)-listed companies should disclose ESG ratings by 2030. Furthermore, the National Pension Service (*NPS*) of Korea, the world's third-largest pension fund with $800 bn in assets, started SRI in 2006 and is continuously expanding its volume of SRI. They also announced the adoption of the ESG integration approach to asset management. Considering that ESG plays an important role in investment decisions, financial analysts' valuations and even in raising capital, it is essential for companies to manage their ESG ratings.

However, in the short term, the cost of an ESG transition outweighs the profit. Companies adopting ESG management require evaluation transparency and comparable ESG ratings. Currently, five evaluation agencies provide ESG ratings for Korean companies, including Morgan Stanley Capital International (*MSCI*), Korea Corporate Governance Service (*KCGS*) and *Refinitiv*. However, their ratings for the same companies differ. According to the

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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 out of 7 possible ratings. More than 40% of companies have an ESG rating gap of 3 or higher between agencies. In our sample, the average MSCI ratings are lower than those of *KCGS*, suggesting that foreign institutions tend to undervalue domestic companies because they lack information.

The lack of uniform requirements to evaluate ESG may explain these disparate ratings (Ho, 2020). Based on the self-imposed score from the target firm, agencies evaluate ESG ratings using independent assumptions, combined with different interpretations of scope, measure and weighting factors, which lead to high inconsistencies (Berg *et al.*, 2022). Chatterji *et al.* (2016) argue that the lack of a common theory and comparability results 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).

While disclosing ESG ratings alleviates information asymmetry by providing a non-financial source for SRI investing, the ESG disagreement can imply a lack of information about the target firm moving between the evaluation agency, target firm and investor. In this case, the ESG disagreement may undermine SRI, decrease investor participation and harm economic performance.

To examine the impact of split ESG ratings on the market, we analyze Korean stocks listed on the KOSPI and Korea Securities Dealers Automated Quotation (KOSDAQ) from 2018 to 2021. We exclude firms with only a single ESG rating and include firms with ESG ratings from *KCGS* and *MSCI* each year. To ensure comparability, we converted the seven *MSCI* and *KCGS* ESG rating levels to a numeric score. Then, we define the absolute value of the difference between two scores for the same firm as a proxy for the ESG disagreement for each year. We then aim to determine how split ESG ratings affect information asymmetry, corporate value, trading volume and investors' trading behavior.

Our findings are summarized as follows. First, we find that the total volatility and idiosyncratic volatility are positively related to the degree of the ESG rating split. These results support the argument that split ESG ratings leads to greater information asymmetry. Second, we find that split ESG ratings have a negative and significant impact on cumulative abnormal returns (CAR) within 180 days, suggesting that ESG disagreement lowers corporate value, consistent with Miller (1977), as we empirically find that differences in ESG ratings among agencies are more likely to create higher volatility and lower stock returns. Miller (1977) explains this phenomenon with an optimism-bias hypothesis that diverging opinions lead to stock overvaluation under short-selling constraints. In this model, stock prices are biased upward because pessimists are restricted to owning zero shares, even when they wish to hold a negative quantity. Hence, the beliefs of the most optimistic investors set the stock price. The optimism-bias hypothesis has two necessary and sufficient conditions: disagreeing opinions about the firm and short-selling constraints. Our empirical results with the short-selling constraint period are consistent with the optimism-bias hypothesis as we show that the ESG disagreement leads to lower expected returns under short-selling restrictions. Finally, we find that not only does split ESG ratings increase trading volume but its effects differ depending on the investor group. Specifically, we examine the net purchase ratio (NPR) for different groups of investors to measure the net demand. Split ESG ratings have a positive relationship with individual investors, but negative relations with *NPS* funds. Our result suggests that split ESG ratings hinder the SRI investment from public pension funds with the largest assets in Korea due to the information asymmetry.

While prior studies concentrate 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 to directly show the relationship between split ESG ratings and the net demand of institutions for certain firms. This study thus enriches the academic discussion of ESG rating disagreement. It also provides valuable insights for policymakers by showing that the lack of transparency and comparability in the ESG evaluation system hinders SRI.

The remainder of the paper proceeds as follows. Section 2 provides a review of the literature on ESG ratings. 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 firms ultimately aim to maximize shareholder value, corporate social responsibility (CSR) activities may fall outside of this scope. Previous studies argue that CSR activity and corporate value have a negative relationship because the cost of CSR activities outweighs their profit (Pava and Krausz, 1996). However, the recent literature shows that CSR activities can improve corporate value by reducing conflicts of interest between managers and stakeholders and improving the firm's reputation (Godfrey, 2005; Jo and Harjoto, 2012). Non-financial ESG performance increases a firm's sustainability (Ben-Amar *et al.*, 2017).

In particular, the information disclosure reduces the expectation of heterogeneous 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) argue that frequent voluntary disclosure improves corporate transparency, which decreases 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 by reducing information asymmetry, reducing stock price volatility and increasing long-term corporate value. Prior studies report a positive relationship between CSR activities and lower information asymmetry (Dhaliwal *et al.*, 2011).

Many recent works contend 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 after examining the ESG disclosure mandate event in the European Union. 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 (Dimson *et al.*, 2015) or the announcement of eco-friendly initiatives (Flammer, 2013). Capelle-Blancard and Petit (2019) report a negative market reaction to negative ESG news. Research in the Korean market also shows that an increase in ESG activity can alleviate information asymmetry. Firms that voluntarily disclose ESG ratings have lower capital cost, thereby reducing the risk of corporate insolvency (Yeo, 2017). ESG disclosure may harm short-term financial performance given the expenditure on and investment in ESG-related activities, but has a positive relationship with long-term corporate value (Na and Leem, 2011). Min and Kim (2019) also demonstrate that the positive relationship between ESG performance and corporate value is prominent in companies with high profitability or high foreign equity, indicating that profitability or advanced normative investors support ESG activities, which may explain the transparency of ESG disclosure (Kang and Jung, 2020). Na and Leem (2011) analyze whether the information effect of ESG ratings affects stock trading volume and cumulative excess return. They find that ESG information is undervalued in the short term and mainly leads to selling transactions. Further, Do and Kim (2022) show that an increase in ESG ratings decreases the volatility of stock returns in the short term, while volatility increases when ESG ratings decrease.

2.2 Split ESG rating

Analysts generally 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 divergent opinions on a firm. The literature thus far disagrees on the nature of the relationship between divergent opinions and future stock prices. The two main hypotheses are the risk-based hypothesis and the optimism-bias hypothesis.

Fundamentally, investors take some risk in their position when they face diverging opinions. Deviating opinions and information asymmetry create a positive risk premium (Livingston *et al.*, 2010) and a positive effect on future stock prices (Billingsley *et al.*, 1985). The risk-based hypothesis contends that investors should be compensated for bearing trading risk due to adverse selection caused by divergent opinions (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.

However, other authors maintain that differences of opinion in the market lead to lower expected returns under short-selling constraints 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, disagreement among investors is more likely to create higher risk (stock return volatility) and yield lower stock returns (Miller, 1977). Other studies report empirical results that disagreements among security analysts reduce future stock returns and firm value (Diether *et al.*, 2002).

The literature related to split ESG ratings and a firm's stock price (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 that 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, a higher market premium and lower demand for the stock. Further, they demonstrate that a greater social–ESG rating disagreement is linked to higher total volatility and idiosyncratic volatility. Atmaz and Basak (2018) find that disagreements are associated with higher stock volatility and trading volume and a positive relation between the two.

Furthermore, the information asymmetry caused by split ESG ratings can have different effects on informed and uninformed investors. Grossman and Stiglitz (1980) argue that the information asymmetry between informed and uninformed investors affects the information retrieval cost, quality of information, noise in risky asset investments and proportion of informed investors. Given the disagreement in the literature thus far, we analyze the impact of split ESG ratings on corporate value.

3. Data and methodology

3.1 Data

3.1.1 Split ESG ratings. We analyze the effects of the split ESG ratings of common stocks listed on the KOSPI and KOSDAQ from 2018 to 2021, excluding firms with a single ESG rating as we require different ratings by multiple agencies for the analysis. Our ESG rating data are from the websites of two agencies, with seven grades: the *KCGS* and *MSCI* (https://www.msci.com and http://www.cgs.or.kr, respectively).

For the empirical analysis, we converted the seven-level *MSCI* and *KCGS* ESG ratings to a numeric score, which we present in the frequency table (Table 1). Panel A summarizes the ESG rating frequency by grade. The higher the ESG score, the worse the ESG grade. The *KCGS* ESG rating consists of seven levels, but they reported grades below B (B, C and D) as

Group	Score	*MSCI* Grade	All	KOSPI	KOSDAQ	*KCGS* Grade	All	KOSPI	KOSDAQ
Panel A. ESG rating frequency by grade									
Leader	1	AAA	1	1	0	S	0	0	0
	1	AA	17	17	0	A+	21	21	0
Average	2	A	51	51	0	A	142	141	1
	2	BBB	73	72	1	B+	99	98	1
	2	BB	64	62	2				
Laggard	3	B	67	64	3	Under B	36	32	4
	3	CCC	25	25	0				
		Sum	298	292	6	Sum	298	292	6

Year	*KCGS* ∩ *MSCI* All	KOSPI	KOSDAQ
Panel B. ESG by year			
2018	69	69	0
2019	77	75	2
2020	75	73	2
2021	77	75	2
Sum	298	292	6

Industry sector (KSIC)	All	*KCGS* ∩ *MSCI* KOSPI	KOSDAQ
Panel C. ESG by industry sector			
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

Note(s): 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: higher than A = 1, below than B = 3 and other scores as 2; score is the criterion for calculating Split. Our sample consists of 298 observations from 77 firms

Source(s): Tables by authors

Table 1.
ESG rating frequency

the "Under B" until 2019. In this case, the actual *KCGS* rating has five levels. Therefore, we set all grades under B from *KCGS* and under BB from *MSCI* as the lowest score. Considering that agencies have different frequency ration in each grade, we divide grade into three group by its range following *MSCI*, the leader (AAA and AA), average (A, BBB and BB) and laggard (B and CCC). Accordingly, we define the scores higher than A = 1, below than B = 3 and other scores as 2. In unreported tests with the splits based on two groups (Upper/Under B), the results are similar. We matched the ESG ratings and financial statement data based on the ESG evaluation year. After matching the year, we exclude firms without financial data from the previous year.

Next, we define *splits* as the difference in scores between *MSCI* and *KCGS*. To capture the impact of spilt ESG ratings, we use two measures. First, we use an indicator variable (*D_Split*) equal to 1 if we find different ratings, and 0 otherwise. Second, we consider the level of divergence (*Abs_Split*), calculated as the absolute value of *splits*.

Panel B of Table 1 presents the ESG rating frequency by year. We find 69 observations in 2018, which increases to 77 observations in 2021. Among domestic companies with a market capitalization of more than 2 trillion KRW, 77 companies were rated by both *MSCI* and *KCGS*, resulting in 298 total firm-year observations between 2018 and 2021. The final sample consists of both KOSPI200 and KOSDAQ150 listed companies. Panel C presents the ESG rating frequency by Korea Standard Industry Code (KSIC).

3.1.2 Control variables. We include control variables related to split ratings and firm characteristics. 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 the percentage of total liabilities divided by total assets. Market to book value (*MB*) is equity value (share price times the number of shares outstanding after deducting the number of treasury stock) divided by book value (net income minus preferred stock cash dividend). Return on assets (*ROA*) is the percentage of operating income divided by total assets. Majority shareholder ownership (*Own*) is the percentage of the firm's shares owned by the majority shareholder. Foreign ownership (*For*) is the percentage of the firm's shares owned by foreign investors. Free cash flow (*FCF*) is the percentage of 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. Variable definitions are displayed in Table A1.

Table 2 presents the descriptive statistics. In the full sample, 156 observations (Column 2) have equal ESG ratings, leaving 142 (Column 3) with diverging ratings. The split level (*Abs_Split*) has a mean of 0.534 and a maximum of 2 grades. The average ESG score (*Rating*), which ranges from 1 (most positive) to 3 (most negative), has a mean of 2.257, suggesting that ESG ratings are slightly towards the negative side. The average value of the ESG score from *MSCI* (*Rating_M*) is higher than that from *KCGS* (*Rating_K*), which implies that *MSCI* is more pessimistic about domestic firm's ESG ratings. Column (4) shows the t-test of the differences between the firms without spilt ESG ratings (Column 2) and firms with spilt ESG (Column 3). As for firm-level characteristics, the spilt ESG firms have relatively negative ESG scores (*Rating*), lower return on asset (*ROA*), higher debt (*LEV*), higher majority ownership (*Own*) and lower foreign ownership (*For*) relative to the firms without.

Table 3 provides the Pearson correlations matrix. The correlation coefficient between the split level (*Abs_Split*) and the average ESG score is 0.237. Additionally, the correlation coefficient between the *MSCI* score and the *KCGS* score is 0.331. This result is consistent with Berg *et al.* (2022) finding that ESG ratings are not highly intercorrelated.

3.2 Methodology

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

We estimate total volatility (*Vola*) as the standard deviation of the firm's daily returns for the year. A larger *Vola* means higher information asymmetry (Jang and Jung, 2014). We also measure idiosyncratic volatility (*iVol4*) as the standard deviation of residuals from the

Table 2.
Descriptive statistics

Variables	(1) Full sample (Obs = 298) Mean	Std. Dev	Min	Max	(2) D Split = 0 (Obs = 156) Mean	SD	(3) D Split = 1 (Obs = 142) Mean	SD	(4) T-test Diff	*T*-stat
D_Split	0.523	0.500	0	1	0	0	1	0		
Abs_Split	0.534	0.520	0	2	0	0	1.019	0.138	1.019***	92.390
Rating	2.257	0.429	1	3	2.141	0.485	2.362	0.339	0.221***	4.525
Rating_M	2.463	0.609	1	3	2.141	0.485	2.756	0.561	0.616***	10.150
Rating_K	2.050	0.435	1	3	2.141	0.485	1.968	0.367	0.173***	3.445
Ret	5.305	35.199	−49.834	213.604	8.105	38.802	2.756	31.476	5.349	1.299
Vola	2.293	0.730	1.007	5.200	2.201	0.668	2.376	0.775	0.175**	2.092
TV	12.869	1.245	10.164	16.909	12.683	1.238	13.038	1.230	0.356**	2.485
Size	23.644	1.434	21.117	27.038	23.683	1.480	23.607	1.395	0.076	0.456
MB	23.906	82.474	−280.960	892.532	32.566	105.900	16.024	51.964	16.541*	1.686
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										

Note(s): 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 the percentage of 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 firm size (Size) is the natural log of 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). Leverage (LEV) is the percentage of total liabilities divided by total assets. Return on assets (ROA) is the percentage of 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 the percentage of 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 spilt ESG rating (Column 2) and firms with spilt ESG rating (Column 3). The symbols *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively

Source(s): Tables by authors

Table 3.
Pearson correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) *D_Split*	1.000														
(2) *Abs_Split*	0.981***	1.000													
	(0.000)														
(3) Rating	0.258***	0.237***	1.000												
	(0.000)	(0.000)													
(4) Rating_m	0.506***	0.504***	0.878***	1.000											
	(0.000)	(0.000)	(0.000)												
(5) Rating_k	−0.199***	−0.238***	0.742***	0.331***	1.000										
	(0.001)	(0.000)	(0.000)	(0.000)											
(6) Ret	−0.076	−0.071	0.055	0.049	0.040	1.000									
	(0.191)	(0.222)	(0.345)	(0.404)	(0.489)										
(7) Vola	0.120**	0.125**	0.087	0.096*	0.037	0.066	1.000								
	(0.039)	(0.031)	(0.135)	(0.098)	(0.525)	(0.257)									
(8) TV	0.143**	0.147**	−0.030	0.022	−0.089	0.082	0.298***	1.000							
	(0.014)	(0.011)	(0.608)	(0.708)	(0.124)	(0.158)	(0.000)								
(9) Size	−0.027	−0.022	−0.314***	−0.212***	−0.322***	−0.098*	−0.260***	0.308***	1.000						
	(0.648)	(0.711)	(0.000)	(0.000)	(0.000)	(0.092)	(0.000)	(0.000)							
(10) MB	−0.100*	−0.089	0.061	0.002	0.117**	−0.010	0.157***	0.012	−0.188***	1.000					
	(0.084)	(0.127)	(0.296)	(0.972)	(0.044)	(0.864)	(0.007)	(0.831)	(0.001)						
(11) LEV	0.145**	0.145**	−0.048	0.057	−0.175***	−0.035	−0.044	0.225***	0.501***	−0.160***	1.000				
	(0.012)	(0.013)	(0.406)	(0.324)	(0.002)	(0.543)	(0.453)	(0.000)	(0.000)	(0.006)					
(12) ROA	−0.182***	−0.195***	−0.051	−0.181***	0.153***	−0.058	−0.090	−0.232***	−0.396***	−0.002	−0.499***	1.000			
	(0.002)	(0.001)	(0.383)	(0.002)	(0.008)	(0.317)	(0.121)	(0.000)	(0.000)	(0.975)	(0.000)				
(13) Own	0.242***	0.257***	0.268***	0.277***	0.141**	−0.067	0.097*	−0.208***	−0.217***	0.079	−0.164***	−0.054	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.015)	(0.245)	(0.096)	(0.000)	(0.000)	(0.174)	(0.005)	(0.357)			
(14) For	−0.260***	−0.211***	−0.443***	−0.392***	−0.324***	−0.076	−0.270***	−0.003	0.302***	0.003	0.001	0.259***	−0.490***	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.188)	(0.000)	(0.959)	(0.000)	(0.960)	(0.991)	(0.000)	(0.000)		
(15) FCF	−0.073	−0.071	−0.113*	−0.153***	−0.008	0.008	0.002	−0.188***	−0.216***	−0.036	−0.347***	0.550***	−0.081	0.117**	1.000
	(0.210)	(0.219)	(0.052)	(0.008)	(0.884)	(0.887)	(0.978)	(0.001)	(0.000)	(0.537)	(0.000)	(0.000)	(0.161)	(0.044)	

Note(s): 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

Source(s): Tables by authors

Fama–French four-factor model (FF4), fitted to the daily data for each year. We estimated the beta loadings ($\widetilde{\beta_{i,t}^{MKT}}, \widetilde{\beta_{i,t}^{SMB}}, \widetilde{\beta_{i,t}^{HML}}, \widetilde{\beta_{i,t}^{MOM}}$) for the period $t = -260$ business days up to $t = -10$ business days, with a minimum observation of 100 and calculated the residuals ($\widetilde{\epsilon_{i,t}}$) using equation (1).

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

where $\widetilde{\epsilon_{i,t}}$ represents the t-day residual of stock i, 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 proxies for the market return and risk-free return, respectively. The standard deviation of residuals is fitted to the daily data for each year. For a robustness check, we also include the idiosyncratic volatility measured using the capital asset pricing model (CAPM) (*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 ratings using the following empirical model:

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

where the dependent variables ($Dep_{i,t}$) are *Vola*, *iVol1*, *iVol2* and *iVol3*, which denote the total volatility and the idiosyncratic volatility from the CAPM (*iVol2*), FF3 (*iVol3*) and FF4 models (*iVol4*). We assess the independent variable (*Splits*) using *D_Split* and *Abs_Split*. $Control_{i,t}^m$ includes the set of control variables, *Rating*, *Size*, *MB*, *LEV*, *ROA*, *Own*, *For* and *FCF*, defined in Section 3.1.2. All continuous variables are winsorized at the 1st and 99th percentiles. We use the fixed effects regression model with a panel dataset. All models include industry 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 the various split ESG ratings by industry, we add a control at the industry level. We check the robustness of the results using year and firm fixed effects instead of the industry effect to examine the within-firm variation in spilt ESG ratings.

3.2.2 Split ESG ratings and corporate value. Next, we examine the impact of spilt ESG rating on corporate value using an event study methodology. The event date is the date at which the firms receive split ratings. Considering that the rating agencies have different announcement dates, the event date is the ESG rating announcement by the agency that discloses its ratings later in that year. A positive relationship between split ESG ratings and future stock returns supports the risk-based hypothesis, while a negative relationship supports the optimism-bias hypothesis. For this analysis, we use the CAR for each stock as our dependent variable:

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

We calculate daily abnormal returns ($AR_{i,t}$) using the FF4 model and estimate the beta loadings using each model for the period $t = -260$ days up to $t = -10$ days with a minimum of 100 observations. We conduct separate regressions for each period using equation (1). The firm's CAR is the cumulative sum of abnormal returns from 0 to τ days. As in prior studies, ESG disclosure has a negative (−) relationship with short-term corporate value but has a positive (+) relationship with long-term corporate value in the Korean market (Kang and Jung, 2020; Min and Kim, 2019; Na and Leem, 2011). We focus on the post-split CAR, which consist of CARs with $\tau 1 = 0$ to $\tau 1 = 250$.

We run a regression with different dependent variables using equation (2). The dependent variables are CAR (0.60), CAR (0.90), CAR (0.120), CAR (0.180) and CAR (0.250), which denote the cumulative abnormal return from the FF4 model. We also include the cumulative raw return, cumulative abnormal return from the CAPM and return using the FF3 model for the robustness checks. We test the independent variable *Splits* using *D_Split* and *Abs_Split*. $Control_{i,t}^{m}$ includes the same control variables as in equation (2). All models include industry and year fixed effects and standard errors are clustered by firm.

3.2.3 Split ESG rating and trading behavior. ESG rating disagreement inevitably affects SRI decisions and may have a negative effect on the trading volume. Moreover, the information asymmetry caused by spilt ESG ratings will have varying effects on informed and uninformed investors (Grossman and Stiglitz, 1980). Considering that individual investors are typically considered to be uninformed whereas institutional investors are considered informed, we check the trading activity each group of investors.

We measure trading volume (*TV*) as the natural log of trading volume and the standardized trading volume (*STV*) as the percentage of the number of shares traded divided by the number of outstanding shares (Campbell and Wasley, 1996). Additionally, we measure the trading behavior using the net purchase ratio (*NPR*), measured as the net amount of buying investors divided by their total transaction amounts over a particular period (Kumar and Lee, 2006):

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

where D_t is the number of days in year t; Buy_{jit} ($Sell_{jit}$) is the buy (sell) trading volume (amount) of stocks for investor group i in year t; i represents 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 analysis for each group using equation (2). The dependent variables are TV, STV and NPR of individuals, institutions and foreign investors. We test the independent variable *Splits* using *D_Split* and *Abs_Split*. $Control_{i,t}^{m}$ includes the same control variables as in equation (2). All models include industry and year fixed effects and standard errors are clustered by firm.

4. Empirical results

Panel A of Table 4 reports the effect of spilt ESG ratings on volatility. Panel A includes the industry and year fixed effect, and Panel B includes the firm and year fixed effect. We provide *t*-statistics in parentheses, and *, ** and *** indicate significance at the 10, 5 and 1% levels, respectively.

We find that the presence and magnitude of split ratings are positively related to idiosyncratic volatility. For example, in Columns (2) and (6), which measure idiosyncratic volatility using the CAPM, the coefficients of *D_Split* and *Abs_Split* are 0.105 and 0.101, respectively, and both are significant at the 5% level. The positive relationship between *splits* and volatility implies that spilt ESG ratings will lead to greater information asymmetry. These results are consistent with Atmaz and Basak (2018), who demonstrate that disagreement in the stock market is linked to greater total volatility and idiosyncratic volatility. While Gibson Brandon *et al.* (2021) show only that E-ESG disagreement is linked to volatility, we find a significantly positive relationship between consolidated spilt ESG and

Table 4.
The effect of split ESG rating on volatility

	(1) Vola	(2) IVol2	(3) IVol3	(4) IVol4	(5) Vola	(6) IVol2	(7) IVol3	(8) IVol4
Panel A. Industry and Year-Fixed effect								
D_Split	0.102*	0.105**	0.097*	0.101**				
	(1.68)	(2.02)	(1.93)	(2.03)				
Abs_Split					0.102*	0.101**	0.088*	0.092*
					(1.79)	(2.04)	(1.84)	(1.93)
Rating	−0.016	−0.045	−0.040	−0.029	−0.017	−0.046	−0.040	−0.030
	(−0.16)	(−0.54)	(−0.48)	(−0.35)	(−0.18)	(−0.55)	(−0.49)	(−0.36)
Size	−0.144***	−0.173***	−0.175***	−0.181***	−0.1440***	−0.143***	−0.172***	−0.174***
	(−4.43)	(−5.92)	(−6.10)	(−6.35)	(−4.40)	(−5.85)	(−6.02)	(−6.26)
MB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.21)	(0.19)	(0.23)	(0.02)	(0.21)	(0.19)	(0.22)	(0.01)
LEV	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.002
	(0.32)	(0.54)	(0.81)	(0.87)	(0.30)	(0.51)	(0.80)	(0.85)
ROA	−0.014	−0.011	−0.015*	−0.015*	−0.014	−0.010	−0.014*	−0.015*
	(−1.61)	(−1.30)	(−1.85)	(−1.90)	(−1.54)	(−1.23)	(−1.78)	(−1.82)
Own	−0.003	−0.002	−0.001	−0.001	−0.003	−0.002	−0.001	−0.001
	(−0.84)	(−0.56)	(−0.45)	(−0.41)	(−0.89)	(−0.61)	(−0.50)	(−0.46)
For	−0.007***	−0.005**	−0.004*	−0.003*	−0.007***	−0.005**	−0.004*	−0.004*
	(−3.16)	(−2.11)	(−1.87)	(−1.70)	(−3.31)	(−2.20)	(−1.95)	(−1.79)
FCF	0.004	0.005	0.007	0.006	0.004	0.005	0.007	0.006
	(0.74)	(0.94)	(1.49)	(1.37)	(0.69)	(0.89)	(1.44)	(1.32)
Constant	5.772***	6.280***	6.243***	6.297***	5.767***	6.277***	6.240***	6.294***
	(5.73)	(7.20)	(7.39)	(7.52)	(5.71)	(7.16)	(7.34)	(7.47)
Ind FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.R^2	0.674	0.441	0.421	0.411	0.675	0.442	0.420	0.410
N	298	298	298	298	298	298	298	298

(*continued*)

Table 4.

	(1) Vola	(2) IVol2	(3) IVol3	(4) IVol4	(5) Vola	(6) IVol2	(7) IVol3	(8) IVol4
Panel B. Firm and year fixed effect								
D_Split	0.129*	0.126**	0.130**	0.133**				
	(1.99)	(2.31)	(2.49)	(2.57)				
Abs_Split					0.127**	0.123**	0.121**	0.124**
					(2.15)	(2.49)	(2.54)	(2.62)
Constant	13.780	1.638	1.056	2.142	13.545	1.437	0.988	2.060
	(1.65)	(0.21)	(0.14)	(0.27)	(1.62)	(0.18)	(0.13)	(0.26)
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.R^2	0.688	0.462	0.439	0.432	0.688	0.462	0.438	0.431
N	298	298	298	298	298	298	298	298

Note(s): 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) Capital asset pricing model (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

Source(s): Tables by authors

volatility. The result is also consistent with Jung and Park (2018), who indicate that split bond ratings 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 signs and significance of the coefficients are robust.

Table 5 presents the relationship between spilt ESG and CAR. Across all firms in our sample, the coefficient of spilt ESG is negatively associated with CAR (0.90), CAR (0.120) and CAR (0.180) at the 5% significance level, as shown in Columns (2)–(4) and Columns (7)–(9). The coefficients of *D_Split* and *Abs_Split* are negatively related to the cumulative abnormal return for the event window 0 to 180 of −5.949% and −5.398%, respectively. These results are consistent with Do and Kim (2022), who find 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), possibly because the split may be resolved by the new ESG ratings, which are issued annually (nearly 250 trading days). Further, the insignificant relation with CAR (0, 60) suggests that the impact of ESG factors may not be fully recognized immediately, and investors may need more 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 the CAPM (Panel B) and FF3 model (Panel C).

Overall, we can interpret our findings that split ESG ratings are more likely to create higher volatility and lower stock returns as support for the optimism-bias hypothesis (Miller, 1977). This hypothesis has two necessary and sufficient conditions: split opinion on the firm and short selling constraints. To provide evidence of the optimism-bias hypothesis, we control for short selling constraints. For our sample firm, which is all listed on KOSPI200 and KOSDAQ150, the financial regulatory authorities banned stock short-selling from March 16, 2020, to May 2, 2021, in response to the COVID-19 pandemic. We thus use a dummy variable (*Short*) that equals 1 for the short-selling constraint period, and 0 otherwise. Further, we add two interaction terms: *D*Short* is the interaction term between *D_Split* and *Short* and *Abs*Short* is the interaction term between *Abs_Split* and *Short*. The signs and significance of these interaction terms show how the effect of split ESG ratings on corporate value differs according to whether the short-selling constraint is in effect. Table 7 provides the results with short-selling constraints. Unlike the previous results, *Abs_Split* and *D_Split* have no significant relationship in any CAR. However, both interaction terms with short-selling constraint period have negative and significant relations with CAR (0.60), CAR (0.90), CAR (0.120) and CAR (0.180). For example, the coefficients of *D*Short* and *Abs*Short* on CAR (0.90) in Column (2) and (7) are −11.548 and −12.246%, respectively, which are statistically significant at the 1% level. Hence, split ESG ratings have a significant effect on firm value under short-selling constraints. Our results imply that ESG disagreement on a firm leads to lower expected returns if short selling is restricted, which supports the optimism-bias hypothesis.

Table 8 reports the relationship between *splits* and trading behavior. The results in Columns (1), (2), (6) and (7) using the two measures of trading volume confirm that an increase in *splits* is positively related to an increase in the stock's trading volume.

For NPR, we find that the NPRs of individual investors in Columns (3) and (8) have a significantly positive relationship, whereas those for institutions in Columns (4) and (9) have a negative relationship with *splits*.

Moreover, considering that previous literature reports a relationship between institutions and ESG ratings (Dyck *et al.*, 2019), we classify institutional investors into eight groups in Panel B and Panel C of Table 8: (1) the NPS, (2) securities companies, (3) insurance companies, (4) investment trust companies, (5) banks, (6) pension funds including, the NPS and nation, (7) private equity funds and (8) others. Interestingly, the NPS, a public pension fund leading SRI investment that holds the world's third-largest fund with $800 bn in assets, has a negative relationship with split ESG ratings (Column 4 in Panel B) and the magnitude of the split

Table 5.
Split ESG rating and cumulative abnormal 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	−2.014	−3.987**	−4.063**	−5.949***	−5.032					
	(−1.06)	(−2.05)	(−2.15)	(−2.60)	(−1.64)					
Abs_Split						−1.769	−3.593*	−3.857**	−5.398**	−4.368
						(−0.98)	(−1.94)	(−2.07)	(−2.40)	(−1.56)
Rating	0.364	2.132	2.154	4.785**	8.059**	0.345	2.112	2.172	4.761**	4.784*
	(0.14)	(0.79)	(0.95)	(2.34)	(2.52)	(0.13)	(0.78)	(0.95)	(2.31)	(1.79)
Size	0.758	0.532	0.872	0.788	0.378	0.737	0.489	0.828	0.724	0.233
	(0.87)	(0.59)	(1.07)	(0.77)	(0.28)	(0.85)	(0.54)	(1.01)	(0.70)	(0.18)
MB	0.026***	0.018*	0.025***	0.013	−0.007	0.026***	0.018**	0.025***	0.013	−0.011
	(3.20)	(1.94)	(2.73)	(0.88)	(−0.72)	(3.23)	(1.98)	(2.76)	(0.91)	(−0.85)
LEV	−0.018	−0.103	−0.185***	−0.050	−0.054	−0.017	−0.102	−0.183***	−0.049	−0.051
	(−0.24)	(−1.35)	(−2.79)	(−0.66)	(−0.42)	(−0.24)	(−1.33)	(−2.75)	(−0.64)	(−0.48)
ROA	−0.416	−0.648***	−0.835***	−0.702*	−1.095**	−0.423	−0.663***	−0.853***	−0.724*	−1.157**
	(−1.56)	(−2.66)	(−2.99)	(−1.74)	(−2.13)	(−1.58)	(−2.66)	(−3.00)	(−1.75)	(−2.41)
Own	−0.043	−0.020	0.006	−0.117	−0.096	−0.041	−0.014	0.014	−0.107	−0.010
	(−0.76)	(−0.32)	(0.10)	(−1.50)	(−0.94)	(−0.70)	(−0.22)	(0.22)	(−1.32)	(−0.10)
For	−0.092	−0.032	−0.007	−0.081	−0.054	−0.085	−0.019	0.007	−0.061	−0.003
	(−1.44)	(−0.46)	(−0.10)	(−0.75)	(−0.34)	(−1.38)	(−0.27)	(0.10)	(−0.54)	(−0.02)
FCF	0.430*	0.352	0.554**	0.400	0.406	0.432*	0.356	0.559**	0.405	0.624
	(1.84)	(1.33)	(1.96)	(1.26)	(1.03)	(1.85)	(1.33)	(1.97)	(1.26)	(1.64)
Constant	−6.003	−3.578	−12.751	−15.835	−11.345	−5.851	−3.299	−12.520	−15.430	−8.453
	(−0.26)	(−0.16)	(−0.61)	(−0.70)	(−0.36)	(−0.25)	(−0.14)	(−0.59)	(−0.68)	(−0.26)
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.R^2	0.111	0.086	0.061	0.049	0.063	0.110	0.084	0.060	0.048	0.056
N	298	298	298	298	298	298	298	298	298	298

Note(s): This table reports the cumulative abnormal return for a particular event period related to the ESG rating split. The firm's CAR are aggregated from event period 0 toτ. 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

Source(s): Tables by authors

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

	(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)
Panel A. Dependent Variable = Cumulative raw return										
D_Split	−2.073	−4.033*	−3.639	−6.602**	−6.159					
	(−0.80)	(−1.66)	(−1.34)	(−2.21)	(−1.61)					
Abs_Split						−1.396	−3.072	−2.998	−5.621*	−5.234
						(−0.53)	(−1.21)	(−1.13)	(−1.90)	(−1.37)
Constant	18.325	46.717	65.298*	90.122**	82.549	18.514	47.028	65.627*	90.968**	83.166
	(0.60)	(1.50)	(1.92)	(2.00)	(1.52)	(0.60)	(1.51)	(1.93)	(2.01)	(1.53)
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.R^2	0.446	0.629	0.553	0.455	0.306	0.446	0.628	0.553	0.456	0.305
N	298	298	298	298	298	298	298	298	298	298
Panel B. Dependent variable = CAPM-adjusted cumulative return										
D_Split	−2.195	−4.233**	−3.798*	−4.878**	−3.284					
	(−1.22)	(−2.35)	(−1.91)	(−2.09)	(−1.26)					
Abs_Split						−1.710	−3.507*	−3.308*	−4.228*	−2.841
						(−0.95)	(−1.96)	(−1.71)	(−1.87)	(−1.14)
Constant	−2.467	19.769	25.925	25.670	−1.019	−2.243	20.146	26.220	26.055	−0.759
	(−0.11)	(0.88)	(1.14)	(1.08)	(−0.03)	(−0.10)	(0.89)	(1.14)	(1.09)	(−0.02)
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.R^2	0.116	0.102	0.086	0.074	0.062	0.114	0.098	0.085	0.074	0.061
N	298	298	298	298	298	298	298	298	298	298
Panel C. Dependent variable = FF3-adjusted cumulative return										
D_Split	−2.025	−4.008**	−4.138**	−5.663***	−4.750*					
	(−1.09)	(−2.06)	(−2.25)	(−2.65)	(−1.86)					
Abs_Split						−1.765	−3.598*	−3.920**	−5.182**	−4.364*
						(−0.99)	(−1.90)	(−2.17)	(−2.46)	(−1.79)

(*continued*)

Table 6.

	(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)
Constant	−8.582	−8.713	−17.711	−12.278	−8.252	−8.425	−8.430	−17.474	−11.904	−7.943
	(−0.37)	(−0.40)	(−0.89)	(−0.61)	(−0.29)	(−0.36)	(−0.39)	(−0.87)	(−0.58)	(−0.28)
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.R^2	0.092	0.065	0.049	0.045	0.051	0.092	0.064	0.049	0.045	0.051
N	298	298	298	298	298	298	298	298	298	298

Note(s): This table relates the cumulative abnormal return for a particular event period related to the ESG rating split. The firm's CAR 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) Capital Asset Pricing Model (CAPM)-adjusted return and (3) Fama–French three-factor (FF3)-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 *, ** and *** indicate significance at the 10, 5 and 1% level, respectively

Source(s): Tables by authors

Table 7. Split ESG rating with short-sell constraint

	(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	−0.194	−1.185	−0.771	−2.103	−2.313					
	(−0.06)	(−0.40)	(−0.23)	(−0.64)	(−0.67)					
*D*Short*	−8.192**	−11.548***	−11.642*	−17.908**	−15.050					
	(−2.30)	(−2.63)	(−1.94)	(−2.06)	(−1.33)					
Abs_Split						0.696	0.046	−0.083	−0.750	−0.650
						(0.22)	(0.01)	(−0.03)	(−0.22)	(−0.18)
*Abs*Short*						−8.772**	−12.246***	−11.496**	−18.853**	−17.557
						(−2.57)	(−2.93)	(−2.06)	(−2.33)	(−1.62)
Short	−6.793**	−16.483***	−7.480	14.854**	32.839***	−6.385**	−15.963***	−7.411	15.579**	34.356***
	(−2.12)	(−4.40)	(−1.54)	(2.07)	(3.70)	(−1.98)	(−4.31)	(−1.56)	(2.21)	(3.90)
Rating	0.501	0.384	0.061	0.847	1.130	0.428	0.284	−0.013	0.730	1.027
	(0.27)	(0.24)	(0.03)	(0.44)	(0.52)	(0.23)	(0.18)	(−0.01)	(0.38)	(0.47)
Size	0.031	−1.658	−2.139*	−3.895**	−4.353**	−0.015	−1.733	−2.205*	−4.036**	−4.499**
	(0.03)	(−1.44)	(−1.73)	(−2.33)	(−2.08)	(−0.01)	(−1.50)	(−1.78)	(−2.40)	(−2.14)
MB	0.015	0.001	0.007	−0.000	−0.018	0.016	0.002	0.008	0.001	−0.016
	(1.51)	(0.09)	(0.53)	(−0.03)	(−1.45)	(1.59)	(0.21)	(0.61)	(0.08)	(−1.35)
LEV	0.047	−0.057	−0.113	0.066	0.171	0.047	−0.056	−0.111	0.070	0.176
	(0.49)	(−0.55)	(−1.09)	(0.58)	(1.28)	(0.49)	(−0.54)	(−1.06)	(0.61)	(1.31)
ROA	−0.239	−0.427	−0.764*	−0.788	−1.102*	−0.233	−0.425	−0.769**	−0.804	−1.108*
	(−0.60)	(−1.46)	(−1.96)	(−1.47)	(−1.86)	(−0.59)	(−1.46)	(−1.97)	(−1.49)	(−1.87)
Own	−0.143*	−0.105	−0.123	−0.227**	−0.208	−0.139*	−0.098	−0.115	−0.211*	−0.192
	(−1.90)	(−1.40)	(−1.36)	(−2.00)	(−1.58)	(−1.81)	(−1.26)	(−1.24)	(−1.80)	(−1.41)
For	−0.159**	−0.054	−0.098	−0.105	−0.060	−0.147**	−0.035	−0.080	−0.073	−0.029
	(−2.18)	(−0.68)	(−1.22)	(−1.08)	(−0.47)	(−2.00)	(−0.43)	(−0.99)	(−0.70)	(−0.21)
FCF	0.478*	0.364	0.544	0.417	0.541	0.468	0.351	0.536	0.409	0.528
	(1.67)	(1.18)	(1.48)	(0.87)	(1.00)	(1.64)	(1.15)	(1.47)	(0.86)	(0.98)
Constant	14.995	50.311*	67.425**	98.658**	96.193*	15.409	50.975*	68.073**	100.145**	97.556*
	(0.49)	(1.69)	(1.98)	(2.12)	(1.71)	(0.50)	(1.71)	(2.00)	(2.15)	(1.72)
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.R^2	0.450	0.635	0.559	0.471	0.315	0.451	0.636	0.558	0.474	0.318
N	298	298	298	298	298	298	298	298	298	298

Note(s): 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; *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 *Short*; *Abs*Short* is the interaction term between *Abs_Split* and *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 *, ** and *** indicate significance at the 10, 5 and 1% level, respectively

Source(s): Tables by authors

Table 8.
The effect of Split Ratings on trading behavior

	(1) TV	(2) STV	(3) Individual	(4) Institution	(5) Foreign	(6) TV	(7) STV	(8) Individual	(9) Institution	(10) Foreign
Panel A. Trading activities										
D_Split	0.157***	0.067**	1.489*	−2.132*	−0.708	0.148***	0.066**	1.642**	−1.990*	−0.863
	(4.19)	(2.08)	(1.83)	(−1.77)	(−0.69)	(4.32)	(2.14)	(2.10)	(−1.74)	(−0.88)
Abs_Split						0.067	−0.011	−0.328	−0.158	0.613
						(0.69)	(−0.26)	(−0.38)	(−0.11)	(0.52)
Rating	0.070	−0.010	−0.277	−0.161	0.573	0.271**	−0.060***	0.817***	−1.017***	0.237
	(0.72)	(−0.24)	(−0.33)	(−0.11)	(0.48)	(2.09)	(−2.73)	(2.75)	(−2.90)	(0.82)
Size	0.270**	−0.060***	0.799***	−0.993***	0.246	−0.000	−0.000	0.003	−0.003	0.007
	(2.08)	(−2.74)	(2.72)	(−2.80)	(0.86)	(−0.76)	(−0.08)	(0.83)	(−0.56)	(1.00)
MB	−0.000	−0.000	0.002	−0.004	0.007	0.001	0.005***	−0.005	−0.044	0.009
	(−0.77)	(−0.09)	(0.80)	(−0.58)	(1.02)	(0.22)	(2.61)	(−0.33)	(−1.57)	(0.34)
LEV	0.002	0.005***	−0.003	−0.045	0.007	−0.019	0.001	0.137	−0.033	−0.105
	(0.24)	(2.62)	(−0.19)	(−1.60)	(0.29)	(−1.26)	(0.12)	(1.31)	(−0.27)	(−0.82)
ROA	−0.019	0.000	0.127	−0.025	−0.099	−0.013	−0.010***	−0.005	0.018	−0.006
	(−1.33)	(0.05)	(1.23)	(−0.20)	(−0.76)	(−1.60)	(−4.47)	(−0.29)	(0.51)	(−0.18)
Own	−0.013	−0.010***	−0.000	0.014	−0.008	−0.015**	−0.008***	0.018	0.038	−0.014
	(−1.56)	(−4.36)	(−0.03)	(0.40)	(−0.29)	(−2.18)	(−3.64)	(0.84)	(0.99)	(−0.44)
For	−0.015**	−0.008***	0.023	0.030	−0.017	0.004	−0.002	−0.053	−0.113	0.295**
	(−2.11)	(−3.42)	(1.23)	(0.78)	(−0.55)	(0.76)	(−0.39)	(−0.73)	(−1.01)	(2.54)
FCF	0.005	−0.001	−0.049	−0.115	0.293**	7.190**	2.277***	−20.512***	26.762***	−6.324
	(0.90)	(−0.35)	(−0.68)	(−1.05)	(2.50)	(2.29)	(4.34)	(−2.67)	(2.79)	(−0.75)
Constant	7.185**	2.279***	−20.488***	26.632***	−6.313	Yes	Yes	Yes	Yes	Yes
	(2.28)	(4.34)	(−2.70)	(2.75)	(−0.75)	Yes	Yes	Yes	Yes	Yes
Ind FE	Yes	Yes	Yes	Yes	Yes	0.484	0.434	0.083	0.039	0.093
Year FE	Yes	Yes	Yes	Yes	Yes	298	298	298	298	298
Adj.R^2	0.485	0.435	0.079	0.040	0.090	0.148***	0.066**	1.642**	−1.990*	−0.863
N	298	298	298	298	298	(4.32)	(2.14)	(2.10)	(−1.74)	(−0.88)

(*continued*)

Table 8.

Institution	(1) NPS	(2) Securities	(3) Insurance	(4) Trust	(5) Bank	(6) Pension	(7) Private	(8) Others
Panel B. The independent variables = D_Split								
D_Split	−4.789**	−0.717	−2.911	−2.670	−0.659	−4.643**	−0.269	−0.973
	(−2.53)	(−0.41)	(−1.41)	(−1.20)	(−0.22)	(−2.43)	(−0.19)	(−0.28)
Constant	39.705**	0.717	55.789***	41.368**	57.343**	38.340**	43.339***	65.912***
	(2.26)	(0.07)	(2.70)	(2.25)	(2.42)	(2.11)	(3.48)	(2.83)
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.R^2	0.049	0.220	0.047	0.073	0.010	0.047	0.050	0.065
N	298	298	298	298	298	298	298	298
Panel C. The independent variables = Abs_Split								
Abs_Split	−4.544**	−0.666	−2.471	−2.365	−0.670	−4.401**	−0.207	−1.125
	(−2.54)	(−0.40)	(−1.22)	(−1.13)	(−0.24)	(−2.45)	(−0.16)	(−0.35)
Constant	39.979**	0.761	56.032***	41.565**	57.368**	38.606**	43.367***	65.913***
	(2.30)	(0.08)	(2.73)	(2.27)	(2.42)	(2.15)	(3.49)	(2.84)
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.R^2	0.048	0.220	0.046	0.072	0.010	0.046	0.050	0.065
N	298	298	298	298	298	298	298	298

Note(s): This table links the spilt 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 *, ** and *** indicate significance at the 10, 5 and 1% level, respectively

Source(s): Tables by authors

(Column 4 in Panel C). Our results suggest that spilt ESG ratings hinder institutional investors' ESG investment by increasing the SRI risk.

5. Conclusions

To expand SRI, the Korean government mandated that all KOSPI-listed companies should disclose their ESG ratings by 2030, which is a critical determinant of SRI. Hence, we are approaching an era in which ESG ratings will influence a firm's investment decisions, valuation from financial analysts and even the cost of capital. In this case, transparency and comparability of ESG ratings can prevent confusion in the ESG transition. However, firms still lack guidelines on how to prepare for ESG management and we find discrepancies in ESG ratings between agencies. Following the Federation of Korean Industries' report in 2021, more than 40% of companies have gaps of more than 3 ratings levels out of 7 possible ratings. In our sample, the ESG ratings of foreign evaluators of domestic companies were undervalued relative to those of domestic evaluators.

To investigate the impact of ESG ratings disagreement on firms, we examine the relationship between split ESG ratings and information asymmetry, corporate value and trading behavior. From the perspective of information asymmetry, we find evidence that split ESG ratings undermine corporate value. In our empirical analysis, higher ESG disparities are related to an increase in volatility and decrease in future stock price, which supports the optimism-bias hypothesis (Miller, 1977). Moreover, we find that ESG divergence decreases the net demand for such firms from institution investors, especially pension funds, including the NPS.

Our findings enrich the academic and policy discussion of ESG rating disagreement by pointing out that differing ESG ratings increase risk and hinder investment. Urgent political or regulatory efforts are necessary to resolve this disparity. This would expand SRI by institutional investors and induce companies to effectively participate in ESG management. Furthermore, considering that firms with more information disclosure tend to have less disagreement among analyst forecasts (Lang and Lundholm, 1996) or credit ratings in Korea (Kim and An, 2021), active voluntary disclosure by firms can help reduce the spread in their ESG ratings.

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Appendix

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 (%), 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 (%), the firm's shares owned by the majority shareholder
For	Foreigner ownership (%), 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

Source(s): Tables by authors

Table A1.
Variable definition

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