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ESG Rating Disagreement and Stock Returns

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Abstract

Using a sample of S&P 500 firms between 2013 and 2017, we study the impact of ESG rating disagreement on stock returns. We conjecture that for disagreement about environmental ratings, a risk-based explanation induces a positive relationship between rating disagreement and stock returns. In contrast, we hypothesize that for disagreement about the social and governance ratings, the impact on stock returns is negative and is driven by mispricing and the rating providers' location in civil or common law jurisdictions. Our empirical findings support these hypotheses.

Keywords: Disagreement, non-financial information, ESG ratings, heterogeneous beliefs, stock returns, legal origins, sustainable finance

JEL Classifications: G12, G24, Q01

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"There's so much disagreement about investing, and it's because nobody really knows."

Robert J. Shiller

Quantitative assessments of a firm's environmental, social, and governance (ESG) policies play an increasingly important role, both in academia and investment practice. In particular, ESG (or non-financial) ratings are now commonly used in finance research (see, for instance, Hong and Kostovetsky 2012; Lins, Servaes, and Tamayo 2017; Liang and Renneboog 2017; Dyck, Lins, Roth, and Wagner 2019). Similarly, such ratings also increasingly shape investment decisions of institutional investors representing trillions of dollars in assets under management (see Gibson, Glossner, Krueger, Matos, and Steffen 2020; GSIA 2016; USSIF 2018; PRI 2018). Recently, however, the financial press (Mackintosh 2018; Wigglesworth 2018) and policy-oriented think tanks (Doyle 2018) have documented considerable disagreement when comparing a firm's ESG ratings issued by different data providers.

In this paper, we pursue two objectives: first, we systematically analyze the level and nature of disagreement about a firm's ESG rating to gain a better scientific understanding of the issue. Secondly, we study the impact of ESG rating disagreement on future stock returns. For the purpose of our analyses, we collect and study ESG ratings from six prominent ESG ratings providers[1] for S&P 500 firms between 2013 and 2017.

We start our analysis by documenting some very basic empirical facts concerning ESG rating disagreement (or divergence, dispersion). We show, for example, that the average correlation between the overall ESG ratings of the six rating providers is about 0.46 in our

[1] We use data from Asset 4 (now Refinitiv ESG), Sustainalytics, Inrate, Bloomberg, MSCI KLD and MSCI IVA.

sample. Surprisingly, the average correlation is lowest for the governance (0.19) and highest for the environmental dimension (0.43). We also provide evidence that disagreement tends to be higher for the largest firms in the S&P 500 and for firms that do not have a credit rating. In contrast, more profitable firms tend to have lower ESG rating disagreement. We further show that rating disagreement is generally more pronounced for the consumer durables industry with the exception of disagreement about governance, which is highest in the financial services industry.

Next, we build on existing theoretical finance research on heterogeneous beliefs to develop two competing hypotheses as to how ESG rating disagreement affects stock returns. The first hypothesis, which we refer to as the *risk-based hypothesis*, posits that higher ESG rating disagreement should result in higher future stock returns. The idea behind this view is that firms with higher ESG rating disagreement are riskier and investors need to be compensated for the additional risk they are taking by investing in such firms (Atmaz and Basak 2018). Under the competing view, the *optimism-bias hypothesis*, higher ESG rating disagreement results in lower future stock returns, mainly because investors are too optimistic initially about stocks with high ESG rating disagreement. This is because investors believe that a firm's true ESG performance is best captured by the most optimistic ESG rating, which leads to overvaluation of the stock today and lower returns in the future (Miller 1977).

Recent research suggests that firms' ESG ratings and a country's legal origin are related (Liang and Renneboog 2017). When testing our hypotheses on the effects of ESG rating disagreement on stock returns, we ask whether the link between legal origin and ESG performance also carries over to the legal origin of the ESG rating providers themselves. We divide rating providers into two groups: those with a civil law origin and those with a common law origin. Based on the idea that corporate governance in civil law countries is more

stakeholder oriented, we conjecture that for the *optimism-bias hypothesis*, disagreement among civil law raters should be more important for the social dimension. In contrast, disagreement among common law rating providers about the governance rating should be more informative, mainly because governance in common law countries is more shareholder-centric. We argue that the legal origin of the data providers should matter primarily for disagreement about social and governance ratings and for the *optimism-bias hypothesis*, mainly because social and governance ratings are more subjective than environmental ratings, which are increasingly based on objective and measurable inputs such as greenhouse gas emissions or water usage.

In our empirical tests, we measure disagreement using the standard deviation of available ESG ratings for a given firm at a given point in time.[2] We calculate the disagreement proxy for the overall ESG rating, separately for the E, S, and G pillars and also stratify the disagreement measure by the legal origin of the data providers (civil vs. common). We then relate monthly stock returns to our ESG ratings disagreement proxies, controlling for a number of characteristics that are known to have predictive power in the cross-section of stock returns.

Consistent with the *optimism–bias hypothesis* and the above arguments based on legal origin theory, we find that disagreement about the social rating negatively predicts stock returns whenever the disagreement is among information intermediaries located in civil law countries. Similarly, we find that disagreement among common law based data providers about the governance rating also negatively predicts returns. In line with *the risk-based hypothesis*, we observe that for disagreement about the environmental rating, the relationship with stock returns is positive and independent of the legal origin of the data-providers. Finally, we examine whether the stock market cycle has a bearing on the relationship between rating disagreement

[2] We also use the range, that is the difference between the maximum and minimum ESG rating for a given firm at a given point in time, which leads to similar conclusions.

and stock returns and find that in times when the S&P 500 returns are high, *the risk-based hypothesis* dominates and leads to a positive relationship between ratings disagreement and stock returns for all three ESG pillars.

While many papers have studied the relation between stock returns and the first moment of ESG ratings (see, for instance, Friede, Busch, and Bassen 2015 and references therein), our paper is the first to systematically examine the stock return consequences of the second moment of ESG ratings, i.e., disagreement about a firm's ESG performance. Another important contribution of our paper is to move beyond simply documenting that disagreement about non-financial information exists and furthering our understanding of why such disagreement exists. In this respect, we add to the debate by suggesting that an important aspect in the debate on ESG rating disagreement is about "who" (civil versus common law based data providers) disagrees about "what" (social, environmental or governance). We also contribute importantly to the debate on ESG rating disagreement by showing that the arguments and predictions laid out in the theoretical asset pricing literature on heterogeneous beliefs in financial markets (see in particular Atmaz and Basak 2018 and Miller 1977) can be extended to disagreement about non-financial or ESG information.

Our empirical results should help academics, institutional investors, financial advisors, policy-makers, and ultimately firms themselves to better understand that beyond ESG ratings, the dispersion of these ratings–stratified by the legal origins of the data providers for the S and the G scores–can have an economically meaningful impact on stock returns and thus potentially on firms' costs of capital.

1. Literature review

Our study is related to three streams of finance literature, namely research on heterogeneous beliefs in asset pricing, general research that uses ESG ratings, and the influential literature on law and finance.

1.1 Heterogeneous beliefs and asset pricing

We anchor our testable hypotheses in the literature on heterogeneous beliefs in financial markets. Studying heterogeneous beliefs has a long tradition in finance, going back at least to Miller (1977). While the majority of studies focus on disagreement about financial information (e.g., earnings forecasts issued by analysts), our contribution is to study heterogeneous beliefs about *non-financial* information. As such we are contributing to the relatively scant research that has examined disagreement about other sources of risk: for example, Basak (2000), studies heterogeneous beliefs about non-fundamental processes that drive non-fundamental firm risk.

Miller (1977) argues that, whenever there is disagreement about the financials of a firm, prices will predominantly reflect optimistic investors because pessimistic investors are kept out of the market due to high short-sales constraints. Thus, higher disagreement about the financials of a stock will increase future losses due to excessive optimism and therefore lower future returns will ensue. Based on Miller (1977), Chen, Hong and Stein (2002) formulate a stock market model with differences of opinion and short-sales constraints. More recently, Atmaz and Basak (2018) develop a dynamic general equilibrium model populated by a continuum of CRRA investors who differ in their beliefs and consume at a single date. In this setting, they underline the dual role of belief dispersion pointing out that with increasing belief dispersion, on the one hand, future returns may decrease (increase) when the view on a given stock is

optimistic (pessimistic). On the other hand, higher belief dispersion reflects higher uncertainty and should thus lead risk-averse agents to require higher future returns. When the view on the stock is sufficiently optimistic, the former effect dominates resulting in a negative relation between the dispersion in beliefs about a stock and the stock's future mean return. To our knowledge, our paper provides the first attempt to test predictions of the heterogeneous beliefs theoretical asset pricing literature in the context of non-financial information.

Empirical studies have tested the relation between dispersion in beliefs and stock returns in a variety of settings. These studies typically use the dispersion in analyst earnings forecasts as a proxy for the extent to which a stock is subject to heterogeneous beliefs. These studies generally document a significant relation between heterogeneous beliefs and stock returns (Diether, Malloy, and Scherbina 2002; Anderson, Ghysels, and Juergens 2005; Yu 2011). However, while some studies find this relationship to be negative (see, in particular, Diether et al. 2002; Chen et al. 2002; Yu 2011; Lakonishok, Shleifer, and Vishny 1994; La Porta 1996; Skinner and Sloan 2002), others find it to be positive (Anderson et al. 2005; David 2008; Banerjee and Kremer 2010).

1.2 ESG ratings

The academic use of ESG ratings has increased considerably over the last two decades and such measures are now commonly used in economics, management, and finance research (see, for instance, Hong and Kostovetsky 2012; Krueger 2015; Lins et al. 2017; Liang and Renneboog 2017; Gibson and Krueger 2018; Dyck et al. 2019). Given the complexity of measuring a firm's non-financial or ESG performance, the validity of these ratings has been debated critically (Chatterji, Levine, and Toffel 2009; Bouten, Cho, Michelon, and Roberts 2017; Delmas, Etzion, and Nairn-Birch 2013). Chatterji, Durand, Levine, and Touboul (2016), for instance, study the

convergence of CSR ratings produced by six well-established information intermediaries. They document a lack of agreement across raters that comes mainly from two sources: the absence of both a common theorization and commensurability.[3] These findings point out that research conclusions are potentially dependent on the choice of ratings providers, a caveat which should be taken into account when drawing conclusions based on existing empirical studies.

More recently, Eccles and Stroehle (2018) explore the importance of the social construction with respect to ESG ratings. They classify ESG rating agencies into value- vs. values-based organizations based on their social origins. Furthermore, they point out how social origins can influence the way in which sustainability is conceptualized, how financial materiality is defined, the way ESG is measured, and how ESG information is sold to investors. We add to this literature by focusing on another classification of ESG information that so far has not been examined in the literature. Namely, we argue that the legal origins of the country in which the data provider producing the ESG information is headquartered plays an important role in the determination of ESG ratings.

Given the heightened interest ESG rating disagreement has generated in both practitioner circles and the financial press, the topic has spurred some recent academic interest too. Christensen, Serafeim, and Sikochi (2019) analyze the determinants of ESG rating disagreement and find that more disclosure leads to higher disagreement.[4] In addition, they point out that the relationship between a firm's average ESG rating and ESG rating disagreement is non-linear. Importantly, they rely on ESG data from three providers, while our paper makes use of six different data sources. Another important difference between their paper

[3] The concept of a *common theorization* refers to the idea that raters agree on a common definition of CSR. The term *commensurability* means that different raters would obtain the same result when measuring the same feature.

[4] In a recent study Lopez-de-Silanes, McCahery, and Pudschedl (2019) find evidence that firms with good ESG scores may disclose more information.

and ours is that they focus on explaining why disagreement exists, while we are more interested in examining the *consequences* arising from ESG rating disagreement, and specifically whether there are implications for stock returns. Another recent paper interested in explaining *why* disagreement exists is Berg, Koelbel, and Rigobon (2020). In this paper, the authors pursue a more granular approach and propose a decomposition of the sources of ESG rating disagreement. By subdividing the ratings of six providers into finer categories, they identify three sources of ESG rating divergence. First, they highlight that raters use different categories, which can lead to disagreement. They refer to this as *scope divergence*. Secondly, they point out that raters measure identical categories differently, which they refer to as *measurement divergence*. Finally, they highlight *weight divergence*, which results from raters attaching different weights to the different categories when generating an aggregated ESG rating. They find that most of the differences can be traced to measurement and scope divergence, while weight divergence seems to play a minor role.[5] There are many differences between their and our study, but the most fundamental one is that they focus on explaining *why* ratings disagree, while we are mainly interested in studying whether there are consequences, namely measurable stock return *effects* resulting from rating disagreement.

1.3 Law and finance

In our paper, we also build on the influential economics and finance research concerned with how legal origins shape economic outcomes and financial decisions (La Porta, Lopez-de-Silanes, Shleifer, and Vishny 1998). In the context of ESG, Liang and Renneboog (2017) show that there is a strong correlation between a firm's ESG rating and the legal origin of the country

[5] Note also that weight divergence could be understood as a special case of scope divergence because differences in categories also arises if a rater attaches a zero weight to a given category. In addition, they find a *Rater Effect*: ratings of one provider are positively correlated across different categories.

in which the firm is headquartered. Building on this work, we hypothesize that in our setting, the legal origin of the data provider's headquarter country should also have a bearing on the definition and understanding of non-financial information, on how financially material such information is regarded to be, and ultimately on the overall methodology the data provider uses to construct ESG ratings. More specifically, civil law countries are known to have a strong norms regarding labor issues and social protection (Botero, Djankov, La Porta, Lopez-de-Silanes, and Shleifer 2004). On the other hand, common law countries are generally regarded to emphasize investor protection, stronger protection of shareholders rights, and a stronger view on traditional governance issues (See for example Doidge, Karolyi, and Stulz 2007; La Porta et al. 1998). Thus, we expect differing effects for social and governance ratings depending on whether they are constructed by data providers based in civil or common law countries.

2. Testable hypotheses and data

2.1 Testable hypotheses

Our two main hypotheses focus on the relation between disagreement about non-financial information and future stock returns. We argue that this relation depends primarily on the type of information about which there is disagreement (e.g., environmental, social, or governance) and secondly about which rating providers disagree about it. More specifically, we conjecture that for the understanding of social and governance information it also matters whether data providers are located in civil or common law countries.

Our two hypotheses rely first on the heterogeneous beliefs literature transposed to the ESG context. First, we argue that if investors believe that a firm's true ESG performance is best captured by the most optimistic ESG rating, this leads to overvaluation of the stock today and

lower future returns (Miller 1977). Therefore, higher disagreement results in lower future returns, mainly because investors are too optimistic initially about high-disagreement stocks. We label this mechanism as the *optimism-bias hypothesis*. On the other hand, this literature also states a basic finance argument, namely that uncertain investments are riskier and thus investors need to be compensated for the additional risk they are taking by investing in high ESG-disagreement stocks (Atmaz and Basak 2018). We refer to this mechanism as the *risk-based hypothesis*.

Based on these two mechanisms, we first focus on the environmental rating, which is more easily quantifiable and thus less prone to subjective judgments and misspecification that could potentially lead to mispricing. Thus, we conjecture that disagreement about the environmental rating should operate primarily through the risk-based channel and we state our first hypothesis with respect to the relation between disagreement about the environmental rating and stock returns accordingly:

Hypothesis 1: *For the environmental rating, the risk-based hypothesis implies a positive relationship between rating disagreement and future stock returns.*

In contrast, governance and social aspects are more difficult to measure and quantify: indeed, they are based primarily on soft information and thus more prone to subjective judgment. These properties make it more likely that disagreement on social and governance ratings are more likely to influence stock returns through the *optimism-bias channel*. Since social and governance ratings may further be prone to cultural and normative judgments related to a data provider's country of origin, we utilize insights from recent research, which suggests

that firms' ESG ratings and a country's legal origin are related (Liang and Renneboog 2017). Here, for the social and governance ratings, we argue that this link between legal origins and ESG performance also carries through to the legal origins of the ESG rating providers themselves. We divide rating providers into two groups; those with a civil law background and those with a common law background. Based on the idea that firm governance in civil law countries is more stakeholder oriented, we conjecture that under the optimism-bias channel, disagreement among civil law raters about the social dimension should be more important for stock returns. In contrast, disagreement among common law rating providers about the governance rating should be more informative, mainly because governance in common law countries is more shareholder-centric.

We can now formulate our second hypothesis, which states that the optimism bias explanation should apply to the relation between disagreement about social and governance ratings and stock returns in a subtle way:

Hypothesis 2: *The optimism-bias hypothesis implies a negative relationship between disagreement about the social (governance) ratings issued by civil (common) law based data providers and future stock returns.*

2.2 Data

To test our hypotheses, we construct a representative and homogeneous sample over the longest possible time period. We face the challenge that the availability of ESG data is restricted in both the cross-section and the time-series. To use a sample as homogeneous as possible and to

maximize the number of available ESG ratings per firm, we restrict ourselves to firms belonging to the S&P 500 and consider a sample period of five years going from 2013 to 2017.

We use financial data from the Center for Research in Security Prices (CRSP) and accounting data from Standard & Poor's Compustat. We collect data from six ESG data providers: (1) Asset 4,[6] (2) Sustainalytics, (3) Inrate, (4) Bloomberg,[7] (5) MSCI KLD,[8] and (6) MSCI IVA.[9] In Appendix A we provide further information on sample selection, dataset matching, and variable definitions.

Table 1 displays important features of these six data providers. Column (1) shows the legal origin for each provider. We classify providers based on their country of legal origin as either *common* or *civil law*.

[Table 1 about here.]

In Column (2), we show the country of origin of each provider. Three providers are US-based (Bloomberg, MSCI KLD, and MSCI IVA) whereas two providers have their origins in Switzerland (Asset 4[10] and Inrate). One provider can be traced back to origins in The Netherlands (Sustainalytics).

In Column (3), we show the rating scales used by each provider. Three providers apply a scale from 0 to 100 for their assessments (Asset 4, Sustainalytics, and Bloomberg) while one

[6] Asset 4 was acquired by Thomson Reuters in 2009, but the ESG data was made available under the old name of Asset 4. More recently, the name was not changed to *Thomson Reuters ESG Scores*. However, since the name Asset 4 is widely known we use the old name for simplicity. Note that as of 2018, the ESG ratings data of Thomson Reuters is part of Refinitiv and known as Refinitiv ESG.

[7] The full name is *Bloomberg ESG*, we denote this dataset simply as Bloomberg.

[8] The MSCI KLD dataset was initially created by Kinder, Lydenberg, and Domini (KLD) Inc., which got acquired by Riskmetrics in 2009. In 2010, MSCI acquired Riskmetrics. Eccles, Lee, and Stroehle (2019) provide details on the history of KLD.

[9] The MSCI IVA dataset was initially created by Innovest, which was also acquired by Riskmetrics in 2009 before Riskmetrics got taken over by MSCI (see Eccles et al. (2019) for further details).

[10] Even though Asset 4 was taken over by Thomson Reuters in 2009, we classify it as being Swiss based. We do so given that Asset 4 was founded as a Swiss company and we thus believe that the conceptualization of nonfinancial information is more likely to have been shaped by civil law origins.

provider uses a scale from 0 to 10 (MSCI IVA) and another provider a scale from 1 to 12 (Inrate)[11]. Originally, MSCI KLD does not provide a genuine scale itself. However, many academic studies sum up KLD's strengths and concerns separately and scale both by the total number of strengths and concerns available. This course of action results in a scale from -1 to +1 (See, for example, Lins et al. 2017).[12]

Because the different rating scales differ not only in terms of their statistical support, but also in terms of the distribution across the statistical support, a simple re-scaling would not suffice to make the different ratings comparable. Therefore, we do the following to achieve comparability across rating providers: At each point in time, we sort all stocks according to the ratings of the respective providers. We then calculate the individual rating specific percentile ranks and use these as adjusted scores.[13] When there are ties, we assign each company the average rank. We normalize these ranks between 0 and 1.

Column (4) shows the average number of sample stocks per year for which we observe an ESG rating from a given data provider. Sustainalytics, MSCI KLD, MSCI IVA and Bloomberg have on average the best coverage (about 460 stocks). Inrate and Asset 4 have the least number of stocks on average with 432 and 439, respectively. However, the average number of stocks for all providers is rather high with well above 400 and we therefore consider the sample as being representative for S&P 500 companies.

The fifth and last column reports the pillar scores supplied by the providers. All providers supply a total score, an environmental score, a social score, and a (corporate) governance score.

[11] Note that this scale is based on sustainability assessments from D- to A+.
[12] We include all available strengths and concerns items except those from the norms-oriented categories related to alcohol, military, firearms, gambling, nuclear, and tobacco.
[13] Using ranked measures is also more consistent with investment practice in which investors compare the ranked value of a given signal relative to the ranked values of the signal for other firms.

In addition, Inrate also provides a labor score. Since the labor score captures a social topic, we use the average of the original social and the labor score as the social score.

3. Analysis

3.1 Descriptive statistics and correlations

Table 2 shows summary statistics and Pearson correlations between the ESG ratings from the six different data providers. We display the results for the total rating and the three E, S, and G pillars in separate panels. The different rating providers are ordered by their legal origin, civil law followed by common law. The first three columns display descriptive statistics for ranked ESG scores from the different providers. The subsequent columns display the cross-correlations. We also display the average correlation between providers in the last row of each panel, which we calculate as the mean of the respective cross correlations (separately for the total rating and the E, S, and G pillars).[14]

[Table 2 about here.]

We first observe that the correlation for the overall ESG ratings is 0.46 on average, which is much lower than average correlations between credit ratings issued by Moody's and S&P. According to Berg et al. (2020) correlations among those two credit rating providers exceed 0.99. Also, the average correlations between providers are lower for the E, S, and G subcategories (Panels B–D) than for the total rating, which is probably due to discrepancies in aggregation and weighting procedures across the three pillars. Surprisingly, the average

[14] Each provider has a rather constant number of observations across the different scores they are issuing, with the exception of Bloomberg which has substantially lower coverage for environmental ratings.

correlation is lowest for the governance (0.19) and highest for the environmental ratings (0.43). Some other interesting features emerge in Panel C (Social pillar), in which we observe a weaker relation between the civil law providers compared to the other panels (especially the relation between the social ratings provided by Inrate and the other two providers). Furthermore, in Panel D, we observe a similar decrease in correlations between the governance ratings, but for the common law data providers.

[Figure 1 about here.]

In Figure 1, we look at whether correlations vary at the industry-level. We plot average correlations across the six ESG rating providers for each of the twelve Fama and French industries. There seems to be some industry heterogeneity when it comes to ESG rating correlations. Average correlations in the total and social ratings are lowest in the consumer durables and telecommunications sectors (see subfigures 1a and 1c). In contrast, ESG data providers seem to disagree the most (i.e. have low average correlations) when it comes to governance ratings of financial services companies (see subfigure 1d).

3.2 Determinants of ESG rating disagreement

In this section, we examine whether ESG rating disagreement correlates with observable firm-level characteristics. We use the standard deviation of ratings available for a given firm at a given point in time as a dependent variable. We calculate this measure for the total rating but also separately for the E,S, and G pillar.[15] We explore the role of variables falling in one of the

[15] We use the standard deviation of ratings as a dependent variable but obtain similar results when using the range between the minimum and maximum rating.

following five categories: (i) Balance sheet related, (ii) Industry related, (iii) Investor transparency, (iv) Valuation, and (v) Price.[16]

We use pooled panel regressions in which the rating disagreement measures serve as dependent variables. We also include industry-month fixed effects. Standard errors are double clustered at the firm and month-level. In Column (1) of Table 3 we display the results for disagreement about the total rating. Columns (2)—(4) display the results separately for disagreement about the E, S, and G pillars.

[Table 3 about here.]

Essentially, three variables play a significant role in explaining ratings disagreement. First, more profitable firms are subject to lower ESG rating disagreement (see columns 1 and 2). Secondly, firms without a credit rating *(NCR)* exhibit higher disagreement (see columns 1 and 3), as do larger firms (see columns 1, 3, and 4).[17] These results seem intuitive: Profitable firms may be viewed less critical by ESG analysts, whereas firms without a credit rating are subject to a less transparent information environment, making their assessment in terms of ESG more difficult. Finally, larger firms might be more diversified and complex and are further analyzed more thoroughly, explaining why they exhibit higher ratings disagreement.[18]

[16] (i) Balance sheet related: Tangibility (*TAN*), current ratio (*CR*), leverage (*LEV*), gross profitability (*GP*) (Novy-Marx 2013); (ii) Industry related: Industry concentration measured by the Herfindahl-Hirschman index (*HHI*) based on book equity, multi-segment (*MSEG*); (iii) Investor transparency: Missing credit rating (*NCR*), institutional ownership (*IO*), number of analysts (*NoA*), the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (*StdDev*) (Diether et al. 2002); (iv) Valuation: Book-to-market (*BM*) (Fama and French 1995); (v) Price: market cap (*ME*) (Banz 1981), momentum (*MOM*) (Jegadeesh and Titman 1993), and total volatility (*TVOL*) (Ang, Hodrick, Xing, and Zhang 2006).

[17] The reader might wonder why S&P 500 firms do not have a credit rating. In general, firms without a credit rating do not seem to be exceptional. For example, in a sample of 12,312 firms, Avramov, Chordia, Jostova, and Philipov (2009) report that 9,051 firms do not have a credit rating. In our sample 194 out of a total of 553 firms do not have a credit rating for at least one month.

[18] Tangibility *(TAN)* plays a specific role in that firms with more tangible assets have lower disagreement in the environmental rating. Again, this is intuitive given that firms with more tangible assets are also likely to have a more negative impact on the environment (e.g., higher emissions) and thus a more easily measurable environmental score.

3.3 ESG rating disagreement and stock returns

We now test our two hypotheses by analyzing the relationship between stock returns and ESG rating disagreement. As in the previous section, we use pooled panel regressions with standard errors double clustered at the firm and month-level. We use monthly stock returns as the dependent variable in the regressions. Besides our main disagreement related explanatory variables, we include industry-month fixed effects and also control for standard characteristics that have been found to explain the cross section of stock returns.[19] Pooled panel regressions with month-industry effects are conceptually similar to Fama and MacBeth (1973) type regressions with industry dummies. Given that our sample period is relatively short, it is important to control for return differences at the industry-level.

We use two measures of ESG rating disagreement, namely the standard deviation of ratings available for a given firm at a given point in time and the range between the highest and the lowest rating. We denote the standard deviation based measure as *Std Dev* and the range based measure as *Range*. We calculate these disagreement measures using all ratings *(All)* and also separately using only ratings from data providers with a civil *(Civil)* or common law *(Common)* background.

[Table 4 about here.]

The regression results are displayed in Table 4. We report coefficient estimates for the main explanatory variables alongside *t*-statistics based on double clustered standard errors (in parentheses). In column (1) the main explanatory variable is the standard deviation of all ratings. In column (2), we use ratings disagreement stratified by civil and common law

[19] We control for market capitalization (Banz 1981), book-to-market (Fama and French 1995), gross profitability (Novy-Marx 2013), momentum (Jegadeesh and Titman 1993), the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (Diether et al. 2002), the firm's beta (Frazzini and Pedersen 2014) and total volatility (Ang et al. 2006).

providers separately. In Columns (3) and (4) we repeat the same procedure for the range based disagreement measures. In Panel A, we report results for the overall ESG rating, and in panels B, C, and D separately for the E, S, and G pillars.

We first test Hypothesis 1, which conjectures a positive relationship between disagreement about the environmental rating and future stock returns. Panel B of Table 4 shows that disagreement in environmental ratings is significantly positively related with future stock returns, at least when the disagreement is measured by the standard deviation. This evidence is consistent with Hypothesis 1 and is in line with the risk-based explanation advocated by Atmaz and Basak (2018).

Next, we test Hypothesis 2 which focuses on the impact of ratings disagreement on stock returns when these ratings concern social and governance issues while also considering the legal origin of the country in which the disagreeing data providers are based. The premise is that rating agencies with civil law origins are more skilled in identifying relevant social issues. In a similar vein, rating agencies with common law origins are more skilled in determining relevant governance issues. When there is disagreement in social (governance) ratings among civil (common) law rating providers, this should lead to lower future returns (following the arguments provided by Miller (1977) and Atmaz and Basak (2018)). The empirical results support Hypothesis 2. Columns (2) and (4) in Panel C show that stock returns for firms subject to more disagreement about social ratings issued by civil law data providers tend to have lower stock returns. In a similar spirit, we also find support for Hypothesis 2 when looking at disagreement by common law data providers about governance ratings. Panel D of Table 4 shows that firms with more disagreement in governance ratings issued by common law data providers exhibit lower future stock returns.

In summary, our results indicate that the *risk-based hypothesis* is supported by the positive relationship between disagreement in environmental ratings and subsequent stock returns (Panel B, Table 4). In contrast, mispricing coupled with the legal origins of the data providers as stated in *the optimism–bias hypothesis* is able to explain the negative relationship between disagreement in the social (governance) rating and future stock returns when these ratings are established by data providers with origins in civil (common) law countries.

3.4 Role of the stock market cycle

Recent literature suggests that sustainable practices may pay off in bad times (e.g. recessions). For example, Lins et al. (2017) show that firms with high social capital had four to seven percentage points higher returns as firms with low social capital (proxied by KLD data) during the 2008–2009 financial crisis. Hence, a related question is whether ESG rating disagreement also displays a distinct effect on stock returns across stock market cycles. We conjecture that at the top of the stock market, when the probability of a bear market is high, the *risk-based hypothesis* may dominate for all three ESG rating pillars. Since there are no major crises during our sample period, we pursue a slightly different approach. More specifically, we define a *bull dummy*, which is set to one if the return of the S&P 500 index in a given month is above the 75th percentile of the overall S&P 500 return distribution during our sample period. We then add an interaction term between the dummy and our measures of ESG rating disagreement to the return regressions outlined above. Since we want to explore the time-series behavior of the relationship between stock returns and ESG disagreement, we do not include time dummies in the specifications.

[Table 5 about here.]

For brevity, we focus on analysis that uses the standard deviation of ESG ratings as explanatory variable. We display the regression results in Table 5. For disagreement about the total rating (Column 1) as well as disagreement about the three individual ESG pillars (columns 2—4), we find significant and negative coefficient estimates in non-bull market states. This is consistent with investors being generally too optimistic (Hypothesis 1). In contrast, in bullish states of the market (that is when the bull dummy is equal to one), we find a significant and positive coefficient. For example, for the total rating (Column 1), the coefficient on the disagreement measure in the non-bull state is -5.8, and the coefficient of the interaction with the bull-dummy is 23.1, which means that bull-state coefficient is 17.3 (since the coefficient estimates are very similar for the E, S, and G pillars, we do not discuss them in detail here). Therefore, in bull-states, we find evidence consistent with *the risk–based hypothesis* (i.e. investors are compensated with higher returns for buying stocks with higher ESG rating disagreement because they then perceive them as being riskier) for all three rating pillars. We find similar results for the range dispersion measure.[20]

3.5 Risk and ESG rating disagreement

Past research has also examined the relationship between stock return volatility and heterogeneous beliefs in financial markets. This literature generally finds that stock return volatility is monotonically increasing with belief dispersion (e.g. Ajinkya and Gift 1985; Anderson et al. 2005; Banerjee and Kremer 2010; Atmaz and Basak 2018). We also test this relationship in our setting, but do not observe a significant relation between stock return volatility and disagreement with respect to non-financial information (See Appendix Table B.1). In addition, we also examine if other risk measures are related to ESG rating disagreement.

[20] Results are available upon request.

Following work by Hoepner, Oikonomou, Sautner, Starks, and Zhou (2019), we focus on downside risk as measured by the lower partial moment and the value at risk, but do not find a significant relation between downside risk measures and ESG ratings disagreement either (See Appendix Tables B.2 and B.3).

4. Conclusion

In this paper, we examine the relation between stock returns and ESG rating disagreement. Recently, the issue of ESG rating disagreement has received considerable attention, for instance, from the financial press and practitioner circles. In addition, ESG rating disagreement has important implications for the generalization of academic research findings and is creating challenges for asset managers in their efforts of implementing ESG investment strategies. To date, there is relatively little quantitative research on ESG ratings disagreement, and we provide a first step towards a better understanding of the impact of ESG rating disagreement on stock returns.

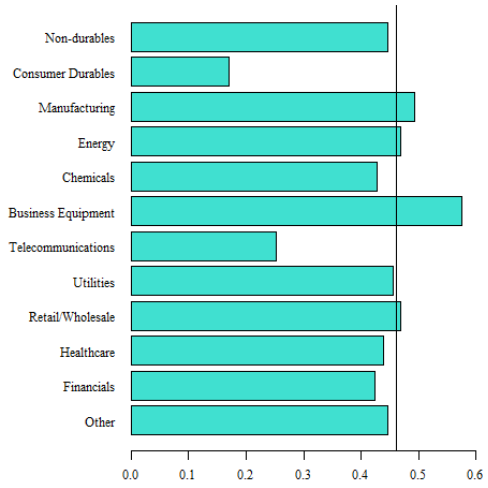
Using ESG ratings from six different information intermediaries for a sample of S&P 500 firms between 2013 and 2017, we document that the average correlation between the total ESG ratings from the six different providers is about 0.46. Surprisingly, the average correlation is lowest for governance and highest for environmental ratings. We also show that disagreement is higher for larger and less profitable firms as well as for firms that do not have a credit rating. We then examine the relation between stock returns and ESG rating disagreement. Motivated by theoretical arguments on the role of heterogeneous beliefs in financial markets combined with insights from the law and finance literature, we hypothesize that dispersion in ESG ratings should negatively predict stock returns whenever the ESG information is likely to be more financially relevant and there is excessive optimism. We argue that given the stakeholder centric

view that shapes corporate governance in civil law countries and the more shareholder centric view typically found in common law countries, disagreement about social (governance) related non-financial information from civil (common) law information should lead to overvaluation of firms and thus lower subsequent stock returns. For the environmental rating, we conjecture a positive relationship between rating disagreement and stock returns which is consistent with disagreement being a source of priced risk as demonstrated by Atmaz and Basak (2018). We find evidence supporting both hypotheses. Finally, we observe that in extreme bull market conditions, the *risk-based hypothesis* prevails irrespective of the rating pillar considered and irrespective of the legal origin of the ESG ratings providers.

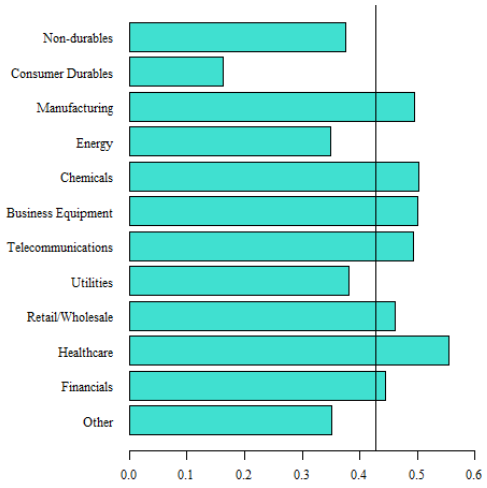
Our empirical results are the first to document the subtle and multi-faceted implications of disagreement in ESG information on stock returns and thus on firms' cost of capital. They also have important consequences for responsible investors who rely on one single data provider for the ESG ratings used in their investment strategies but fail to account for ESG rating disagreement among data providers and the subtle and time-varying impact of this disagreement on future stock returns.

Figure 1: Average correlations by Fama and French 12 industry

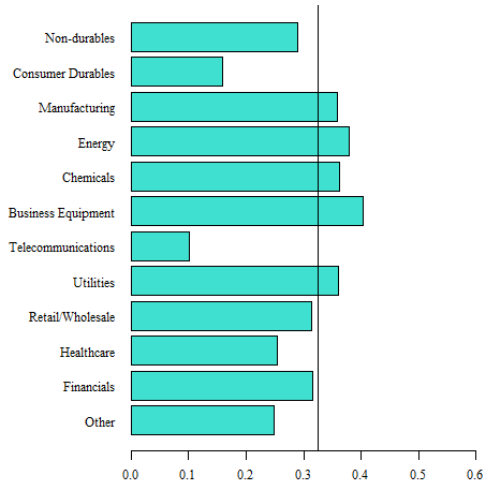
(a) Total rating



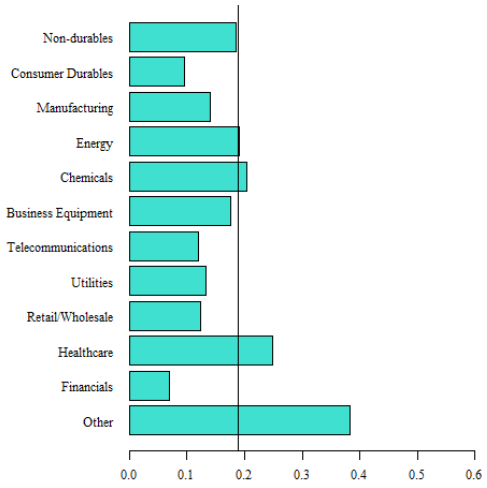
(b) Environmental pillar



(c) Social pillar



(d) Governance pillar



Note: This figure plots average pairwise Pearson correlations between the ratings of the six different ESG data providers for each of the twelve Fama and French industries. We report average correlations for the total rating in subfigure 1a and the respective ESG components in subfigures 1b, 1c, and 1d. The vertical line represents the average correlation across all industries.

Table 1: ESG data providers

Data provider	Legal origin	Origin	Rating scale	Number of stocks (sample)	Pillars
	(1)	(2)	(3)	(4)	(5)
Asset4	Civil law	CH	0 – 100	439	E, S, G, Total
Sustainalytics	Civil law	NL	0 – 100	460	E, S, G, Total
Inrate	Civil law	CH	1 – 12	432	E, L, S, G, Total
Bloomberg	Common law	US	0 – 100	456	E, S, G, Total
MSCI KLD	Common law	US	-1 – +1	457	E, S, G, Total
MSCI IVA	Common law	US	0 – 10	460	E, S, G, Total

Note: This table provides an overview of the ESG data providers which we use in this study. We list the name of the respective data provider (Data provider), the legal origin of each provider (Legal origin), the country in which the data provider has its origins (Origin), the rating scale used by the respective data provider (Rating scale), the average number of stocks per year in the sample for the total rating of each provider (Number of stocks (sample)), and the data dimensions (e.g., environmental, social, and governance) that are available from each provider. We refer to these data dimensions as Pillars.

Table 2: Descriptive statistics and correlations

	N	Mean	StdDev	Pearson correlations				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Asset4	Sust.	Inrate	Bloom.	KLD
Panel A: Total rating								
Asset4	26,313	0.501	0.289					
Sustainalytics	27,592	0.498	0.289	0.768				
Inrate	25,945	0.501	0.284	0.233	0.303			
Bloomberg	27,349	0.501	0.289	0.747	0.719	0.122		
KLD	27,434	0.501	0.288	0.587	0.619	0.290	0.537	
MSCI IVA	27,587	0.501	0.289	0.428	0.469	0.319	0.316	0.469
Average correlation						**0.462**		
Panel B: Environmental Pillar								
Asset4	26,245	0.501	0.289					
Sustainalytics	27,516	0.501	0.289	0.714				
Inrate	25,880	0.501	0.286	0.305	0.488			
Bloomberg	23,941	0.501	0.289	0.650	0.569	0.206		
KLD	27,423	0.501	0.280	0.643	0.659	0.422	0.481	
MSCI IVA	27,522	0.501	0.289	0.154	0.313	0.403	0.120	0.276
Average correlation						**0.427**		
Panel C: Social Pillar								
Asset4	26,313	0.501	0.289					
Sustainalytics	27,592	0.501	0.289	0.618				
Inrate	25,945	0.501	0.288	0.133	0.143			
Bloomberg	27,261	0.501	0.288	0.679	0.541	0.061		
KLD	27,434	0.501	0.288	0.392	0.423	0.128	0.297	
MSCI IVA	27,587	0.501	0.289	0.299	0.330	0.236	0.208	0.390
Average correlation						**0.325**		
Panel D: Governance Pillar								
Asset4	26,313	0.501	0.289					
Sustainalytics	27,592	0.505	0.289	0.315				
Inrate	25,945	0.501	0.283	0.297	0.401			
Bloomberg	27,349	0.501	0.284	0.413	0.361	0.343		
KLD	27,434	0.501	0.230	-0.026	-0.040	0.083	0.009	
MSCI IVA	27,587	0.501	0.288	0.155	0.139	0.144	0.049	0.174
Average correlation						**0.188**		

Note: This table shows summary statistics and Pearson correlations between the ratings of the six different data providers. The results are displayed in separate panels for the Total rating and the E, S, and G components. The first three columns show the descriptive statistics of the different ESG providers' ranked scores (number of observations (*N*), mean (*Mean)*, and standard deviation (*StdDev*)). The following columns display the cross-correlations. We also display the average correlation between providers all providers in the last row of each panel.

Table 3: Determinants of ESG rating disagreement

Dependent variable:	ESG rating disagreement			
	(1)	(2)	(3)	(4)
Pillars:	Total	Environmental	Social	Governance
Balance Sheet related				
TAN	-0.007	**-0.051**	-0.010	-0.018
	(-0.401)	**(-2.810)**	(-0.563)	(-1.013)
CR	0.017	-0.002	-0.001	0.011
	(1.295)	(-0.165)	(-0.040)	-1.083
LEV	-0.015	-0.017	0.005	-0.006
	(-1.222)	(-1.376)	(0.388)	(-0.601)
GP	**-0.038**	**-0.040**	-0.022	-0.015
	(-1.905)	**(-2.233)**	(-1.195)	(-0.889)
Industry				
HHI	0.024	0.017	0.002	-0.013
	(1.465)	(0.968)	(0.110)	(-0.980)
MSEG	-0.004	-0.002	-0.001	-0.005
	(-0.700)	(-0.379)	(-0.185)	(-1.004)
Investor Transparency				
NCR	**0.027**	-0.015	**0.025**	-0.013
	(2.328)	(-1.423)	**(2.550)**	(-1.513)
IO	0.002	0.009	-0.012	**-0.021**
	(0.158)	(0.749)	(-0.985)	**(-2.050)**
NoA	-0.011	-0.005	0.002	0.005
	(-0.990)	(-0.433)	(0.134)	(0.547)
StdDev	0.006	0.002	**0.021**	0.000
	(0.672)	(0.211)	**(2.110)**	(-0.004)
Valuation				
BM	0.015	-0.006	**0.033**	0.014
	(0.948)	(-0.381)	**(2.136)**	(1.128)
Price				
ME	**0.028**	0.011	**0.032**	**0.032**
	(1.845)	(0.804)	**(2.222)**	**(2.627)**
Momentum	-0.008	-0.005	-0.003	-0.008
	(-1.348)	(-0.913)	(-0.435)	(-1.543)
TVOL	-0.009	-0.004	-0.006	-0.007
	(-0.782)	(-0.329)	(-0.499)	(-0.737)
Fixed Effects	Yes	Yes	Yes	Yes
N	21,199	21,160	21,199	21,199
Adjusted R^2	0.063	0.078	0.061	0.052

Note: This table displays the results of pooled panel regressions in which ESG rating disagreement measured as the standard deviation of all firm level ratings available at a given point in time is regressed on observable firm characteristics. We use disagreement about the total rating (column 1) and the E, S, and G pillars separately (columns 2—4). The explanatory variables are the following: tangibility (*TAN*), current ratio (*CR*), leverage (*LEV*), gross profitability (*GP*) (Novy-Marx 2013), Herfindahl-Hirschman index (*HHI*), multisegment (*MSEG*), missing credit rating (*NCR*), institutional ownership (*IO*), number of analysts (*NoA*), the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (*StdDev*) (Diether et al. 2002), book-to-market (*BM*) (Fama and French 1995), market cap (*ME*) (Banz 1981), momentum (*MOM*) (Jegadeesh and Titman 1993), and total volatility (*TVOL*) (Ang et al. 2006). We also include industry-month fixed effects. *t*-statistics based on double clustered standard errors (month and firm) are reported in parentheses.

Table 4: Stock returns and ESG rating disagreement

Dependent Variable:	Returns			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel A: Total Pillar				
All	-0.291		-0.151	
	(-0.561)		(-0.787)	
Common		-0.372		-0.214
		(-1.066)		(-1.173)
Civil		0.214		0.116
		(0.580)		(0.614)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,913	25,913	25,913	25,913
Adjusted R^2	0.296	0.296	0.296	0.296
Panel B: Environmental Pillar				
All	**1.118**		0.341	
	(1.989)		(1.535)	
Common		0.475		0.224
		(1.315)		(1.155)
Civil		0.209		0.128
		(0.487)		(0.568)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,850	25,850	25,850	25,850
Adjusted R^2	0.297	0.297	0.297	0.297
Panel C: Social Pillar				
All	-0.318		-0.148	
	(-0.576)		(-0.714)	
Common		0.442		0.214
		(1.149)		(1.063)
Civil		**-0.917**		**-0.475**
		(-2.511)		**(-2.449)**
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,913	25,913	25,913	25,913
Adjusted R^2	0.296	0.297	0.296	0.297

Continued on next page

Table 4 (continued): Stock returns and ESG rating disagreement

Dependent Variable:	Returns			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel D: Governance Pillar				
All	-0.639		-0.282	
	(-1.100)		(-1.180)	
Common		**-0.819**		**-0.438**
		(-2.248)		**(-2.328)**
Civil		-0.089		-0.102
		(-0.260)		(-0.574)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,913	25,913	25,913	25,913
Adjusted R^2	0.296	0.297	0.296	0.297

Note: This table displays the results of pooled panel regressions of monthly stock returns on ESG rating disagreement. The results are separated into four panels: Panel A reports the results for disagreement in the total ESG rating and Panels B, C, and D for the E, S, and G pillar separately. The dependent variable *Returns* is the firm's monthly stock return. We use two ways of measuring ESG ratings disagreement. In columns 1 and 2, we use the standard deviation of ratings available for a given firm at a given point in time (*Std Dev*). In columns 3 and 4 we use the range between the highest and the lowest rating (*Range*). We calculate these disagreement measures using all ratings *(All)* and also separately using ratings issued only by data providers from civil law *(Civil)* or common-law *(Common)* countries. We also include industry-month fixed effects and control for standard characteristics that have been found to explain stock returns, namely market capitalization (Banz 1981), book-to-market (Fama and French 1995), gross profitability (Novy-Marx 2013), momentum (Jegadeesh and Titman 1993), the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (Diether et al. 2002), the firm's beta (Frazzini and Pedersen 2014), and total volatility (Ang et al. 2006). *t*-statistics based on double clustered standard errors (month and firm) are reported in parentheses.

Table 5: Role of the stock market cycle

Dependent variable:	Returns			
	(1)	(2)	(3)	(4)
Pillars:	Total	Environmental	Social	Governance
All	**-5.774**	**-4.081**	**-5.136**	**-5.277**
	(-3.823)	**(-2.925)**	**(-3.642)**	**(-4.072)**
All*Bull	**23.054**	**22.663**	**20.849**	**19.940**
	(10.019)	**(10.011)**	**(10.155)**	**(10.250)**
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Time FE	No	No	No	No
Observations	25,913	25,850	25,913	25,913
Adjusted R^2	0.085	0.088	0.088	0.090

Note: This table displays the results of pooled panel regressions of monthly stock returns on ESG rating disagreement. We interact the respective ESG rating disagreement variable with a *bull market dummy*. This dummy is set to one if the return of the S&P 500 index is above its 75th percentile. The table reports results for disagreement about the total rating in column (1) and the individual ESG pillars in columns 2–4. The dependent variable *Returns* is the firm's monthly stock return. We use the standard deviation of ratings available for a given firm at a given point in time to measure ratings disagreement. We calculate this disagreement measure using all ratings *(All)*. We also include industry fixed effects and control for standard characteristics that have been found to explain stock returns, namely market capitalization (Banz 1981), book-to-market (Fama and French 1995), gross profitability (Novy-Marx 2013), momentum (Jegadeesh and Titman 1993), the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (Diether et al. 2002), the firm's beta (Frazzini and Pedersen 2014), and total volatility (Ang et al. 2006). *t*-statistics based on double clustered standard errors are reported in parentheses.

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Appendix A: Sample selection, financial data, dataset matching and variable definitions

A.1 Sample selection

To test our hypotheses, we construct a representative and homogeneous sample over the longest possible time period. We face the challenge that the availability of ESG data is restricted in both the cross-section and the time-series. In other words, ESG data is often only available for the largest firms and for more recent years. To use a sample as homogeneous as possible and to maximize the number of available ESG ratings per firm, we restrict ourselves to firms belonging to the S&P 500 and consider a sample period of five years going from 2013 to 2017.

See Table A.1 for an overview of the variables used in this study.

[Table A.1 about here.]

A.2 Financial data

We use financial data from the Center for Research in Security Prices (CRSP) and accounting data from Standard & Poor's Compustat. For each stock, we calculate idiosyncratic volatility, total volatility, and the stock market beta at the end of each month using up to 250 daily observations (we require a minimum of 60 daily observations). We calculate market capitalization as (adjusted) total shares outstanding times stock price, both at the end of the month. The momentum signal at time t is calculated as the continuously compounded returns from month $t - 2$ to month $t - 12$. Book value of equity is the sum of shareholders' equity, deferred taxes and investment tax credit minus preferred stock.[21] Only firms with a positive book value are selected into the sample. Following Novy-Marx (2013), gross profitability is

[21] If available, we use the redemption value as preferred stock. Otherwise, we use the liquidating value or, if the liquidation value is also not available, the carrying value.

calculated as total revenues (revt) minus cost of goods sold (cogs), divided by total assets (at). In addition, we also match the dispersion in EPS forecasts for one year ahead earnings from IBES (Diether et al. 2002).

A.3 Dataset matching

A big challenge for constructing a dataset from many sub-datasets is to properly match the different datasets. We match on three identifiers: (1) CUSIP, (2) ISIN, and (3) company name. The CUSIP code is available for all providers, except Inrate.[22] However, since the ISIN code is available for Inrate, we extract the CUSIP code from the ISIN code. Note also, that we only use the first six CUSIP characters for matching (known as the *issuer* identifier). The characters seven and eight identify the specific issue (for example *10* indicates common equity), and the ninth character is a check digit. The ISIN code is available for all providers except MSCI KLD. For the CRSP/Compustat data we retrieve the ISIN number from the CUSIP code and the current ISO country code of incorporation (fic).[23] To do the merge with the company names, we first convert the original names of the providers, by using some commonly used abbreviations to avoid rather trivial mismatches. We use the unique union of all three matching procedures to compile our sample.

To construct the sample, we also require that at least two rating observations for each *legal origin* be available for each company. This choice provides us with an internally consistent sample, and, in addition, it is not overly restrictive.

[22] For the MSCI KLD dataset there seems to be some issues with the CUSIP code. The codes do not always have the same number of characters, and it seems that leading zeros are often truncated. Therefore, we re-fill leading zeros if the number of characters is less than eight. Then we add the self-computed check digit to the code if the eighth number is not the would-be check digit if there would be an additional leading zero (in that case we add a leading zero) or the last two characters consist of commonly used issue codes.

[23] For US stocks the ISIN number is composed of the country code (first two characters), the CUSIP code (characters three to eleven), and a check digit.

In addition, we use a monthly frequency for our sample. Asset 4, Sustainalytics and MSCI IVA already provide data at a monthly frequency; Inrate provides ratings update on a semi-annual basis for the years 2015 and 2016; and Bloomberg and MSCI KLD provide data on a yearly frequency. To convert from a semi-annual or annual frequency, we simply use the respective annual or semi-annual value for the whole time period. Note that most ratings (also for the providers with a monthly frequency) change rather infrequently, with most ratings being constant for about one year, but also for longer periods.[24]

[24] Since the providers change their ratings at different points in time, we argue that for our purposes it makes sense to use a monthly frequency.

Table A.1: Variables Overview

Variables	Description	Details	Source
ESG rating disagreement variables			
Std Dev - All	standard deviation of all firm-level ratings	To compute standard deviations, we adjust the raw ratings as follows: we calculate the percentile ranks and use these as adjusted scores.	Thomson Reuters/Refinitiv, Sustainalytics, Inrate, Bloomberg, MSCI
Std Dev - Common	standard deviation of firm-level ratings from common law providers	To compute standard deviations, we adjust the raw ratings as follows: we calculate the percentile ranks and use these as adjusted scores.	Bloomberg, MSCI
Std Dev - Civil	standard deviation of firm-level ratings from civil law providers	To compute standard deviations, we adjust the raw ratings as follows: we calculate the percentile ranks and use these as adjusted scores.	Thomson Reuters/Refinitiv, Sustainalytics, Inrate
Range - All	range of all firm-level ratings	To compute ranges, we adjust the raw ratings as follows: we calculate the percentile ranks and use these as adjusted scores.	Thomson Reuters/Refinitiv, Sustainalytics, Inrate, Bloomberg, MSCI
Range - Common	range of firm-level ratings from common law providers	To compute ranges, we adjust the raw ratings as follows: we calculate the percentile ranks and use these as adjusted scores.	Bloomberg, MSCI
Range - Civil	range of firm-level ratings from civil law providers	To compute ranges, we adjust the raw ratings as follows: we calculate the percentile ranks and use these as adjusted scores.	Thomson Reuters/Refinitiv, Sustainalytics, Inrate
Additional independent variable(s)			
Return	Stock returns	Monthly stock returns	CRSP
Control variables			
TAN	Tangibility	Property, plant, and equipment (PPENT) divided by total Assets (AT).	Compustat
CR	Current Ratio	Current assets (ACT) divided by current liabilities (LCT).	Compustat
LEV	Leverage	Long term debt (DLTT) plus debt in current liabilities (DLC) divided by total assets (AT).	Compustat
GP	Gross Profitability	Revenues (REVT) minus costs of goods sold (COGS) divided by Total Assets (AT).	Compustat
HHI	Herfindahl-Hirschman Index (HHI) based on book equity	The HHI measures industry concentration, by using book equity and the 2-digit SIC level.	Compustat
MSEG	Multi-Segment	Dummy variable, which is one if the firm operates in more than one segment.	Compustat Segments Data
NCR	Missing Credit Rating	Dummy variable, which is one if there is no credit rating available.	Compustat Company S&P Credit Ratings
IO	Institutional Ownership	Percentage of institutional ownership.	Thomson Reuters Institutional (13f) Holdings
NoA	Number of Analysts	Number of analysts, based on IBES summary files.	IBES
StdDev	Dispersion of analyst forecasts of the firm's one year ahead earnings forecasts	Dispersion of analyst forecasts of the firm's one year ahead earnings forecasts, measured by standard deviation.	IBES
BM	Book-to-Market Ratio	Book equity (shareholders' equity (SEQ) plus deferred taxes (TXDB) plus investment tax credit (ITCB) minus preferred stock (which is either redemption value (PSTKRV), liquidation value (PSTKL) or carrying value (PSTK), based on availability)) divided by Market Capitalization.	Compustat, CRSP
ME	Market Capitalization	Absolute value of stock price (PRC) times shares outstanding (SHROUT).	CRSP

Momentum	Momentum	Cumulative returns of the most recent 12 month, excluding the most recent one for each firm (from month t-12 to t-2).	CRSP

Continued on next page

Table A.1 (continued): Variables Overview

Variables	Description	Details	Source
Control variables			
TVOL	Total Volatility	Standard Deviation computed from the most recent 250 daily return observations.	CRSP
Beta	Firm's beta	Market beta computed from the most recent 250 daily return observations.	CRSP
Bull	Bull Market Dummy	Dummy variable, which is one if the return of the S&P 500 index is above its 75th percentile.	CRSP
Downside risk measures			
LPM	Lower partial moment (log-transformed)	The lower partial moment is the square root of the standard deviation of the negative return part of the distribution. For details, see Hoepner et al. (2019).	CRSP
VaR	Value at Risk	Value at Risk is measured at the firm-month level by calculating daily return outcomes ranked in the bottom fifth percentile (see, Hoepner et al. 2019).	CRSP

Note: This table provides an overview of the variables used in this study. We classify the variables into four groups: ESG rating disagreement variables, additional independent variable(s), control variables and downside risk measures.

Appendix B: Volatility, downside risk measures, and ESG ratings disagreement

Table B.1: Risk and ESG rating disagreement

Dependent variable:	Risk (Volatility)			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel A: Total Pillar				
All	0.075		0.010	
	(0.621)		(0.219)	
Common		0.055		0.033
		(0.723)		(0.803)
Civil		0.011		-0.009
		(0.137)		(-0.210)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.417	0.418	0.417	0.418
Panel B: Environmental Pillar				
All	-0.050		-0.022	
	(-0.397)		(-0.452)	
Common		-0.090		-0.049
		(-1.118)		(-1.107)
Civil		0.069		0.017
		(0.822)		(0.383)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,860	25,860	25,860	25,860
Adjusted R^2	0.418	0.419	0.418	0.419
Panel C: Social Pillar				
All	0.081		0.021	
	(0.740)		(0.498)	
Common		0.052		0.024
		(0.766)		(0.672)
Civil		0.006		-0.010
		(0.081)		(-0.235)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.418	0.418	0.417	0.417

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Table B.1 (continued): Risk and ESG rating disagreement

Dependent variable:	Risk (Volatility)			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel D: Governance Pillar				
All	-0.012		-0.011	
	(-0.109)		(-0.268)	
Common		-0.018		-0.017
		(-0.266)		(-0.492)
Civil		-0.112		**-0.078**
		(-1.593)		**(-2.126)**
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.417	0.419	0.417	0.420

Note: This table displays the results of pooled panel regressions of the monthly stock return volatility on ESG rating disagreement. The results are separated into four panels: Panel A reports the results for the total ESG rating and Panels B, C, and D report results for the E, S, and G pillar separately. The dependent variable *Risk (Volatility)* is total volatility log transformed. We use two ways of measuring ESG ratings disagreement. In columns 1 and 2, we use the standard deviation of ratings available for a given firm at a given point in time (*Std Dev*). In columns 3 and 4 we use the range between the highest and the lowest rating (*Range*). We calculate these disagreement measures using all ratings *(All)* and also separately using ratings issued only by data providers from civil law *(Civil)* or common-law *(Common)* countries. We also include industry-month fixed effects and control for standard characteristics that have been found to explain stock returns, namely market capitalization (Banz 1981), book-to-market (Fama and French 1995), gross profitability (Novy-Marx 2013), momentum (Jegadeesh and Titman 1993), and the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (Diether et al. 2002). *t*-statistics based on double clustered standard errors (month and firm) are reported in parentheses.

Table B.2: LPM and ESG rating disagreement

Dependent variable:	LPM			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel A: Total Pillar				
All	0.105		0.024	
	(0.927)		(0.553)	
Common		0.074		0.040
		(1.005)		(1.016)
Civil		0.020		0.001
		(0.239)		(0.012)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.415	0.415	0.414	0.415
Panel B: Environmental Pillar				
All	-0.038		-0.011	
	(-0.310)		(-0.242)	
Common		-0.081		-0.043
		(-1.030)		(-1.007)
Civil		0.040		0.004
		(0.472)		(0.083)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,860	25,860	25,860	25,860
Adjusted R^2	0.415	0.415	0.415	0.415
Panel C: Social Pillar				
All	0.082		0.031	
	(0.752)		(0.716)	
Common		0.025		0.011
		(0.374)		(0.304)
Civil		0.033		0.010
		(0.423)		(0.232)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.415	0.414	0.415	0.414

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Table B.2 (continued): LPM and ESG rating disagreement

Dependent variable:	LPM			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel D: Governance Pillar				
All	0.038		0.012	
	(0.332)		(0.278)	
Common		-0.022		-0.02
		(-0.320)		(-0.561)
Civil		-0.084		-0.059
		(-1.183)		(-1.562)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.414	0.415	0.414	0.415

Note: This table displays the results of pooled panel regressions of the monthly lower partial moment(LPM) on ESG rating disagreement. The results are separated into four panels: Panel A reports the results for the total ESG rating and Panels B, C, and D report results for the E, S, and G pillar separately. The dependent variable *LPM* is the monthly lower partial moment log transformed. We use two ways of measuring ESG ratings disagreement. In columns 1 and 2, we use the standard deviation of ratings available for a given firm at a given point in time (*Std Dev*). In columns 3 and 4 we use the range between the highest and the lowest rating (*Range*). We calculate these disagreement measures using all ratings *(All)* and also separately using ratings issued only by data providers from civil law *(Civil)* or common-law *(Common)* countries. We also include industry-month fixed effects and control for standard characteristics that have been found to explain stock returns, namely market capitalization (Banz 1981), book-to-market (Fama and French 1995), gross profitability (Novy-Marx 2013), momentum (Jegadeesh and Titman 1993), and the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (Diether et al. 2002). *t*-statistics based on double clustered standard errors (month and firm) are reported in parentheses.

Table B.3: VaR and ESG rating disagreement

Dependent variable:	VaR			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel A: Total Pillar				
All	-0.003		-0.001	
	(-1.179)		(-0.897)	
Common		-0.002		-0.001
		(-0.972)		(-1.138)
Civil		-0.001		-0.000
		(-0.615)		(-0.336)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.459	0.459	0.458	0.459
Panel B: Environmental Pillar				
All	0.001		0.001	
	(0.402)		(0.594)	
Common		0.002		0.001
		(0.843)		(0.858)
Civil		-0.002		-0.000
		(-0.804)		(-0.418)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,860	25,860	25,860	25,860
Adjusted R^2	0.458	0.459	0.459	0.459
Panel C: Social Pillar				
All	-0.004		-0.001	
	(-1.406)		(-1.237)	
Common		-0.002		-0.001
		(-1.492)		(-1.438)
Civil		-0.000		-0.000
		(-0.232)		(-0.023)
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.459	0.459	0.459	0.459

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Table B.3 (continued): VaR and ESG rating disagreement

Dependent variable:	VaR			
	(1)	(2)	(3)	(4)
Main explanatory variables:	Std Dev		Range	
Panel D: Governance Pillar				
All	0.001		0.001	
	(0.374)		(0.572)	
Common		0.000		0.000
		(0.101)		(0.240)
Civil		**0.003**		**0.002**
		(1.817)		**(2.432)**
Controls	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
N	25,924	25,924	25,924	25,924
Adjusted R^2	0.458	0.459	0.458	0.460

Note: This table displays the results of pooled panel regressions of the monthly value at risk (VaR) on ESG rating disagreement. The results are separated into four panels: Panel A reports the results for the total ESG rating and Panels B, C, and D report results for the E, S, and G pillar separately. The dependent variable VaR is the monthly value at risk. We use two ways of measuring ESG ratings disagreement. In columns 1 and 2, we use the standard deviation of ratings available for a given firm at a given point in time (*Std Dev*). In columns 3 and 4 we use the range between the highest and the lowest rating (*Range*). We calculate these disagreement measures using all ratings *(All)* and also separately using ratings issued only by data providers from civil law *(Civil)* or common-law *(Common)* countries. We also include industry-month fixed effects and control for standard characteristics that have been found to explain stock returns, namely market capitalization (Banz 1981), book-to-market (Fama and French 1995), gross profitability (Novy-Marx 2013), momentum (Jegadeesh and Titman 1993), and the dispersion of analyst forecasts of the firm's one year ahead earnings forecasts (Diether et al. 2002). *t*-statistics based on double clustered standard errors (month and firm) are reported in parentheses.

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