A Practical Approach to Incorporating ESG Risk Into Equity Valuation

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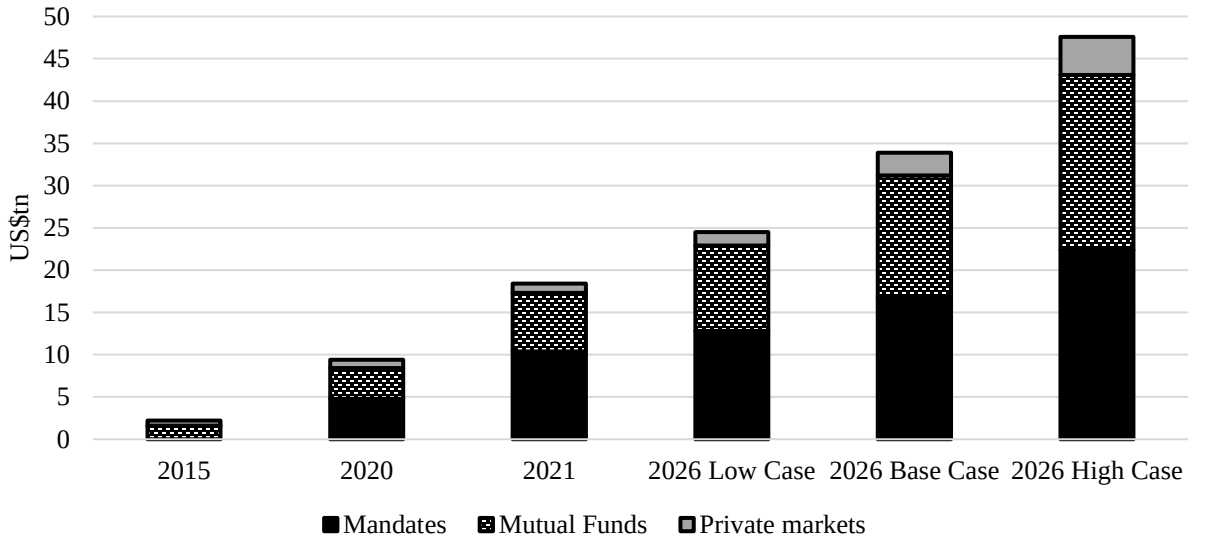
The rise in the capital allocated and investor focus attributed to ESG investing over the past several years has been significant. However, the current literature is not settled regarding the value that ESG risk measures and reporting has on investments and valuations. If this risk is essential, then this risk should be incorporated to account for the presence or the lack of ESG-related risk in valuation models. However, with the relative newness and difficulty of quantifying ESG risk, there is little practical guidance on incorporating this risk into valuation estimates. We provide evidence that ESG-related risk scores are positively associated with the cost of equity. Building upon that result, we operationalize the positive relationship to adjust the cost of equity in free cash flow to equity valuation models. Firms with higher ESG risk have a higher required return, while firms with lower ESG risk have a lower discount rate. Our approach is a practical guide for investors and analysts to account for ESG risk adjustments in valuation models.

Keywords: ESG, equity analysis, equity valuation, free cash flow to equity, valuation methods

INTRODUCTION

Environmental, Social, and Governance (ESG) related funds have seen significant inflows over the last decade. ESG-related investments have grown by approximately 700% from 2015 to 2021 (PWC, 2022). As of 2021, global ESG-related funds accounted for $18.4 trillion in assets under management, with growth expected to outpace the average growth of the investment industry. The value of ESG-related investment could reach approximately $34 trillion by 2026 in the base case. PWC estimates that ESG-related investments could be between $24.40 and $47.60 trillion in the world's low- and high-state, respectively.

FIGURE 1
GROWTH OF ESG INVESTING



This rapid increase in capital allocated to ESG-related funds has led to investment entities assigning ESG risk scores to firms and making them accessible to the investor. These scores attempt to quantify how socially responsible a firm is and help the investor allocate capital in line with ideas that may be important to them. These scores have many implications for company management, shareholders, and equity analysts. However, a significant omission regarding ESG risk scores and investment is the lack of clarity on how to incorporate the risk scores into investment valuation. Currently, the scores give a numeric value and attempt to quantify the ESG risk of the firm. However, they fail to help investors understand if the security being analyzed is under, correctly, or overvalued regarding relevant investment valuation models. Incorporating ESG risk into financial valuation models could prove helpful and provide more insight into this decision-making process. In this paper, we utilize readily available ESG risk scores and incorporate these scores into the cost of equity to better value a firm for ESG risk conscious investor.

ESG risk, if actual risk, should be important considerations for an investor to make regarding the valuation of securities when deciding whether to purchase equity. In building a framework to incorporate ESG-related risk score metrics into valuation models, we analyze this using two separate but equivalent approaches to adjust the valuation of equities to reflect ESG risk. We estimate cross-sectional regressions to estimate the cost of equity adjustment for high ESG risk securities and low ESG risk securities. This empirical approach allows one to quantify the risk that should be added (or subtracted) to the cost of equity for valuation models for High (Low) ESG risk equity values.

The practical approach and econometric modeling we present help fill the void left by the current literature and provides a model that allows investors to account for ESG risk by adjusting the cost of equity from the capital asset pricing (CAPM) model. In the cost of equity and ESG Risk model, we control for firm size, leverage, and industry fixed effects. The results of the model estimates support the model's validity. The company's equity cost decreases as the firm's size increases (or vice versa). Leverage is positively associated with the cost of equity. We find that higher ESG risk scores result in a higher cost of equity, supporting the notion that ESG risk should influence the cost of equity. In the ESG risk model, there is a significant positive relationship with the cost of equity, approximately 34 basis points. Thus, in valuation models for High ESG Risk related firms, one should increase the cost of equity by 34 basis points while lowering it by 34 basis points for Low ESG Risk related firms.

In this paper, we contribute to the current literature by providing a practical application to incorporating ESG risk into asset valuation. Our approach allows one to incorporate ESG risk into valuation models instead of sorting or investing in firms based solely on their ESG scores. The premise of investing recommendations is predicated on valuation. The application to include ESG-related risk provided in this research is agnostic as to whether investors should invest in lower or higher ESG risk firms. The process allows one to account for the presence or the lack of ESG-related risk in their valuation models by estimating the value considering this potential risk, providing a valuation estimate that reflects risk that may be important to an investor.

The organization of this research proceeds as follows. Section 2 explores ESG investment-related literature. Section 3 describes the sample and empirical methods. Section 4 presents and discusses the findings of the models. Finally, Section 5 concludes the study.

LITERATURE AND HYPOTHESIS DEVELOPMENT

The current literature regarding ESG investing, or socially responsible investing (SRI), tends to focus on these risks' positive or negative aspects. This vast literature has yet to reach a consensus, and we attempt to shed light on all facets of the literature. For a survey related to this literature, please see Rau and Yu (2023). First, we review the parts of the literature that show positive aspects related to ESG investing, followed by the drawbacks (or negatives) that have been identified. We then discuss the potential issues identified in the literature with the data available to investors. Finally, we present a hypothesis related to the ESG-related risk of a firm and its relationship to the required rate of return for equity investors.

Several studies find that SRI (i.e., less ESG risk) conscious firms exhibit better or equal performance compared to non-SRI firms (i.e., high ESG risk). First, Hamilton et al. (1993) show that Jensen's alpha of a portfolio of 32 SRI-related funds was not significantly different than that of conventional funds. Hamilton et al. conclude that *"investors can expect to lose nothing by investing in socially responsible funds."* Comparing two equity portfolios that differ in their levels of eco-efficiency, Derwall et al. (2005) find that the stock portfolio consisting of the "most eco-efficient" firms outperformed the less eco-efficient portfolio from 1995 to 2003. Next, Kempf and Osthoff (2007) examine the effect of SRI on portfolio performance based on the SRI ratings provided by KLD Research & Analytics. Kempf and Osthoff utilize a trading strategy that buys securities with high SRI scores (low ESG risk) and sells securities with low SRI scores (high ESG risk) from 1992 through 2004. This strategy yielded an abnormal return of 8.7% per year. Using an international database of ethical mutual funds, Bauer et al. (2005) find that ethical funds do not perform worse than conventional funds. In a 2016 letter to corporate leaders, Larry Fink, CEO of BlackRock, stated his belief that ESG risks are quantifiable and financially impactful (BlackRock, 2016). Dyck et al. (2019) confirm that ESG benefits can manifest in better stock performance (i.e., higher firm valuation). Long-term institutional investors tend to tilt their portfolios to firms with lower ESG-related risk or better ESG metrics (Starks et al., 2017). Firms with better measures of CSR intensity experienced better performance during the 2008-2009 financial crisis than low CSR firms (Lins et al., 2017).

The positives of ESG-related investing manifest not just in the performance of the investment but also in other aspects that can impact the performance of the securities. El Ghoul et al. (2011) find that firms with better CSR performance exhibit a lower cost of equity capital. This lower equity cost is logical as firms with lower risk should exhibit lower costs of capital. Cheng et al. (2014) show that firms with better CSR performance have fewer capital constraints. They argue that enhanced stakeholder engagement and increased transparency reduce capital constraints. Having better quantity and quality of CSR information can lead to higher liquidity, lower costs of capital, and superior capital allocation (Christensen et al., 2019). ESG practices can also help attract and retain a workforce (Greening & Turban, 2000) and foster better customer relations. Better ESG practices can also offer insurance against event risk such as stock price crash risk (Kim et al., 2014).

However, there is an argument that ESG investing is costly and does not cover the costs of its actions. Research focusing on the returns for "sin" stocks in the tobacco, alcohol, weapons, or gambling industries experience higher expected returns than comparable stocks outside of those sectors (Dimson et al., 2020;

Fabozzi et al., 2008; Hong & Kacperczyk, 2009). Similarly, firms with higher carbon emissions exhibit higher returns (Bolton & Kacperczyk, 2021). On a mutual fund level, Renneboog et al. (2008) find that SRI mutual funds from around the world underperform domestic benchmarks. Additionally, if investors chose to completely divest from companies that supply an undesirable product or behavior, this would eliminate significant exposure to companies and industries in the S&P 500 (Regan & Love, 1985).

Significant other issues have also been identified with the rise of ESG. The quality of ESG data can be challenging to quantify. As ESG disclosure requirements have increased, many firms have published their own ESG Reports. These reports have led to accusations of "greenwashing" and pose questions about the data's quality and reliability. Companies have an incentive to be selective or overstate their ESG practices, resulting in greenwashing (Delmas & Burbano, 2011). For example, Dai et al. (2021) show that U.S. firms reduce their carbon footprints by outsourcing carbon emissions to foreign entities. There is also evidence of a lack of agreement between ESG rating scores (Berg et al., 2022; Chatterji et al., 2016; Gibson et al., 2021). This lack of agreement is understandable as there is no specific formula to quantify the risk associated with the firm, such as a credit score. Currently, there are no set requirements for what exemplifies an ESG stock.

The current literature regarding ESG risk provides evidence of several positives and negatives related to investment or security performance. However, the literature is absent on how one would attempt to incorporate ESG risk into a firm's valuation. This inability to incorporate this risk into valuations is one of the major challenges facing ESG-related investing that Starks (2021) identifies. A common approach in the industry to estimate a firm's value is the discounted value approach, such as the free cash flow to equity (FCFE) valuation model (Pinto et al., 2019). Using FCFF presents two possibilities for incorporating ESG risk into the valuation model. The first is forecasting how the ESG risk will affect future cash flows. The other is via the discount rate of those cash flows. Our approach focuses on the latter and alters the discount rate by incorporating ESG risk (or lack of) into the firm's cost of equity. This approach allows us to fill the void in the current literature by making a simple adjustment to CAPM. It allows investors to derive a firm's valuation that incorporates a firm's ESG risk.

The goal of this study is to provide a practical approach for investors to be able to include adjustments to the discount rate (i.e., cost of equity) in free cash flow to equity holders' valuation model to help individuals determine if the security is under, correctly, or overpriced relative to their valuation models. Before this can be done, the relationship between ESG risk and the cost of equity needs to be investigated. If there is no relationship, then it will be tough to establish an ESG risk adjustment to the cost of equity from an econometric standpoint. If ESG risk, in fact, is risk that impacts valuation through the discount rate, then as the level of ESG risk increases, the COE should also increase. This logic leads to the central hypothesis:

H1. *ESG Risk Scores are positively related to the cost of equity.*

SAMPLE AND METHODS

We use a Bloomberg Terminal security screen search to collect ESG risk scores and relevant firm characteristics for collecting data for our practical approach to incorporating ESG risk scores into security valuation. The data collection process is as follows, we use the equity stock screener (EQS) to collect a sample of firms that currently have an active trading status and are a member of the Russell 3000 Index. We then collect the Sustainalytics ESG Risk Score, cost of equity (COE), leverage (debt divided by assets), sector identifier, and firm size (natural log of total assets) as provided by Bloomberg.[1]

Our final sample of firms consists of 927 observations. 16.29% of the sample are firms from the industrial industry. Financial companies make up approximately 16.29% of the sample. The third most common sector is information technology, accounting for 13.48% of the sample. In comparison, the three smallest sectors are energy, communication services, and utilities as they each comprise 4.21% (39 firm observations) of the final sample.

TABLE 1
SAMPLE DISTRIBUTION BY INDUSTRY

Industry Classification	N
Energy	39
Materials	57
Industrials	151
Consumer Disc.	103
Consumer Staples	54
Health Care	107
Financials	149
Information Technology	125
Comm. Services	39
Utilities	39
Real Estate	64
Total	*927*

Sustainalytics (2022), a subsidiary of Morningstar, calculates ESG risk scores using a comprehensive approach that considers a range of factors. Information from multiple sources, including media coverage, company disclosures (e.g., 10Ks, 10Qs, and ESG reports), and stakeholder engagement, influence these factors. The process begins by assessing corporate governance, crucial in determining a firm's potential exposure to material ESG risk. Companies with weaker governance are more likely to face such risk. Material ESG issues focus on specific topics such as employee recruitment, diversity, and labor practices. Sustainalytics also incorporates idiosyncratic risk driven by unpredictable events into their ESG risk scores.

Sustainalytics assigns a subindustry exposure score to reflect a company's ESG exposure within its industry. Then they estimate issue betas to measure the company's specific exposure to each ESG issue. Sustainalytics multiplies the subindustry exposure score with the company's issue beta resulting in the firm's exposure score. The final ESG risk score considers manageable, managed, and unmanaged risk exposures. The score represents the level of unmanaged ESG risk a company faces, indicating the extent to which material ESG risk has not been addressed or mitigated. ESG risk scores range from 0 to 100. A score of 0 suggests negligible ESG risk, while a score of 100 signifies extreme ESG risk.

Table 2 reports the descriptive statistics for the sample. The average ESG Risk score for the sample is 22.44 with a standard deviation of 7.47. The lowest ESG Risk score found in the sample is 6.75 with the highest being 54.97. The average COE for the sample is 9.68% with the average leverage being 31.01%.

TABLE 2
DESCRIPTIVE STATISTICS

	Mean	Median	Min	Max	Std. Dev.	Skewness	Kurtosis
COE	9.6804	9.3990	5.8910	20.3800	1.8071	1.3382	6.9104
ESG Risk Score	22.4398	22.1953	6.7457	54.9709	7.4740	0.6843	3.7160
Leverage	31.0074	30.1160	0.0000	85.0495	18.3834	0.2927	2.5657
Size	23.4221	23.3098	18.8856	28.9301	1.4109	0.5118	3.5408

The dependent variable in the main analysis is the *COE*. Cost of equity (*COE*) is measured as the weighted average cost of capital (WACC) cost of equity. *COE* is used as the discount rate in FCFE valuation models. The main independent variable in the test of H1 is labeled as *ESG Score*. *ESG Score* is the ESG risk score that Sustainalytics estimates. In the cross-sectional regression, we control for leverage, firm size, and industry fixed effects. *Leverage* is defined as the amount of total debt divided by total assets. The *Size* of the firm should have a negative relationship to the cost of equity (e.g., Archer & Faerber, 1966; Alberts & Archer, 1973). *Size* is defined as the natural logarithm of the firm's total assets. One would expect

Leverage that as the leverage of the firm increases the COE should increase as well (e.g., Solomon, 1963; Davenport, 1971). Lastly, we control for industry specific effects by estimated industry fixed effects as the industry in which a firm is a component can directly impact the firm's cost of equity. We estimate the following cross-sectional regression to test the main hypothesis (H1):

$$COE_i = \alpha_i + \beta_1 ESG\ Risk\ Score_{\ i} + \beta_2 Leverage_i + \beta_3 Size_i + \beta` X_i + \varepsilon_i \quad (1)$$

where α_i is the intercept, X_i is a vector of industry control variables, and ε_i is the error term.

The Capital Asset Pricing Model (CAPM) is often used to estimate the discount rate (or cost of equity) for FCFE valuation models. The CAPM equation adds the risk-free rate to a beta value that is multiplied by the market risk premium. The market risk premium is calculated by subtracting the risk-free rate from the return on the market. Beta is a measure of systematic risk. CAPM in equation form is as follows:

$$COE = r_f + \beta_i(r_{mkt} - r_f) \quad (2)$$

We operationalize CAPM and suggest a minor adjustment to account for ESG risk in the cost of equity. Gibson et al. (2021) suggest analysts should adjust the cost of equity to reflect ESG risk disagreements. If a firm has significant ESG risk, then the cost of equity should increase appropriately in the valuation model. Likewise, if a firm has minimal ESG risk then the firm can be seen as having less risk overall and this should be reflected in its' COE. We alter CAPM in Model 2 to incorporate an ESG risk adjustment as follows:

$$COE = r_f + \beta_i\left(r_{mkt} - r_f\right) \pm ESG\ Risk_{Adjustment} \quad (3)$$

Now that we have identified a COE model with an ESG risk adjustment, we need to be able to estimate the appropriate ESG Risk Adjustment value to calculate a COE to be used in FCFE valuation models. We make a simple adjustment to use when estimating valuation models for a firm with a high level of ESG risk. Defining high ESG risk can be challenging and thus we propose a simple and practical approach, if the firm's ESG Risk Score is greater than the median of the firms in the sample it will be identified as a *High ESG* firm. The High ESG variable is a binary in nature and takes the value of one if the firm's ESG Risk Score is greater than the median ESG Risk Score, and zero otherwise. To estimate this High ESG risk adjustment value to include in Model 3, we estimate the following:

$$COE_i = \alpha_i + \beta_1\ High\ ESG + \beta` X_i + \varepsilon_i \quad (4)$$

where α_i is the intercept, X_i is a vector of control variables including *Size*, *Leverage*, and industry controls, and ε_i is the error term. β_1 provides the adjustment that needs to be made to the COE for firms with a high level of ESG risk.

Likewise, one may want to make an adjustment to the COE for a firm that has nonmaterial ESG risk when estimating a security's value. This is consistent with El Ghoul et al. (2011) where firms with better CSR ratings exhibit a lower cost of equity. In this instance, we define low ESG risk firms as those with ESG Risk Scores less than the median score of the firms in the sample. The *Low ESG* variable is a binary in nature and takes the value of one if the firm's ESG Risk Score is less than the median ESG Risk Score, and zero otherwise. To estimate the Low ESG risk adjustment value to include in Model 3, we estimate the following:

$$COE_i = \alpha_i + \beta_1\ Low\ ESG + \beta` X_i + \varepsilon_i \quad (5)$$

where α_i is the intercept, X_i is a vector of control variables including *Size*, *Leverage*, and industry controls, and ε_i is the error term. β_1 provides the adjustment that needs to be made to the COE for firms with a low level of ESG risk.

RESULTS AND DISCUSSION

The results associated with H1 appear in Table 3. The coefficient for ESG Risk Score is statistically significant ($p < 0.01$) and positive. This finding supports H1 and provides evidence that ESG-related risk is positively associated with the COE of a firm. One can interpret the coefficient of 0.0260 for *the ESG Risk Score* as for each unit that the firm's ESG risk score increases, the estimated cost of equity for the firm increases by 2.6 basis points after controlling for other variables that impact the cost of equity. As expected, *Size* is statistically significant and negative, and *Leverage* has a significantly positive relationship with the *COE*. The results in Table 3 provide support that ESG risk is positively associated with a firm's COE. This result allows us to continue and provide a practical approach to including ESG risk in equity valuation models such as the FCFE model.

TABLE 3
ESG RISK SCORE REGRESSION ANALYSIS

	Coefficient	
ESG Risk Score	0.0260***	(0.0086)
Leverage	0.0072**	(0.0032)
Size	-0.2847***	(0.0421)
Constant	15.1728***	(1.0254)
Industry fixed effects	Yes	
Adj. R-squared	0.2291	
No. observations	927	
F-Statistic	22.1642***	

Next, we establish a baseline example that includes the basic assumptions and the current method used to estimate the value of a firm's equity without any ESG adjustment. The base case uses the standard CAPM equation and does not account for ESG-related risk. The base assumption for our hypothetical firm is that in Year 0, the firm had FCFE of $2.00 with an initial growth rate of 12%.[2] Using an H-Model for valuation with an annual growth de-escalation rate of 1% down to a terminal growth rate of 2% over ten years. We will also use the following assumptions for illustrative purposes: a risk-free rate of 4%, a beta of 1, and a market risk premium of 6%. This results in a required rate of return of 10%. This assumption, not accounting for ESG-related risk, gives our base firm's equity an estimated value of $39.25.[3] Thus, if the current market price was significantly lower than $39.25, then an investor would assume that the firm is potentially undervalued and reflect a buy recommendation. Conversely, if the current price for the stock was significantly higher than $39.25, an investor could believe that the security is overvalued and reflect a sell recommendation. Ultimately, this estimated value provides the investor insight that incorporates essential valuation assumptions but does not incorporate ESG-related risk.

TABLE 4
TYPICAL COMPANY FCFE VALUATION ((NO ESG RISK ADJUSTMENT)

FCFE Assumptions	
Year 0 FCFE	$2.00
Initial growth rate	12.00%
Growth de-escalation rate	1.00%
Terminal growth rate	2.00%
Risk-free rate	4.00%
Firm beta	1.00
Market risk premium	6.00%
ESG risk adjustment	-
CAPM required rate of return	10.00%

Year	***forecasted* Growth Rate**	***forecasted* FCFE**	**PV of *forecasted* FCFE**	**Valuation**
Year 1	12.00%	$2.24	$2.04	**$39.25**
Year 2	11.00%	$2.49	$2.05	
Year 3	10.00%	$2.74	$2.05	
Year 4	9.00%	$2.98	$2.04	
Year 5	8.00%	$3.22	$2.00	
Year 6	7.00%	$3.45	$1.94	
Year 7	6.00%	$3.65	$1.87	
Year 8	5.00%	$3.83	$1.79	
Year 9	4.00%	$3.99	$1.69	
Year 10	3.00%	$4.11	$1.58	
Horizon Value in Year 10			$20.19	
Year 11 (Horizon Year)	2.00%	$4.19	$52.37	

After providing an example of what is currently done in practice with valuation models using a required rate of return on equity, we now move on to incorporating adjustments reflecting ESG-related risk to the firm. The first case of incorporating ESG risk focuses on firms with relatively high ESG-related risk. We estimate Equation (4) to obtain how much one should adjust the required return for equity to reflect the higher risk. In the high-case model, high ESG risk is identified as firms with an ESG risk score above the median. The *High ESG Risk Score* estimate is positive and statistically significant ($p < 0.01$). This positive coefficient suggests that firms with higher ESG risk should have a higher COE. The interpretation of the 0.3383 coefficient estimate is that a firm with ESG risk greater than the median in the sample exhibits a required return rate that is approximately 34 basis points higher. The control variables are significant, and the expected signs.

TABLE 5
HIGH ESG RISK REGRESSION ANALYSIS

	Coefficient	
High ESG Risk	0.3383***	(0.1170)
Leverage	0.0070**	(0.0032)
Size	-0.2921***	(0.0421)
Constant	15.1745***	(1.0080)
Industry fixed effects	Yes	
Adj. R-squared	0.2284	
No. observations	927	
F-Statistic	22.0812***	

Now that we have an estimate of how much to adjust the COE for the FCFE model to reflect a firm with significant ESG risk, we can modify our base model (Table 4) to incorporate ESG-related risk into an FCFE valuation model. The model maintains the prior assumptions but adjusts the required rate of return to reflect the higher ESG risk.[4] We maintain the following assumptions, a risk-free rate of 4%, a beta of 1, a market risk premium of 6%, and the addition of 0.3383% reflecting ESG risk from Table 5. This results in a required rate of return of 10.34%. This increase in the required rate of return reflects more significant ESG-related risk and results in a valuation of $37.54.[5] Relative to the baseline model, the estimated value is approximately $1.71 lower. This lower value provides the fair value estimate to compensate an investor for the ESG-related risk associated with the firm. If the current market price is significantly lower than $37.54, an investor could conclude that the firm is undervalued and provide a buy recommendation despite the ESG risk. Conversely, if the current price for the stock was significantly higher than $37.54, leading an investor to estimate that the security is overvalued and reflect a sell recommendation. This estimated value provides the investor insight into valuation to incorporate higher ESG-related risk.

TABLE 6
HIGH ESG RISK COMPANY FCFE VALUATION
(HIGH ESG RISK ADJUSTMENT | INCREASE IN EQUITY DISCOUNT RATE)

FCFE Assumptions	
Year 0 FCFE	$2.00
Initial growth rate	12.00%
Growth de-escalation rate	1.00%
Terminal growth rate	2.00%
Risk-free rate	4.00%
Firm beta	1.00
Market risk premium	6.00%
ESG risk adjustment	+ 0.34%
CAPM required rate of return	10.00%

Year	*forecasted* Growth Rate	*forecasted* FCFE	PV of *forecasted* FCFE	Valuation
Year 1	12.00%	$2.24	$2.03	**$37.54**
Year 2	11.00%	$2.49	$2.04	
Year 3	10.00%	$2.74	$2.04	
Year 4	9.00%	$2.98	$2.01	
Year 5	8.00%	$3.22	$1.97	
Year 6	7.00%	$3.45	$1.91	
Year 7	6.00%	$3.65	$1.83	
Year 8	5.00%	$3.83	$1.75	
Year 9	4.00%	$3.99	$1.65	
Year 10	3.00%	$4.11	$1.54	
Horizon Value in Year 10			$18.79	
Year 11 (Horizon Year)	2.00%	$4.19	$50.24	

The case of incorporating ESG risk focuses on firms with relatively low ESG-related risk. We estimate Equation (5) to determine how much one should adjust the required return for equity to reflect the lower risk. If a company has significantly lower ESG-related risk or is immaterial, then the required rate of return should be lower to highlight this lower risk. This is consistent with El Ghoul et al. (2011) where firms with better CSR ratings exhibit a lower cost of equity. In the low-case model, low ESG risk is quantified as firms with an ESG risk score below the median. The *Low ESG Risk Score* estimate is negative and statistically significant ($p < 0.01$). This negative coefficient suggests that firms with lower ESG risk should have a lower required rate of return. The -0.3383 coefficient estimate for Low ESG Risk has the interpretation that a firm with ESG risk less than the median in the sample exhibits a required return rate that is approximately 34 basis points lower. The control variables continue to be significant, and the expected signs.

TABLE 7
LOW ESG RISK REGRESSION ANALYSIS

	Coefficient	
Low ESG Risk	-0.3383***	(0.1172)
Leverage	0.0070**	(0.0032)
Size	-0.2923***	(0.0421)
Constant	16.0577***	(1.0135)
Industry fixed effects	Yes	
Adj. R-squared	0.2284	
No. observations	927	
F-Statistic	22.0792***	

The symbols *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively. Standard errors are presented in parentheses.

Now that we have an estimate of how much to adjust the COE for the FCFE model to reflect a firm with significant ESG risk, we can modify our base model (Table 4) to incorporate ESG-related risk into an FCFE valuation model. The model maintains the prior assumptions but adjusts the required rate of return to reflect the higher ESG risk.[6] We maintain the following assumptions, a risk-free rate of 4%, a beta of 1.00, a market risk premium of 6%, and the subtraction of 0.3383% reflecting ESG risk from Table 6. This

results in a required rate of return of 9.66%. This decrease in the required rate of return reflects low ESG-related risk, resulting in an estimated equity value of $41.12.[7] Relative to the baseline model, the estimated value is approximately $1.87 higher. The spread from the low ESG risk situation relative to the high ESG case represents a spread of $3.58. This higher value provides the fair value estimate to compensate an investor for investing in a firm with minimal or low ESG risk. If the current market price is significantly lower than $41.12, an investor could assume that the firm is potentially undervalued and reflect a buy recommendation. Conversely, if the current price for the stock was significantly higher than $41.12, an investor could conclude that the security is overvalued and reflects a sell recommendation despite the firm having little to non-existent ESG-related risk. This estimated value provides the investor insight into valuation to incorporate lower ESG-related risk.

TABLE 8
LOW ESG RISK COMPANY FCFE VALUATION
(LOW ESG RISK ADJUSTMENT | DECREASE IN EQUITY DISCOUNT RATE)

FCFE Assumptions	
Year 0 FCFE	$2.00
Initial growth rate	12.00%
Growth de-escalation rate	1.00%
Terminal growth rate	2.00%
Risk-free rate	4.00%
Firm beta	1.00
Market risk premium	6.00%
ESG risk adjustment	- 0.34%
CAPM required rate of return	10.00%

Year	***forecasted* Growth Rate**	***forecasted* FCFE**	**PV of *forecasted* FCFE**	**Valuation**
Year 1	12.00%	$2.24	$2.04	**$41.12**
Year 2	11.00%	$2.49	$2.07	
Year 3	10.00%	$2.74	$2.07	
Year 4	9.00%	$2.98	$2.06	
Year 5	8.00%	$3.22	$2.03	
Year 6	7.00%	$3.45	$1.98	
Year 7	6.00%	$3.65	$1.91	
Year 8	5.00%	$3.83	$1.83	
Year 9	4.00%	$3.99	$1.74	
Year 10	3.00%	$4.11	$1.63	
Horizon Value in Year 10			$21.74	
Year 11 (Horizon Year)	2.00%	$4.19	$54.68	

The next step is a sensitivity analysis to highlight how changes to model assumptions impact the estimated valuation. In the sensitivity analysis, we allow the forecasted FCFE and beta of the firm to fluctuate across all three cases (base, high, and low ESG-related risk) using the same assumptions used in Tables 4, 6, and 8. Panel A shows this analysis for the base case assumption of the standard CAPM model. This panel represents the effect of changing the FCFE growth rate and beta on the value of the equity. As expected, the base case valuation for the prior assumptions is $39.25, as shown in Table 4. Using the FCFE valuation approach, a firm with a beta of 0.8 and an initial forecasted FCFE growth rate of 8% results in an

estimated intrinsic value of $39.20. If the firm has a beta of 0.8 and an initial forecasted FCFE growth rate of 16%, the intrinsic value of the equity increases to $55.55. The typical FCFE valuation approach for a firm with a beta of 1.20 and the initial forecasted FCFE growth rate of 16% results in an intrinsic value of $39.83. As constructed, as the forecasted FCFE increases, the estimated intrinsic value of the firm increases monotonically, holding the firm's beta constant. Additionally, the firm's intrinsic value monotonically decreases as the beta of the firm increases, holding the growth rate constant.

Panel B shows the estimated intrinsic value of the high ESG risk firm using the high ESG risk adjusted CAPM model of adding to the cost of equity.[8] For example, in Panel B, a high ESG risk firm with a beta of 0.80 and initial forecasted FCFE of 16% has an estimated intrinsic value of 52.68. If the forecasted FCFE growth rate is constant, but the firm's beta rises to 1.20, the estimated intrinsic value is $38.26. Panel C represents the valuation for a low ESG risk firm with changes to the estimated growth rate and beta using the low ESG risk adjusted CAPM model of subtracting from the cost of equity.[9] A low ESG risk firm with an initial forecasted FCFE growth rate of 8% and a beta of 0.80 results in an intrinsic value for the firm of $41.34. A firm valuation with the same forecasted FCFE growth but with a beta of 1.20 yields an intrinsic value of $29.72.

TABLE 9
SENSITIVITY ANALYSIS

Panel A. Sensitivity Analysis for Base Company FCFE Valuation

		Firm beta (β)				
		0.80	**0.90**	**1.00**	**1.10**	**1.20**
Initial *forecasted* FCFE Growth Rate	**8.00%**	$39.20	$35.89	$33.08	$30.67	$28.57
	10.00%	$42.80	$39.15	$36.04	$33.38	$31.06
	12.00%	$46.72	$42.68	$39.25	$36.31	$33.76
	14.00%	$50.96	$46.50	$42.73	$39.49	$36.68
	16.00%	$55.55	$50.65	$46.49	$42.92	$39.83

Panel B. Sensitivity Analysis for High ESG Risk Company FCFE Valuation

		Firm beta (β)				
		0.80	**0.90**	**1.00**	**1.10**	**1.20**
Initial *forecasted* FCFE Growth Rate	**8.00%**	$37.26	$34.25	$31.68	$29.45	$27.51
	10.00%	$40.67	$37.34	$34.49	$32.03	$29.89
	12.00%	$44.36	$40.68	$37.54	$34.83	$32.47
	14.00%	$48.35	$44.30	$40.84	$37.86	$35.25
	16.00%	$52.68	$48.22	$44.41	$41.13	$38.26

Panel C. Sensitivity Analysis for Low ESG Risk Company FCFE Valuation

		Firm beta (β)				
		0.80	**0.90**	**1.00**	**1.10**	**1.20**
Initial *forecasted* FCFE Growth Rate	**8.00%**	$41.34	$37.68	$34.61	$31.98	$29.72
	10.00%	$45.17	$41.13	$37.73	$34.83	$32.33
	12.00%	$49.33	$44.87	$41.12	$37.92	$35.16
	14.00%	$53.84	$48.92	$44.78	$41.26	$38.22
	16.00%	$58.72	$53.31	$48.75	$44.87	$41.52

Comparing the dollar spread (or range) in firm value for the estimated intrinsic value of high ESG risk firms (Panel B) and low ESG risk firms (Panel C) provides valuable insight. The largest difference in dollar amount between the high ESG risk firm and the low ESG risk firm is $6.04. The difference between the models increases as the firm's beta decreases and the forecasted growth rate increases. The smallest difference is $2.21 when the initial forecasted FCFE growth rate is 8%, and the beta is 1.20. Next, one can look at the percent change in the firm's value using the spread between the high and low ESG risk intrinsic values relative to the base case situation where ESG risk is not incorporated. The percentage difference between the high ESG risk firm and the low ESG risk firm is the largest at 10.88% when the initial forecasted FCFE growth rate is 16%, and the beta is 0.80. The percentage range is the lowest when the forecasted FCFE growth rate is 8%, with a firm beta of 1.20, resulting in a percent difference of 7.74%.

In this section, we presented the base FCFE valuation model currently in practice and how to model equity valuation. However, the base model does not account for the presence or the lack of ESG-related risk. We then estimated the risk adjustments to include in the approach that can be incorporated that allows investors to account for ESG risk. The approach is agnostic as to whether investors should invest in lower or higher ESG risk firms. This approach allows an investor to account for the presence or the lack of ESG-related risk in their valuation models by estimating the value considering this potential risk.

CONCLUSION

In recent years, the amount of capital allocated to ESG related investments and investor awareness has grown exponentially. The current literature highlights both positive and negative aspects regarding ESG investing with points for investors to consider. The findings related to the positive aspects of ESG investing include superior fund performance and beneficial impacts on the investor and the firm. On the other hand, the literature's negative side highlights underperformance, greenwashing, and risk measurement disagreements. This divergence in evidence and the need for practical applications for investors to incorporate this risk into financial modeling presents an opportunity. Investors may want to avoid investing in companies because they are deemed good or bad on an ESG risk metric. They want to determine if the prospective investment represents a good value and provides an appropriate required rate of return. Investors investing in good or bad ESG firms should still consider the current price and valuation.

Our study provides evidence that ESG-related risk may be positively related to the required rate of return for equity. Building on this finding, ultimately, we present a practical and novel approach that allows investors and practitioners to incorporate the presence or the lack of ESG-related risk into their valuation models. Given, the divergence in the literature regarding ESG investing and its value, we present and model an approach that is agnostic to whether ESG investing is valuable or not; by doing this, the individual investor can make their own decision that can alter the estimated value for the security. Another benefit of our suggested approach is that the individual can adjust the model and variables to fit their personal beliefs. Firms can be sustainable and have less ESG-related risk, but that does not make them a good investment or a buy. On the other hand, just because a company has ESG-related risk does not necessarily mean the firm is not a good investment or a sell. Ultimately, an investor should care about price and valuation, which this model allows.

ENDNOTES

1. The exact EQS criterion used to create the sample is as follows: Open EQS (Equity Stock Screener), use the following criteria: "Trading Status: Active," "Indices: Russell 3000 Index," "WACC Cost of Equity has data," "Financial Leverage has data," "GICS Sector has data," "Total Assets has data," "Total Debt to Total Assets has data." And lastly, the "Display Only Fields" will be "SA ESG Risk Score," Click see results and export data to Excel. In Excel (2,733 observations), remove all firms with "N/A" as an ESG risk score which left us with 927 firm observations.
2. All assumptions are for presentation purposes. The assumptions can be adjusted to reflect the current market assumptions and firm-specific values. Changing these assumptions does not change the approach or how one can incorporate ESG-related risk into equity valuation models.

3. Table 4 represents the base case situation using CAPM as typically done in practice. The first year's forecasted growth rate is 12%, resulting in a forecasted FCFE of $2.24, and when that value is discounted to the present, it results in a value of approximately $2.04. The growth rate in year 2 following the H-model declines by 1% to 11%, resulting in a forecasted FCFE of $2.49, when discounted to the present, has a value of $2.05. This 1% annual de-escalation in the growth rate continues until year 11 when the forecasted terminal growth rate of 2% is reached. Using the constant growth model for the forecasted FCFE of $4.19 results in a value of $52.37 in year 10. Once that value is discounted to the present, it represents a present value of $20.19. The sum of the present values in the forecasted FCFE column is the security's valuation of $39.25.
4. All assumptions are for presentation purposes. Changing these assumptions does not change the approach or how one can incorporate ESG-related risk into equity valuation models. The base assumption for our hypothetical firm is that in Year 0, the firm had an FCFE of $2.00 with an initial growth rate of 12%. The H-Model valuation model has an annual growth de-escalation rate of 1% per year, decreasing to a terminal growth rate of 2% over ten years.
5. Table 6 represents the high ESG risk situation using an adjusted CAPM to reflect the additional risk. The first year's forecasted growth rate is 12%, resulting in a forecasted FCFE of $2.24, and when that value is discounted to the present, it results in a value of approximately $2.03. The growth rate in year 2, per the H-model, declines by 1% to 11%, resulting in a forecasted FCFE of $2.49, when discounted to the present, has a value of $2.04. This 1% annual de-escalation in the growth rate continues until year 11 when the forecasted terminal growth rate of 2% is reached. Using the constant growth model for the forecasted FCFE of $4.19 results in a value of $50.24 in year 10. Once that value is discounted to the present, it represents a present value of $18.79. The sum of the present values in the forecasted FCFE column is the security's valuation of $37.54.
6. All assumptions are for presentation purposes. Changing these assumptions does not change the approach or how one can incorporate ESG-related risk into equity valuation models. The base assumption for our hypothetical firm is that in Year 0, the firm had an FCFE of $2.00 with an initial growth rate of 12%. The H-Model for valuation uses an annual growth de-escalation rate of 1% down to a terminal growth rate of 2% over ten years.
7. Table 8 represents the low ESG risk situation using an adjusted CAPM to reflect the additional risk. The first year's forecasted growth rate is 12%, resulting in a forecasted FCFE of $2.24, and when that value is discounted to the present, it results in a value of approximately $2.04. The growth rate in year 2 per the H-model declines by 1% to 11%, resulting in a forecasted FCFE of $2.49, which, when discounted to the present, has a value of $2.07. This 1% annual de-escalation in the growth rate continues until year 11 when the forecasted terminal growth rate of 2% is reached. Using the constant growth model for the forecasted FCFE of $4.19 results in a value of $54.68 in year 10. Once that value is discounted to the present, it represents a present value of $21.74. The sum of the present values in the forecasted FCFE column is the equity valuation of $41.12.
8. The first example of this analysis for high ESG-related risk firms can be seen in Tables 5 and 6. The intrinsic value from Table 6 is in Panel B for a firm with a beta of 1.00 and an initial forecasted FCFE growth of 12%, $37.54.
9. The first example of this analysis for low ESG-related risk firms can be seen in Tables 7 and 8. The intrinsic value from Table 8 is in Panel C for a firm with a beta of 1.00 and an initial forecasted FCFE growth of 12%, $41.12.

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