



Can investing in corporate social responsibility lower a company's cost of capital?

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Abstract

Purpose – This paper aims to investigate the effect of corporate social responsibility (CSR) ratings on the *ex ante* cost of capital of more than 2,300 listed US companies in a panel from 2003 to 2010. It examines whether financial markets value continuous investment in CSR activities through higher market capitalization and lower cost of capital.

Design/methodology/approach – The measure of the cost of capital reflects the perceived riskiness of individual companies expressed in the unobserved internal rate of return that investors expect to hold a risky asset. Based on descriptive portfolio estimations, panel and quantile regressions, the authors model the cost of equity capital as a function of CSR strengths and concerns obtained from the KLD-database and accounting controls.

Findings – The authors show that firms' CSR strategies differ significantly across industry sectors. Customer-orientated companies such as telecommunications and automobile outperform asset-driven sectors such as real estate or chemical companies. Furthermore, the authors find a 10-bp positive effect for one standard deviation of firms' intensive allocation of resources in sustainable activities.

Research limitations/implications – Since the authors are interested in the effect environmental, social and governance activities have on the firm's perceived market valuation rate, the authors apply the Fama-French model because of its efficiency in explaining realized returns, rather than incorporating analyst's long-term growth forecasts into the proxy for the equity premium.

Practical implications – Managers of companies with low or intermediate CSR scores may consider the financial benefits of improving their social and environmental performance. A good starting point is usually to draw up a company-wide CSR agenda, possibly guided by a dedicated CSR task force, mapping out the potential costs and benefits of such measures. In addition, by improving their CSR ratings, a company may get access to additional resources, ranging from the growing ethical investment industry to employees for whom CSR performance matters when choosing an employer.

Originality/value – The authors expand the existing literature by considering firm's CSR level to be in relation to the overall CSR performance and decompose firm's CSR agenda into strengths and concerns rather than counting the number of activities a firm is involved in. The applied methodology allows a better understanding of firm's CSR agenda and its implication for capital markets and investors on both long and short investment terms.

Keywords Corporate social responsibility, Sustainability, Cost of capital, Quantile regression, Granger causality

Paper type Research paper



Corporate social responsibility (CSR) has experienced considerable growth over the last decade, not least in the financial sector. In 2010, the market value of all assets managed under socially and environmentally responsible criteria reached US\$3 trillion, which corresponds to a 380 percent increase compared to 1995 (US SIF, 2010). In turn, this has triggered a large number of academic studies that try to establish whether responsible investment is associated with higher returns and/or lower risk. This paper investigates whether companies that invest in CSR investments are also rewarded in the form of higher market capitalization and lower cost of capital.

Previous studies provide evidence that CSR activities tend to lower the cost of capital for listed companies. Recent examples include Dhaliwal *et al.* (2011) and Ghoual *et al.* (2011)[1]. Most of these empirical studies use the KLD MSCI Database to proxy for CSR activities and quantify the effects on the performance of listed US companies across different sectors. However, these conclusions are not undisputed, not least because of the reported potential measurement inconsistencies with respect to CSR proxies. Semenova (2010) identifies some potentially serious problems with the aggregate CSR scores derived from the underlying binary CSR ratings contained in this database. The present study seeks to circumvent these problems by separating CSR strengths from CSR concerns. Furthermore, we provide controls for variations in CSR intensity across industries. However, our results are broadly in line with the findings of the studies cited above and provide some additional evidence on the differential effect of CSR strengths and concerns.

Related literature

There is a large body of literature on the financial implications of companies' CSR activities (Carroll, 1999; Baron, 2001; Waddock, 2004). In principle, CSR activities can be understood as a voluntary attempt to internalize negative social and environmental externalities, thereby potentially "sacrificing" part of a company's profits. This behavior is not easily explained by mainstream economic theory which recognizes profit-maximization as the sole underlying motive of a company's actions (Friedman, 1970)[2]. A number of studies attribute the ascent of CSR investments to complementary relationships between economic conditions, internal strategic decisions and external mediators such as governmental and non-governmental organizations (Bansal and Roth, 2000; Campbell, 2007; Reinhardt and Stavins, 2010). Increased managerial awareness together with a favorable financial and economic climate have been identified as the main drivers for establishing a social responsibility agenda within the broader competitive strategy of a firm. Ideally, the company then undergoes a changed market position in which product innovation, costs optimization and access to new technologies play a more prominent role. Additionally, the introduction of new government regulations, pressure from independent watchdog organizations as well as the establishment of industry codes and best practices act as catalysts in the CSR adoption process.

Overall, the establishment of a CSR agenda appears to affect "hard" financial indicators but it is controversial whether the financial benefits are mainly intangible and of a long-term nature and how the benefits can be pinpointed in standard accounting and/or market-based performance measures. First, there appears to be a relatively broad consensus among empirical studies that firms actively involved in CSR lower their perceived information asymmetry and stock volatility as a consequence of investors' demand for additional information on a firm's strategic positioning in response to

longer-term socio-economic transformations (Lee and Faff, 2009; Luo and Bhattacharya, 2009; Cajias and Bienert, 2011). Second, any opportunities that will have to be rejected under a CSR strategy are potentially rewarded subsequently by lower operational costs (Lundgren, 2011), higher productivity levels and enhanced shareholder value (Surroca *et al.*, 2010; Kang *et al.*, 2010; Cajias *et al.*, 2012)[3]. Third, the acquired differentiated image and reputation may lead thus to new investment opportunities and governmental incentives (Kempf and Osthoff, 2007; López *et al.*, 2007; Eccles *et al.*, 2011). Overall, the intrinsic value of a responsible strategy may translate into better financial performance under certain circumstances, whenever this strategy is viewed as a production factor rather than a hedge against unexpected losses.

The present study complements prior empirical findings in providing evidence that the financial benefits of a CSR agenda are rewarded on average in subsequent lower levels of costs of capital and affecting so the unobserved internal rate of return for holding a risky asset. Furthermore, our portfolio analysis shows, in accordance with the results of Kang *et al.* (2010), large industry variations in the connection between CSR and financial performance, particularly in customer and reputation orientated industries such as telecommunications, food or automobile manufacturing.

Apart from the traditional factors affecting the cost of capital, such as market conditions, firms' activities (Pratt and Grabowski, 2008, pp. 3-13), quality and quantity of available information (Lambert *et al.*, 2007; Easley and O'Hara, 2004; Botosan, 1997), a small number of studies find a cost of equity capital premium for firms with high CSR ratings (Chava, 2011; Ghoul *et al.*, 2011; Dhaliwal *et al.*, 2011). Information about current strategies and ongoing CSR programmes – explicitly related to financial performance – are priced by investors and capital markets and influence the distribution of firms' expected cash flows. Thus, CSR benchmarking and rating contribute to diminishing the information asymmetry and, so, reducing latent risks. Lambert *et al.* (2007) demonstrates in a theoretical model that more precise information reduces the variance of a firm's cash flows. Following these empirical evidence showing that companies actively involved in CSR activities attract higher analyst coverage as well as lower levels of perceived idiosyncratic risks, we expect that a continuous CSR agenda mitigates latent risks and lowers the cost of capital.

Sample description and descriptive statistics

To relate CSR ratings to financial performance measures, we merged the KLD MSCI environmental social and governance database with financial data obtained from Thomson Reuters DataStream. Dubbed by Waddock (2003) "the *de facto* research standard" in sustainability research, the KLD Database has been used by a number of studies because it covers a large sample of US companies and provides detailed annual scores on a large number of CSR criteria. Of 2,801 listed US companies contained in the KLD database, we were able to match 2,356 with financial data.

Next, we construct a CSR rating index for each company in each year. The KLD database consists of a simple binary measure of strengths and concerns for each CSR criterion. However, KLD have changed both the number of criteria over time and consequently also the ratio of possible scoring points on strengths versus concerns. To avoid spurious results, particularly in the time series dynamics of the scores, an index is required that eliminates these artificial variations. Creating a combined CSR score by simply adding up the individual binary scores is also problematic because all CSR

criteria are treated as equally important in the calculation of the score (Griffin and Mahon, 1997; Simpson and Kohers, 2002). To resolve this issue, we derive a weighted CSR score in the following manner:

$$ESG_{i,t} = \sum_{j=1}^J (S_{i,t}w_{j,t}) - \sum_{j=1}^J (C_{i,t}w_{j,t}) + 1 \quad (1)$$

where $S_{i,t}$ and $C_{i,t}$ are individual binary strength and concern ratings for a company i at time t multiplied by the criterion j weights $w_{j,t}$. In this index, a score of 1 represents a neutral position where strengths and concerns balance each other out, whereas a score below 1 indicates more concerns than strengths and vice versa for scores above 1. The weights in equation (1) are derived by:

$$W_{j,t} = \frac{\sum_{i=1}^N S_{i,t} + \sum_{i=1}^N C_{i,t}}{\sum_{i=1}^N \sum_{j=1}^J S_{i,t} + \sum_{i=1}^N \sum_{j=1}^J C_{i,t}} \quad (2)$$

Hence, the weight of a CSR criterion in year t is based on the sum of all individual binary counts for all companies for this criterion over the sum of all criteria and companies in that year. In other words, the weight of each criterion is determined by the number of non-zero weightings for all companies in a particular year. Using this measure, we allow strengths and concerns to be asymmetric in that the sum of weights of strengths does not need to equal the sum of weights of concerns. This weighting scheme is in principle equivalent to a Paasche current-weighted-index in that the individual weights of the criteria vary from year to year. Our calculation of the CSR variable differs from the measures of Chava (2011), Ghoul *et al.* (2011) and Dhaliwal *et al.* (2011), especially regarding the asymmetric treatment of positive and negative CSR activities, i.e. strength and concerns. Thus, rather than lumping all strengths and concerns into a single variable, we generate two variables that measure a firm's CSR performance while normalizing for year-to-year fluctuations in average CSR performance of all firms and changes in the composition of the index. The assumption underlying the studies mentioned above, that strengths and concerns are symmetric and can be added up and combined with simple measures is problematic because of the unequal number of strengths and concerns in each year. Additionally, given the sector heterogeneity of the KLD database, some sectors are likely to concentrate on some CSR areas that are vital to their operations but might get negative ratings in areas of lesser relevance to their business operations which is then also masked and averaged out by a combined score as applied by most of the extant studies.

Roughly half of our sample comprises of financial (22 percent), industrial (18 percent) and consumer orientated (13 percent) companies including banks, REITs, manufacturers and supplier of services and goods. Table I shows that variation of the strength and concern scores between all 19 SIC-sectors and presents also the skewness of the data as a measure of the symmetry of the data[4]. The lowest strength scores are recorded by banks, real estate and insurance companies whereas the top three high-strengths sectors are automobile, oil, gas and chemical firms. The highest concern scores are found in the food and beverage, utilities and banking industries.

The mean and the skewness of strengths and concerns confirm the asymmetry of the CSR activities and the intra-sector comparison shows that the mean of positive

SEF
31,2

206

Table I.
Sector sample
distribution and
CSR metrics

ICB code	ICB industry	ICB super sector	Strengths		Concerns		n*t = N	%
			Mean	Skewness	Mean	Skewness		
500		Oil and gas	0.15	1.95	0.02	0.40	901	5.77
1300	Basic	Chemicals	0.15	1.57	0.04	0.32	337	2.16
1700	materials	Basic resources	0.14	2.27	0.03	0.43	318	2.04
2300	Industrials	Construction and materials	0.13	1.04	0.03	0.43	311	1.99
2700		Industrial goods and services	0.14	1.68	0.03	0.40	2,556	16.36
3300	Consumer	Automobile and parts	0.15	2.84	0.03	0.21	161	1.03
3500	goods	Food and beverage	0.13	1.07	0.06	0.39	364	2.33
3700		Personal and household goods	0.13	1.36	0.05	0.48	808	5.17
4500		Health care	0.12	1.68	0.04	0.63	1,673	10.71
5300	Consumer	Retail	0.12	1.23	0.04	0.44	1,045	6.69
5500	services	Media	0.12	0.99	0.05	0.47	405	2.59
5700		Travel and leisure	0.13	1.47	0.04	0.34	580	3.71
6500		Telecommunications	0.12	1.33	0.05	0.70	173	1.11
7500	Utilities		0.10	0.89	0.05	0.61	548	3.51
8300	Financials	Banks	0.07	1.23	0.05	1.41	1,452	9.29
8500		Insurance	0.12	1.25	0.04	0.67	560	3.58
8600		Real estate	0.11	1.96	0.02	0.77	839	5.37
8700		Financial services	0.12	1.51	0.04	0.68	612	3.92
9500		Technology	0.14	1.42	0.04	0.42	1,979	12.67

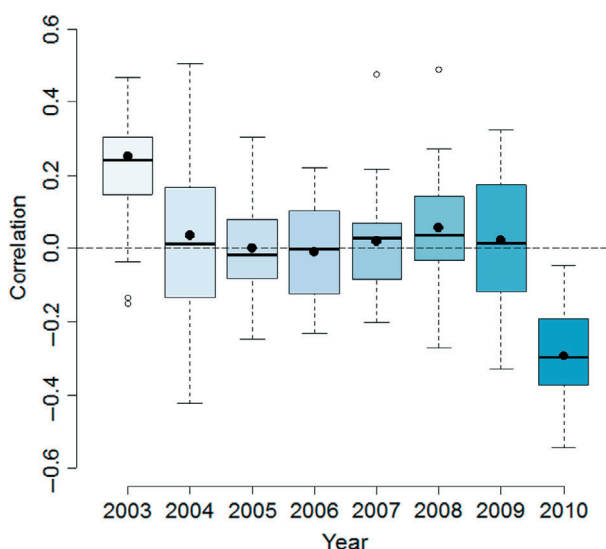
activities is higher than the concerns. The highest skewness (asymmetry) in the strengths and concerns was found in the automobile and bank industry, respectively, indicating larger spreads of CSR performance in these industries.

Figure 1 shows the distribution of intra-sector correlations of strengths and concerns and confirms the orthogonality of these two CSR measures. Except in 2003 and 2010, the mean intra-sector correlation is virtually zero which indicates that a separate estimation of strengths and weaknesses is preferable over a combined score, i.e. which simply subtracts concerns from strengths.

The cost of equity capital is estimated using the Fama and French (1993) three-factor model with the market excess return[5]. Our estimation of the cost of capital differs from comparable studies such as Chava (2011), Ghoul *et al.* (2011) and Dhaliwal *et al.* (2011) in that we also proxy for firm risk exposure to the overall stock market as well as for specific risk factors such as market capitalization (SMB) and book-to-market ratio (HML), as described by Barth *et al.* (2008) and Kothari *et al.* (2009). We estimate the cost of equity capital for year $t + 1$ in equation (3) with varying factor loadings for each firm using weekly returns:

$$R_i - R_f = a_i + b_i[R_m - R_f] + s_i\text{SMB} + h_i\text{HML} + e_i \quad (3)$$

The estimated cost of capital measure is equal to the average risk free rate \bar{R}_f plus the estimated slope coefficients \hat{b} , \hat{s} and \hat{h} multiplied, respectively, with the yearly average returns of $\bar{R}_m - \bar{R}_f$, $\bar{\text{SMB}}$ and $\bar{\text{HML}}$ in $t + 1$. In order to illustrate the industry effect of isolated CSR areas to the equity premium, we construct portfolios of firms



Notes: For each ICB-sector we calculate the correlation between strengths and concerns; we repeat the procedure for every year; the line in the box indicates the median value of the data, the point the mean; the ends of the vertical lines indicate the minimum and maximum data values; the points outside the ends of the whiskers are outliers or suspected outliers

Figure 1. Intra-sector correlation strengths vs concerns

with high and low strengths and concerns for each industry and year, respectively. We then calculate the abnormal differences of cost-of-capital portfolios and present the results in Table II and Figure 2. The mean equity premium of high-minus-low responsible firms is -1.24 percent, lower than firms included in high-minus-low-concern-portfolios with a mean of -0.22 percent for all years. As for the strengths, the highest compensation occurred in 2006 and 2004 with a premium of -2.63 and -2.09 percent.

Only in 2005, high-strengths companies appear to have had above average cost of capital while firms included in high-concerns portfolios had on average four times higher cost of capital as firms with low concerns. Overall, the variation over time shows that firms included in high-CSR portfolios have the tendency to have lower capital costs in comparison to low-CSR companies.

We show the abnormal differences in industry cost of equity capital for high-minus-low strengths and concerns portfolios in Figure 2. Except for the sectors chemicals, construction and materials, real estate, and insurance (SIC: 1300, 2300, 8600 and 8500), the mean premium for sustainability was positive. In contrast to this, customer orientated firms, such as telecommunications, travel and leisure and automobile and parts (SIC: 6500, 5700 and 3300) establish a benchmark for high responsible firms. Thus, for responsible firms in these sectors, the mean equity cost ("point within the boxplot") in telecommunication companies is 7.42 percent for all years, whereas 4.66 percent for those rated with low-KLD scores. This indicates a significant

Table II.
Annual cost of capital
abnormal difference of
portfolios with high
strengths and concerns

Difference in cost of capital (%)	All	2003	2004	2005	2006	2007	2008	2009	2010
High-minus-low strengths	Mean	-1.238	-1.574	-2.089	0.443	-2.627	-1.198	-0.532	-1.452
	Stabw	3.691	3.363	4.348	3.412	4.042	3.676	3.422	4.127
High-minus-low concerns	Mean	-0.215	1.131	-3.167	1.07	-0.093	-1.037	-0.488	0.393
	Stabw	4.816	9.069	4.874	5.098	5.618	3.138	2.092	4.588

Notes: For each year we sort companies into portfolios across each ICB-super sector and above and below the mean of the strengths-variable; we then calculate the difference between the high-strength-portfolio and the low-strength-portfolio; we repeat the procedure for concerns

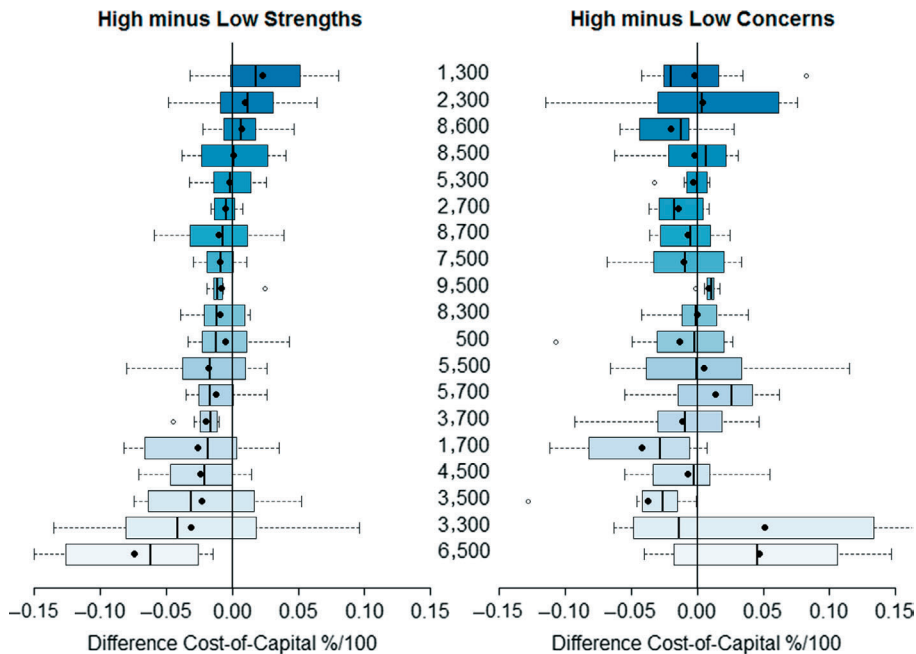


Figure 2. ICB-intra-sector cost of capital abnormal difference of portfolios with high strengths and concerns

Notes: For each year we sort companies into portfolios across each ICB-super sector and above and below the mean of the strengths-variable; we then calculate the difference between the high-strength-portfolio and the low-strength-portfolio; we repeat the procedure for concerns; the line in the box indicates the median value of the data, the point the mean; the ends of the vertical lines indicate the minimum and maximum data values; the points outside the ends of the whiskers are outliers or suspected outliers

differentiation in terms of valuation of risks and in accordance to Kang *et al.* (2010) the importance of industry effects in explaining sustainability activities. As a consequence, it is to expect that companies identified as highly responsible enjoy higher capitalization levels regarding the strengths-portfolios (“right of the 0 percent-line”). The concern-portfolio boxplots show that the difference between high- and low-concern portfolios varies significantly between -0.21 and 5.07 percent.

Overall, the benefits of a responsible strategy show common patterns. Based upon the abnormal differences, the cost of capital portfolios vary across industries and years with regard to the nature of responsible activities, i.e. strengths a/o concerns (consistent with Surroca *et al.*, 2010; Semenova, 2010). A negative premium between high- and low-responsible firms is to observe especially in 2004 and 2006 indicating that firms operating continuously across several CSR areas showed lower risk levels.

Tables III and IV provide definitions and summary statistics for all variables in our model. The mean cost of equity capital is 22.7 percent and varies from 5.2 to 42 percent with a standard deviation of 14.2 percent moderate as for our estimation methodology (Kothari *et al.*, 2009). The size effect is positively correlated with a firm’s strengths but nearly uncorrelated with concerns.

Variable	Description	Source
Cost of equity capital	Firm's cost of capital estimated from the three-factor Fama-French model with varying factor loadings	Thomson Reuters DataStream and Kenneth R. French Database
Market to book value	Logarithm of market capitalization divided by total assets	Thomson Reuters DataStream
Market value	Logarithm of market capitalization of the firm defined as market price-year end multiplied by common shares outstanding	
Leverage	Ratio, calculated as total debt divided by total assets	
Total return	Annual change in stock prices at the end of the year	
Weighted strengths	Number of CSR strengths of a company weighted by the number of non-zero (strength and concern) entries of all companies in a particular year	KLD MSCI Database
Weighted concerns	Number of CSR concerns of a company weighted by the number of non-zero (strength and concern) entries of all companies in a particular year	
CSR index	Weighted concerns minus weighted strengths centered on 1, i.e. a value of 1 represents a company with a completely neutral CSR position	

Table III.
Description of variables
and sources

Econometric approach

Granger causality analysis

Next, we analyze the causality between CSR and the equity premium without any a priori assumption. In other words, we test whether the present financial performance is determined by firm's past investments in CSR, after controlling for the past financial situation:

$$\begin{bmatrix} \text{CoEC} \\ \text{CoEC} \\ \text{STR} \\ \text{CON} \end{bmatrix}_{i,t} = \begin{bmatrix} \text{CoEC} \\ \text{CoEC} \\ \text{STR} \\ \text{CON} \end{bmatrix}_{i,t-m} \mathbf{\Gamma} + \begin{bmatrix} \text{STR} \\ \text{CON} \\ \text{CoEC} \\ \text{CoEC} \end{bmatrix}_{i,t-m} \mathbf{\Theta} + \begin{bmatrix} \mu_j^{\text{ICB}} \\ \mu^t \end{bmatrix} \begin{bmatrix} \delta^{\text{ICB}} \\ \delta^t \end{bmatrix} + \begin{bmatrix} u^{\text{STR}} \\ u^{\text{CON}} \\ e^{\text{STR}} \\ e^{\text{CON}} \end{bmatrix}_{i,t} \quad (4)$$

Based on the results of Nelling and Webb (2009), we estimate the equation system (4) by OLS, where $\mathbf{\Gamma}$, $\mathbf{\Theta}$, δ^{ICB} and δ^t represent estimated coefficients, μ_j^{ICB} and μ^t control for sector and year variation and u as well as e are *iid*-error terms [6]. We estimate

Variable	All	Descriptive statistics										Correlation matrix								
		2003	2004	2005	2006	2007	2008	2009	2010	SD	Q1	Q9	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cost of capital (%/100)	0.23	0.25	0.23	0.26	0.34	0.22	0.16	0.18	0.17	0.14	0.05	0.42	1							
ESG score	0.92	0.98	0.94	0.93	0.91	0.92	0.93	0.92	0.82	0.12	0.77	1.05	0.03	1						
Strengths	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.05	0.000	0.11	-0.02	0.52	1					
Concerns	0.12	0.06	0.11	0.11	0.13	0.12	0.11	0.12	0.21	0.10	0.000	0.25	-0.05	-0.9	-0.09	1				
Log MV/val	9.67	6.43	6.61	6.94	6.94	6.93	6.77	6.56	6.74	4.27	8.10	9.93	-0.05	0.07	0.30	0.07	1			
(Log (Mio. \$))	0.20	20.88	19.37	19.39	19.82	20.62	22.09	19.33	19.52	0.19	0.00	0.48	-0.04	0.00	-0.03	-0.02	0.02	1		
Leverage (%/100)	0.11	0.44	0.22	0.15	0.16	0.03	-0.36	0.34	0.24	0.46	-0.44	0.66	0.07	-0.03	-0.03	0.02	0.00	-0.05	1	
Total return	-7.16	-7.18	-7.05	-7.01	-7.02	-7.01	-7.26	-7.39	-7.39	1.06	-8.64	-5.89	0.05	0.02	0.03	-0.00	0.04	-0.35	0.08	1
Log MIB																				

Table IV. Descriptive statistics and correlation

the equation with a lag of $m = 1$ and $m = 2$ years to control for possible long run causality relationships. We are interested in the estimates of Θ , since these represent the causality terms of the strengths (STR), concerns (CON) and the cost of equity capital (CoEC), respectively, and show the results in Table V. We expect the $\hat{\Theta}$ coefficients of STR and CON to be significant indicating a unidirectional temporal causality of a CSR strategy into the cost of capital.

Linear regression models

After the Granger causality tests, we apply a linear regression model using the following basic equation:

$$\text{CoEC}_{i,t+1} = [\text{STR} \quad \text{CON}]_{i,t} \boldsymbol{\theta} + \mathbf{X}_{i,t} \boldsymbol{\beta} + \mu_j^{\text{ICB}} \delta^{\text{ICB}} + \mu^t \delta^t + u_{i,t+1} \quad (5)$$

where the vectors $\boldsymbol{\theta}$ and $\boldsymbol{\beta}$ represent the estimated linear coefficients of CSR and \mathbf{X} our control variables – market value, leverage, market to book and the growth in returns – described in Table III. δ^{ICB} and δ^t control for ICB-industries and year-effects. We expect the coefficients of $\boldsymbol{\theta}$ to be significant different from zero in order to quantify the impact that CSR has on the dependent variable, the cost of equity capital CoEC. For the parametrization of equation (5), we include sector and year dummies and present the results in Table VI.

Second, in order to provide cross-sectional and time-varying evidence that the CSR effect is significant different from zero across all 19-industries and all periods, we estimate equations (6) and (7) including both iterated terms between strengths and concerns with sector and year dummies, respectively:

$$\begin{bmatrix} \text{CoEC} \\ \text{CoEC} \end{bmatrix}_{i,t+1} = \begin{bmatrix} \sum_{j=1}^J (\text{STR}_{i,t} * \mu_j^{\text{ICB}}) \\ \sum_{j=1}^J (\text{CON}_{i,t} * \mu_j^{\text{ICB}}) \end{bmatrix}' \begin{bmatrix} \Phi^{\text{STR}} \\ \Phi^{\text{CON}} \end{bmatrix} + \mathbf{X}_{i,t} \boldsymbol{\beta} + \mu^t \delta^t + \begin{bmatrix} \varpi^{\text{STR}} \\ \varpi^{\text{CON}} \end{bmatrix}_{i,t+1} \quad (6)$$

$$\begin{bmatrix} \text{CoEC} \\ \text{CoEC} \end{bmatrix}_{i,t+1} = \begin{bmatrix} \sum_{t=1}^T (\text{STR}_{i,t} * \mu^t) \\ \sum_{t=1}^T (\text{CON}_{i,t} * \mu^t) \end{bmatrix}' \begin{bmatrix} \Pi^{\text{STR}} \\ \Pi^{\text{CON}} \end{bmatrix} + \mathbf{X}_{i,t} \boldsymbol{\beta} + \mu_j^{\text{ICB}} \delta^{\text{ICB}} + \begin{bmatrix} \eta^{\text{STR}} \\ \eta^{\text{CON}} \end{bmatrix}_{i,t+1} \quad (7)$$

Next, we estimate the expected value of the slope coefficients $\hat{\Phi}$ as well as $\hat{\Pi}$, which contain the distribution of the estimated coefficients for the CSR premium given each sector and across each year, respectively. In order to confirm the stability of the CSR effects, we run an F -test under the null of equality to zero. The matrix \mathbf{X} contains all predictor variables. We present the expected values and test in Table VII.

Independent variable	Dependent variable			
	Cost of capital t	CSR-strengths t	Cost of capital t	CSR-concerns t
Cost of capital $t-1$	+	-0.01*** [-2.96]	+	-0.00 [-0.01]
Cost of capital $t-2$	-	0.00 [0.06]	-	-0.01* [-1.95]
CSR strengths $t-1$	-0.10*** [-5.50]	+	-	-
CSR strengths $t-2$	0.045 [0.761]	+	-	-
CSR concerns $t-1$	-	-	-0.06*** [-3.66]	+
CSR concerns $t-2$	-	-	-	+
F-statistic	29.00*** (0.00)	7.50 (0.00)	11.96*** (0.00)	0.00 (0.99)
p-value	+	+	+	+
Sector dummies	+	+	+	+
Year dummies	+	+	+	+
				2.88* (0.06)

Notes: Significant at: *10, **5 and ***1 percent levels; *t*-statistics with robust standard errors following Arellano (1987) due to $N > T$ are reported within the brackets []; *p*-values in parenthesis ()

Table V.
Granger-causality tests

Table VI.
Effect of CSR strengths
and concerns on the cost
of equity capital

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	19.84*** [1.398]	22.07*** [10.51] 0.74 [0.47]	22.28*** [14.08]	22.90*** [14.46]	27.54*** [20.04]	28.07*** [20.40]	25.48*** [15.45]	26.27*** [15.85]
ESG Score _{t-1}								
Strengths _{t-1}			-10.14*** [-3.46]		-9.99*** [-3.28]		-9.41*** [-2.98]	
Concerns _{t-1}				-4.53** [-2.52]		-3.68** [-2.06]		-5.00** [-2.56]
Log MVal _{t-1}	-0.31*** [-3.70]	-0.80*** [-8.72]	-0.72*** [-7.53]	-0.77*** [-8.36]	-0.89*** [-9.12]	-0.94*** [-9.97]	-0.61*** [-6.28]	-0.64*** [-6.79]
Leverage _{t-1}	0.00 [0.03]	0.00 [-0.05]	-0.00 [-0.33]	0.00 [-0.07]	-0.01 [-1.03]	-0.01 [-0.61]	-0.01 [-0.70]	-0.00 [-0.50]
Log MtB _{t-1}	-0.28* [-1.84]	-0.29* [-1.71]	-0.31* [-1.86]	-0.29* [-1.75]	-0.12 [-0.77]	-0.06 [-0.37]	0.10 [0.55]	0.11 [0.64]
Returns growth _{t-1}	-0.77*** [-3.37]	-0.89*** [-3.38]	-0.88*** [-3.32]	-0.88*** [-3.34]	-0.89*** [-3.36]	-0.89*** [-3.38]	-0.73*** [-2.96]	-0.71*** [-2.91]
Adjusted R ²	21.83	25.20	25.41	25.36	22.68	22.61	4.10	4.10
n * t = N	10,487	8,262	8,262	8,262	8,262	8,262	8,262	8,262
Sector dummies	+	+	+	+	-	-	+	+
Year dummies	+	+	+	+	+	+	-	-

Notes: Significant at: *10, **5 and ***1 percent levels; *t*-statistics with robust standard errors following Arellano (1987) due to $N > T$ are reported within the brackets []; the dependent variable is the cost of equity capital

Table VII.

Iterated cross-sectional and time-varying effect of strengths and concerns on the cost of equity capital

	Strengths $t-1$	Concerns $t-1$
<i>Sector interactions</i>		
Mean coefficients	$\bar{\Phi}^{STR} = -5.42$	$\bar{\Phi}^{CON} = -3.64$
F-statistic	10.68 ***	4.97 ***
p-value	(0.00)	(0.00)
Adjusted R^2	23.93	24.50
<i>Year interactions</i>		
Mean coefficients	$\bar{\Pi}^{STR} = -2.07$	$\bar{\Pi}^{CON} = +2.19$
F-statistic	85.50 ***	31.73 ***
p-value	(0.00)	(0.00)
Adjusted R^2	9.99	15.51

Notes: Significant at: *10, **5 and ***1 percent levels; F-test with robust standard errors following Arellano (1987) due to $N > T$; p-values reported in brackets (); the dependent variable is the cost of equity capital; column 1 estimated with all interaction terms between strengths and concerns with sector and year; first line calculates the mean of the estimated coefficients, second the F-statistic under the null of zero-equality and last line gives the respective p-value

Lastly, in addition to the cross-sectionally and time-varying iterated analysis, we are interested in the accurate effect of CSR activities given several cost of capital levels. In other words, it might be possible that cost of capital levels react asymmetrically to past CSR activities:

$$Q_{CoEC_{i,t+1}}(\tau|X) = [STR \quad CON]_{i,t} \theta^\tau + X_{i,t} \beta^\tau + \mu_j^{ICB} \delta^{(\tau|ICB)} + \mu^t \delta^{(\tau|t)} + u_{i,t+1}^\tau \quad (8)$$

The marginal effects of firms with lower equity premium to changes in their CSR strategy might respond weaker as for companies with higher capital costs. Therefore, we estimate equation (8) conditional on the quantiles τ of CoEC.

Empirical results

Granger causality analysis

The granger causality results of equation (4) are presented in Table V. Columns 1 and 2 show the estimated coefficient for lagged strengths and indicate that the present responsible allocation of resources diminishes the future equity premium after controlling for past financial performance. Conversely, the present cost of capital Granger causes future investment in CSR strengths negatively in both one and two year window. In both cases, the F test null hypotheses of zero-equality are rejected, implying a virtuous circle where firms “doing good” at present also “perform good” in the future and vice versa over 2003 and 2010. The bivariate causality predicts two main results. First, this virtuous circle confirms the positive effects of sustainability on financial performance and second, how companies subsequently allocate resources in CSR independently of their past financial performance. Based on these results however, column five to eight provide evidence of a circular causality in terms of concerns. In the first case (columns 5 to 6), the results show a negative and significant effect of the previous year’s concerns on the cost of equity capital and that firms with high concern scores are able to achieve subsequently lower equity premiums. With regard to the cost of capital, columns 7 and 8 show that financial performance two years earlier has a marginally significant effect on CSR concerns.

Linear regression models

We present our linear regression results in three stages. Table VI shows the estimates of equation (5) using OLS and linear effects for the explanatory variables. Second, Figure 3 presents the estimated iterated coefficients and tests regarding the cross-sectional and time-varying effects, equations (6) and (7). Third, Figure 3 shows the estimated coefficients and graphical decomposition of the quantile-conditional linear regression of equation (8). The dependent variable is the yearly cost of equity capital estimated using

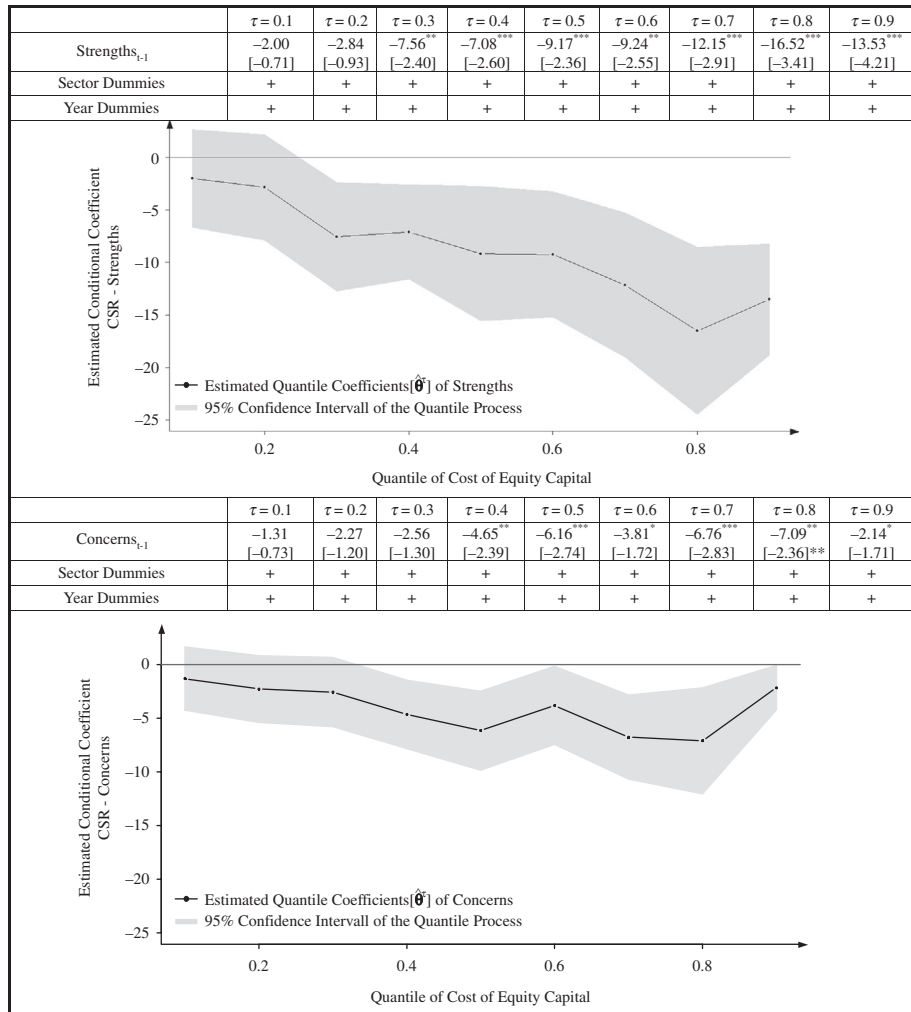


Figure 3. Parametric linear effect decomposition of CSR strengths and concerns on the cost of equity capital

Notes: Significant at: *10, **5 and ***1 percent levels; *t*-statistics in brackets []; 95 percent confidence interval is presented; quantile of cost of equity capital; the dependent variable is the cost of equity capital; coefficients estimated separately from quantile regressions for strengths and concerns with 0.1 steps (τ)

the three factor Fama-French asset pricing model with varying factor loadings from 2003 and 2010. The cost of capital measures firms' perceived valuation as the internal rate of return investors apply in order to estimate the risk of the company. The estimated coefficients for firm size are negative and significant in all models indicating lower levels of capital cost for high valued companies *ceteris paribus*. Investment opportunities and the growth in returns present as negative and significant whereas accounting leverage remains insignificant. The explained variation is above 20 percent after controlling for sector and year dummies, whereas by 4 percent without year dummies.

The basic model is presented in column 1, whereas column 2 includes the ESG index as explanatory variable. The compound effect between strengths and concerns is not significant and near to zero. This suggests that the equally treatment of strengths and concerns is neutral and not able to affect the future cost of capital. This result might indicate that CSR has no influence on the cost of capital and also on investors' perception about firms' risk. However, we include the results for the separately effects in model three to eight to capture the differentiation between strengths and concerns effects. The coefficients of strengths are negative across all models and indicate that an increment in present firm's responsibility agenda diminishes the cost of equity capital by ten basis points in the following year. The concern scores affect the estimated cost of equity negatively across all models. Nevertheless, the absolute value of this effect is lower in comparison to the benefits a high-responsible agenda has on the cost of equity capital. Thus, the measurement of KLD strengths and concerns as exogenous variables captures the asymmetric reaction of firms' willingness to pay for a CSR strategy. Following these results and taking the heterogeneity of our sample into account, the benefit of a low CSR strategy is 5.61 basis points lower than continuously investments in CSR.

In order to investigate whether the CSR effect varies across industry sectors and years, we estimate the interaction dummies between strengths and concerns with the sector and year dummies. The resulting vector of coefficients contains the estimated coefficients of the partial effect (strengths or concerns) given all industry sectors or years. Table VII presents the mean slope and the *F*-statistic. Across all sectors high-responsible firms diminished their capital costs by -5.42 basis points ($\hat{\Phi}^{STR}$) and over 2003 and 2010 by -2.07 basis points ($\hat{\Pi}^{STR}$).

In contrast to these results, firms neglecting investments in CSR diminished their capital costs by -3.64 basis points ($\hat{\Phi}^{CON}$) across all sectors, but suffered a reverse effect as for the long-term over 2003 and 2010. The mean of $\hat{\Pi}^{CON}$ – the iterated concerns slope – is $+2.19$ basis points, indicating an increment in investors' perceived firm's risk. Thus, the cross-sectional and time-varying sustainability effects differ with respect to the expected effects, showing a remuneration in the equity premium in favor of responsible firms. In combination with the granger-causality results, these results reinforce our hypothesized effects demonstrating that the permanent benefits of sustainability do pay off.

Linear effects in the response variable might vary for different levels of cost of capital with respect to strengths and concerns. Therefore, a quantile effect decomposition allow to separate marginal effects in dependence of the distribution of the response variable taking time and cross-sectional variation into account. The main purpose of this robustness parametric quantile-regression is to isolate marginal effects of a set of covariates given several levels (quantiles) of the dependent variable. We present the results of equation (8) in Figure 3[7].

For both CSR strengths and concerns we find a decreasing effect on the cost of equity capital. The response of firms with low capital costs (quantile 10-20 per cent) is nearly to zero and statistically not significant, whereas for the remaining sample the evidence shows considerable effects. The marginal effect of a CSR agenda increases for high levels of equity premium, while CSR concerns remain relative constant. The consequences of an intensive CSR agenda in the present diminish firm's perceived risk and consequently the future estimated cost of capital from -7 to -13 basis points. This indicates that sustainability affects the cost of capital asymmetrically. While past investments in a CSR agenda reduce actual risks and internal rates of return, the relative gain of a CSR isolated strategy remains stable but particularly low. The linear decompositions show a decreasing and not horizontal pattern, which confirms that, the conditional asymmetric treatment of strengths and concerns is important. The quantile treatment allow a precise understanding of the consequences a CSR agenda has on the expect capital costs. It is clear that the marginal price treatment capital markets and investors apply to firms' strategy differs regarding the intensity and purpose of responsible activities.

Conclusions

This paper investigates the effect of corporate social responsibility ratings on the *ex ante* cost of capital of more than 2,300 listed US companies in a panel framework from 2003 to 2010. In line with previous studies, our results show that capital markets and investors pay higher premiums for firms allocating resources to sustainable activities. However, rather than assuming the aggregated KLD criteria to be an exogenous variable, we generate a CSR index that separates strength and concern and report considerable variation across industries, in particular showing a remarkable difference between consumer and asset-orientated industries, such as telecommunications and real estate. We find a decreasing effect of each of these dimensions on the cost of equity capital. The response of firms with low capital costs to CSR ratings is nearly zero and statistically not significant, whereas for the remaining sample the evidence shows considerable effects. After controlling for sector and time bias, the marginal effect of a CSR agenda increases the equity premium while CSR concerns remain relative constant. Across all sectors, high-responsible firms diminished their capital costs significantly. Somewhat surprisingly, we also find that firms with a high number of CSR concerns diminished their capital costs in the short run but suffered a reverse effect over the long run in the 2003-2010 period. Overall, we find empirical evidence for our hypothesized effects that longer-term commitment to sustainability and social responsibility is associated with positive financial effects for listed companies and their shareholders.

Notes

1. Ghoul *et al.* (2011, p. 2394) – “Does corporate social responsibility affect the cost of capital?” Report a reduction of 10 bp.
2. For additional information regarding the development and differences across various CSR-definitions, see: Carroll (1999) and Waddock (2004).
3. Surroca *et al.* (2010) decides to proxy CSR using the “Sustainalytics” database and discusses a threefold identification problem of the KLD database. Since we aim to propose an alternative measure of the KLD-database, we summarize his argumentation in two points.
4. See: www.icbenchmark.com/

5. See: <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html>
6. Since our sample comprehends of eight time periods and of a large sample of firms across different industry sectors, we control in our Granger-Causality-Tests for time-varying and cross-sectional effects in order to avoid latent inference errors as described by Petersen (2009) in general and Nelling and Webb (2009), in the CSR area.
7. The results of the entire quantile regression process are omitted. Since the overall effects are shown in Table VI, we only concentrate our focus on the conditional values of strengths and concerns.

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