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The impact of the environmental, social and governance dimensions of sustainability on firm risk in the hospitality and tourism industry

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Abstract

This paper explores the relationship between adherence to corporate social responsibility goals and firm financial risk. Data on an international sample of 209 firms were collected for the period 2002 to 2022. Firm risk was proxied using stock return volatility and probability of default. The results show that the environmental performance of hospitality and tourism firms unequivocally influences firm risk, whether this risk is quantified as probability of default or volatility of stock market returns. This finding confirms that the adoption of environmentally sustainable and responsible practices is crucial not only for the environment but also for the stability of hospitality and tourism firms.

KEYWORDS

corporate social responsibility, default risk, environmental, governance, social, stock volatility

1 | INTRODUCTION

In recent years, there has been growing concern for sustainable growth and the preservation of the environment. This trend has meant that companies belonging to the tourism sector have been subjected to rigorous scrutiny by society. The tourism industry is a major sector of the world economy. According to World Travel and Tourism Council data (WTTC, 2021), in 2019, the tourism industry provided around 10.4% of global gross domestic product (GDP) and 10.6% of all jobs. In 2020, due to mobility restrictions because of COVID-19, the tourism industry suffered. However, despite these restrictions, its share of global GDP was still 5.5%.

Tourism activity has a major impact on the environment. It also depends on local communities, as well as human and natural resources. This sector is highly vulnerable to climate change because of extreme weather events, loss of biodiversity, damage to tourist destinations and other such effects. Tourism activity also has

implications for local communities and the environment. These implications include the consumption of resources, carbon emissions, deforestation, large influxes of travellers to natural environments and so on (Koseoglu et al., 2021; Uyar et al., 2020).

According to the 2020 United Nations World Tourism Organisation (UNWTO, 2020) report, in 2016, total transport-related emissions from tourism accounted for 22% of all transport emissions and 5% of all human-made emissions. These emissions are expected to continue to increase. Estimates for 2030 predict these figures to reach 21% and 5.3%, respectively. Emissions are not just confined to transport. According to the 2021 WTTC report, in 2019, the tourism industry was responsible for about 5.4 billion tons of CO₂ emissions, of which 6% were from accommodation and 9% from food and beverage.

Consequently, this sector has recently been subjected to observation and assessment by stakeholders such as politicians, regulators, financial markets and society in general. Companies in the hospitality and tourism (H&T) sector have embraced corporate social

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responsibility (CSR) measures that reflect a concern for society, the environment and sustainability. The aim of these measures is not only to comply with legal requirements but also to mitigate the socioeconomic and environmental impact of tourism activity and reduce reputational costs (Koseoglu et al., 2021; Madanaguli et al., 2021; Uyar et al., 2020).

The literature explains that the adoption of CSR measures has a host of benefits for companies. Better CSR leads to an improved reputation (Bouslah et al., 2013). It can also improve brands and the image of products among consumers (Brown & Dacin, 1997). It can even attract highly qualified employees (Greening & Turban, 2000). In addition, companies with high CSR commitment attract socially responsible investors, which leads to lower capital constraints (Cheng et al., 2014). Overall, the literature suggests that higher CSR results in an increase in expected future cash flows and a reduction in risk and the probability of crisis (Bouslah et al., 2013; Sassen et al., 2016). By contrast, some authors have suggested that if CSR costs are too high or there is overinvestment by entrenched managers, CSR engagement may result in an increase in financial risk (Kim et al., 2017), hence the importance of understanding the effects of CSR investment on a firm's financial stability.

The concept of CSR encompasses the environment, society and governance. However, the environmental dimension is currently one of the most highly targeted aspects of CSR. Kassinis and Vafeas (2006) and Welford et al. (2007) have described the environment as one of the most important concerns for firms in their CSR efforts. Oikonomou et al. (2012) treated the environmental features of firms as a specific individual dimension of CSR. The authors of the present study are of the view that examining the overall measure of CSR can hide the specific impact of each individual dimension on firm value.

This study focuses on the impact of the dimensions of CSR (environmental, social and governance) on the risk of firms in the H&T industry. Here, risk is proxied using two alternative market-based measures of corporate financial risk: stock return volatility and probability of default. Despite a wide range of mainstream business studies on the impact of CSR measures on firm value, studies of the H&T industry are scarce (Madanaguli et al., 2021; Uyar et al., 2020). Moreover, there is little evidence of the relationship between each of the dimensions of CSR and firm risk. Scholars have analysed the link between overall CSR and firm risk. However, the results are inconclusive (Kim et al., 2017; Kumar, 2023; Ozdemir et al., 2020; Park et al., 2017). To the authors' knowledge, there is no evidence of the impact of each of the CSR dimensions on H&T firm risk, hence the relevance of the present study. Managers need to understand the effects of CSR initiatives that may not only increase reputation and credibility but also reduce a firm's financial risk.

The aim of the article is twofold. First, it analyses the relationship between the dimensions of CSR and firm risk by considering the environmental, social and governance aspects of CSR. This approach follows the same stream of research as authors such as Sassen et al. (2016), who argued that each dimension of CSR can have a different impact on firm risk. Second, it analyses whether CSR during adverse events provides protection to mitigate the effect of CSR on firm risk. This approach builds on the ideas of authors such as Al Amosh et al.

(2023), Al Amosh and Khatib (2023), Godfrey (2005), Godfrey et al. (2009) and Shahrour et al. (2021), who showed that CSR initiatives can provide insurance-like protection.

An international study was carried out to analyse data for the period 2002 to 2022. This period spans two economic crises: one caused by the collapse of the global financial system between 2008 and 2012 and one due to the COVID-19 outbreak in 2020. The data were gathered from Thomson Reuters Eikon database (TR_Eikon). Companies in the H&T sector were selected, regardless of their country of origin. An unbalanced panel data structure of 1630 firm-year observations was used. The data were analysed using linear dynamic panel data regression analysis to test the hypothesised relationships.

The results reveal that the environmental performance of H&T firms unequivocally influences firm risk, whether this risk is quantified as probability of default or volatility of stock market returns. This finding confirms that the adoption of environmentally sustainable and responsible practices is crucial not only for the environment but also for the stability of H&T firms.

This study makes important contributions to the literature. First, it enriches research on the impact of CSR engagement on risk in a crisis-prone industry with a profound environmental impact. The relationship between CSR commitment and risk in H&T companies has scarcely been studied, and the findings are inconclusive. Consequently, further study is needed to understand the possible effects of each dimension of CSR on the risk of H&T firms. In this study, the risk measures used in previous studies (i.e. systematic and idiosyncratic risk) are extended by including default risk. In addition, the analysis was performed for both the overall CSR measure and its three core dimensions (environmental, social and governance). Second, the study provides evidence of the importance of adopting environmental measures in H&T companies to increase financial soundness. The study contributes to the literature on risk management and confirms that CSR measures, which are often mandatory, have direct benefits for companies and can help reduce the rate of company crises. Overall, this study contributes to the literature by providing guidance for strategic decision-making in CSR engagement, considering the impact in terms of financial risk reduction.

The remainder of the article is structured as follows. Section 2 presents the theoretical framework and hypotheses. Section 3 describes the sample, variables and methodology. The results are discussed in Section 4. Section 5 presents the conclusions.

2 | THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

CSR refers to actions 'whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis' (Communities, 2001, p. 6). Being socially responsible means going beyond minimum legal requirements by investing in human capital, the environment and relations with stakeholders. Greater social responsibility is expected to contribute to competitiveness.

Recent research reflects the growing concern for the environment. It typically focuses on the impact of CSR measures on firms' sustainable behaviour and value (Biswas et al., 2018; Galbreath, 2018; Gangi et al., 2020; Jo & Harjoto, 2011; Lin et al., 2020; Liu et al., 2021; Shahrour et al., 2021). In the H&T industry, most of the empirical research has focused on the impact of CSR initiatives on employees and customers. It has overlooked the impact on financial variables. Madanaguli et al. (2021) provided a literature review. The evidence suggests that the H&T industry is aware of the impact of its activity on local communities and the environment and that it is concerned with sustainable development. Although engaging in these practices is costly, the benefits in the form of, say, reputation, brand image, legitimacy, energy and water savings, and attracting travellers who are willing to pay outweigh the costs (Uyar et al., 2020).

The H&T industry has specific firm characteristics that may differ from those of other industries, such as fiercer competition, higher leverage and greater capital intensity (Li & Singal, 2021). Accordingly, the benefits of CSR measures are particularly valuable. The increased involvement of stakeholders and the resulting moral capital and enhanced reputation can make CSR a valuable asset for companies in the H&T industry. In addition, the H&T industry is extremely sensitive to socioeconomic changes such as economic crises or health emergencies such as the COVID-19 pandemic. This sensitivity owes to its high level of dependence on the discretionary spending of travellers. Moreover, it is affected by a highly dynamic external environment (Ozdemir, 2020; Yeh & Trejos, 2015). In recent years, it has been greatly affected by changes in the dominant business model due to the emergence of online booking platforms and home-sharing alternatives to traditional hotels (Li & Singal, 2021). The ability of companies to adapt to changes and their resilience to financial difficulties are fundamental for business survival. As noted by Godfrey (2005), CSR engagement may provide H&T firms with an insurance-like protection in times of crisis. Indeed, Dogru et al. (2022) and Chen et al. (2022) found that sustainable business practices of tourism firms provided greater resilience to the negative effects of the pandemic.

Therefore, specific studies of the H&T sector are important to understand how CSR measures implemented by companies can help reduce company risk. Despite growing interest in this topic, studies are still scarce and provide inconclusive findings. Most studies have focused on equity-holder risk, without considering corporate risk. Park et al. (2017) found no relationship between CSR measures and systematic risk. However, Kim et al. (2017) found a negative relationship between CSR measures and systematic risk and no relationship when the measure was unsystematic risk. Ozdemir et al. (2022) observed a negative relationship between CSR and unsystematic risk. Kumar (2023a) analysed the impact of corporate sustainability disclosure on firm risk, finding a negative relationship with total risk, systematic risk and probability of default. Moreover, studies have focused on overall CSR, overlooking the relevance of its three core dimensions.

The current study addresses the highlighted gap in the literature by examining the impact of the three dimensions of CSR (environmental, social and governance) on two measures of corporate financial

risk: stock return volatility and probability of default of H&T firms. Firm risk is the result of external or internal factors that may affect returns. A company's involvement in socially responsible activities can improve its reputation and corporate image, thereby reducing risk through CSR activities.

Several theories use complementary arguments to explain the impact of CSR on firm risk and probability of default. This study focuses on stakeholder theory, risk management theory and managerial opportunism theory.

2.1 | Stakeholder theory

Stakeholder theory (Freeman, 1984) holds that the implementation of environmental and social strategies goes beyond the creation of value for shareholders. Instead, all stakeholders must be involved, including consumers, employees, suppliers, activists, regulators and society in general. Firms must enhance their relationships with all stakeholders and develop sustainable policies by aligning managers' and stakeholders' long-term goals (Hussain et al., 2018; Michelon & Parbonetti, 2012).

Implementing CSR strategies has multiple benefits. Compliance with legal regulations on environmental issues (anti-pollution measures, reduction of emissions, reuse of resources, etc.) and social issues (employee relations, respect for human rights, etc.) reduces the risk of sanctions and fines and attracts talent (Feldman et al., 1997; Greening & Turban, 2000; Sharfman & Fernando, 2008). CSR measures can reduce firms' operating risk, improve the image of their products among consumers, enhance their reputation and increase brand value (Brown & Dacin, 1997). There are also strengths with regard to financing. High levels of CSR can foster relations with the government and the financial community, reducing financial risk, lowering capital constraints and facilitating access to capital markets (Cai et al., 2016; Cheng et al., 2014). The participation of socially responsible investors who apply financial and non-financial criteria increases the demand for socially responsible stocks. Such stocks become overvalued, leading to lower risk and expected returns (Bouslah et al., 2013). Moreover, poor sustainable behaviour, including the misappropriation of stakeholders' resources, can increase stock return volatility (Tasnia et al., 2021). By contrast, CSR activities reduce the uncertainty of future cash flow and variations in stock returns (Kim et al., 2017).

Overall, stakeholder theory implies that firms with high levels of CSR will reduce their financial risk, stock return volatility and probability of experiencing a crisis (Bouslah et al., 2013; Sassen et al., 2016). Shahrour et al. (2021) found a negative association between CSR and default risk, whereas Lin et al. (2020) observed that the credit ratings of firms improve when CSR activities are acknowledged by investors. Following this argumentation, the corresponding hypothesis can be stated as follows:

Hypothesis 1. *CSR activity is negatively related to the risk and probability of default of H&T firms.*



2.2 | Managerial opportunism theory

Unlike the previous theory, managerial opportunism theory posits a positive relationship between CSR engagement and firm risk. Managerial opportunism theory (Preston & O'Bannon, 1997) holds that managers mainly pursue private goals. Managers overinvest in CSR to improve their reputation as good citizens and strengthen their relationships with stakeholders (politicians, unions and society). This approach pursues their private interests at the expense of those of shareholders (Bouslah et al., 2013; Sassen et al., 2016).

Cespa and Cestone (2007) found that managers invest in CSR as an entrenchment strategy to gain stakeholder support and reduce the likelihood of redundancy in takeovers. Other authors, such as Jo and Harjoto (2011), have highlighted the risk that managers overinvest in CSR to build their reputation at the expense of shareholders. From the perspective of agency theory, CSR engagement results in a waste of resources that may weaken the finances of a firm and reduce the wealth of shareholders. However, other authors, such as Gangi et al. (2020), have noted that this drawback can be addressed by monitoring the board of directors. This monitoring can prevent the use of resources in costly CSR measures to the detriment of firm value. Following this argumentation, the corresponding hypothesis can be stated as follows:

Hypothesis 2. *CSR activity is positively related to the risk and probability of default of H&T firms.*

2.3 | Risk management theory

Risk management theory (Godfrey, 2005) holds that CSR engagement can generate moral capital among firms and stakeholders. This moral capital creates goodwill and provides shareholders with insurance-like protection against crises. In times of crisis, stakeholders are loyal to companies. This loyalty reduces the impact of negative events on companies' cash flows, reducing their volatility and risk (Cheng et al., 2014; Godfrey et al., 2009). For socially responsible investors, moral capital can prevent them from withdrawing their investment in response to a crisis (Sassen et al., 2016). Bollen (2007) and Renneboog et al. (2011) found that socially responsible investors are less sensitive to negative returns than traditional investors. Following this argumentation, the corresponding hypothesis can be stated as follows:

Hypothesis 3. *CSR activity protects H&T firms against adverse events.*

2.4 | Impact of CSR dimensions on firm risk

Studies have shown the different impacts of each CSR dimension on firm risk (Bouslah et al., 2013; Cai et al., 2016; Sassen

et al., 2016). One of the main arguments employed to explain these differences in relationships is that the effect of each dimension depends on the nature of the firm's business. For instance, capital-intensive industries are more exposed to environmental risk, whereas labour-intensive industries are more exposed to employee relation risk (Bouslah et al., 2013). Another argument relates to the fact that each dimension concerns different kinds of stakeholders (Godfrey et al., 2009). Also, measurement of some of the components of these dimensions is difficult and subjective, which makes it challenging to analyse their influence on company risk. Accordingly, Bouslah et al. (2013) observed a negative relationship between employee relations, community and corporate governance, and firm risk, while reporting that environment positively affects S&P500 firms' risk and negatively affects risk for non-S&P500 firms. Cai et al. (2016) argued that corporate environmental responsibility is a part of CSR but that the strengths and concerns of these dimensions are different. They reported that corporate environmental responsibility is negatively related to firm risk. Sassen et al. (2016) observed different relationships between the three dimensions of ESG and firm risk. They found that social performance decreases total firm risk, environmental performance only decreases total risk in environmentally sensitive industries and governance performance does not affect risk. The lack of consensus in these results makes further study of this issue important.

Analysing the possible relationship between a firm's risk and CSR performance (proxied by the ESG score) is likely to give incorrect results. The ESG score is based on a company's performance in three approximately equally weighted areas: environment, society and governance. However, each of these areas addresses a specific aspect of sustainability. A company does not necessarily have to participate in all areas. Moreover, if it does participate, it does not necessarily have to do so in the same way. For example, a company can be environmentally aware but have weak social or governance policies (Ionescu et al., 2019; Sassen et al., 2016). Paek et al. (2013) explained that CSR investments in different dimensions target different stakeholders and may achieve different outcomes.

In addition, the literature shows that CSR attributes vary and have different effects on certain company variables. Therefore, the approach in this study is to analyse the relationship between the ESG score and firm risk and between each of the three pillars of ESG separately and firm risk. However, in the current study, a true commitment to sustainability (environmental, social or governance) and suitable resource allocation to match this commitment is expected to have positive impacts in terms of social perception, image improvement and employee loyalty, among other factors. These positive impacts should translate into greater financial stability and/or a reduction in financial risk.

Thus, this article tests whether companies with high overall ESG scores and high scores for any of the individual ESG dimensions have lower stock return volatility and a lower probability of default. This effect should be stronger when negative events occur, especially during times of crisis.

3 | VARIABLES, DATA AND METHODOLOGY

3.1 | Variables and data

This study explored the impact of CSR practices on firms' risk in the H&T industry for the period 2002 to 2022. CSR commitment was proxied using the ESG score available in the Thomson Reuters Eikon ASSET4 database (TR_Eikon) for the ESG_score variable and its environmental, social and governance dimensions. The ESG_score (along with its pillars) gives each company a weighted average relative rating based on the data submitted by companies. This objective score measures and compares companies' attitudes towards CSR. The scores range from 0 (worst) to 100 (best).¹

The environmental score (ENV_score) measures the impact of a firm on its natural living and non-living environment. It includes the firm's commitment to resource use, emissions and innovation in eco-efficient products or services. The social score (SOC_score) measures the commitment of the firm to its workforce, customers and society. It covers issues such as product responsibility, human rights, equal opportunities and high-quality working conditions. The governance score (GOV_score) measures the commitment to follow best corporate governance practices, focusing on board members', executives' and shareholders' long-term interests.

Firm risk (FRisk) was proxied by two variables. The first was the standard deviation of daily stock returns (STD_R), which measures the firm's total risk. The second was the probability of default (PD) based on the Merton measure (Merton, 1974), as shown in Equation 1. Unlike traditional risk approaches based on accounting data, this variable is based on option pricing theory. It uses information on stock returns, leverage and volatility to measure the difference between the value of a firm's assets and the nominal value of its default point.

$$PD = \mathcal{N}\left(-\frac{\ln\left(\frac{V_A}{D}\right) + (\mu - 0.5\sigma_A^2) * T}{\sigma_A \sqrt{T}}\right). \quad (1)$$

Here, V_A is the value of the firm's assets, μ is the expected immediate rate of return on V_A , σ_A is asset return volatility, D is the debt's face value and T is the maturity period. $\mathcal{N}(\cdot)$ is the cumulative standard normal distribution function.

The model also included specific variables that may influence firm risk. The model included corporate governance variables related to having an effective corporate board that can reduce a firm's risk. Board size, CEO duality, the percentage of independent directors and board gender diversity were used. Consistent with other studies (Cai et al., 2016; Sassen et al., 2016), the model included firm-level control variables. These variables were size, leverage and financial performance. The size of the firm was measured as the logarithm of market

TABLE 1 Variable definitions.

Variable	Definition
Dependent variables	
PD	Probability of default of Merton (1974) shown in Equation 2
STD_R	Volatility of stock returns: Standard deviation of daily stock returns
Independent variables	
ESG_score	ESG score: evaluates how sustainably a company is conducting business. The ESG score is a comprehensive score made to measure a company's commitment to environmental, social, and governance investing standards.
ENV_score	Environmental pillar score: weighted average relative rating based on reported environmental information. Ranges from 0 (worst) to 100 (best). Provided by Eikon Thomson Reuters.
SOC_score	Social pillar score: weighted average relative rating based on reported social information. Ranges from 0 (worst) to 100 (best). Provided by Eikon Thomson Reuters.
GOV_score	Governance pillar score: weighted average relative rating based on reported governance information. Ranges from 0 (worst) to 100 (best). Provided by Eikon Thomson Reuters.
Control variables: Corporate board	
B_Independence	Independence: number of independent directors as a percentage of total directors on the board
B_Gender	Gender diversity: number of women directors as a percentage of total directors on the board
B_Size	Board size: number of directors on the board
Duality	Duality: dummy variable taking the value 1 if the chair of the board is the CEO, and 0 otherwise
Control variables: Firms	
Firm_Size	Firm size: logarithm of market capitalisation
ROA ^a	EBITDA divided by total assets
Leverage ^a	Leverage: total debt to total assets
Control variables: Crisis	
Crisis	Dummy variable taking the value 1 if year is in the range 2008 to 2012 (financial crisis) or 2020 (COVID-19 health crisis), and 0 otherwise

^aTo mitigate the impact of outliers, *Leverage* and *ROA* were winsorised at the 1st and 99th percentiles of their empirical distributions.

capitalisation, and financial performance was measured by return on assets (ROA). All variables are shown in Table 1.

Like the data on companies' CSR performance, these data were also collected from the TR_Eikon database. For the period 2002 to 2022, listed companies classified as H&T companies in TR_Eikon were

¹The Thomson Reuters ESG Scores Document describes the ESG score methodology in detail (<https://eikon.thomsonreuters.com/index.html>).

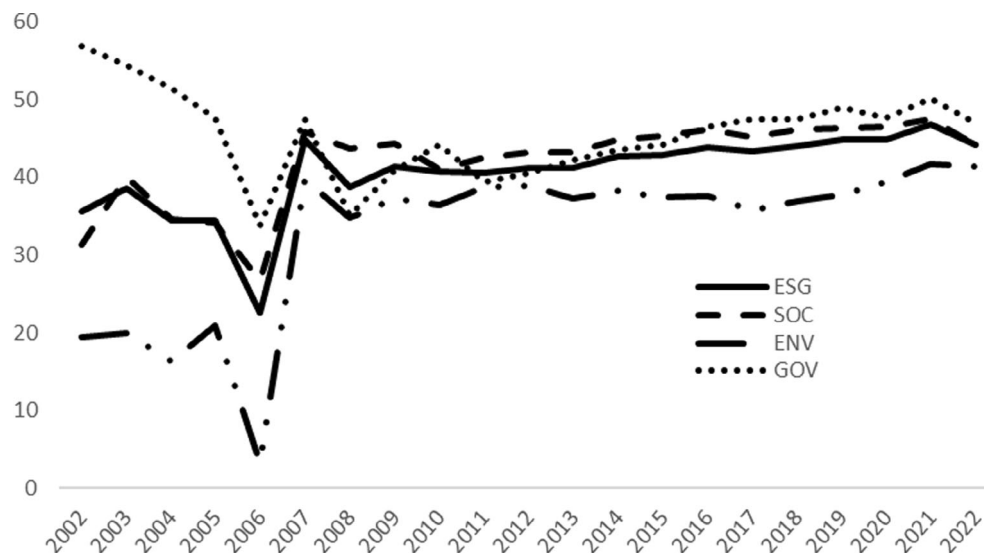
TABLE 2 Descriptive statistics and matrix of correlations for final sample.

	PD	STD_R	ESG_s	ENV_s	SOC_s	GOV_s	B_Size	B_Gen.	B_Ind.	Duality	F_Size	Levera.	
PD	1												
STD_R	0.780	1											
ESG_score	−0.026	−0.132	1										
ENV_score	−0.030	−0.130	0.895	1									
SOC_score	−0.025	−0.141	0.927	0.788	1								
GOV_score	−0.004	−0.044	0.678	0.430	0.444	1							
B_Size	−0.043	−0.095	0.353	0.382	0.327	0.158	1						
B_Gender	0.010	−0.019	0.192	0.132	0.171	0.192	−0.045	1					
B_Independence	0.038	0.020	0.184	0.067	0.183	0.220	−0.136	0.018	1				
Duality	0.015	0.023	0.035	0.052	0.031	−0.004	0.124	−0.014	0.108	1			
Firm Size	−0.184	−0.285	0.436	0.420	0.405	0.253	0.403	−0.045	0.146	0.216	1		
Leverage	0.348	0.269	0.073	0.093	0.075	0.005	−0.043	0.002	0.027	−0.036	−0.272	1	
ROA	−0.283	−0.418	−0.033	−0.059	−0.035	0.020	0.048	−0.017	−0.050	0.002	0.259	−0.362	1
Obs	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630	1630
Mean	0.013	0.025	43.173	37.328	44.83	46.146	9.277	0.171	0.576	0.434	21.411	0.311	0.044
SD	0.062	0.014	21.432	30.027	24.545	21.391	2.880	0.152	0.221	0.496	1.612	0.197	0.089
Min	0	0.006	2.371	0	0.480	2.220	3	0	0	0	15.873	0	−0.223
Max	0.979	0.228	92.274	98.137	97.127	98.300	28	1	1	1	25.663	0.774	0.321

Note: See Table 1 for variable definitions.

Abbreviations: Obs, number of observations; SD, standard deviation.

FIGURE 1 Time profile for the ESG score and the environmental (ENV), social (SOC) and governance (GOV) pillar scores. See Table 1 for variable definitions.



selected. Subsequently, data on these companies were collected. For each year, companies were included in the sample if they had data on the variables of interest. Specifically, companies were included if they had data on their ESG score and a score for each ESG pillar (environmental, social and governance), size, independence, gender diversity, CEO duality, volume of assets, debt and ROA. Finally, data on market capitalisation and share prices were collected. Companies lacking this information or with a negative volume of equity were removed. Thus, an unbalanced panel data set of 1630 observations for 246 firms in 45 countries was obtained.

Table 2 shows the correlation matrix and descriptive statistics for the variables of interest. To mitigate the impact of outliers, all ratios (leverage and ROA) were winsorised at the 1st and 99th percentiles of their empirical distribution. The correlation coefficients did not indicate problems of collinearity, except for the correlation between the environmental and social variables. However, given that some corporate governance variables (board size, CEO duality, board independence and board gender diversity) were also used by TR_Eikon to calculate the ESG scores, there was a chance that the results could be biased due to multicollinearity problems. To dispel any remaining doubts over collinearity, the variance inflation factor (VIF) was analysed.

The correlation coefficients for the ESG scores and probability of default (PD) were negative, as were the correlation coefficients for the ESG scores and standard deviation of returns (STD_R). These results indicate an inverse relationship, suggesting that greater commitment to CSR is associated with lower firm risk. The correlations between the ESG score and each of its pillars were also studied. Governance had the lowest correlation with the risk variables PD and STD_R, as well as with the ESG index and its environmental (ENV) and social (SOC) pillars.

The average values for the ESG scores did not indicate high ESG engagement in H&T firms. Even though GOV_score had the highest average value, it was still less than 50. As shown in Figure 1, SOC_score had a similar trend to the ESG index throughout the study

period. GOV_score had the highest values. However, during the financial crisis (2008–2012), it fell substantially and then rose to have the highest score again. ENV_score had the lowest values throughout the period. However, since 2008, companies seem to have begun to pay more attention to environmental responsibility. As expected, during years of crisis, there was an increase in both the probability of default and the deviation of stock market returns (Figure 2).

3.2 | Methodology

To examine the impact of CSR practices on the financial risk of H&T companies, ESG scores were compared with firm characteristics in crisis and non-crisis periods. Crisis periods spanned the years 2008 to 2012 and 2020. These years corresponded to the financial crisis and the pandemic, respectively. A univariate t-test of differences between means of the variables was performed to compare crisis and non-crisis periods.

The Granger causality test was also applied, considering a lagged vector autoregression model. The aim was to analyse the possible causal relationship between a company's socially responsible attitude and its risk. That is, the approach intended to analyse whether an active attitude towards sustainability, measured by ESG scores, affects a firm's risk, proxied by probability of default (PD) and the standard deviation of stock market returns (STD_R), or whether the level of risk perceived by a firm determines its commitment to CSR.

Next, a regression model (Equation 2) was run using the two-step system GMM estimator. The GMM model was chosen because it is the best estimation technique for dynamic panel data and can generally be used in these situations. Using the GMM model provided consistent results in the presence of different sources of endogeneity, unlike with fixed effects or ordinary least squares (OLS). The possible endogeneity of the independent variables was addressed using internal instruments, specifically their own lagged values. There are two

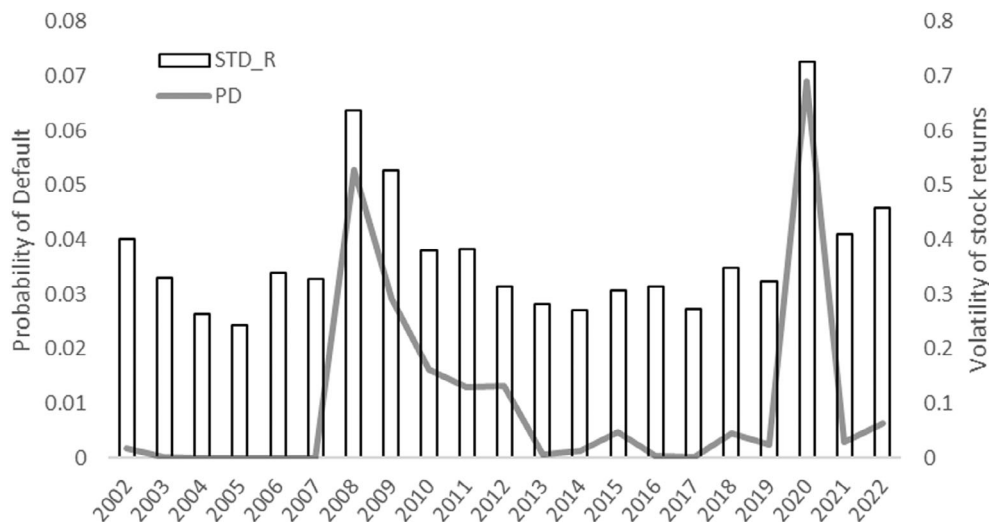


FIGURE 2 Time profile for the probability of default (PD) and volatility of stock returns (STD_R). See Table 1 for variable definitions.

types of GMM models: two-step system and difference GMM. However, according to Jiang and Khan (2023), a two-step system GMM is more reliable and efficient than difference GMM because difference GMM may be asymptotically weak, and the instruments used may be biased. The consistency of the GMM estimator depends on the validity of the instruments. Various tests were employed for this purpose. The first test was Hansen's overidentification test. It tested for the absence of correlation between the instruments and the error term. Essentially, it assessed the joint validity of the chosen instruments. The second test examined the hypothesis of the absence of second-order serial correlation in the residuals of first differences.

$$FRisk_{it} = \beta_0 + \beta_1 FRisk_{it-1} + \beta_2 Crisis + \beta_3 Score_{it} + \beta_4 Crisis * Score_{it} + \sum_{j=5}^8 \beta_j Board Control_{it} + \sum_{j=9}^{11} \beta_j Firm Control_{it} + \varphi Country_i + \gamma Industry_i + \vartheta_i + \mu_{it}. \quad (2)$$

Firm risk ($FRisk_{it}$) was proxied by two variables: the standard deviation of daily stock returns (STD_R_{it}) and the probability of default (PD_{it}) based on the Merton measure (Merton, 1974). $Score_{it}$ was the TR_Eikon database score for the ESG variable and its three components. Each of the score variables interacted with crisis, a dummy variable that took the value 1 for the years 2008 to 2012 and 2020, and 0 otherwise.

The analysis also controlled for other variables (Table 1). Following previous studies of risk in hospitality (Kim et al., 2017; Ozdemir et al. 2020 and Park et al., 2017), the analysis controlled for the firm characteristics of firm size, leverage and ROA. Specifically, it was expected that larger firms would have higher debt capacity and stable returns (Rego et al., 2009), leverage would be negatively related to a firm's repayment capacity (Ferreira & Laux, 2007) and higher ROA would be associated with higher solvency and low risk (Ferreira & Laux, 2007).

Furthermore, in line with the corporate governance literature on the role of board characteristics in corporate risk (Sila et al., 2016), the

analysis also controlled for board composition. Specifically, the control variables were board size, gender diversity, independence and CEO duality. It is argued that larger, more independent and more diverse boards provide better oversight and control over managerial decisions and consequently prevent managers from engaging in risky behaviour. However, the evidence in the tourism sector is inconclusive. For example, Trinh and Seetaram (2022) observed the expected relationship for board size and board independence but did not find significant results for either gender diversity or duality. On the contrary, Kumar (2023a) reported that default risk decreased for tourism businesses with increasing board gender diversity, while there was no significant impact of an increase in independent board directors. The country of the company's headquarters was also included as a control variable, as was the company's industry. Finally, standard errors were clustered at the firm level.

As mentioned in the discussion of the correlation matrix, there did not seem to be a worrying correlation between board characteristics and the ESG_score variable and the score for each of the ESG pillars. However, to detect possible multicollinearity problems, the variance inflation factor (VIF) was examined.² The average VIF, regardless of whether the dependent variable was probability of default or stock return volatility, was 1.22. The maximum value never exceeded 1.6. VIF values of explanatory variables were less than the threshold value of 10. Hence, the results implied non-significant multicollinearity among variables (Hair et al., 2006).

4 | RESULTS

Table 3 summarises the statistics and tests of mean differences between crisis and non-crisis periods for all variables. As expected, during years of crisis, both the probability of default and the variability of stock returns increased significantly. With respect to the ESG score and the scores for each ESG pillar, a significant negative difference

²Due to space reasons, the VIF data do not appear in the table but are available on request.

TABLE 3 Crisis and non-crisis periods—summary statistics and differences in means.

	Non-crisis period			Crisis period			Diff. mean (p-value)
	Obs.	Mean	SD	Obs.	Mean	SD	
PD	1161	0.002	0.02	469	0.041	0.107	0.038*** (0.000)
STD_R	1161	0.021	0.008	469	0.034	0.021	0.013*** (0.000)
ESG_score	1161	43.518	21.128	469	42.321	22.165	−1.197 (0.308)
ENV_score	1161	36.968	29.863	469	38.219	30.443	1.252 (0.446)
SOC_score	1161	45.066	24.132	469	44.245	25.553	−0.821 (0.541)
GOV_score	1161	47.293	21.218	469	43.306	21.573	−3.987*** (0.001)
B_Size	1161	9.208	2.853	469	9.446	2.94	0.237 (0.132)
B_Gender	1161	0.176	0.156	469	0.157	0.14	−0.019** (0.021)
B_Independence	1161	0.578	0.218	469	0.571	0.228	−0.007 (0.569)
Duality	1161	0.421	0.494	469	0.465	0.499	0.044 (0.108)
Firm size	1161	21.449	1.627	469	21.315	1.571	−0.134 (0.130)
Leverage	1161	0.307	0.198	469	0.322	0.196	0.015* (0.100)
ROA	1161	0.051	0.079	469	0.028	0.109	−0.023*** (0.000)

Note: See Table 1 for variable definitions.

Abbreviations: Diff. mean, difference in mean values in crisis versus non-crisis periods; Obs, number of observations; SD, standard deviation.

*Significance level of 10%.

**Significance level of 5%.

***Significance level of 1%.

was observed only for the GOV pillar. In relation to the rest of the variables, significant differences were observed for a lower representation of women on the board, higher leverage and lower ROA in periods of crisis.

To investigate the possible causal relationship between sustainability adherence (measured by ESG scores) and firm risk (proxied by probability of default and stock return volatility), Stata's 'xtgranger' command was used to perform Granger causality analysis. The results are presented in Table 4. The results in Panel A indicate a significant causal relationship of the ESG variable on these risk variables, at the usual significance levels. The results in Panel B of Table 4 divide the ESG score into its environmental (ENV), social (SOC) and governance (GOV) components. These results suggest that the aforementioned causal relationship is due to the ENV variable, which is the only one that was significant. Finally, Panel C of Table 4 suggests that the focal relationship was not subject to any reverse causality problems.

After this preliminary analysis, the results of estimation of the model described in Equation 2 with the Stata command 'xtabond2'

are presented. Tables 5 and 7 present the results for the relationship of probability of default (Table 5) and stock return variability (Table 7) with CSR performance and each CSR performance pillar in H&T firms. The Hansen test *p* value and the first- and second-order correlation test results are shown. The values confirm the validity of the instruments used and the absence of second-order serial correlation in the error term.

In addition, the analysis tested the sensitivity of the results to all possible combinations of inclusion or exclusion of all control variables using Stata's 'checkrob' command. The results for the relationship of probability of default and stock return variability with CSR performance and its pillars are shown in Tables 6 and 8, respectively.

With respect to the main variables, Table 5 shows that there was a significant positive relationship between probability of default and crisis periods and a significant negative relationship of ESG with probability of default, but only in interaction with the crisis dummy variable. Although this finding does not confirm Hypotheses 1 and 2 (H1 and H2), it supports Hypothesis 3 (H3), which predicts that H&T firms

TABLE 4 Result of the Granger casual test.

	PD	STD
Panel A		
	HPJ Wald test (<i>p</i> -value)	HPJ Wald test (<i>p</i> -value)
H ₀ : ESG does not Granger-cause	11.1463*** (0.0008)	2.8912* (0.0891)
Panel B		
	Coefficient (<i>p</i> -value)	Coefficient (<i>p</i> -value)
L1.ENV	−0.0016** (0.014)	−0.0001* (0.076)
L1.SOC	−0.0003 (0.802)	0.0000 (0.932)
L1.GOV	0.0003 (0.715)	0.0000 (0.432)
	BIC selection	BIC selection
lags = 1, BIC	−707.40136 [#]	−7013.813 [#]
lags = 2, BIC	−663.72489	−6170.7957
	HPJ Wald test (<i>p</i> -value)	HPJ Wald test (<i>p</i> -value)
H ₀ : Selected covariates do not Granger-cause	12.3642** (0.0062)	7.1164* (0.0683)
Panel C		
	HPJ Wald test (<i>p</i> -value)	HPJ Wald test (<i>p</i> -value)
H ₀ : PD (STD) does not Granger- cause ENV	2.742 (0.2539)	1.265 (0.5312)

Note: See Table 1 for variable definitions.

*Significance level of 10%.

**Significance level of 5%.

***Significance level of 1%.

[#]The BIC is used to select the number of lags that provides the best model fit.

with high ESG scores are less prone to insolvency during periods of financial distress. Moreover, this finding is in line with previous evidence comparing CSR to insurance in crisis periods (El Ghoul & Karoui, 2017; Godfrey, 2005; Godfrey et al., 2009) and with the findings of Kumar (2023b), who showed that tourism firms involved in sustainability practices are less risky in crisis periods.

Analysis of each of the ESG components separately showed that environmental (ENV) and social (SOC) initiatives had the aforementioned significant negative relationships. This finding is in line with those of Benlemlih et al. (2018), who argued that a company's communication of its social and environmental initiatives enhances its reputation and builds stakeholder trust. In contrast, the governance pillar (GOV) was not statistically significant in any case. This finding supports the research of Barnea and Rubin (2010), who argued that

investing in the governance pillar is a waste of resources that simply increases the firm's risk through management entrenchment.

With respect to the control variables, only leverage and ROA had a statistically significant relationship with probability of default. Specifically, probability of default had a negative relationship with leverage and a positive relationship with ROA.

The results of the sensitivity analysis (Table 6) indicate that the findings for ESG and social initiatives should be interpreted with caution because the estimated sign of this variable and its statistical significance depended on the model. However, the sign of the estimated coefficient and the statistical significance were consistent in all cases for the crisis and environmental performance (ENV) variables. Therefore, the analysis confirms that firms' risk increases significantly in periods of crisis and that environmental commitment is the sustainability factor that has a significant negative relationship with probability of default. With respect to the control variables, the analysis confirms that only leverage (negatively) and ROA (positively) have a significant relationship in all cases.

The volatility of stock returns (STD_R) was used as a market-based alternative to probability of default as a measure of risk. Tables 7 and 8 show the results and sensitivity analysis. No differences were observed with respect to the findings when the risk variable was probability of default.

Specifically, Table 7 shows a significant positive relationship between the variable crisis and stock return variability. Likewise, a significant negative relationship was observed between return volatility and ESG, ENV and SOC scores in crisis periods. The sensitivity analysis (Table 8) showed that the aforementioned relationship for the crisis variable remained stable for any model specification. However, for the relationship between volatility and sustainability, only the environmental factors (ENV) in crisis times had the same sign and significance in all cases. Finally, regardless of the estimated model, volatility had a significant negative relationship with leverage and a significant positive relationship with ROA.

In summary, regardless of the measure used as an indicator of company risk, the results confirm that environmental performance (ENV) is the relevant sustainability factor in reducing the risk of H&T companies in periods of crisis. Therefore, for this variable, the results are in line with the argumentation of risk management theory, supporting Hypothesis 3 (H3) and confirming the protection of H&T firms against adverse effects.

5 | CONCLUSIONS

CSR consists of a diverse set of discretionary sustainable initiatives that can have a direct or indirect impact on a company. The literature shows that CSR influences the success of firms (Sun & Cui, 2014; Weber, 2008) by enabling better access to capital and increasing revenues. Among other effects, it can also influence default risk.

In this study, CSR was decomposed into its three dimensions: environmental, social and governance. The study examined the

TABLE 5 Relationship between CSR and probability of default (PD).

Probability of default (PD)								
PD (−1)	−0.1200*	−0.1142*	−0.1328*	−0.0648*	−0.0987*	−0.0465*	−0.1037**	−0.1123*
	(0.089)	(0.093)	(0.071)	(0.083)	(0.057)	(0.057)	(0.048)	(0.083)
Crisis	0.0314***	0.0496***	0.0351***	0.0614***	0.0347***	0.0573***	0.0337***	0.0416**
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.022)
ESG_Score	0.0004	−0.0001						
	(0.192)	(0.77)						
Crisis*ESG_Score		−0.0005*						
		(0.079)						
ENV_Score			0.0001	−0.0001				
			(0.762)	(0.261)				
Crisis*ENV_Score				−0.0007***				
				(0.002)				
SOC_Score					0.0004	−0.0001		
					(0.149)	(0.451)		
Crisis*SOC_Score						−0.0005*		
						(0.084)		
GOV_Score							0.0003	0.0001
							(0.415)	(0.961)
Crisis*GOV_Score								−0.0003
								(0.449)
B_size	−0.0020**	−0.0011	−0.0015	−0.0016	−0.0017*	−0.0011	−0.0014	−0.0026
	(0.025)	(0.254)	(0.137)	(0.262)	(0.036)	(0.177)	(0.116)	(0.244)
B_gender	0.0011	0.0186	0.0025	0.0006	−0.0012	0.0041	0.0004	−0.0598*
	(0.932)	(0.268)	(0.848)	(0.971)	(0.929)	(0.784)	(0.978)	(0.071)
B_Independence	−0.0244	0.0014	−0.0098	−0.0205	−0.0224	−0.0032	−0.0220	−0.0313
	(0.174)	(0.931)	(0.521)	(0.401)	(0.194)	(0.841)	(0.276)	(0.550)
Duality	0.0017	0.0028	0.0016	0.0033	0.0020	0.0003	0.0022	0.0123
	(0.763)	(0.657)	(0.786)	(0.557)	(0.745)	(0.948)	(0.709)	(0.590)
Firm_size	−0.0046	−0.0008	−0.0034	0.0086	−0.0052	−0.0014	−0.0033	−0.0035
	(0.119)	(0.728)	(0.203)	(0.204)	(0.065)	(0.451)	(0.172)	(0.716)
Leverage	0.0276***	0.0295***	0.0292***	0.0423***	0.0281***	0.0242***	0.0294***	0.0385***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.004)	(0.000)	(0.001)
ROA	−0.1444***	−0.161***	−0.1505***	−0.2212***	−0.1394***	−0.1453***	−0.1549***	−0.2121***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Control industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster (firm)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1340	1340	1340	1340	1340	1340	1340	1340
Test for AR (1)	0.007	0.005	0.008	0.004	0.004	0.004	0.005	0.006
Test for AR (2)	0.112	0.115	0.17	0.151	0.151	0.175	0.113	0.138
Hansen's test	0.231	0.263	0.234	0.305	0.305	0.244	0.277	0.201

Note: See Table 1 for variable definitions. The table shows the *p*-values of the AR (1) and AR (2) tests and Hansen's test. In each case, the number of instruments was lower than the number of groups.

*Significance level of 10%.

**Significance level of 5%.

***Significance level of 1%.

relationship of each pillar with firm risk. The study focused on the H&T industry. In recent years, this industry has adopted sustainable forms of tourism and environmental initiatives to mitigate its impact on the environment and society. CSR, particularly environmental protection, increasingly attracts interest from regulators, investors and

companies. At the academic level, this study contributes to knowledge in this area by studying the effects of the sustainable credentials of companies on their level of risk.

The results imply that there is a negative relationship between firm risk and sustainable initiatives during periods of crisis for H&T

TABLE 6 Relationship between CSR and probability of default: Sensitivity of the results to the inclusion of all combination of control variables.

	PD (−1)	Score	Crisis	Crisis*score	B_Size	B_Gender	B_Independence	Duality	Firm size	Leverage	ROA
ESG_Score	(1)	0.118	0.001	0.082	0	0.001	0.028	0.031	0.001	0.037	−0.137
	(2)	−0.115	0	0.038	−0.001	−0.003	−0.011	−0.005	−0.016	0.025	−0.26
	(3)	−0.027	0	0.058	0	−0.001	0.009	0.013	−0.003	0.03	−0.193
	(4)	0.067	0	0.016	0	0.001	0.015	0.012	0.002	0.007	0.034
	(5)	0.822	1.343	3.522	1.573	1.112	0.659	1.427	1.916	4.047	5.733
	(6)	14.258	32.422	100	50.391	22.266	0	35.156	47.656	100	100
	(7)	42.578	28.906	100	0	35.547	95.313	98.438	18.75	100	0
	(8)	18.349	32.432	100	0	0	0	35.714	16.667	100	0
	(9)	57.422	71.094	0	100	64.453	4.688	10.156	81.250	0	100
	(10)	11.224	32.418	50.391	34.545	0	0	0	54.808	100	100
ENV_Score	(1)	0.083	0	0.081	0	0.001	0.015	0.02	0.009	0.049	−0.143
	(2)	−0.075	0	0.051	−0.001	−0.002	−0.016	−0.023	−0.015	0.025	−0.291
	(3)	−0.002	0	0.066	−0.001	0	0	0.002	−0.001	0.035	−0.217
	(4)	0.038	0	0.014	0	0.001	0.014	0.014	0.002	0.008	0.039
	(5)	0.929	1.117	4.697	2.681	0.907	0.237	0.672	1.268	4.277	5.677
	(6)	18.75	31.055	100	100	12.891	0	14.844	28.516	100	100
	(7)	40.625	26.563	100	0	45.313	39.844	66.016	48.047	100	0
	(8)	30.769	26.471	100	0	10.345	0	22.485	10.569	100	0
	(9)	59.375	73.438	0	100	54.688	60.156	33.984	51.953	0	100
	(10)	10.526	32.713	100	15	0	0	0	45.113	100	100
SOC_Score	(1)	0.100	0.001	0.076	0	0.001	0.019	0.022	0.001	0.045	−0.158
	(2)	−0.083	0	0.043	−0.001	−0.003	−0.008	−0.01	−0.024	0.023	−0.319
	(3)	−0.001	0	0.058	0	0	0.003	0.006	−0.004	0.032	−0.233
	(4)	0.048	0	0.016	0	0.001	0.016	0.013	0.003	0.009	0.041
	(5)	0.984	1.277	3.503	1.516	0.908	0.302	0.934	1.363	3.811	5.803
	(6)	14.063	36.914	100	39.063	15.234	0	27.734	33.984	100	100
	(7)	56.25	26.953	100	0	39.844	85.547	74.219	30.078	100	0
	(8)	22.222	14.493	100	0	3.922	0	37.368	20.779	100	0
	(9)	43.750	73.047	0	100	60.156	14.453	32.422	69.922	0	100
	(10)	3.571	45.187	39.063	22.727	0	0	0	39.665	100	100

TABLE 6 (Continued)

GOV_Score	(1)	PD (−1)	Score	Crisis	Crisis*score	B_Size	B_Gender	B_Independence	Duality	Firm size	Leverage	ROA
	(1)	0.054	0	0.067	0	0.002	0.008	0.029	0.019	0.001	0.048	−0.12
	(2)	−0.115	−0.001	0.035	0	−0.005	−0.066	−0.041	−0.008	−0.025	0.025	−0.307
	(3)	−0.039	0	0.048	0	−0.001	−0.028	−0.002	0.005	−0.004	0.034	−0.205
	(4)	0.05	0	0.019	0	0.002	0.027	0.024	0.013	0.004	0.009	0.04
	(5)	1.008	1.012	2.465	0.29	0.954	1.022	0.899	0.467	0.845	4.046	5.271
	(6)	26.367	21.484	100	0	5.859	3.906	17.188	0	19.922	100	100
	(7)	17.969	10.352	100	24.219	47.656	3.125	56.641	91.406	24.219	100	0
	(8)	0	5.66	100	0	9.836	0	30.345	0	3.226	100	0
	(9)	82.031	89.648	0	75.781	52.344	96.875	43.359	8.594	75.781	0	100
	(10)	32.143	23.312	0	0	2.239	4.032	0	0	25.258	0	100

Note: See Table 1 for variable definitions. (1) Maximum coefficient (2) Minimum coefficient (3) Mean coefficient (4) Average standard deviation (5) Average t-value (6) Share of regressions significant at the 10-percent level (7) Share of regressions where the coefficient sign is positive (8) Share of regressions with coefficient sign is positive and significant at the 10-percent level (9) Share of regressions where the coefficient sign is positive, and (10) Share of regressions with coefficient sign is positive and significant at the 10-percent level. The above sensitivity analysis is conducted using Stata's Checkrob-command written by Mikkel Barslund.

businesses. However, in the sensitivity analysis, this relationship held only for the environmental pillar (ENV). Environmental initiatives provide insurance-like protection during crises. They improve risk management, enhance brand value and the image of H&T companies with sustainable attitudes, and even facilitate access to financial markets. The moral capital created by the sustainable behaviour of H&T firms reduces uncertainty. This feature is important in a highly intangible sector such as the H&T industry, where consumers cannot test products prior to purchase (Kim et al., 2017). Also, socially responsible investors value the quality signals provided by environmental achievement.

The findings imply that including environmental strategies in broader corporate strategy reduces firm risk, lowering stock return variability for shareholders. This finding is in line with the premises of risk management theory and stakeholder theory. This study highlights the risk-reducing effect of the sustainable commitment of H&T firms. The integration of non-financial objectives in decision making is beneficial for firms. Although sustainable strategies are costly and provide long-term results, investors, customers and society value sustainable development initiatives. Firms with greater commitment have lower risk, especially in times of crisis.

5.1 | Theoretical implications

Some theoretical implications can be derived from this study. The results suggest that H&T companies with higher environmental sustainability have lower default risk and lower total risk during times of crisis. Therefore, the adoption of environmentally sustainable initiatives can have a beneficial impact on the risk profile of H&T firms and can offer insurance-like protection. These initiatives include activities linked to the use of natural resources, energy efficiency, CO₂ emissions and conservation of tourist destinations. Therefore, the role of such initiatives should be considered when making risk management strategies.

5.2 | Managerial implications

The study suggests that managers can reduce the risk of default and total risk during times of crisis by adopting environmental initiatives. These findings are pertinent for various stakeholders. First, the findings are useful for corporate managers and hospitality practitioners, who must consider firm characteristics as well as sustainable initiatives when managing risk. The results may help managers develop strategies that reduce firm risk, especially during periods of great pressure such as crises.

Second, the findings are relevant for investors. The findings suggest that H&T companies that have taken environmentally sustainable measures may be an investment target for investors seeking socially responsible investments and/or looking to protect their investment in times of crisis. Finally, the findings are also relevant for policymakers and society in general. Politicians can encourage H&T firms to adopt environmentally sustainable practices to mitigate the negative effects of tourism activity while reducing firm risk in the industry.

TABLE 7 Relationship between CSR and volatility of stock returns (STD_R).

Standard deviation of stock returns (STD_R)								
STD_R (−1)	−0.0805** (0.026)	−0.1072*** (0.001)	−0.0763** (0.032)	−0.0755** (0.015)	−0.0709** (0.05)	−0.088** 1 (0.018)	−0.0832** (0.048)	−0.0726** (0.015)
Crisis	0.0121*** (0.000)	0.0179*** (0.000)	0.0123*** (0.000)	0.0173*** (0.000)	0.0126*** (0.000)	0.0223*** (0.000)	0.0126*** (0.000)	0.0115*** (0.000)
ESG_Score	0.0001 (0.231)	0.0001 (0.161)						
Crisis*ESG_Score		−0.0001** (0.016)						
ENV_Score			0.0000 (0.848)	0.0000 (0.563)				
Crisis*ENV_Score				−0.0001*** (0.001)				
SOC_Score					0.0000 (0.906)	0.0001 (0.143)		
Crisis*SOC_Score						−0.0002** (0.021)		
GOV_Score							0.0001 (0.261)	0.0001 (0.430)
Crisis*GOV_Score								0.0000 (0.958)
B_size	−0.0009* (0.091)	−0.0008* (0.088)	−0.0007 (0.102)	−0.0008* (0.074)	−0.0007 (0.283)	−0.0006 (0.387)	−0.0004 (0.239)	−0.001** (0.018)
B_gender	0.0009 (0.888)	−0.002 (0.712)	0.0007 (0.913)	0.0004 (0.947)	−0.0042 (0.547)	−0.0046 (0.560)	−0.0061 (0.391)	0.0056 (0.276)
B_Independence	−0.0082 (0.226)	−0.0033 (0.656)	−0.0035 (0.599)	−0.0008 (0.887)	−0.0009 (0.91)	−0.0047 (0.600)	−0.0022 (0.772)	0.0034 (0.533)
Duality	0.0005 (0.735)	0.0018 (0.383)	0.0002 (0.869)	0.001 (0.581)	0.0007 (0.644)	0.0003 (0.827)	0.0002 (0.871)	0.0003 (0.946)
Firm_size	−0.0011 (0.388)	−0.002 (0.140)	−0.0004 (0.739)	0.0002 (0.894)	−0.0014 (0.283)	−0.0019 (0.185)	−0.0019 (0.158)	−0.0036** (0.034)
Leverage	0.0044** (0.016)	0.0059*** (0.000)	0.0046** (0.008)	0.0059*** (0.000)	0.0046*** (0.010)	0.0049*** (0.004)	0.0043** (0.019)	0.0062*** (0.000)
ROA	−0.0692*** (0.000)	−0.0677*** (0.000)	−0.0669*** (0.000)	−0.0675*** (0.000)	−0.0661*** (0.000)	−0.0696*** (0.000)	−0.0670*** (0.000)	−0.0694*** (0.000)
Control industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster (firm)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1340	1340	1340	1340	1340	1340	1340	1340
Test for AR (1)	0.030	0.029	0.029	0.030	0.030	0.022	0.030	0.030
Test for AR (2)	0.724	0.444	0.795	0.855	0.855	0.518	0.788	0.776
Hansen's test	0.231	0.24	0.238	0.208	0.208	0.218	0.222	0.248

Note: See Table 1 for variable definitions. The table shows the *p*-values of the AR (1) and AR (2) tests and Hansen's test. In each case, the number of instruments was lower than the number of groups.

*Significance level of 10%.

**Significance level of 5%.

***Significance level of 1%.

5.3 | Limitations and future research

The main limitation of this study is the lack of data on ESG variables for many of the firms in the initial sample. This lack of data greatly reduces the sample size and may limit the validity of the findings.

Future analyses should cover more firms. Another limitation is that the research focuses on listed companies. Therefore, the results are not applicable to unlisted companies or should at least be taken with caution in the case of such firms. Future analyses could replicate the study for private companies, although the availability of data on these

TABLE 8 Relationship between CSR and volatility of stock returns sensitivity of the results to the inclusion of all combination of control variables.

	STD_R (-1)	Score	Crisis	Crisis*score	B_Size	B_Gender	B_Independence	Duality	Firm size	Leverage	ROA	
ESG_Score	(1)	0.429	0	0.033	0	0.001	0.007	0.012	0.003	0.001	0.01	-0.021
	(2)	-0.11	0	0.012	0	-0.001	-0.006	-0.009	-0.001	-0.008	0.003	-0.091
	(3)	0.109	0	0.017	0	0	0.002	0.002	0.001	-0.002	0.006	-0.065
	(4)	0.054	0	0.006	0	0	0.004	0.004	0.001	0.001	0.014	0.026
	(5)	4.774	1.953	5.212	1.525	1.806	0.693	1.394	0.679	4.698	4.427	6.975
	(6)	81.25	48.828	100	38.477	53.125	3.125	25.781	11.719	93.75	100	100
	(7)	67.578	59.57	100	9.766	28.906	77.344	61.719	87.891	50	100	0
	(8)	87.861	45.902	100	0	59.459	4.04	41.772	13.333	100	100	0
	(9)	32.422	40.43	0	90.234	71.094	22.656	38.281	12.109	50	0	100
	(10)	67.47	53.14		42.641	50.549	0	0	0	87.5		99.609
ENV_Score	(1)	0.541	0	0.031	0	0.001	0.01	0.014	0.003	0.001	0.009	-0.01
	(2)	-0.086	0	0.016	0	-0.001	-0.002	-0.003	-0.001	-0.006	0.004	-0.082
	(3)	0.11	0	0.02	0	0	0.003	0.003	0.001	-0.001	0.006	-0.061
	(4)	0.033	0	0.002	0	0	0.004	0.004	0.001	0.001	0.001	0.008
	(5)	4.162	1.808	8.586	3.146	2.091	0.714	1.44	0.66	4.441	5.063	7.643
	(6)	74.414	47.461	100	100	60.547	10.156	26.563	12.891	77.344	100	100
	(7)	67.383	33.398	100	0	41.016	91.406	75.781	78.906	54.297	100	0
	(8)	82.029	36.257	100		60.952	11.111	35.052	16.337	92.086	100	
	(9)	32.617	66.602	0	100	58.984	8.594	24.219	21.094	45.703	0	100
	(10)	58.683	53.079		100	60.265	0	0	0	59.829		100
SOC_Score	(1)	0.391	0	0.042	0	0.001	0.007	0.012	0.003	0.001	0.008	-0.028
	(2)	-0.094	0	0.018	-0.001	-0.001	-0.009	-0.007	-0.001	-0.007	0.003	-0.088
	(3)	0.073	0	0.023	0	0	0.001	0.003	0	-0.001	0.005	-0.066
	(4)	0.038	0	0.005	0	0	0.005	0.005	0.001	0.001	0.001	0.01
	(5)	3.23	1.885	5.023	2.286	1.406	0.618	1.395	0.613	4.365	3.826	6.771
	(6)	75	47.07	100	56.055	37.109	3.516	27.734	5.859	92.969	100	100
	(7)	57.813	58.594	100	0	34.766	80.078	76.172	55.078	50	100	0
	(8)	86.486	45.333	100		51.685	4.39	36.41	10.638	100	100	
	(9)	42.188	41.406	0	100	65.234	19.922	23.828	44.922	50	0	100
	(10)	59.259	49.528		56.055	29.341	0	0	0	85.938		100

(Continues)

(Continues)

TABLE 8 (Continued)

GOV_Score	STD_R (-1)	Score	Crisis	Crisis*score	B_Size	B_Gender	B_Independence	Duality	Firm size	Leverage	ROA
(1)	0.343	0	0.025	0	0.001	0.02	0.012	0.005	0.001	0.011	-0.032
(2)	-0.095	0	0.009	0	-0.002	-0.001	-0.004	-0.007	-0.01	0.004	-0.093
(3)	0.101	0	0.013	0	-0.001	0.007	0.005	0	-0.002	0.006	-0.068
(4)	0.204	0.003	0.064	0.002	0.018	0.198	0.005	0.072	0.001	0.012	0.833
(5)	3.92	1.499	4.422	0.672	1.993	1.14	1.355	0.877	3.52	4.745	7.532
(6)	76.953	33.594	100	4.883	64.844	25.781	37.647	14.063	88.672	100	100
(7)	68.75	85.938	100	65.234	35.547	96.484	88.235	44.531	50	100	0
(8)	95.455	39.091	100	0	49.451	26.721	42.667	24.561	82.031	100	100
(9)	31.25	14.063	0	34.766	64.453	3.516	11.765	55.469	50	0	100
(10)	36.25	0	14.045	14.045	73.333	0	0	5.634	95.313	100	100

Note: See Table 1 for variable definitions. (1) Maximum coefficient (2) Minimum coefficient (3) Mean coefficient (4) Average standard deviation (5) Average t-value (6) Share of regressions significant at the 10-percent level (7) Share of regressions where the coefficient sign is positive (8) Share of regressions with coefficient sign is positive and significant at the 10-percent level (9) Share of regressions where the coefficient sign is positive, and (10) Share of regressions with coefficient sign is positive and significant at the 10-percent level. The above sensitivity analysis is conducted using Stata's Checkrob-command written by Mikkel Barslund.

companies that would enable their inclusion in such studies is limited. Nevertheless, the current sample size was as large as possible, given the available data at the time of the study. Finally, future research could include other measures of risk and/or a further breakdown of CSR measures to analyse the specific influence of sustainable decisions on risk mitigation.

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