Analysis of sources of risk in socially responsible investment: The Moroccan case

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Abstract

This study examines the relationship between socially responsible investment (SRI) and financial risk in listed Moroccan companies. While SRI is often considered less risky than conventional investments (CI), the study aims to understand why this is the case. The analysis takes into account two aspects of risk: specific risk and systematic risk. Specific risks are assessed in terms of the complexity associated with managing SRI and how certain features can mitigate this risk and improve financial performance. Systematic risk is explored in relation to investment diversification while taking ethical considerations into account. The study aims to determine whether the application of social responsibility (SR) criteria to assets reduces diversification and increases risk. Using panel data modeling, the study confirms a positive impact of SR on corporate risk. Specifically, it finds that the "Top Performing CSR" trophy (indicating a high commitment to CSR) has a positive effect on "systematic risk" and that the "CGEM CSR label" (indicating a commitment to CSR) has a positive effect on "specific risk." In conclusion, the study establishes a positive correlation between social responsibility and investment risk. Companies that adhere to ethical standards tend to present higher levels of risk. This is explained by the complexity of managing socially responsible investments to achieve an optimal level of risk and by the limited diversification resulting from the application of ethical criteria.

1. Introduction

The increasing emergence of socially responsible investments (SRI) is generating keen interest in current research. This dynamic field reveals a thriving market that continues to attract a growing number of investors. However, despite this rising popularity, the academic literature concerning the financial performance of socially responsible investments highlights an imbalance between studies focusing on profitability and those addressing risk-related issues. This situation raises essential questions. Indeed, existing analyses present contradictory and inconclusive results. Grasping the risk associated with an investment involves identifying various endogenous and exogenous characteristics that could potentially impact the security of market-generated flows. Typically, the volatility of returns is employed to measure the risk of a stock. This volatility represents an increasing function of risk, meaning that higher volatility is considered indicative of greater risk, and vice versa. However, unlike conventional investments, socially responsible investments are distinguished by their distinct risk profiles. The incorporation of both financial and extra-financial criteria in the selection of these investments adds value, particularly in the long term. SRI enables

better management of risks related to the investment's image concerning the environment and various stakeholders.

In this context, this study aims to address these gaps by specifically examining risk within the framework of socially responsible investments. We will explore how portfolio theory can shed light on the diversification degree of SRI funds and its potential impact on the financial risk of these funds. Ultimately, this analysis will elucidate investors' motivations in their decisions regarding responsible investments. To tackle these objectives, this study is structured as follows: in the next section, we will review the existing literature on socially responsible investments and their financial performance. Subsequently, we will delve into the methodology used to assess the financial risk of SRI funds. The fourth section will present the results of our study and then go into great detail about the implications of these findings. Finally, we will conclude by emphasizing the importance of this research for investors, practitioners, and researchers interested in the ever-evolving field of socially responsible investments.

2. Review of the Literature

Over the past decade, numerous studies have examined the relationship between Socially Responsible Investment (SRI) and financial performance. The results vary according to the aspects of Corporate Social Responsibility (CSR), the sectors studied, and the methodologies used. CSR has a strong impact on the risk management strategies of companies and banks, which is crucial for investors seeking to integrate Environmental, Social and Governance (ESG) criteria into their decisions. The article by Gupta and Das (2022) looked at several studies using a meta-analytical approach. After carefully examining disclosure methodologies and measurement techniques using econometric tools, they concluded that CSR indeed had an impact. In a specific cultural context, such as Bangladesh, Kabir and Chowdhury (2023) examined CSR engagement in the banking sector, questioning the motivations behind increased CSR spending. Bannier, Bofinger, and Rock (2019) showed that portfolios based on ESG ratings generate negative alpha, suggesting a link between security and CSR, and pointed out that ESG activity reduces risk and mitigates market volatility. Giese, Lee, Melas, Nagy, and Nishikawa (2019) found that ESG information improves company valuation and performance, reduces systematic risk profiles, and increases profitability.

Hübel and Scholz (2020) studied the integration of sustainability risks in asset management. They constructed ESG risk factors to quantify companies' exposure to ESG risks. Their findings showed that considering these factors significantly improved the explanatory power of standard asset valuation models. CSR has also been studied in the banking context by Bouslah, Kryzanowski, and M'Zali (2018), who analyzed the impact of CSR on banking risk after the 2008-2009 financial crisis. Their results demonstrated that CSR reduced volatility during the financial crisis, mainly due to community, diversity, employee relations, and environmental aspects. Neitzert and Petras (2022) examined how CSR activities affect banking risk. Their results indicated that higher CSR scores are associated with lower bankruptcy risk for banks. Leite and Cortez (2015) closely examined the dynamics between SRI and corporate risk, suggesting that companies striving for socially responsible practices might face increased bankruptcy risk and capital withdrawals from investors. Their analysis points to the fact that mechanisms related to social and environmental obligations may incur additional costs for companies, potentially constraining their financial flexibility and ability to cope with economic and operational challenges. Taking a different perspective, Nofsinger and Varma (2014) focused their research on European and French SRI funds, and their results demonstrated that these funds exhibited a higher level of systematic risk compared to conventional investments. This discovery suggests that despite the underlying goal of social responsibility in these funds, they are not necessarily immune to market fluctuations and may be subject to elevated levels of risk. It is evident from the aforementioned that researchers do not concur on the impact of SRI on financial performance, with some studies indicating that socially responsible investments and conventional investments achieve a similar level of risk (Amenc & Le Sourd, 2008; Chung, Yeo-Chang, & Cho, 2012; Cortez, Silva, & Areal, 2009; Gregory & Whittaker, 2007; Mill, 2006). Other studies have confirmed that SRI has a positive impact on financial performance as it generates long-term financial value and decreases bankruptcy risk (Bannier et al., 2019; Becchetti, Ciciretti, Dalò, & Herzel, 2015; Giese et al., 2019; Kabir & Chowdhury, 2023; Kreander, Gray, Power, & Sinclair, 2005; Mallin, Saadouni, & Briston, 1995). Additional publications assert that SRI has a negative impact on financial performance by increasing risk rates; authors found that European and French SRI funds present higher systematic risk than conventional investments (Leite & Cortez, 2015; Nofsinger & Varma, 2014). The disparity of results concerning the impact of SRI on financial performance leads us to pose the following research question:

How Can Taking Non-Financial Factors into Account when Making Investments Affect the Risk and Financial Performance of Listed Moroccan Companies?

For specification reasons, financial risk is divided into three types: the first is directly linked to the market, the second is called specific risk inherent to the company, and the third is composed of the two previous risks, called total risk.

First, the *systematic risk*, measures the variation of the portfolio's profitability in relation to the market, this risk cannot be eliminated because it is linked to the market and differs from one security to another. According to the literature, several works have tried to measure the systemic risk of socially responsible investment

(Bauer, Otten, & Rad, 2006; Kempf & Osthoff, 2008; Kreander et al., 2005; Leite & Cortez, 2014; Mallin et al., 1995), among others. Systemic risk is represented by the Capital Asset Pricing Model (CAPM) beta.

Equation 1 represents the systematic risk of a financial asset, calculated by multiplying the square of the asset's beta coefficient (β) by the market variance σ_M^2. Systematic risk measures an asset's sensitivity to general market movements. The higher the beta, the more sensitive the asset is to market fluctuations, thus contributing to a higher systematic risk.

$$\text{Systematic risk} = \beta_i^2 * \sigma_M^2 \quad (1)$$

Then, for *Specific risk*, this is a risk attached to the security itself and is never remunerated because it can be eliminated through diversification. The literature shows that few works have been interested in this measure. Several authors have used this indicator (Becchetti, Ciciretti, & Hasan, 2015; Bello, 2005; Bloomfield, Leftwich, & Long Jr, 1977; Fisher & Lorie, 1970; Nofsinger & Varma, 2014; Renneboog, Ter Horst, & Zhang, 2008; Statman, 2004).

Equation 2 describes the specific risk associated with a particular financial asset. In this equation, $Var[\varepsilon_i]$ refers to the variance of the residuals or prediction errors (ε_i) for that specific asset. This term captures the portion of total risk that is not related to general market variations (systematic risk) but is specific to the asset itself. In other words, it is the residual or idiosyncratic risk that cannot be diversified because it is specific to that particular asset.

$$Risk\ specific = Var[\varepsilon_i] \quad (2)$$

Where ε_i is the residual.

Finally Total Risk is the result of combining systemic risk and specific risk. Several authors, including (Chang & Witte, 2010; Chang & Chen, 2012; Gregory & Whittaker, 2007; Kreander et al., 2005; Utz & Wimmer, 2014), and others, have explored this indicator. It's quantified by the standard deviation of portfolio returns, where total risk encompasses both systematic risk and specific risk, summed together, with systematic risk and specific risk are given by (1) and (2) respectively. Explicitly, the following rule is applied:

$$\sigma_i^2 = \beta_i^2 * \sigma_M^2 + Var[\varepsilon_i] \quad (3)$$

Equation 3 represents the variance of the return on a specific financial asset σ_i^2, calculated as the sum of two components: systematic market risk and asset-specific risk.

From the above, the research hypotheses follow a descending sequence that starts from a main hypothesis and then divides into more specific sub-hypotheses. Figure 1 shows the main of our hypotheses.

H	SRI has a positive impact on the risk		
H1	Very engaged SRI has a positive impact on the risk	H2	Engaged SRI has a positive impact on the risk
H1.1	Very engaged SRI has a positive impact on the systematic risk	H2.1	Engaged SRI has a positive impact on the systematic risk
H1.2	Very engaged SRI has a positive impact on the specific risk	H2.2	Engaged SRI has a positive impact on the specific risk
H1.3	Very engaged SRI has a positive impact on the total risk	H2.3	Engaged SRI has a positive impact on the total risk

Figure 1. Summary of the research hypothesis.

3. Method

The study we present stands out for its focus on the specific impact of Socially Responsible Investment (SRI) on the financial performance of companies listed on the Casablanca Stock Exchange in Morocco. Unlike previous work, our study focuses specifically on the 48 companies listed on the Casablanca Stock Exchange, offering a singular geographical perspective to our analysis. These companies were carefully chosen to make up our sample, with strict attention given to factors including the caliber and accessibility of financial data.

Our analysis period, from 2011 to 2019, was selected for crucial reasons. Significant events that had a big impact on financial markets during this time period marked the global economy. The 2008 financial crisis left a lasting imprint on companies and markets, while the COVID-19 pandemic in 2019 caused major economic disruption worldwide. By excluding the years 2020-2022 from our analysis, we aim to avoid potential biases induced by the pandemic crisis, which could have unrepresentatively distorted the results of our study.

An original feature of our research lies in the way we have operationalized the financial performance variables. Rather than assessing financial risk globally, we decomposed risk into two distinct dimensions: market risk, also known as systematic risk, and the specific risk arising from management choices specific to each company. This approach offers a more nuanced perspective on the effect of SRI on financial performance, highlighting how each category of risk is influenced.

Our control variables incorporate factors such as industry sector, number of year's listed, total assets, social capital, and the impact of the Conference of the Parties (COP22) global event in 2016. These variables are crucial for isolating the effect of SRI on financial performance while taking into account external factors that may influence our results.

The careful construction of our variables is based on official data sources from the Casablanca Stock Exchange, the AMCC, and corporate financial reports.

To ensure the quality and reliability of the data used in our analyses, we have constructed our SRI measure by combining data from companies awarded the CSR label by the CGEM and reports issued by Vigeo-Eiris for the period from 2011 to 2019.

Our survey lies at the convergence of two distinct classifications: that of Vigeo-Eiris Maroc, which annually rewards the best-performing players, and the CGEM CSR label, which differentiates three levels of social responsibility: "Very Engaged" (VeryEng.) designated by Vigeo-Eiris as "Top Performer", "Engaged" (Eng.) labeled CSR by the CGEM, and "Not-Engaged" (N.Eng.), encompassing companies perceived as focused solely on profitability, neglecting the impact of their actions on the environment.

We want to find out that how investments that is good for society affect the profits of publicly traded companies. This is based on previous research that put investments into groups based on rating from the companies like Vigeo-Eiris (Chetty, Naidoo, & Seetharam, 2015;Lin-Hi & Blumberg, 2018; Masoud & Halaseh, 2017; Simionescu & Gherghina, 2014). We measure financial performance through risk variables, specifically systematic risk, specific risk, and total risk. To rigorously test our hypotheses, we have included several control variables, such as sector, year's listed, total assets, and share capital. Additionally, we accounted for the influence of the Cop 22[1] world event held in Morocco in 2016. The conceptual model illustrating our findings is presented in Figure 2.
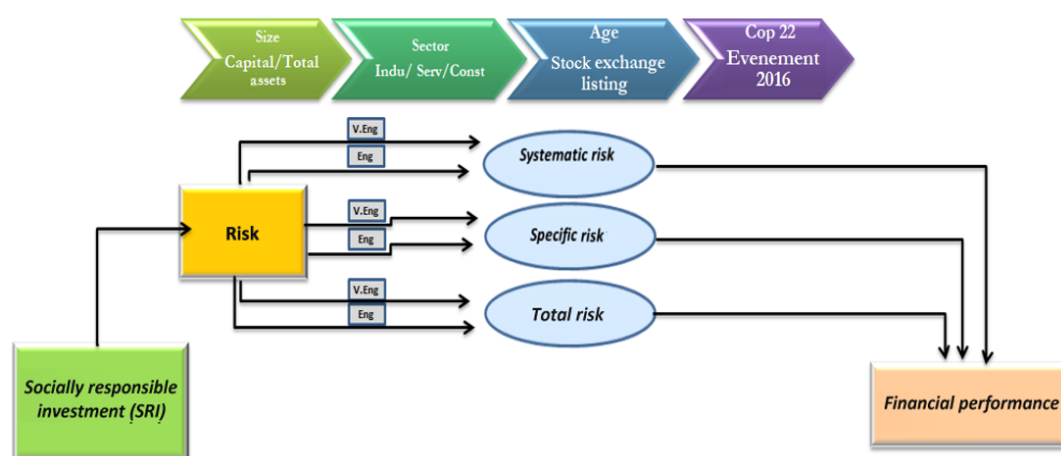

Figure 2. The conceptual model.

This research covered a set of 48 firms listed on the Casablanca Bourse, deliberately excluding unlisted companies because of the importance of the quality and availability of information in financial reports. The period covered by the study extends from 2011 to 2019, a selection justified by two crucial global events: the 2008 financial crisis and the 2019 COVID-19 pandemic. The data collected totals 432 observations.

All the data used in this study comes directly from the official websites of the Casablanca Stock Exchange[2] and the AMCC[3], as well as from the financial reports of the companies included[4]. These reports were considered essential and trustworthy secondary data sources, in line with previous research (Fraser, Zhang, & Derashid, 2006). For the socially responsible investment (SRI) variable, information from companies holding the CSR label, as designated by the CGEM[5] and Vigeo-Eiris[6] reports from 2011 to 2019, was merged.

This study stands out for its meticulous methodology and specific focus on how Socially Responsible Investment (SRI) influences the financial performance of entities listed on the Casablanca Stock Exchange. Using a panel model, the study effectively explored changes over time and among the entities observed, providing a deeper understanding of this complex relationship.

The models adopted are summarized by the following equations:

$$Systematic\ risk = \alpha + ISR + Sector + Size\ (Log\ Capital) + Age + Cop22 \qquad (4)$$

$$Specific\ Risk = \alpha + ISR + Sector + Size\ (LogTActif) + Age + Cop22 \qquad (5)$$

$$Total\ Risk = \alpha + ISR + Sector + Size\ (LogCapital) + Age + Cop22 \qquad (6)$$

The identical estimation procedure is detailed below for all three models:

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[1] Cop 22 (Conference of the Parties) is a dichotomous variable which takes the value "0" before 2016, i.e. before the organization of the event and the value "1" after 2016.
[2] http://www.casablanca-bourse.com/bourseweb/index.aspx
[3] http://www.ammc.ma Moroccan Capital Market Authority (Autorité Marocaine du Marché des Capitaux)
[4] Websites of different companies that compose our sample /financial publication section.
[5] http://rse.cgem.ma/liste-entreprises-labellisees.php Confédération Générale des Entreprises du Maroc
[6] https://vigeo-eiris.com/

The derived F-statistic is used to establish the presence of individual effects. If present, a specification test becomes necessary to determine the nature of these individual effects and whether they have the characteristics of fixed or random effects. This assessment is carried out using the Hausman test. To guarantee model accuracy and mitigate estimation bias, a battery of tests has been implemented, encompassing specification and goodness-of-fit assessments. Specifically, Ramsey's (Regression Specification Error Test) RESET test, the homoscedasticity test, and the autocorrelation test were used.

4. Results

This section begins with an in-depth description, exploration, and examination of the statistical data before moving on to model estimation. The examination covers both explanatory and explained variables. Regarding the independent variable "SRI", Table 1 shows an unstable number of labelled companies. This instability becomes more pronounced when we consider the exclusion of companies that did not retain their labels throughout the study period. This exclusion was made to improve the clarity of the impact of socially responsible investment on the financial performance of listed Moroccan companies. The highest number of listed firms awarded the CSR label between 2011 and 2019 was recorded in 2017, with a total of 7 companies. This number then stabilized at six companies up to 2019.

Table 1. Statistics of companies engaged in SRI between 2011 and 2019.

Years	Engaged	Not engaged	Very engaged	Total
2011	002	038	008	048
2012	004	036	008	048
2013	003	039	006	048
2014	004	035	009	048
2015	004	036	008	048
2016	006	032	010	048
2017	007	029	012	048
2018	006	028	014	048
2019	006	030	012	048

In the year 2018, there was a notable occurrence as the number of companies reached 14; constituting 30% of the total sample's companies, marking the highest count ever recorded (refer to Figure 3).
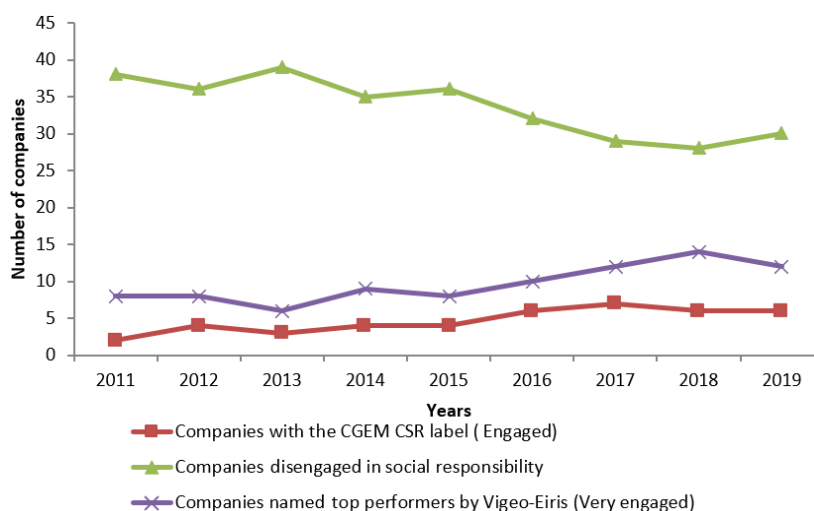
Figure 3. Evolution of SRIs between 2011 and 2019.

Regarding the dependent variables, the annual progression is scrutinized by examining the changes in means from one year to the following.

Table 2. Statistic descriptive of risk variables.

Variable	N	Mean	Std. dev.	Min.	Max.	Skewness	Kurtosis
Variable	432	0.010	0.001	0.007	0.010	–0.542	2.852
Total risk	432	0.005	0.001	0.002	0.007	–0.723	2.895
Systematic risk	432	0.009	0.001	0.009	0.011	0.217	2.420

Table 2 displays the systematic risk associated with the general instability of the market overall. The sample has an average market risk of 0.5%, which means that stocks are not very sensitive to market

variations. In fact, the stocks increase by 0.5% when the market increases by 1%. This sample has a minimum systematic risk of 0.1% and a maximum of 0.7%, which shows that the distribution is not dispersed and is concentrated more in the center with a standard deviation of 0.1%.

Figure 4 shows a volatile trend with a peak observed in 2017 of 0.7%, followed by a decline from mid-2018 to 0.2% in 2019.
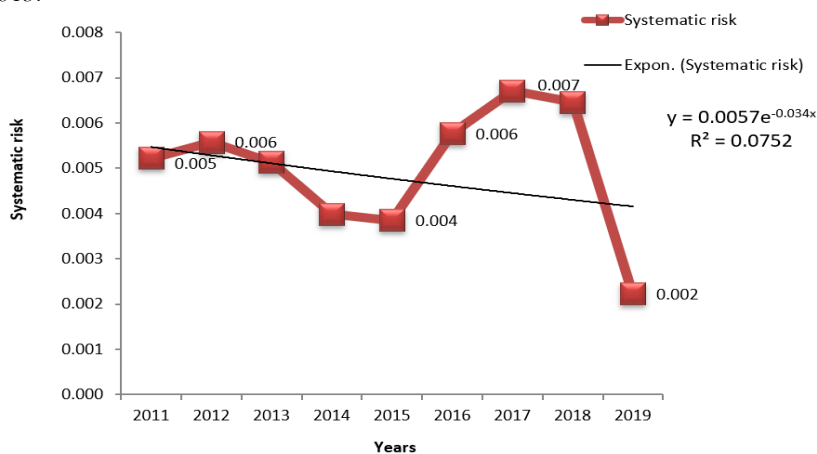

Figure 4. Evolution of average Systematic Risk between 2011 and 2019.

However, the stocks have an average specific risk of 0.9%, the portion of risk that causes the investment value to go up or down, regardless of its relationship to the market.
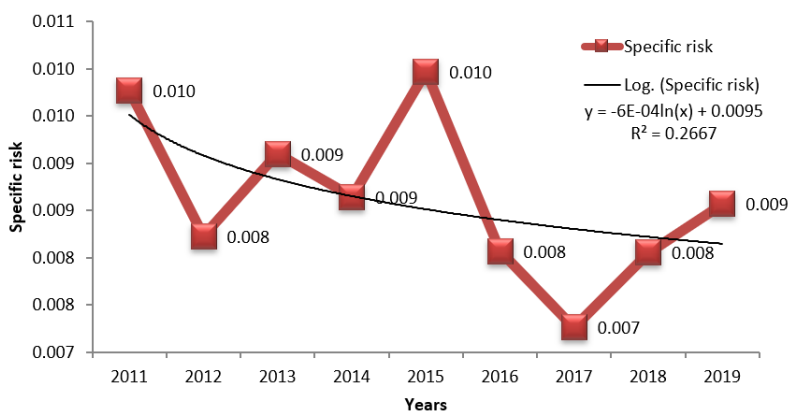
Figure 5. Evolution of average specific risk between 2011 and 2019.

From Figure 5, a peak was observed in 2015 (1%), followed by an exponential fall from mid-2015 to a record (0.7%) in 2017. After that the average specific risk evolves to (0.9%) in 2019. Generally, it can be said that, the stocks have a lower risk related to the company's management style.

Finally, the average of the total risk is between a minimum of 0.7% and a maximum of 1%. The companies in the sample have an average total risk of 1% (Standard Deviation±0.1 %).
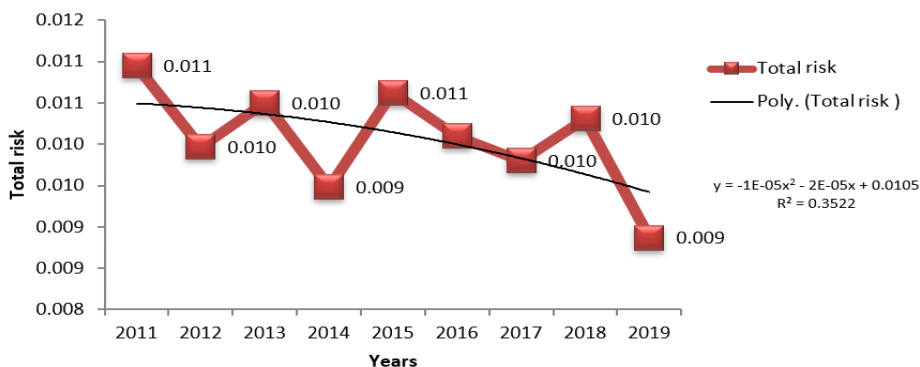
Figure 6. Evolution of the average total risk between 2011 and 2019.

Figure 6 shows that the average total risk is up and down. Indeed, several peaks were observed over the period from 2011-2019. The most acute was recorded in 2015 (1.1%), followed by a drop from mid-2015 to a

record (0.9%) in 2019. To assess the correlation between variables, it is necessary to perform a coefficient of interdependence test to check whether there is a significant linear relationship between the variables in the sample. The coefficients obtained lie between -1 and 1. When the coefficient is closer to 1 or -1, this indicates the potential presence of multicollinearity between the chosen pair of variables (Gujarati & Porter, 2009).

Table 3. Correlation matrix.

Variable	Sector	Total risk	Systematic risk	Specific risk	Log capital	Log total assets	Listing
Sector	1.000						
Total risk	-0.177	1.000					
Systematic risk	-0.067	*0.643*	1.000				
Specific risk	-0.180	*0.939*	0.432	1.000			
Log capital	-0.117	-0.127	-0.020	-0.124	1.000		
Log total assets	0.108	-0.291	-0.114	-0.287	0.806	1.000	
Listing	-0.082	-0.266	-0.141	-0.272	0.295	0.278	1.000

Table 3 displays the correlation between variables, demonstrating both positive and negative associations. The coefficients range from -0.1175 to 0.8062. Generally, the correlation coefficients exhibit no evident collinearity issues, as most values significantly deviate from -1 and 1. Once the initial exploratory analysis has been completed, econometric modeling is applied. The chosen approach begins by running regressions on the various panel models selected. For each model, a uniform estimation technique has been employed. The process begins with presenting the key outcomes derived from the regressions of the three fixed effects models. These models delineate the link between SRI and Specific Risk (model 1), Systematic Risk (model 2), and Total Risk (model 3). Subsequently, an array of specification and adjustment tests ensue, followed by an interpretation of the outcomes attained from the adjusted models.

The results shown in Table 4 shows that the models have statistical significance with significance levels lower than 1%. The null hypothesis, suggesting the absence of individual effects, is refuted, thereby establishing the presence of individual effects.

Table 4. Summarizes the results of the fixed effect model regression on the three risk variables.

Variables	Specific risk model 1	Systematic risk model 2	Total risk model 3
SRI			
Engaged	0.098 (0.089)	0.067 (0.228)	0.050 (0.090)
Very engaged	-0.001 (0.095)	0.413 (0.246) *	0.089 (0.097)
Cop22	0.000 (0.070)	0.386 (0.182) **	0.059 (0.072)
Size	-0.194 (0.103) *	-0.183 (0.267)	-0.178 (0.106) *
Constant	50.85 (27.58) *	228.7 (71.50) ***	66.43 (28.35) **
F	4.52	2.95	3.52
Prob> F	0.00	0.01	0.00
Observations	432	432	432
R-squared	0.056	0.037	0.044
Nbr of investments	48	48	48

Note: Robust standard errors in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5. Summary of random-effect model regression results for the 3 risk variables.

Variables	Specific risk model 1	Systematic risk model 2	Total risk model 3
ISR			
Engaged	0.127 (0.081)	0.170 (0.181)	0.094 (0.083)
Very engaged	0.016 (0.080)	0.339 (0.161) **	0.094 (0.082)
Sector			
Industry	-0.237 (0.147)	- 0.639 (0.207) ***	- 0.309 (0.145) **
Services	-0.289 (0.133) **	- 0.388 (0.185) **	- 0.310 (0.131) **
Cop22	0.003 (0.070)	0.384 (0.181) **	0.058 (0.072)
Age	-0.362 (0.174) **	- 0.278 (0.244)	- 0.332 (0.172) *
Size	-0.138 (0.053) ***	- 0.207 (0.085) **	- 0.161 (0.053) ***
Constant	54.66 (27.32) **	228.0 (70.54) ***	68.72 (28.090) **
Wald chi² (Model)	42.16	30.92	39.44
Prob>chi²	0.0000	0.0001	0.00
Observations	432	432	432
Number of investments	48	48	48

Note: Robust standard errors in parentheses.
***$p<0.01$, ** $p<0.05$, * $p<0.1$.

To discern the characteristics of the individual effects inherent in the models, it becomes necessary to employ a Hausman test. This test serves to validate whether the model is uniform across all investments or if distinct disparities exist for each individual investment. To execute this diagnostic evaluation, a secondary estimation of the association between SRI and risk will be undertaken using a random effects model. This step will assist in selecting the most accurate estimation. The findings of this specification test will be encapsulated within Table 5, offering a comprehensive overview of the outcomes derived from the regression employing the random-effects model. This regression pertains to the three risk variables under investigation.

The significance levels of all three models are comfortably below 5%, establishing their statistical significance. Considering the outcomes obtained, the next step involves conducting the Hausman specification test. Table 6 provides a comprehensive summary of the results from these Hausman tests.

Table 6. Hausman specification test FE vs RE.

Variables	Test Hausman FE vs RE		
	Chi²	Prob>chi2	Decision
Systematic risk	0.70	0.983	Random effects
Total risk	1.73	0.885	Random effects
Specific risk	1.50	0.913	Random effects

According to Table 6, the plus-values from the Hausman test concerning the three variables are higher than the significance level of 5%, so the null hypothesis is accepted, i.e., the absence of random effects and the presence of random effects.

This test is very important in that it allows you to verify if there are variables omitted from the model. The results of the Ramezy tests concerning the three models are summarized in Table 7.

Table 7. Ramsey-reset specification test.

Variables	Test Ramsey-reset		
	$F_{(3, 420)}$	Prob>F	Decision
Systematic risk	1.23	0.300	Well specified model
Total risk	1.33	0.086	Well specified model
Specific risk	1.01	0.270	Well specified model

Referring to Table 7, it's evident that the plus-values for all variables surpass the 5% threshold. Consequently, the null hypothesis is endorsed, indicating a robust model specification.

Following the establishment of profitability models, the process of adjustment proceeds by initiating tests for autocorrelation and homoscedasticity. To execute this evaluation, the initial step involves regressing the model to identify the residuals. Subsequently, a second regression involves regressing the squares of the residuals against the explanatory variables. The final step involves conducting an F-test to gauge the significance of the coefficients.

Many software applications offer the capability to conduct this autocorrelation test. An alternative test aimed at identifying error dependency entails a direct analysis of the residuals aligned with the adopted model. For instance, Stata software version 16 facilitates this with the "xtserial()" command, allowing the execution of a Wooldridge test to identify autocorrelation in panel data.

With reference to Table 8, it is apparent that the plus-values for all models exceed the 5% threshold, enabling the dismissal of the alternative hypothesis, and the acceptance of the null hypothesis implying the absence of first-order autocorrelation.

Table 8. Wooldridge test of autocorrelation.

Variables	Test Wooldridge of autocorrelation		
	$F_{(3.20)}$	Prob>F	Decision
Systematic risk	0.22	0.640	No autocorrelation
Total risk	1.118	0.295	No autocorrelation
Specific risk	2.001	0.163	No autocorrelation

Following the implementation of the specification test for three risk variables, a random-effects model was found. The Stata16 software[7] offers a feature that enables the issue of heteroscedasticity to be assessed directly. The "xtreghet()" command serves as a module to estimate heteroscedasticity in panel data regressions, particularly when a random effects model is involved. These two tests are used to validate the following hypotheses:

H_0: Panel Homoscedasticity.

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[7]StataCorp. 2019. *Stata Statistical Software: Release 16.* College Station, TX: StataCorp LLC.

H₁: Panel Groupwise Heteroscedasticity.

Table 9. Results of the heteroscedasticity test.

Variables	Specific risk model 1		Systematic risk model 2		Total risk model 3	
Lagrange multiplier	1.19E+04	p<0 .01	3.30E+04	p < 0 .01	3.13E+04	p <0 .01
Wald	3.20E+04	p<0 .01	2.21E+05	p < 0 .01	1.46E+05	p < 0 .01
Decision	H1: Heteroscedasticity		H1: Heteroscedasticity		H1: Heteroscedasticity	

Referring to Table 9, the outcomes of the Breusch and Pagan (1980) Lagrange Multiplier and Wald tests exhibit values falling beneath the significance threshold of 5%. As a result, the initial assumption of homoscedasticity is invalidated, and the presence of heteroscedasticity across all models is acknowledged. This situation necessitates a process of correction and adjustment. The outcomes of the diverse tests conducted reveal the prevalence of both autocorrelation and heteroscedasticity issues within the models. To ensure unbiased estimations, these concerns require rectification. Regarding the risk models, the appropriate course of action involves implementing the Generalized Least Squares (GLS) technique for rectifying these problems. In this regard, the Stata software provides a direct means of addressing autocorrelation and homoscedasticity concerns through the utilization of the "xtgls()" command. This command is tailored to accommodate linear panel data models, with a specific focus on random effects models utilizing generalized least squares. Its feature makes it easier to improve and fine-tune models that have problems with panel-based auto correlation or heteroscedasticity. Following the necessary corrections, the adjusted models are depicted in Table 10.

Table 10. Risk model adjustment report.

Cross-sectional time-series feasible generalized least squares (FGLS) regression
Coefficients: « Generalized least squares »
Panels: Homoscedastic
Correlation: No autocorrelation

Variables	Specific risk model 1	Risk. systematic model 2	Total risk model 3
ISR			
Engaged	0.211 (0.162)	0.215 (0.075) ***	0.207 (0.076) ***
Very engaged	0.324 (0.136) **	0.047 (0.063)	0.110 (0.063) *
Sector			
Industry	-0.638 (0.156) ***	-0.237 (0.072) ***	-0.315 (0.073) ***
Services	-0.391 (0.139) ***	-0.301 (0.064) ***	-0.323 (0.065) ***
Cop22	0.383 (0.187) **	0.0023 (0.086)	0.058 (0.087)
Age	-0.280 (0.184)	-0.387 (0.085) ***	-0.347 (0.086) ***
Size	-0.203 (0.067) ***	-0.124 (0.030) ***	-0.154 (0.031) ***
Constant	228.4 (72.67) ***	57.83 (33.510) *	71.55 (33.92) **
Wald chi² (Model)	42.80	103.12	105.06
Prob>chi²	0.0000	0.0000	0.0000
Observations	432	432	432
Number of actions	N=48	N=48	N=48

Note: Robust standard errors in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

5. Discussion

From the above, a summary of the adjusted risk models is given in the following equations:

$$Specific\ Risk\ =\ 57.83\ +\ 0.21*Eng - 0.23*Industry\ -\ 0.30*Services\ -\ 0.38*Age\ -\ 0.12*Size \quad (9)$$

$$Systematic\ Risk\ =\ 228.36\ +\ 0.32*V.Eng - 0.64\ *Industry\ -\ 0.39*Services\ +\ 0.38*Cop22\ -\ 0.20\ Size \quad (10)$$

$$Total\ Risk\ =\ 71.55\ +\ 0.21*Eng - 0.31\ Industry\ -\ 0.32*Services\ -\ 0.34*Age\ -0.15\ Size \quad (11)$$

According to the adjustment report, the problems of heteroscedasticity and autocorrelation have been dealt with effectively. Their highly significant p-values at 1% level demonstrate that all three models exhibit substantial significance. The key results concerning the assumptions and their corresponding interpretations have been consolidated and are available in Table 11.

Table 11. Summary the results of the assumptions and interpretations.

Hypothesis		Impact	Interpretation
H	SRI has a positive impact on the financial performance	Positive	Partially confirmed
H.1	Very engaged SRI has a positive impact on risk	Positive	Partially confirmed
H.1.1	Very engaged SRI has a positive impact on systematic risk	+0.32	Confirmed
H.1.2	Very engaged SRI has a positive impact on specific risk.	Insignificant	Not validated
H.1.3	Very engaged SRI has a positive impact on total risk.	Insignificant	Not validated
H.2	Engaged SRI has a positive impact on company risk.	Positive	Partially confirmed
H.2.1	Engaged SRI has a positive impact on systematic risk.	Insignificant	Not validated
H.2.2	Engaged SRI has a positive impact on specific risk.	+0.21	Confirmed
H.2.3	Engaged SRI has a positive impact on total risk.	+0.20	Confirmed

According to Table 11, three (03) of the hypotheses refer to a positive impact between SRI and financial performance, and subsequently they were confirmed. On the other hand, the other (03) hypotheses were insignificant. The ascending hierarchy of the results of the hypotheses leads us to a partially confirmed positive result of the main hypothesis H.

The hypothesis (H.1) is partially confirmed, since not all of the 03 sub-hypotheses derived from it are confirmed. Indeed, the risk of the firm is subdivided into three categories, namely systematic risk (H.1.1), specific risk (H.1.2) and total risk (H.1.3).

Only the hypothesis that states the positive impact of Very Engaged SRI on systematic risk was confirmed (+0.32), while the other two hypotheses are insignificant. In other words, Very Engaged SRI is less sensitive to market fluctuations than other investments. This result is confirmed by several studies. Mallin et al. (1995); Bauer, Koedijk, and Otten (2005); Kreander et al. (2005) and Bauer et al. (2006) found that SRI funds have lower systematic risk than conventional funds. However, the results of Bauer et al. (2006); Gregory and Whittaker (2007); Kempf and Osthoff (2008); Chentoufi, Zari, and Tikouk (2022); Chentoufi and Zari (2020); Chang and Witte (2010) and Leite and Cortez (2014) indicate that SRI funds invested in company stocks are well ranked and have lower systematic risk compared to conventional investments. The same result for Leite and Cortez (2015), who directed their work on SRI investments in Euro zone companies, they found that the latter showed a lower return than that of conventional investments. This is explicable by the ability of SRI managers to foresee market changes, which will undoubtedly increase the profitability of the investments by keeping their betas higher in a bull market and lower in a bear market. In other words, managers of very engaged SRIs can predict the market in order to reduce the exposure of their funds to systemic risks.

For Engaged SRI, hypothesis (H.2) measuring the impact of CGEM-labeled socially responsible investment on risk is partially confirmed, since the 03 sub-hypotheses derived from it are not all confirmed. Indeed, the sub-hypothesis (H.2.1) is insignificant. While the other two hypotheses show a positive effect of SRI on specific risk (H.2.2) and total risk (H.2.3) with an almost equal coefficient of (+0.21). For specific risk this result can be explained by the appropriate level of diversification (Lee, Humphrey, Benson, & Ahn, 2010) achieved by an engaged SRI. For Boutin-Dufresne and Savaria (2004), they find that the best and even the worst performing Canadian SRI firms have lower specific risk. For their part, Lee and Faff (2009) analyze the specific risk of large socially responsible companies that are part of the Dow Jones Industrial Average (DJSI). The authors find that these SRIs have lower specific risk than other investments. While for total risk, several previous studies have reached the same results. Among the earliest is the work of Spicer (1978), who found that firms that are very active in pollution control have lower total risk than those of that are less active. These results are confirmed by other studies, such as that of Herremans, Akathaporn, and McInnes (1993), which divided firms into two. Highly reputable and less reputable firms in terms of social responsibility, and they find that highly reputable firms have very low total risk compared to less reputable firms. Lee, Faff, and Langfield-Smith (2009), in their study of high-performing companies in social responsibility, recorded a lower total risk compared to low-performing companies. The study was based on Dow Jones Sustainability Index (DJSI) reports. Chang and Witte (2010), on the other hand, conducted work on US SRIs, and found that SRI funds have lower total risk over the medium to long term. Eccles, Ioannou, and Serafeim (2014) show that high-responsibility assets are less volatile than disengaged assets in terms of sustainability. Indeed, these results can be justified by the social responsibility policy engaged by the CGEM CSR-labeled companies, which considers the requirements of its immediate environment. This awareness provides investments with certain legitimacy among their stakeholders. In fact, the image of the investment provides it with a certain tolerance on the part of direct partners, when it comes to poor management. Another very important element to take into consideration when explaining the positive impact of engaged SRI on risk is that CSR labeling can be seen as a company's ability to deal with the various issues to which it is exposed and subsequently control the risks that may harm its reputation and image on the market. Otherwise, the company is exposed to a risk of losing confidence, which could have negative consequences for its financial performance.

6. Conclusion

In conclusion, the aim of this research was to elucidate the nature of the impact of socially responsible investments (SRI) on the financial performance of Moroccan companies, operationalized through three risk variables. A thorough review of theoretical foundations and an analysis of empirical literature revealed a certain lack of theoretical consensus regarding the impact of SRI on financial performance, given the contradictory results of research conducted.

The discussion and analysis of hypotheses corroborated the existence of a positive impact of SRI on the risk of Moroccan companies listed on the Casablanca Stock Exchange. Modern portfolio theory says that a well-performing portfolio should be well-diversified. This is strongly supported by the fact that SRI limits investment opportunities and diversification by imposing selection and sectoral exclusion biases, which in turn hurt SRI's level of financial performance.

The discussion of the results also suggests that these results may have been fair because managers' weren't able to control the risks that came with SRI, especially when it came to managing environmental risks and dealing with social conflicts. They also weren't able to make sure that stakeholder needs and expectations were taken into account in the activities of the company. This contradicts the theory of the insurance effect. It's also worth noting that our findings could impact managers' decisions regarding their involvement in a corporate social responsibility (CSR) certification process or their withdrawal from such an engagement.

In terms of policy implications, it is crucial to highlight that our results hold significant implications for policymakers. When considering the ramifications of SRI on companies' financial risk, governmental bodies could consider formulating policies and incentives aimed at encouraging businesses to adopt socially responsible practices. However, it's important to consider the potential diversification constraints brought about by these investments. Additionally, our conclusions underscore the need for more targeted regulations to enhance the transparency and quality of CSR-related practices, aiming to mitigate the risks associated with SRI while promoting a more comprehensive integration of sustainable development within Moroccan enterprises.

6.1. Limits of the Research

This work, even though it presents an original and specific approach to the problem evoked, suffers from a certain number of limitations that we will present as follows:

Limitations related to the study period: We have followed a sample of 48 companies for 9 years; although this period is interesting, it remains short for an evaluation.

Limitations related to the work sample: We consider a sample of 48 firms to be representative, but we cannot claim to be exhaustive.

Data quality limitations: the presence of missing values for a given year or more is a challenge to properly conducting this econometric analysis.

Limitations related to the econometric model: Several alternative models could give significant results: "Non-linear Panel Regression" or "Quantile Panel Regression".

Limitations related to the choice of variables: other variables can be considered; however, their availability on balance sheets and financial reports is lacking.

6.2. Perspectives of the Research

To improve the scientific scope of the research and in order to explore new perspectives, we will propose the following new research avenues:

Include in our working sample socially responsible companies that are not listed on the stock exchange.

The use of a qualitative approach will contribute to a better understanding of SRI through a content analysis of the different reports published by the companies.

Expanding the sample size to reach other economies if they have a common relationship, be it geographical, economic, political, or cultural...

Conduct a comparative study to measure differences in impacts between countries or regions. An impact study that integrates different types of investment and is not limited to equities (indices, bonds, opvcm...)

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