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Impact of ESG factors on firm risk in Europe

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Agenda

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Introduction: Sustainability and CSR – ESG and firm risk

- Sustainability and Corporate Social Responsibility (CSR)
  - Relevance: increased importance and attention of firms, media as well as public's consciousness in recent years (e.g., Bassen et al. 2006; Gramlich and Finster 2013)
  - Regulation: e.g., CSR-EU directive in October 2014
  - Convergence: CSR and sustainability are mostly consistent concepts
  - Operationalization: e.g., Triple Bottom Line (Elkington 1997), **Environmental, Social and Governance (ESG)** indicators
- A positive **ESG** performance can increase a company's value both by an increase in financial returns (**cash flows**) and/or by a reduction in the **cost of capital** whereby **firm risk** is a main element of the cost of capital.

Introduction: Prior empirical research

- Relationship between ESG performance and corporate **financial performance**
  - Many studies: The results of these studies are contradictory.
  - Nevertheless, meta-analyses have shown that the integration of social and/or environmental aspects into the corporate strategy has a positive impact on financial performance (or value) (Margolis and Walsh 2003; Orlitzky et al. 2003; Beurden and Gössling 2008; Margolis et al. 2009).
- Also, the relationship between non-financial performance indicators and the **cost of capital** (equity costs and/or debt costs) was subject to studies in recent years (e.g., Bassen et al. 2006, El Ghoul et al. 2011).

Introduction: Prior empirical research

- **Meta-analytic review:** Corporate social performance and **firm risk** (Orlitzky and Benjamin 2001)
  - "This integrative empirical study supports the theoretical argument that the higher a firm's CSP the lower its financial risk." (Orlitzky and Benjamin 2001)
  - Based on 18 primary studies, published in the period 1978-1995, small samples (n: max. 469), data only from US, measurement of CSR performance: problematic (Salama et al. 2011)
  - "Past research has often presented CSP-risk analyses as a side issue only." (Orlitzky and Benjamin 2001).
- Recently, little research on the relationship between ESG performance and firm risk (mostly US-data, limited risk measures)

Introduction: Aim, method, data and sample

- Aim: Assessing the impact of ESG factors on firm risk (systematic, idiosyncratic and total risk) in Europe
- Method: Unbalanced panel data, fixed-effects regressions with clustered standard errors at firm-level
- Data:
  - Database “Asset4”: ESG performance
  - Database “DataStream”: risk ratios (systematic, idiosyncratic and total risk) and control variables
- Sample: European firms, 8,752 firm-year observations over 13 years (from 2002 to 2014)

Literature review: Theoretical background, CSR and sustainability

- CSR: “The responsibility of enterprises for their impacts on society […] to integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders” (European Commission 2011).
- Sustainability: Companies can promote sustainable development if they meet “the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987).
- As a result of convergence, the concepts CSR and sustainability are considered consistent concepts (e.g., Hahn and Kühnen 2013).
- ESG: One possibility to operationalize the concepts of CSR and sustainability

Literature review: Theoretical background, ESG

- Environmental aspects
  - Resource reduction
  - Emission reduction
  - Product innovation
- Corporate governance aspects
  - Board structure
  - Compensation policy
  - Board functions
  - Shareholder rights
  - Vision and strategy

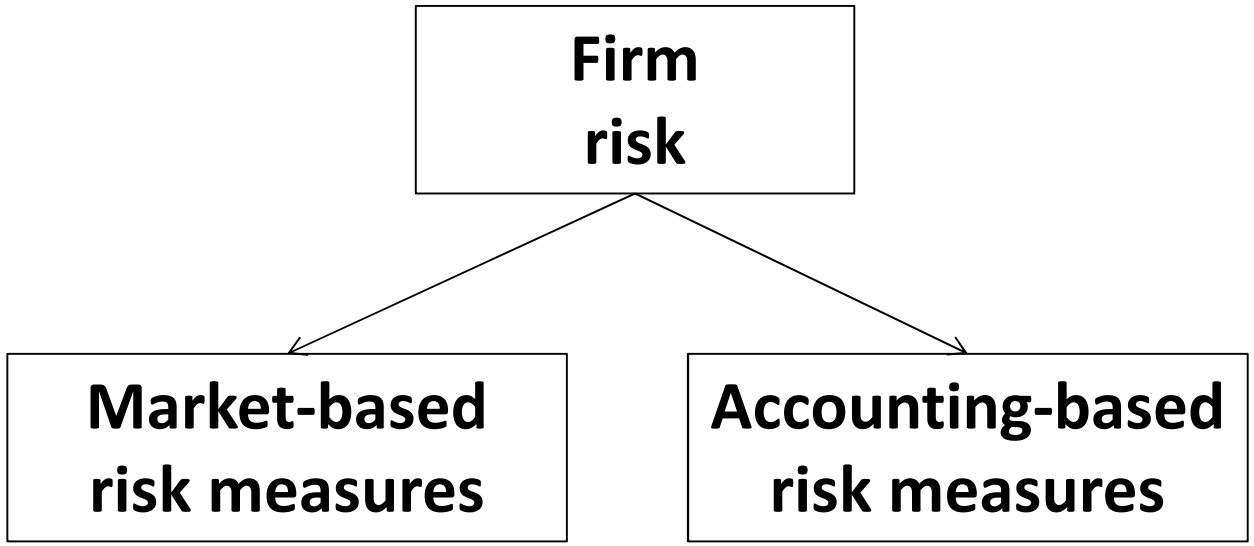
Literature review: Theoretical background, ESG

- Social aspects
  - Employment quality
  - Health and safety
  - Training and development
  - Diversity
  - Human rights
  - Community
  - Product responsibility

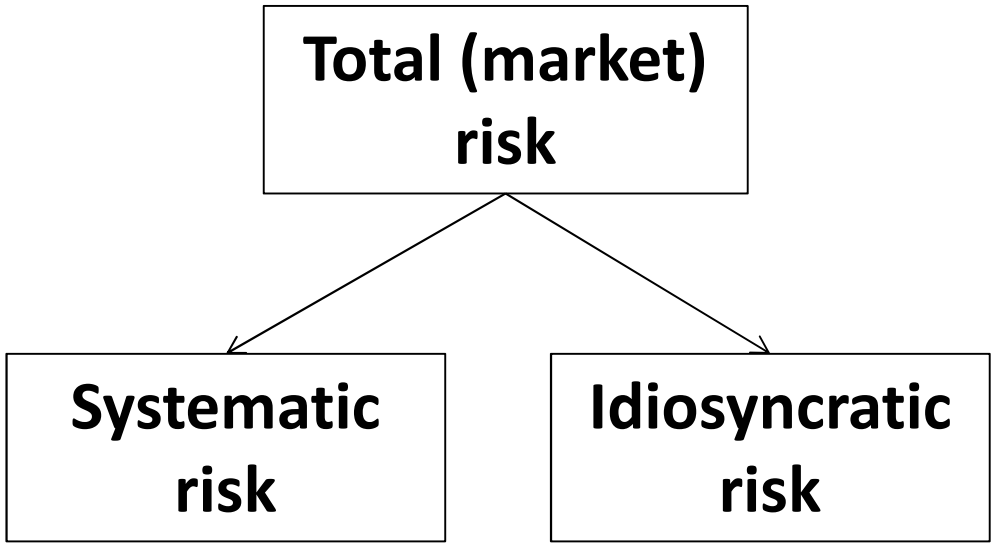
Literature review: Theoretical background, ESG and firm risk

- A positive ESG performance can increase a company's value both by an increase in financial returns (cash flows) and/or by a reduction in the cost of capital whereby firm risk is a main element of the cost of capital.
- Thus, ESG performance impacts value if it affects expected future cash flows and/or risk (Bouslah et al. 2013).
- Ideally, the integration of ESG indicators into management tools leads to an increase in value or at least to a maintenance of value by using ESG-potentials or by avoiding ESG-risks (Hinze and Sassen 2014).
- More specifically, an increase of value can be reached by utilization of efficiency potentials and generation of strategic competitive advantages (Hinze and Sassen 2014).

Literature review: Theoretical background, firm risk



Literature review: Theoretical background , firm risk



Author(s), year	Sample	Firms (FYO)	Time frame	CSR aggregate measure	CSR individual measure	System. risk (β)	Idiosyn-cratic risk	Total risk	Accounting based and other risk meas.
Boutin-Dufresne and Savaria 2004	Canada	400	1995-1999	Canadian Social Investment Database			X		
Bassen et al. 2006	World: utilities	44	2004	Scoring based on 38 criteria	Social score, environmental score	X			Credit risk (credit rating)
Lee and Faff 2009	World	400	1998-2002	Dow Jones Sustainability Index			X		
Luo and Bhattacharya 2009	World	541 (1,082)	2002-2003	Fortune's Most Admired Companies			X		
Bauer et al. 2009	USA	976	1995-2006		Employee relations index				Credit risk (credit rating)
Salama et al. 2011	UK	(1,625)	1994-2006		Environmental performance	X			
El Ghoul et al. 2011	USA	2,809 (12,915)	1992-2007	KLD					Equity premium
Oikonomou et al. 2012	USA	769 (6,986)	1991-2008	KLD	Qualitative screens KLD	X			
Jo and Na 2012	USA: sinful industries	513 (2,719)	1991-2010	KLD				X	
Bouslah et al. 2013	USA	3,100 (16,599)	1991–2007	KLD	Qualitative screens KLD		X	X	
Gramlich and Finster 2013	Europe	167 (1,503)	2001-2009	Inclusion into sustainability indices					Profitability and liquidity ratios
Chang et al. 2014	USA	583 (5,289)	1995-2009	KLD		X		X	
This study	**Europe**	**921 (8,752)**	**2002-2014**	**Asset4 ESG score**	**Asset4 pillar scores**	**X**	**X**	**X**	

Hypotheses on the impact of ESG on firm risk

- H1: Overall ESG performance affects a company´s total, systematic, and idiosyncratic risk.

- H2: Environmental, social, and corporate governance performance affect a company´s total, systematic, and idiosyncratic risk differently.

- H3: Environmental performance has a negative effect on a company´s total, systematic, and idiosyncratic risk in environmentally sensitive industries.

Research Design: Sample

- All large-, medium-, and small-capitalized companies from European countries that are part of the Thompson Reuters Asset4 database
- Timeframe: 2002 to 2014
- Initial sample: 9,375 firm-year observations
- Final sample (due to missing risk and control variables): 8,752 firm-year observations from 921 firms → unbalanced panel
- About 540 firms are part of the Stoxx Europe 600
- Firms from 19 countries (UK including four British Oversea Territories)

Research design: Fixed-effects regression

- Panel data, Hausman test suggests **fixed-effects regression**
- Fixed-effects control for all time-invariant effects between firms (management, industry, diversification, country, listing…)
- Significant test for serial autocorrelation according to Wooldridge (2010), significant modified Wald test for groupwise heteroscedasticity
  → use of **clustered standard errors** by firm, robust to autocorrelation and heteroscedasticity
- **Year fixed-effects** to control for changing economic conditions that affect firm risk

I. Baseline fixed-effects regression:

$$FIRM\ RISK_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 SIZE_{it} + \beta_3 ROA_{it} + \beta_4 SDROA_{it} + \beta_5 LEV_{it}$$
$$+\beta_6 MTB_{it} + \beta_7 LIQ_{it} + \beta_8 DIV\_1_{it} + \sum_{q=1}^{12} \beta_d YEAR_{qi} + \varepsilon_{it}$$

II. Pillar Scores fixed-effects regression:

$$FIRM\ RISK_{it} = \beta_0 + \beta_1 CGS_{it} + \beta_2 ENS_{it} + \beta_3 SOS_{it} + \beta_4 SIZE_{it} + \beta_5 ROA_{it}$$
$$+\beta_6 SDROA_{it} + \beta_7 LEV_{it} + \beta_8 MTB_{it} + \beta_9 LIQ_{it} + \beta_{10} DIV\_1_{it} + \sum_{q=1}^{12} \beta_d YEAR_{qi} + \varepsilon_{it}$$

III. Pillar Scores fixed-effects regression with interaction term:

$$FIRM\ RISK_{it} = \beta_0 + \beta_1 CGS_{it} + \beta_2 ENS_{it} + \beta_3 ENS_{it}\#\text{ENV\_SEN}_i + \beta_4 SOS_{it} + \beta_5 SIZE_{it} + \beta_6 ROA_{it}$$
$$+\beta_7 SDROA_{it} + \beta_8 LEV_{it} + \beta_9 MTB_{it} + \beta_{10} LIQ_{it} + \beta_{11} DIV\_1_{it} + \sum_{q=1}^{12} \beta_d YEAR_{qi} + \varepsilon_{it}$$

Research design

Dependent variables: Risk measures

- Total Risk (RSTD)
  - total stock volatility
  - measured by annualized standard deviation of daily stock returns over the previous year

- Systematic Risk (BETA):
  - sensitivity to changes in market returns
  - measured based on CAPM model using the monthly excess returns of previous 60 months in a five-year moving window

Research design

Dependent variables: Risk measures

- Idiosyncratic Risk (IR)
  - unsystematic risk that can not be explained by broad market movements
  - measured by annualized standard deviation of the residuals from the Carhart four-factor model using the previous year´s daily excess returns

$$R_{it} - R_{ft} = a_i + ß_{iM}(R_{Mt} - R_{ft}) + ß_{iS}SMB_t + ß_{iH}HML_t + ß_{iW}WML_t + \varepsilon_{it}$$

$R_{it} - R_{ft}$: daily excess return of company i for day t; $R_{mt} - R_{ft}$: excess return of a value-weighted market portfolio of European stocks; SMB_t: return difference between small and big stocks; HML_t : return difference between high and low book-to-market-ratio stocks; WML_t : return difference between previous winner and loser stocks; ε_{it}: error term

Research design

Independent variables: ESG measures

- ESG performance scores derived from Thompson Reuters Asset4
- Database covers more than 5,000 global publicly listed companies and provides more than 500 ESG data points, historical data back to 2002

- Overall ESG performance (ESG)
  - measured as equally weighted average of pillar scores CGS, SOS and ENS

Research design

Independent variables: ESG measures

- Corporate Governance performance (CGS)
  - pillar score measuring a company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders

- Environmental performance (ENS)
  - pillar score measuring a company's impact on living and non-living natural systems, including the air, land, and water, as well as complete ecosystems

Research design

Independent variables: ESG measures

- Social performance (SOS)
  - pillar score measuring a company´s capacity to generate trust and loyalty with its workforce, customers and society
  - consists of 7 category scores:
    Customer /Product Responsibility (SOPR), Society /Community (SOCO), Society /Human Rights (SOHR), Workforce /Diversity and Opportunity (SODO), Workforce /Employment Quality (SOEQ), Workforce /Health & Safety (SOHS), Workforce /Training and Development (SOTD)

Research design

Control variables

- SIZE: company size (value of total assets $ (ln))
- ROA: return on assets (pretax income $/total assets $)
- SDROA_5: volatility of ROA (standard deviation of ROA over previous 5 years)
- LEV: leverage (long term debt $ /total assets $)
- MTB: market to book ratio (market value $ /book value of common equity $)
- LIQ: stock liquidity (turnover by volume/common shares outstanding)
- DIV_1: dividend payment (dividends per share $ for previous year)
- YEAR: year dummy

Results: Descriptive statistics

Variable	mean	median	sd	min	max	skewness	kurtosis	N
Panel A: Risk measures								
BETA	0.8030	0.7373	0.4351	-0.4058	3.0885	0.8135	4.0147	7,959
RSTD	0.3377	0.2934	0.1734	0.0000	3.3010	3.0964	26.4128	8,547
IR	0.3313	0.2958	0.1824	0.0001	2.4260	2.0410	12.8634	8,752
Panel B: ESG scores								
ESG	0.6131	0.6689	0.2333	0.0494	0.9700	-0.5907	2.2854	8,752
CGS	0.5566	0.6038	0.2671	0.0148	0.9726	-0.3850	1.9578	8,752
ENS	0.6354	0.7346	0.2921	0.0827	0.9734	-0.5597	1.8085	8,752
SOS	0.6473	0.7274	0.2820	0.0346	0.9896	-0.6117	2.0675	8,752
Panel C: Control variables								
SIZE	15.8380	15.5648	1.8139	11.9890	20.1576	0.4857	2.7576	8,752
ROA	0.0686	0.0578	0.0830	-0.1549	0.3220	0.6271	4.6849	8,752
SDROA_5	0.0336	0.0202	0.0388	0.0008	0.1970	2.2986	8.7738	8,752
LEV	0.1895	0.1666	0.1520	0.0000	0.6094	0.7740	3.0262	8,752
MTB	2.6361	1.9054	2.3703	0.2523	12.5925	2.3523	9.2772	8,752
LIQ	3.8873	3.0834	3.2342	0.0205	14.7222	1.3146	4.7147	8,752
DIV_1	0.0303	0.0284	0.0222	0.0000	0.5522	2.1807	38.3915	8,752

VARIABLES	(I) BETA	(II) BETA	(III) BETA	(I) RSTD	(II) RSTD	(III) RSTD	(I) IR	(II) IR	(III) IR
ESG	0.005			-0.032*			-0.041***		
	(0.068)			(0.017)			(0.012)		
CGS		0.069	0.073		0.004	0.004		0.003	0.003
		(0.046)	(0.046)		(0.014)	(0.014)		(0.012)	(0.012)
ENS		0.046	0.118		0.015	0.031		-0.020*	-0.018
		(0.054)	(0.073)		(0.015)	(0.020)		(0.011)	(0.014)
ENV_SEN # ENS			-0.155*			-0.033*			-0.003
			(0.092)			(0.023)			(0.016)
SOS		-0.103*	-0.101*		-0.050***	-0.049***		-0.021**	-0.021**
		(0.054)	(0.054)		(0.015)	(0.015)		(0.011)	(0.011)
SIZE	0.026	0.026	0.026	-0.028***	-0.028***	-0.028***	-0.016***	-0.016***	-0.016***
	(0.022)	(0.022)	(0.022)	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)
ROA	-0.059	-0.056	-0.056	-0.231***	-0.230***	-0.230***	0.066*	0.066*	0.066*
	(0.104)	(0.105)	(0.105)	(0.040)	(0.039)	(0.039)	(0.034)	(0.034)	(0.034)
LEV	0.063	0.065	0.063	0.046	0.047	0.046	-0.000	-0.000	-0.000
	(0.086)	(0.086)	(0.086)	(0.033)	(0.033)	(0.033)	(0.026)	(0.026)	(0.026)
MTB	0.008**	0.008**	0.008**	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
DIV_1	-2.061***	-2.056***	-2.084***	-0.687***	-0.685***	-0.691***	-0.042	-0.042	-0.043
	(0.455)	(0.457)	(0.453)	(0.149)	(0.150)	(0.149)	(0.100)	(0.100)	(0.100)
SDROA_5	0.965***	0.969***	0.954***	0.147**	0.147**	0.145**	-0.035	-0.034	-0.034
	(0.285)	(0.283)	(0.284)	(0.066)	(0.066)	(0.065)	(0.056)	(0.056)	(0.056)
LIQ	0.015***	0.015***	0.015***	0.010***	0.010***	0.010***	-0.001	-0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.452	0.459	0.475	0.838***	0.838***	0.838***	0.538***	0.538***	0.538***
	(0.333)	(0.334)	(0.335)	(0.124)	(0.124)	(0.124)	(0.084)	(0.083)	(0.083)
Observations	7,959	7,959	7,959	8,547	8,547	8,547	8,752	8,752	8,752
R-squared	0.126	0.128	0.129	0.459	0.460	0.461	0.358	0.358	0.358
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Results: Summary of the main results

	H1	H2			H3			
	ESG	CGS	ENS	SOS	CGS	ENS	SOS	ENS Int.
BETA	-	-	-	sig. neg.	-	-	sig. neg.	sig. neg.
RSTD	sig. neg.	-	-	sig. neg.	-	-	sig. neg.	sig. neg.
IR	sig. neg.	-	sig. neg.	sig. neg.	-	-	sig. neg.	-

→ **Negative** associations between ESG performance scores and firm risk

→ **Social performance** seems to the most important ESG performance score

→ Negative association between ENS and risk is stronger for firms in **environmentally sensitive industries**

Note: *** p<0.01, ** *p*<0.05, * *p*<0.1, all *p*s two-tailed except for ENV_SEN#ENS (one-tailed)

Results: Granger causality test

- Model assumption: ESG performance affects firm risk
- However, reverse causality or simultaneity might be possible:
  E.g., firms that suffer from higher risk tend to improve their governance
- Performing Granger causality test with two lags (Wooldridge 2002):

	BETA	RSTD	IR
CGS	bidirectional	bidirectional	bidirectional
ENS	unidirectional: ENS → BETA	unidirectional: ENS → RSTD	unidirectional: ENS → IR
SOS	unidirectional: SOS → BETA	unidirectional: SOS → RSTD	unidirectional: SOS → IR

→ Simultaineity leads to biased coefficients of CGS

Results: Social performance categories

- Significantly negative association between social performance and all risk measures
- Social performance seems to be the most important ESG performance score
- Aim to obtain a clearer picture of social performance categories that affect firms risk → test of the seven social performance category scores instead of SOS
- **Society/community** category score has the most relevant negative impact on firm risk. This category measures a company's management commitment and effectiveness towards maintaining the company's reputation within the general community (Thompson Reuters, 2015).

Results: Robustness checks

- Independent and control variables:
  - Endogeneity concerns: Lagged independent variables, results mainly unaffected
  - Inclusion of total current assets/total current liabilities as control: all results unaffected
- Sample:
  - Focus on STOXX-firms:
    - Results mainly unaffected
    - Changes: CGS positively associated with BETA, negative association between SOS and IR turns insignificant
  - Exclusion of banks and insurances because their capital and risk requirements are heavily regulated and atypical: all results unaffected

Discussion

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