

Is investment capital cheaper for green firms? Evidence from equity issues at Euronext – Oslo

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Research issue

Stock markets key to financing the circular economy

- Financing large green investments (e.g. Renewable energy generation).
- Financing green innovations – IPO and subsequent SEO's finance the scaling up of startups – particularly green innovations.

Question: Is “green” investment different?

- Do investor demand different returns depending on ESG properties?

E.g.

- Is there an additional “green glow”?
 - investors demand less return from green projects (subsidized financing)
- Reluctance to finance “brown” projects (exclusions)?
 - brown projects have to offer higher returns?

→ Investigate in context of recent Norwegian IPO (Initial Public Offers).

Are the terms in the IPOs linked to firm ESG properties?

Summarizing findings

- Find some evidence that IPO price is higher for good ESG
- But no evidence that underpricing is linked to ESG.
- Magnitudes: Small

Literature and hypotheses

ESG and stock returns

Modelling differences in cost of capital due to ESG

- The pecuniary view.
 - Stock prices do not fully reflect future ESG consequences (e.g. climate).
 - Short-termism (Stein, 1989)→ Green stocks higher long term return
- The non-pecuniary view (ESG in utility function)
 - Equilibrium models – tradeoff ESG/Cost of Capital
 - Pástor et al. (2021) Pedersen et al. (2021)
 - ESG ranking uncertainty muddle tradeoff (Avramov et al., 2022)→ Green stocks can sustain lower return

Literature - ESG and stock returns

Estimates of a Green Return Premium

- Evidence support non-pecuniary view (Green Return Premium < 0)

Examples (estimated return difference)

- Sin (Hong and Kacperczyk, 2009) (-3.5%)
- Environment (Chava, 2014) (-0.7% to -1.4%)
- Carbon (Bolton and Kacperczyk, 2021) (-1.5% to -3.6%).
- Green vs Brown (Pástor, Stambaugh, and Taylor, 2022) (-1.4%)
- Exclusions from The Oil Fund (Berle, He, and Ødegaard, 2024) (-5%)

Literature – Initial Public Offers

Empirically: Large underpricing – Money “left on the table”

- Classical IPO literature
 - explaining underpricing in bookbuilding
 - Informational issues

Newer issues in IPOs

- “The decline of the listed corporation”

Reactions:

- Intermediaries: Fiddling with form of IPO
 - Auction IPOs
 - Direct Listings
 - SPACs
- Exchanges: Create menu of market places, differing on
 - Direct cost of being listed
 - Listing requirements
 - Regulation

Our research – ESG in context of IPOs

Argument from asset pricing theory:

→ Cost of capital depend on ESG properties.

Our question:

- Are these cost of capital differences linked to IPO outcomes?

Ways to test – depend on theoretical framing .

Tests based on IPO *price*

Theoretical framing: The link between ESG and Cost of Capital is understood by all (no asymmetrical information).

- IPO *issue price* reflect the ESG properties of the firm.
- Method: Infer cost of capital from issue price.

Hypothesis 1: Measures of environmental/ESG qualities of a firm are linked to the implied cost of capital of the IPO price.

Tests based on IPO *underpricing*

Alternative theoretical framework:

Informational differences between parties in IPO:

- Investment bank – set price
- Buyers of stocks at IPO stage.

Theories

- *Partial adjustment* theory: Investors better informed about their valuations (ESG preferences). To elicit true revelation from investors when setting (higher) issue price for sustainable investments, issue price lower than true price.
- *Neglected demand* theory: ESG aspects of cost of capital ignored by investment bank in price setting

Tests based on IPO *underpricing* (ctd)

Implication of both theories

→ Underpricing increasing in sustainability.

Hypothesis 2: Measures of underpricing increases with the firm's environmental quality.

Also: To move prices to their correct price trading is necessary

→ first day trading increasing in sustainability.

Hypothesis 3. Early trading interest (which we measure as turnover) is increasing in the measure of environmental quality of the firm.

Tests based on Post-IPO behavior

If cost of capital differ with ESG, will be reflected in realized return:
Hypothesis 4: The post-IPO expected return depends on the company's environmental stance.

Of additional interest

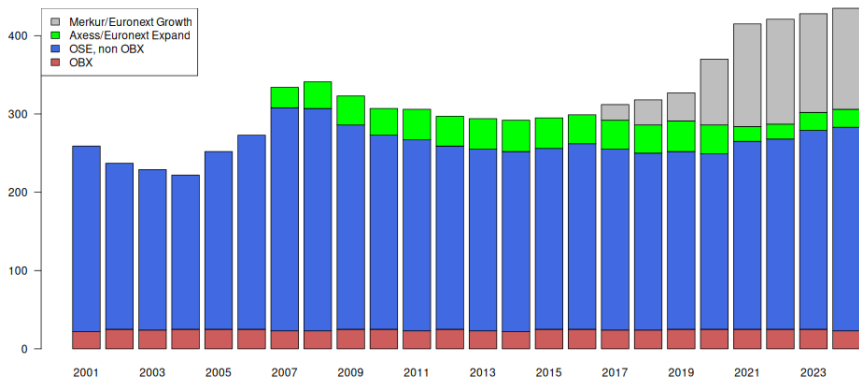
Provide evidence on current Norwegian stock market:

- IPO market at Euronext-Oslo.
- Alternative market places
 - Main board
 - Euronext Axess
 - Euronext Expand
- Alternative ways of listing
 - Traditional IPOs (raising additional capital)
 - Pure listings

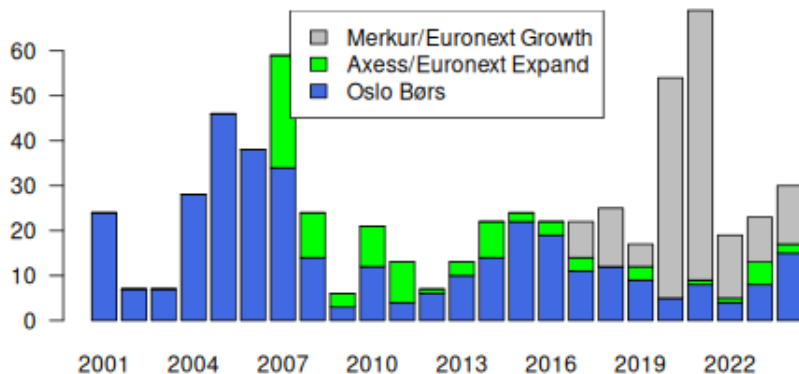
Data and Economic Environment

Stocks traded at the OSE / Euronext Oslo - 2001-2024

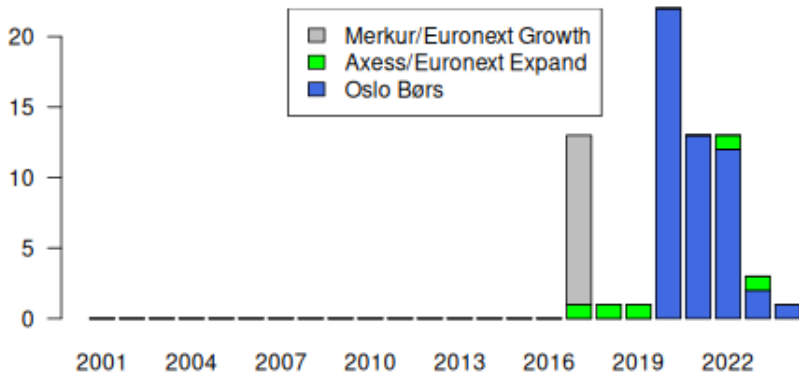
- OSE (main board)
- Axess / Euronext Expand
- Merkur / Euronext Growth



New stocks at OSE. 2001-2024.



Movements between OSE market places. 2001-2014.



Listings in analysis period (2018–2024)

Analysis start in 2018 (Limited by ESG data)

Distinguish

- IPO – raising additional capital
- Pure listing – no additional capital

	IPO	Listing	Total
Oslo Børs(Main List)	26	7	33
Euronext Expand(Axess)	3	1	4
Euronext Growth(Merkur)	78	62	140
Total	107	70	177

Industry Classification of listing companies

ICB	ICB label	Number
10	Technology	20
15	Telecommunications	5
20	Healthcare	11
30	Financials	11
35	Real Estate	3
40	Consumer Discretionary	10
45	Consumer Staples	21
50	Industrials	36
55	Basic Materials	11
60	Energy	33
65	Utilities	16
	Total	177

Size of listing companies

Market Capitalization (millions)

Mean

	IPO	Listing
Oslo Børs(Main List)	12741	6455
Axess/Euronext Expand	4651	
Merkur/Euronext Growth	2173	2315

Median

	IPO	Listing
Oslo Børs(Main List)	3710	1038
Euronext Expand(Axess)	3054	
Euronext Growth(Merkur)	1241	871

ESG - how to measure?

ESG - Environmental Social Governance

Of particular concern for this paper: E

- Environment
- Sustainability
- Climate

ESG proxy group 1 – What do firms say in prospectus?

Text analysis

- Nonstandard part of prospectus (business plan)
- Among the IPOs at OSE, relative occurrence of terms:
 - Positive towards environment. ESG(environment).
 - Negative towards environment. ESG(brown)

→ Idea: Measure how central these issues are to business plan of firm.

Note

- Ranking is relative to the corpus of OSE IPOs.
- Does not imply ranking by “Greenness”

ESG proxy group 2 – Mandated self-reported data

Reporting (accounts) requirements widen

- *Scope 1* – Direct greenhouse (GHG) emissions from firm. Normalized by Enterprise Value (EV).
- *Total GHG Emissions* – Sum of the firms Scope 1, 2 and 3 emissions. also normalized by EV.
- Fossil fuel sector – dummy variable

	mean	std	min	med	max	n
Scope1/EV	40	143	0	0	817	59
TotalGHGEmissions/EV	668	3120	0	41	24379	63
ind(FossilFuel)	0	0	0	0	1	140

ESG proxy group 3 – Categorizing business plan

Manual group firms into 3 types

- 1 **Green.** Renewable energy. Sustainability innovation. Circular Economy.
- 2 **Neutral.** Firms not easily categorized. Example: Financials.
- 3 **Brown.** Oil and Gas related.

	No Obs
Green	66
Neutral	85
Brown	26
Total	177

(listings since 2018).

Results

Results - IPO price inferred cost of capital

From finance 101

$$P_i = \frac{EPS_i}{r_i}$$

→ Estimate *implied cost of capital*

$$\hat{r}_i = \frac{EPS_i}{P_i}$$

Only use companies with $EPS_i \geq 0$.

	min	med	mean	max	no EPS > 0
EPS Year before IPO/Issue Price	0.00	0.02	0.09	1.24	53
EPS Year of IPO/Issue Price	0.00	0.03	0.07	0.65	62
EPS Year after IPO/Issue Price	0.00	0.03	0.06	0.41	49

Results - IPO price inferred cost of capital

Asking whether ESG matters

$$\text{EPS}_i/P_i = \alpha + \beta^{ESG} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

- **ESG measures**
 - Three ESG proxy groups
- **Controls**
 - Firm size
 - Industry sector (ICB)

Results - IPO price inferred cost of capital

$$\text{EPS}_i/P_i = \alpha + \beta^{\text{ESG}} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

ESG measure: Group 1 – ESG inferred from

	(4)	(5)	(6)
(Intercept)	0.004 (0.328)	0.024 (0.320)	0.072 (0.351)
ln(ESG Environment)	-0.023 (0.009)**	-0.020 (0.005)***	
ln(ESG Brown)	0.003 (0.006)		-0.010 (0.004)**
ln(MktCap)	0.004 (0.015)	0.003 (0.014)	0.002 (0.016)
Merkur	-0.060 (0.039)	-0.058 (0.038)	-0.029 (0.040)
ICB-10 (Tech)	-0.099 (0.052)	-0.106 (0.048)*	-0.142 (0.052)**
ICB-45 (Cons Stapl)	-0.034 (0.056)	-0.040 (0.053)	-0.101 (0.053)
ICB-50 (Indus)	-0.064 (0.039)	-0.065 (0.038)	-0.089 (0.041)*
ICB-60 (Energy)	-0.068 (0.045)	-0.065 (0.043)	-0.076 (0.048)
Adj. R ²	0.331	0.348	0.227
Num. obs.	42	42	42

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Results - IPO Underpricing and ESG

To estimate

$$\text{Underpricing}_i = \alpha + \mathbf{b}^{ESG} \mathbf{ESG\ measures}_i + \mathbf{b}^2 \mathbf{Controls}_i + \varepsilon_i,$$

Underpricing:

IPO issue price vs Closing price (efficient price)

Results - IPO Underpricing and ESG

Describing Underpricing

Opening day underpricing (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors(Main List)	-8.25	0.00	2.82	7.97	28.00	26
IPO Euronext Expand (Acess)	-5.17	0.00	-1.72	2.98	0.00	3
IPO Euronext Growth (Merkur)	-37.36	2.47	4.96	17.44	65.69	78
Listing Oslo Bors	-28.57	0.00	-4.28	16.13	17.76	7
Listing Euronext Growth	-129.06	-1.60	-3.70	22.21	40.97	60

First week underpricing (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors (Main List)	-19.09	2.23	4.04	13.38	58.73	26
IPO Euronext Expand (Acess)	-21.67	-1.18	-7.72	12.09	-0.31	3
IPO Euronext Growth (Merkur)	-30.31	0.03	7.73	26.76	131.60	78
Listing Oslo Bors	-26.39	-1.53	-0.97	15.27	17.57	7
Listing Euronext Growth	-33.50	-2.33	7.47	52.24	282.80	59

Results - IPO Underpricing and ESG

$$\text{Underpricing}_i = \alpha + \mathbf{b}^{ESG} \text{ESG measures}_i + \mathbf{b}^2 \text{Controls}_i + \varepsilon_i,$$

ESG measure: Group 3 – manual categorization

	(1)	(2)	(3)
(Intercept)	4.2 (31.2)	4.0 (31.0)	4.5 (31.1)
Green	-2.4 (3.4)	-2.6 (3.2)	
Brown	0.6 (4.6)		1.6 (4.4)
ln(MktCap)	-0.1 (1.4)	-0.1 (1.4)	-0.1 (1.4)
Merkur	3.2 (3.9)	3.2 (3.9)	2.5 (3.8)
Adj. R ²	-0.0	-0.0	-0.0
Num. obs.	107	107	107

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Results – Liquidity and ESG

Idea: More under-priced stocks need more activity to move prices to efficient price.

To test

$$\text{Liquidity}_i = \alpha + \mathbf{b}^{ESG} \text{ESG measures}_i + \mathbf{b}^2 \text{Controls}_i + \varepsilon_i,$$

Liquidity measure: Turnover

Results – Liquidity and ESG

Describing turnover

Opening day turnover (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors (Main List)	0.0	0.2	0.3	0.3	1.2	25
IPO Euronext Expand (Axess)	0.0	0.1	0.1	0.1	0.3	3
IPO Euronext Growth (Merkur)	0.0	0.2	0.4	0.7	4.2	75
Listing Oslo Bors	0.0	0.2	1.4	3.3	8.9	7
Listing Euronext Growth	0.0	0.2	0.4	1.0	7.2	56

First week turnover (in %)

	min	med	mean	sd	max	n
IPO Oslo Bors (Main List)	0.2	0.9	1.4	1.4	6.9	26
IPO Euronext Expand (Axess)	0.2	0.9	0.7	0.5	1.1	3
IPO Euronext Growth (Merkur)	0.0	1.1	2.1	3.0	15.4	78
Listing Oslo Bors	0.0	1.5	4.1	8.2	22.6	7
Listing Euronext Growth	0.0	0.8	2.3	6.0	41.2	60

Results – Liquidity and ESG

$$\text{Liquidity}_i = \alpha + \mathbf{b}^{ESG} \mathbf{ESG\ measures}_i + \mathbf{b}^2 \mathbf{Controls}_i + \varepsilon_i,$$

ESG measure: Group 3 – manual categorization

	First Day		
	(1)	(2)	(3)
(Intercept)	3.2** (1.4)	3.1** (1.4)	3.0* (1.4)
Green	0.4** (0.2)	0.4* (0.2)	
Brown	0.1 (0.2)		-0.0 (0.2)
ln(MktCap)	-0.1* (0.1)	-0.1 (0.1)	-0.1 (0.1)
Merkur	-0.3 (0.2)	-0.3 (0.2)	-0.2 (0.2)
Adj. R ²	0.0	0.0	0.0
Num. obs.	166	166	166

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Results: Post IPO analysis

Standard crosssectional investigation:

Is there a return difference linked to ESG?

Apply to IPO sample:

Return of Green Stocks minus Brown stocks.

Estimate alpha

$$R_{p,t} - R_{f,t} = \alpha_p + b^m(R_{m,t} - R_{f,t}) + b^{HML}HML_t + b^{SMB}SMB_t + \varepsilon_t$$

Results: Post IPO analysis

Alpha estimation

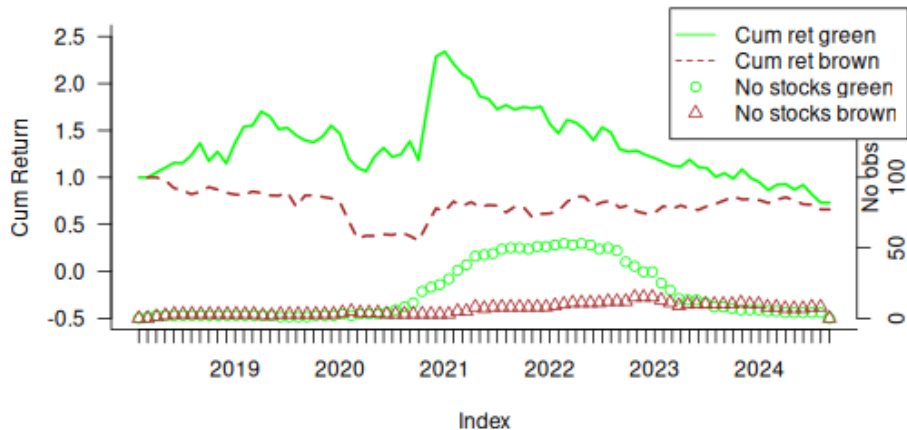
$$R_{p,t} - R_{f,t} = \alpha_p + b^m(R_{m,t} - R_{f,t}) + b^{HML}HML_t + b^{SMB}SMB_t + \varepsilon_t$$

	(One Year)	(Two Years)
alpha	-0.007 (0.021)	0.008 (0.013)
RMRF	-0.553 (0.345)	-0.148 (0.210)
HML	-0.343 (0.288)	-0.455** (0.175)
SMB	0.435 (0.550)	0.146 (0.335)
Adj. R ²	0.079	0.153
Num. obs.	59	59

*** $p < 0.01$; ** $p < 0.025$; * $p < 0.05$

Results: Post IPO analysis

What is going on?



Hypothesis 1 – symmetric info – IPO price correct

Hypothesis 2 – asymmetric info – Price moves to the close price.

Joining the hypotheses: Use the close price to estimate implied cost of capital.

Conclusion

Results support link between ESG properties of firms and IPO issue price.
But no link with underpricing

Attempting to look at magnitude: No significant return difference.

Issues

- Norway is only one country, is it representative?
- The sample period is special, with the Ukrainian war coinciding with drying up of the IPO market.

Extra results

Results - IPO price inferred cost of capital

$$\text{EPS}_i/P_i = \alpha + \beta^{\text{ESG}} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

Regressing EPS/Price on measures of ESG inferred from prospectus

	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	0.16 (0.52)	0.16 (0.53)	0.11 (0.45)	0.30 (0.48)	0.26 (0.50)	-0.01 (0.41)
ln(ESG Environment)	0.00 (0.02)	-0.00 (0.02)		0.02 (0.02)	0.01 (0.02)	
ln(ESG Brown)	-0.01 (0.00)		-0.01 (0.00)	-0.01* (0.00)		-0.01 (0.00)
ln(MktCap)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	0.01 (0.02)
ICB-10 (Tech)				-0.19** (0.07)	-0.17* (0.08)	-0.19** (0.07)
ICB-45 (Cons Stapl)				-0.20*** (0.07)	-0.17* (0.07)	-0.16** (0.06)
ICB-50 (Indus)				-0.15*** (0.05)	-0.16*** (0.05)	-0.13** (0.05)
ICB-60 (Energy)				-0.07 (0.07)	-0.11 (0.07)	-0.07 (0.07)

Results - IPO price inferred cost of capital

$$\text{EPS}_i/P_i = \alpha + \beta^{\text{ESG}} \text{ESG measures}_i + \beta^2 \text{Controls}_i + \varepsilon_i$$

Regressing EPS/Price on reported emissions

	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	0.198 (0.540)	0.224 (0.532)	0.021 (0.284)	0.186 (0.596)	0.257 (0.570)	-0.059 (0.294)
Scope1/EV	-0.000 (0.000)			-0.000 (0.000)		
Tot GHG/EV		0.000 (0.000)			0.000 (0.000)	
FossilFuel			-0.059 (0.048)			-0.014 (0.054)
ln(MktCap)	-0.004 (0.025)	-0.007 (0.024)	0.003 (0.013)	-0.000 (0.027)	-0.004 (0.026)	0.009 (0.014)
ICB-10 (Tech)				-0.173 (0.109)	-0.152 (0.106)	-0.140* (0.067)
ICB-45 (Cons Stapl)				-0.126 (0.136)	-0.117 (0.129)	-0.094 (0.060)
ICB-50 (Indus)				-0.143 (0.073)	-0.166** (0.067)	-0.105** (0.042)

Results - IPO Underpricing and ESG

Regressing first day underpricing on measures of ESG inferred from prospectus

	(1)	(2)	(3)
(Intercept)	12.5 (31.8)	10.8 (31.6)	16.6 (31.5)
ln(ESG Environment)	-0.8 (0.9)	-1.2 (0.7)	
ln(ESG Brown)	-0.4 (0.5)		-0.6 (0.4)
ln(MktCap)	-0.4 (1.5)	-0.3 (1.5)	-0.6 (1.5)
Adj. R ²	0.0	0.0	0.0
Num. obs.	82	82	82

Results - IPO Underpricing and ESG

Regressing underpricing on reported emissions data.

	(1)	(2)	(3)
(Intercept)	-44.59 (52.64)	-7.96 (58.80)	-5.47 (28.58)
Scope1/EV	-0.00 (0.02)		
Tot GHG/EV		-0.00 (0.00)	
FossilFuel			-3.17 (5.54)
ln(MktCap)	2.18 (2.39)	0.55 (2.67)	0.44 (1.35)
Adj. R ²	-0.03	-0.04	-0.02
Num. obs.	39	43	90

Results – Liquidity and ESG

Regressing turnover on measures of ESG inferred from prospectus

	First Day			First Week		
	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	2.5 (1.3)	2.5 (1.3)	2.8* (1.3)	34.5 (23.8)	2.7*** (0.6)	34.4 (23.7)
ln(ESG Environment)	-0.1 (0.0)	-0.0 (0.0)		0.0 (0.1)	0.0 (0.1)	
ln(ESG Brown)	0.0 (0.0)		0.0 (0.0)	-10.4 (7.8)		-10.4 (7.8)
ln(MktCap)	-0.1 (0.1)	-0.1 (0.1)	-0.1 (0.1)	-0.9 (0.7)	-1.0 (0.7)	-0.8 (0.7)
Adj. R ²	0.0	0.0	0.0	0.0	0.0	0.0
Num. obs.	120	120	120	124	124	124

Results – Liquidity and ESG

Regressing turnover on emissions data

	First Day			First Week		
	(1)	(2)	(3)	(4)	(5)	(6)
(Intercept)	1.0 (0.9)	1.8 (1.0)	2.5* (1.1)	1.9 (5.4)	5.4 (5.9)	10.1 (6.2)
Scope1/EV	-0.0 (0.0)			-0.0 (0.0)		
Total GHG Emissions/EV		-0.0 (0.0)			-0.0 (0.0)	
FossilFuel			-0.2 (0.2)			-1.1 (1.1)
ln(MktCap)	-0.0 (0.0)	-0.1 (0.0)	-0.1 (0.1)	-0.0 (0.3)	-0.2 (0.3)	-0.4 (0.3)
Adj. R ²	-0.0	0.0	0.0	-0.0	-0.0	0.0
Num. obs.	55	59	132	59	63	139

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