

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

Erika Berle, Kjell Jørgensen and Bernt Arne Ødegaard

Oct 2024

# Overview

- 1 Research Issue
- 2 Literature and hypotheses
  - Literature - ESG and stock returns
  - Literature – IPOs
  - Our research
  - Additionally
- 3 Data and Economic Environment
  - Setting: The Oslo Stock Exchange / Euronext Oslo
  - Setting – How to measure ESG?
- 4 Results
  - Inferring cost of capital from the IPO price
  - Results - IPO Underpricing
  - Results – Liquidity and ESG
  - Post IPO analysis
  - Digging into information effects
- 5 Conclusion
- 6 Extra results
  - Inferring cost of capital from the IPO price

# 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, 2025) ( $-5\%$ )

# 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

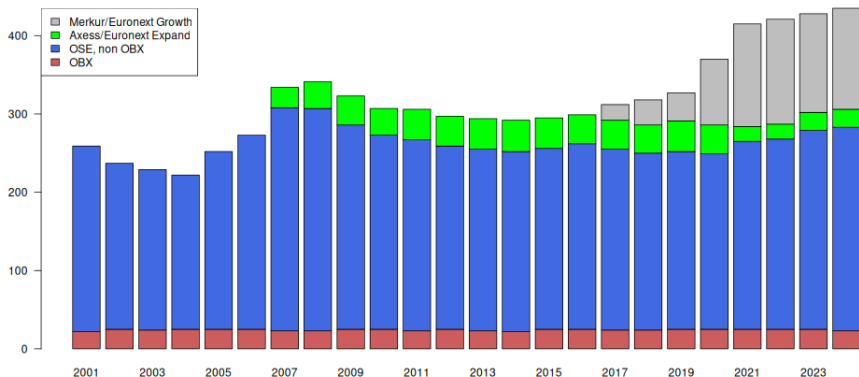
Provide evidence on current Norwegian stock market:

- 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

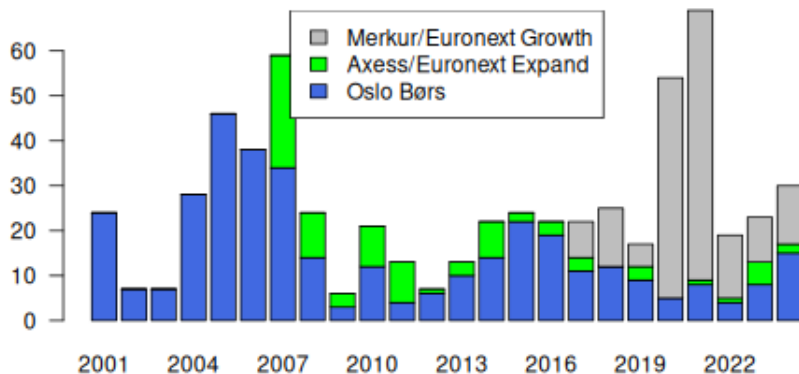
# Data and Economic Environment

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

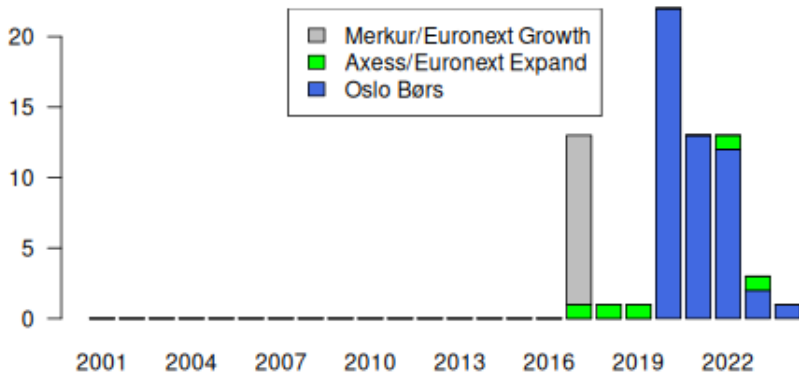
- OSE (main board)
- Axess / Euronext Expand
- Merkur / Euronext Growth



# 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)
- Listing market (Merkur dummy)

# 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 <sup>2</sup>	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)

## Controls

- Firm size
- Listing market (Merkur dummy)

# 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 <sup>2</sup>	-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

## Controls

- Firm size
- Listing market (Merkur dummy)

# 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 <sup>2</sup>	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

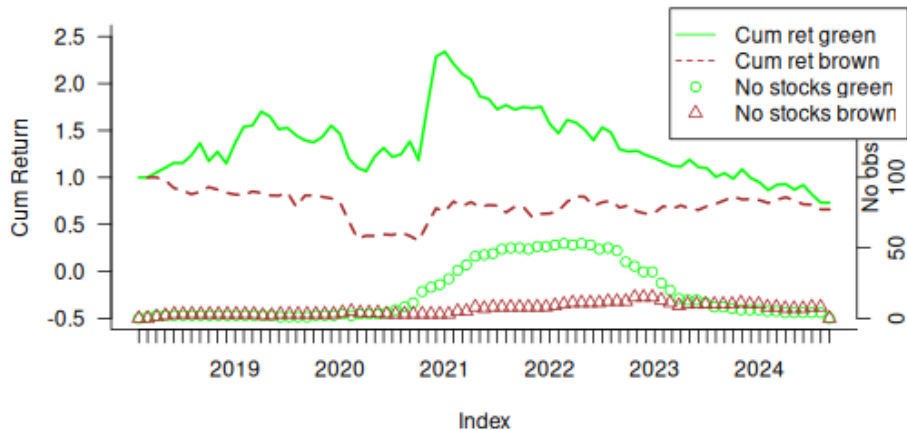
$$R_{p,t} - R_{f,t} = \alpha_p + b^m(R_{m,t} - R_{f,t}) + b^{HML}HML_t + b^{SMB}SMB_t + \varepsilon_t$$

	(One Year)	(Two Years)
alpha	-0.007	0.008
	(0.021)	(0.013)
RMRF	-0.553	-0.148
	(0.345)	(0.210)
HML	-0.343	-0.455**
	(0.288)	(0.175)
SMB	0.435	0.146
	(0.550)	(0.335)
Adj. R <sup>2</sup>	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?



## Merging hypothesis 1 and 2

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.

Results → No major differences relative to using the IPO price.

# 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

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

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 <sup>2</sup>	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 <sup>2</sup>	-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 <sup>2</sup>	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 <sup>2</sup>	-0.0	0.0	0.0	-0.0	-0.0	0.0
Num. obs.	55	59	132	59	63	139

- Doron Avramov, Si Cheng, Abraham Lioui, and Andrea Tarelli. Sustainable investing with ESG rating uncertainty. *Journal of Financial Economics*, 145(2, Part B): 642–664, 2022. doi: 10.1016/j.jfineco.2021.09.009.
- Erika Berle, Wanwei (Angela) He, and Bernt Arne Ødegaard. The stock market and corporate consequences of ethical exclusions by the world's largest fund. 2025.
- Patrick Bolton and Marcin Kacperczyk. Do investors care about carbon risk? *Journal of Financial Economics*, 142(2):517–549, 2021. doi: 10.1016/j.jfineco.2021.05.008.
- Sudheer Chava. Environmental externalities and cost of capital. *Management Science*, 60(9):2223–2247, 2014. doi: 10.1287/mnsc.2013.1863.
- Harrison Hong and Marcin Kacperczyk. The price of sin: The effects of social norms on markets. *Journal of Financial Economics*, 93(1):15–36, 2009. doi: 10.1016/j.jfineco.2008.09.001.
- Lúboš Pástor, Robert F Stambaugh, and Lucian A Taylor. Sustainable investing in equilibrium. *Journal of Financial Economics*, 142(2):550–571, 2021. doi: 10.1016/j.jfineco.2020.12.011.
- Lúboš Pástor, Robert F Stambaugh, and Lucian A Taylor. Dissecting green returns. *Journal of Financial Economics*, 146(2):403–424, 2022. doi: 10.1016/j.jfineco.2022.07.007.
- Lasse Heje Pedersen, Shaun Fitzgibbons, and Lukasz Pomorski. Responsible investing: The ESG-efficient frontier. *Journal of Financial Economics*, 142(2):572–597, 2021. doi: 10.1016/j.jfineco.2020.11.001.

Jeremy Stein. Overreactions in the options market. *Journal of Finance*, 44(4):1011–23, 1989. doi: 10.1111/j.1540-6261.1989.tb02635.x.