

Question: ESG disagree and stock return

ESG invest:



In theory :

Value↑ Risk↓ (Pastor et al.,2021) : —

In practice :

Lots of mixed evidence: (Avramov et al., 2022, Pastor et al., 2022)

Why?

Researchers use ESG ratings from different agencies. In reality, ratings can disagree, and investors may be affected

answer

- **Avramov et al.(2022)** : ESG disagree→invest demand, stock return, ESG premium

Other stock
return reaction:

- 张伟伟等(2024) : ESG disagree→股票错误定价
- **Serafeim et al.(2022)** : ESG disagree→ESG news-market reaction

Sustainable investing with ESG rating uncertainty

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Motivation

- Sustainable invest grown rapidly, with capital focus on ESG.
 - UN PRI AUM rose from \$21T in 2010 to \$103T in 2020
- **Challenge: investors face firm's true ESG performance uncertainty.**
 - Significant disagreement among rating agencies——avg corr: 0.48
- Exist studies assume ESG are deterministic, ignore impact of ESG uncertainty on **investment decision** and **asset pricing** (Pástor et al., 2021).
- ESG uncertainty can mislead investors on 'green' assets, impacting **capital allocation and social welfare**.

Question

- What is the impact of ESG rating uncertainty on:
 - Investors' asset demand: for green prefer investor, ESG score $\uparrow \rightarrow$ risk asset demand \uparrow , ESG uncertainty $\uparrow \rightarrow$ risk asset demand \downarrow
 - Cross-sectional stock returns: ESG uncertainty $\uparrow \rightarrow$ ex return(alpha), ESG \downarrow 。

Contribution

- contributes to literature on ESG profile in equilibrium asset pricing:
 - prior: focus on investors' ESG preferences (Pástor et al., 2021)
 - extend: highlight ESG uncertainty when analyzing sustainable invest.
- contributes to literature on cross-sectional return predictability of ESG profile.
 - prior: weak return predictability of ESG (Pedersen, 2021) and mixed evidence from different ESG proxies (Edmans, 2011; Bolton & Kacperczyk, 2020).
 - extend: ESG uncertainty could tilt the ESG-performance relation and serve as a potential mechanism to explain the opposing findings.

Design

What is the impact of ESG rating uncertainty on:

Investor demand

alpha

beta

One risky asset: single-period, market portfolio and a riskless asset.

Investor demand	<p>excess market return: $\widetilde{r}_M = \mu_M + \widetilde{\epsilon}_M$, ESG score: $\widetilde{g}_M = \mu_{g,M} + \widetilde{\epsilon}_{g,M}$, $\sigma_{g,M}, \rho_{g,M}$</p> <p>↓</p> <p>CARA function(Pástor et al. 2021): $V(\widetilde{W}_1, x) = -e^{-AW_1 - BW_0 x \widetilde{g}_M}$</p> <p>$x^* = \frac{1}{\gamma} \frac{\mu_M + b\mu_{g,M}}{\sigma_{M,U}^2}$, $b = \frac{B}{A}$, $\gamma = AW_0$, $\sigma_{M,U}^2 = \sigma_M^2 + b^2\sigma_{g,M}^2 + 2b\sigma_{g,M}\rho_{g,M}$</p> <p>Finance + ESG return $\sigma_{M,U}^2 > \sigma_M^2$, uncertainty → risk, $x^* \downarrow$</p>
alpha	<p>Equilibrium: $x^* = \frac{1}{\gamma} \frac{\mu_M + b\mu_{g,M}}{\sigma_{M,U}^2} = 1$, $\mu_M^U = \gamma\sigma_M^2 - b\mu_{g,M} + \gamma(\sigma_{M,U}^2 - \sigma_M^2)$</p> <p>ESG prefer → alpha ↓, Uncertainty → alpha ↑ Maybe explain mixed studies</p>

Design

What is the impact of ESG rating uncertainty on:

Investor demand

alpha

beta

multi-asset economy

$$X_i^* = \frac{1}{\gamma_i} \frac{\mu_r + b_i \mu_g}{\Sigma_{i,U}}, \Sigma_{i,U} = \Sigma_r + b_i^2 \Sigma_g + 2b_i \Sigma_{r,g}$$

$$\beta = \frac{\text{Cov}(r, r_M)}{\text{Var}(r_M)} = \frac{\Sigma_r X_M}{\sigma_M^2}, \quad \sigma_M^2 = X_M^T \Sigma_r X_M$$

beta

Excluding ESG uncertainty

$$\mu_r = \beta \mu_M - b_M (\mu_g - \beta \mu_{g,M})$$

alpha adjustment term



beta remains CAPM beta

Consider ESG uncertainty

$$\mu_r = \beta \mu_M + (\beta_{eff} + \beta) \mu_M - b_M (\mu_{g,U} - \beta_{eff} \mu_{g,M,U})$$

$$\beta_{eff} = \frac{\Sigma_{M,N} X_M}{\sigma_{M,U}^2} = \frac{\sigma_M^2}{\sigma_{M,U}^2} \beta + \frac{b^2 \sigma_{g,M}^2}{\sigma_{M,U}^2} \beta_g + \frac{2b \sigma_{r,g}}{\sigma_{M,U}^2} \beta_{r,g}$$

$$\beta_{eff,j} = \frac{\sigma_M^2}{\sigma_{M,U}^2} \beta_j + \frac{b^2 \sigma_{g,M}^2}{\sigma_{M,U}^2} \frac{X_j \sigma_{g,j}^2}{\sigma_{g,M}^2} + \frac{2b \sigma_{r,g}}{\sigma_{M,U}^2} \frac{X_j \sigma_{r,g,j}}{\sigma_{r,g,M}^2}$$

beta ↑

Design-empirical

ESG rating uncertainty↑

Risk asset demand ↓

Y: institutional ownership

ESG prefer

high norm-constrained

M other mutual funds

low hedge funds

ESG uncertainty

ESG rating 5×5

alpha↑, beta ↑

Y: ex return

ESG uncertainty

ESG rating 5×5

ESG rating—Y ↓

High uncertainty—Y ↓ ×

Y: ex return

FM reg:

$$rt_{i,m} = \alpha_0 + \beta_1 ESG_{i,m-1} + \beta_2 ESG_{i,m-1} \times Low\ ESG\ uncertainty_{i,m-1} + \beta_3 Low\ ESG\ uncertainty_{i,m-1} + control_{i,m-1} + e_{i,m}$$

$\beta_2 < 0$

Design-data

- Data sources:
 - Stock data: Daily and monthly common stock returns CRSP
 - ESG ratings: Six vendors –Asset4 (Refinitiv), MSCI KLD, MSCI IVA, Bloomberg, Sustainalytics, RobecoSAM.
 - Institutional holdings: Thomson-Reuters 13F database
- ESG rating measures:
 - (AAA-CCC),(0-100),(-11 - +19)
 - rank,to (0-1)
 - pairwise comparison: $U_{j,t}^{A,B} = \frac{|g_{j,t,A} - g_{j,t,B}|}{\sqrt{2}}$
 - firm level: $U_{j,t} = \text{mean}(U_{j,t}^{A,B})$ ——mean:0,48

Result-H1:green prefer investor.esg disagree–risk asset demand ↓

Panel A: Norm-constrained institutions								
ESG rating	ESG uncertainty							
	Low	2	3	4	High	HML-U	t-stat	All
Low	0.170	0.183	0.187	0.178	0.179	0.009	(0.80)	0.177
2	0.185	0.192	0.207	0.209	0.184	−0.001	(−0.23)	0.195
3	0.189	0.215	0.210	0.212	0.191	0.002	(0.40)	0.200
4	0.211	0.211	0.211	0.215	0.211	0.000	(0.04)	0.211
High	0.228	0.236	0.238	0.225	0.181	−0.047***	(−2.73)	0.230
HML-R	0.058*** (10.21)	0.053*** (12.00)	0.050*** (8.33)	0.047*** (8.51)	0.002 (0.08)			0.053*** (11.39)
Panel B: Hedge funds								
ESG rating	ESG uncertainty							
	Low	2	3	4	High	HML-U	t-stat	All
Low	0.157	0.157	0.160	0.156	0.130	−0.027***	(−3.70)	0.157
2	0.143	0.147	0.155	0.153	0.149	0.006	(1.31)	0.149
3	0.153	0.144	0.144	0.149	0.153	−0.000	(−0.08)	0.150
4	0.148	0.144	0.140	0.142	0.141	−0.006*	(−1.96)	0.142
High	0.127	0.124	0.128	0.128	0.119	−0.008	(−1.33)	0.127
HML-R	−0.031*** (−6.14)	−0.033*** (−8.15)	−0.032*** (−6.30)	−0.029*** (−5.57)	−0.011 (−1.25)			−0.030*** (−8.06)
Panel C: Other institutions								
ESG rating	ESG uncertainty							
	Low	2	3	4	High	HML-U	t-stat	All
Low	0.347	0.367	0.357	0.363	0.317	−0.030**	(−2.57)	0.356
2	0.343	0.374	0.387	0.390	0.354	0.010	(1.43)	0.370
3	0.370	0.373	0.371	0.384	0.360	−0.011	(−1.66)	0.368
4	0.382	0.375	0.378	0.369	0.360	−0.022***	(−3.25)	0.370
High	0.363	0.368	0.363	0.357	0.328	−0.035	(−1.63)	0.363
HML-R	0.016 (1.28)	0.001 (0.13)	0.006 (0.59)	−0.005 (−0.37)	0.011 (0.35)			0.007 (0.71)

Result-H2:esg disagree—ex rt,alpha ↑

ESG rating	Panel A: Return						Panel B: CAPM-adjusted return					
	ESG uncertainty						ESG uncertainty					
	Low	2	3	4	High	All	Low	2	3	4	High	All
Low	1.235*** (2.95)	1.113*** (2.99)	0.767** (1.98)	0.875** (2.30)	0.760** (2.32)	0.923** (2.58)	0.168 (0.93)	0.064 (0.40)	−0.311* (−1.82)	−0.141 (−0.89)	−0.101 (−0.58)	−0.101 (−0.84)
2	1.245*** (3.36)	1.026*** (2.84)	1.093*** (3.30)	1.043*** (2.74)	1.095*** (2.91)	0.963*** (2.85)	0.187 (1.16)	0.076 (0.38)	0.115 (0.77)	0.042 (0.29)	0.151 (0.77)	−0.008 (−0.07)
3	1.096*** (2.69)	0.965*** (2.83)	1.050*** (2.86)	1.104*** (2.89)	0.949*** (3.15)	1.021*** (3.11)	0.040 (0.23)	−0.031 (−0.20)	0.002 (0.02)	0.064 (0.46)	0.079 (0.42)	0.053 (0.64)
4	0.730** (2.09)	0.695* (1.81)	1.105*** (2.90)	1.019*** (2.96)	0.990*** (2.68)	1.017*** (3.42)	−0.192 (−1.24)	−0.389*** (−3.28)	0.108 (0.55)	0.040 (0.34)	0.006 (0.03)	0.095 (1.32)
High	0.642* (1.97)	0.842** (2.53)	0.855*** (3.06)	1.184*** (3.62)	0.854*** (2.81)	0.805** (2.57)	−0.230* (−1.95)	−0.063 (−0.55)	−0.012 (−0.10)	0.245* (1.83)	−0.001 (−0.01)	−0.095 (−1.49)
LMH-R	0.594*** (2.72)	0.271 (1.30)	−0.088 (−0.39)	−0.309 (−1.43)	−0.094 (−0.42)	0.118 (0.78)	0.398* (1.86)	0.128 (0.58)	−0.299 (−1.25)	−0.387* (−1.75)	−0.100 (−0.42)	−0.006 (−0.04)
ESG rating	ESG uncertainty						ESG uncertainty					
	Low	2	3	4	High	HML-U	Low	2	3	4	High	HML-U
All	0.753** (2.31)	0.875*** (2.61)	0.935*** (3.07)	1.083*** (3.28)	0.940*** (3.29)	0.187 (1.40)	−0.155** (−1.98)	−0.090 (−1.20)	−0.003 (−0.04)	0.120* (1.72)	0.071 (0.84)	0.226* (1.67)

Result-H3:esg disagree-beta ↑

Stock returns regressed on lagged ESG rating and uncertainty								
	Excess return				CAPM-adjusted return			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ESG	0.002 (0.01)	0.098 (0.65)	0.062 (0.33)	0.199 (1.03)	0.042 (0.23)	0.139 (0.91)	0.162 (0.77)	0.301 (1.65)
ESG × Low ESG Uncertainty			-0.163* (-1.91)	-0.223* (-1.75)			-0.254** (-2.26)	-0.312** (-2.36)
Low ESG Uncertainty			0.114* (1.86)	0.109 (1.38)			0.125** (2.20)	0.114 (1.61)
Log(Size)	-0.100 (-1.28)	-0.036 (-0.27)	-0.101 (-1.30)	-0.038 (-0.29)	-0.044 (-0.59)	0.111 (0.77)	-0.044 (-0.60)	0.111 (0.77)
Log(BM)	0.001 (0.01)	0.009 (0.14)	-0.001 (-0.01)	0.008 (0.12)	-0.021 (-0.19)	0.019 (0.18)	-0.024 (-0.21)	0.017 (0.17)
6M Momentum	0.336 (0.70)	0.188 (0.40)	0.335 (0.69)	0.194 (0.42)	0.275 (0.50)	0.105 (0.20)	0.276 (0.50)	0.111 (0.21)
Log(Illiquidity)		0.056 (1.00)		0.056 (1.03)		0.103** (2.17)		0.103** (2.15)
Gross Profitability		0.178 (0.99)		0.180 (1.00)		0.355* (1.83)		0.359* (1.85)
Corporate Investment		0.037 (0.49)		0.037 (0.50)		-0.005 (-0.08)		-0.007 (-0.09)
Leverage		-0.037 (-0.78)		-0.037 (-0.79)		-0.034 (-0.73)		-0.034 (-0.73)
Log(Analyst Coverage)		-0.019 (-0.15)		-0.019 (-0.14)		-0.174 (-1.40)		-0.175 (-1.41)
Analyst Dispersion		-0.536*** (-2.67)		-0.539*** (-2.71)		-0.828*** (-4.37)		-0.831*** (-4.37)
Constant	2.309* (1.71)	1.800 (1.09)	2.281* (1.70)	1.775 (1.09)	0.591 (0.46)	-0.555 (-0.31)	0.533 (0.42)	-0.614 (-0.34)
Obs	283,671	254,873	283,671	254,873	272,728	245,451	272,728	245,451
R-squared	0.045	0.080	0.048	0.082	0.043	0.076	0.045	0.078

《估值修复还是信息混淆? —— 基于多方 ESG 评级与股票错误定价的研究》(金融研究, 2024)

- H1: 在**异质信念**理论模型下,ESG 评级分歧加剧了股票错误定价
- H2: ESG 评级分歧通过影响**信息透明度**和**噪声交易者**进而加剧股票错误定价
- H3: ESG 评级分歧主要导致股价被高估

$$\text{MisPi}_{i,t} = \beta_0 + \beta_1 \text{DivESG}_{i,t-1} + \gamma X_{i,t-1} + \lambda_t + \mu_i + \varepsilon_{i,t}$$

Idea

- 替换 X: 其他 ESG 不确定性?
 - 国内 v.s. 国际
 - 公司与评级机构的内幕联系
- 替换 Y: ESG 分歧的其他市场影响?
 - 股价波动风险? 下行风险?
- 进一步:
 - 分析师有偏? —— ESG 是否会有偏?
 - 如何

Thanks!

