The Cost of ESG Investing

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Introduction

Timely topic

Recent events show that the backlash against ESG investing has finally arrived... Arizona Attorney General Mark Brnovich explains how he and 18 other state AGs are seeking answers from the investing giant BlackRock about its political agenda... The best news is that the U.S. may finally get a real debate over ESG and politicized investment.

– Editorial Board, WSJ Aug 15 2022

Asset managers claim they focus on financial returns, but they have joined with left-wing state pension funds to cram "environmental, social and governance" policies down the throats of American companies and employees whose retirement funds are under asset managers' control... ESG simply isn't a natural outgrowth of a focus on financial returns. And research reflects that some ESG funds have underperformed.

– Mark Brnovich (AG for AZ), WSJ Aug 15 2022

Introduction

ESG mandates are challenging

- Rapidly growing client demand for ESG investing:
  - Fund managers are increasingly looking for ways to integrate ESG goals
  - However, the implications of doing so are unclear
- Widespread disagreement on the return predictability of ESG characteristics:
  - Yes: Fabozzi et al. [2008], Luo and Balvers [2017], Pedersen et al. [2020], Zerbib [2020], Glossner [2021], Baker et al. [2018], Bolton and Kacperczyk [2020], and Pastor et al. [2022]
  - No: Hartzmark and Sussman [2019], Pedersen et al. [2020], Gorgen et al. [2020]
  - Cheap-talk: Kim and Yoon [2020], Brandon et al. [2021].
- Costs and benefits of ESG integration:
  - Kim and Yoon [2020], Brandon et al. [2021], Ceccarelli et al. [2021], Aragon et al. [2020]
- *This paper:*
  What is the return-performance cost of different ESG mandates? Why?

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What we do

Methodology and Contributions

1. We use IPCA (instrumented PCA) to extract aggregate risks that better-capture the mean-variance-efficient frontier (see Kelly et al. [2019, forthcoming]):
   - Best-possible depiction of systematic risks when we evaluate effect of ESG on average returns
   - Avoid inappropriately attributing them to an alpha because one's factor model is poor
2. Explicitly allow for ESG measures and other firm characteristics to drive cross-sectional and time-series variation in alphas or betas.
   - Do ESG ratings identify systematic (conditional) risk exposures or exploitable mispricing?
3. Take into account a large amount of the conditioning information investors have at their disposal *already* in addition to ESG scores.
4. Use data from seven major ESG providers in our empirical analysis (and evaluate topline and subcomponent performance, industry adj. or not, variations in imputation, etc.)

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Take aways

- **Yes we can** adjust portfolios to improve ESG performance without sacrificing return performance
  - Screened tangency portfolios and responsible-investing model portfolios yield little change in Sharpe ratios
- ESG can deliver alpha from *careful integration*
  - Certain measures, combinations [connects to Pastor et al., 2022, Berg et al., 2021]

  within the context of *rich* conditioning information available to investors
  (find no role in beta)
- Consistent with equilibrium theory
  - as different ESG-minded investors use different ESG measures, and those measures disagree

The IPCA model

Conditional, time-varying alpha, beta

$$r_{n,t+1} = \alpha_{n,t} + \beta'_{n,t} f_{t+1} + \varepsilon_{n,t+1}, \quad \text{where } \alpha_{n,t} = \Gamma'_{\alpha} \zeta_{n,t} \text{ and } \beta_{n,t} = \Gamma'_{\beta} z_{n,t}$$

$z_{n,t}$ vector of firm characteristics ($L \times 1$)

$\zeta_{n,t}$ zero, or vector of ESG firm characteristics ($L_\zeta \times 1$)

$\beta_{n,t}$ instrument for with characteristics ($\Gamma'_{\beta} z_{n,t}$) $\Rightarrow$ *conditional exposures*

$\alpha_{n,t}$ instrument for with characteristics ($\Gamma'_{\alpha} \zeta_{n,t}$) $\Rightarrow$ *conditional alpha*

f_t *estimated* factors ($K \times 1$) $\Rightarrow$ Kelly et al. [2019, 2021, forthcoming] show that estimating factors produces large gains relative to well-known factors [Hou et al., 2015, Fama and French, 2015] for stocks and bonds

Output $\beta_{n,t}$, moments of $f, \epsilon \Rightarrow$ tangency portfolio, model-implied moments of r_{t+1}

ESG strategies in practice

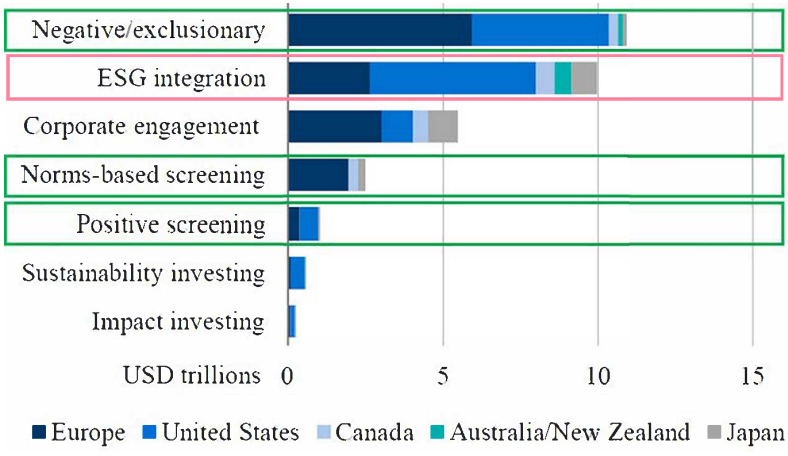

Figure: From Dimson et al. [2020]

We look at strategies covering upwards of 80% of ESG-linked assets

ESG strategies in the IPCA framework

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Tilted systematic portfolios: $\zeta = 0$, z is non-ESG chars

- Adjust portfolio for an ESG mandate, *after* model estimation

1. (Tangency ptf) + (Screen "bad" or "good" ESG) = ESG-screened tangency ptf
2. (Model-implied moments of r_{t+1}) +(Responsible-investing model) = ESG-tilted Markowitz ptf

Use Pedersen et al. [2020] and Pastor et al. [2021]

ESG integration:

β $\zeta = 0$, z is ESG and non-ESG $\Rightarrow$ ESG informs beta?

α ζ is ESG, z is non-ESG $\Rightarrow$ ESG-driven alpha?

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Data

- Non-ESG data: CRSP and Compustat via the codes provided by Jensen et al. [forthcoming]. » Non-ESG Data
  - 50 characteristics, based on those that provide the greatest firm-month coverage.
  - In robustness check: subset of 16 that are "slow" (small time-series vol)

- ESG data: 7 major ESG data providers (KLD, MSCI, Asset4, Sustainalytics, RepRisk, S&P Global, Trucost).
  - Coverage varies widely across data providers and time » ESG Data 1
  - Coverage better after 2010; market attention greater [Giglio et al., forthcoming]
  - ESG data availability much better for large firms
  - $\Rightarrow$ Main results focus on post-2010 sample
  - $\Rightarrow$ Main tests focus on sample of *large firms* Kelly et al. [2019] show lower profits in large-firm sample $\Rightarrow$ more stringent test of effects of ESG)

- All measures (ESG and Non-ESG) rank-demeaned to $[-0.5, 0.5]$ so mean/median equals 0

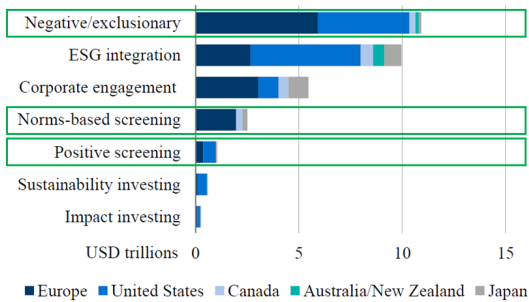
Results: Screened portfolios

Baseline unscreened results

ESG measure	Mean		Skewness	Kurtosis
Tangency	19.97	(7.18)	−0.28	0.78

- Result consistent with Kelly et al. [2019]
- Annualized mean, and excess kurtosis and skewness of the monthly returns for tangency portfolio (t-statistics in parentheses)
- Scaled to have 10% ann vol: divide mean by 10 to get Sharpe ratio
- Reference point: vol-scaled market mean return of 9.59% over 2010–2020

Results: Screened portfolios



Results: Screened portfolios

- ESG Mandate: Negative Screening #1 $\Rightarrow$ exclude firms with ESG below median

ESG measure	Mean		Skewness	Kurtosis
Tangency	19.97	(7.18)	−0.28	0.78
	Panel I: Screened, long-and-short			
Asset4	19.47	(6.89)	−0.39	0.62
KLD	18.31	(6.93)	−0.43	0.11
MSCI	20.24	(7.62)	−0.33	0.40
RepRisk	22.18	(7.87)	−0.35	0.67
S&P	20.35	(7.15)	−0.31	0.73
Sustainalytics	20.89	(7.58)	−0.31	0.54
Trucost	17.49	(6.77)	−0.54	0.56

Results: Screened portfolios

- ESG Mandate: Negative Screening #2 $\Rightarrow$ do not go long 'bad' ESG firms

ESG measure	Mean		Skewness	Kurtosis
Tangency	19.97	(7.18)	−0.28	0.78
	Panel II: Screened, long-only			
Asset4	14.64	(4.51)	−0.26	1.27
KLD	16.12	(4.96)	−0.16	1.61
MSCI	15.89	(5.11)	−0.26	1.41
RepRisk	14.35	(4.56)	−0.22	1.18
S&P	19.17	(6.47)	−0.34	0.93
Sustainalytics	16.76	(5.37)	−0.31	1.61
Trucost	14.34	(4.62)	−0.22	1.46

Results: Screened portfolios

- ESG Mandate: Positive Screening $\Rightarrow$ only invest in 'good' ESG firms (i.e. zero-out firms with missing ESG scores)

ESG measure	Mean		Skewness	Kurtosis
Tangency	19.97	(7.18)	−0.28	0.78
Panel A: Screened				
Asset4	15.29	(5.94)	−0.45	0.00
KLD	16.43	(6.44)	−0.28	0.19
MSCI	16.77	(6.19)	−0.38	0.58
RepRisk	17.84	(6.00)	−0.09	0.41
S&P	7.75	(2.81)	−0.39	2.22
Sustainalytics	14.19	(5.57)	−0.44	−0.11
Trucost	14.60	(5.75)	−0.56	0.90

Results: Responsible-investing models

Responsible-investment model: Pedersen et al. [2020]

- Firms with ESG score above targeted average ESG score $\bar{s}$ receive higher ptf weight
- Portfolio weights: $w_{PFP,t} = \Sigma_t^{-1}\left(\mu_t + \pi_t(s_t - \iota_{N_t}\bar{s})\right)$
- We take $\bar{s} = p_{75}$

ESG measure	Mean	Skewness	Kurtosis
Markowitz	20.85 (7.66)	−0.32	0.17
Panel A: Pedersen et al. [2020]			
Asset4	20.42 (7.52)	−0.33	0.17
KLD	20.53 (7.56)	−0.27	0.10
MSCI	20.40 (7.43)	−0.31	0.22
RepRisk	20.91 (7.75)	−0.30	0.17
S&P	20.86 (5.53)	−0.17	−0.08
Sustainalytics	20.32 (7.33)	−0.32	0.13
Trucost	20.79 (7.63)	−0.23	0.02

Results: Responsible-investing models

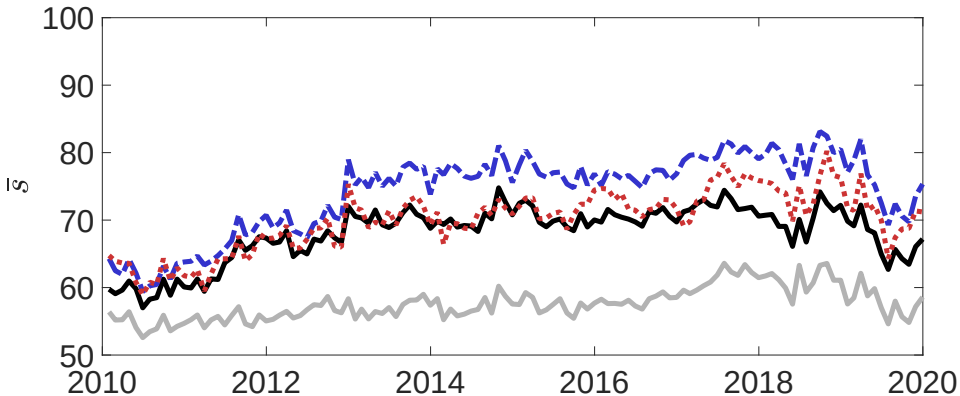
Responsible-investment models: Pastor et al. [2021]

- Investor's 'taste' for ESG determines weight of firm in portfolio
- Portfolio weights: $w_{PST,t} = \Sigma_t^{-1}(\mu_t + ds_t)$
- We set taste parameter $d = 0.001$, 10 basis points per month

ESG measure	Mean		Skewness	Kurtosis
Markowitz	20.85	(7.66)	−0.32	0.17
Panel B: Pastor et al. [2021]				
Asset4	15.83	(5.75)	−0.29	0.23
KLD	17.54	(5.96)	0.05	−0.13
MSCI	18.33	(6.33)	−0.23	0.27
RepRisk	19.79	(7.76)	−0.22	0.14
S&P	19.98	(7.30)	−0.39	0.04
Sustainalytics	16.63	(5.99)	−0.22	−0.07
Trucost	16.16	(5.57)	0.06	−0.22

Properties of overlaid portfolios: portfolio-weighted average ESG scores

- Negative screen long and short
- Negative screen long only
- Pastor et al. (2021) optimal portfolio



Robustness

ESG screening and models

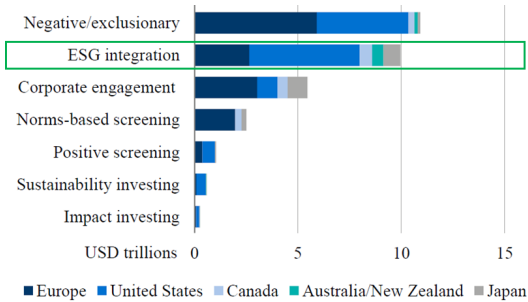
- Alternative ESG thresholds, model parameters Robustness screening Robustness models
- Subcomponents (E, S, G)
- Only nonmissing; imputed 0 or -0.5
- Best-in-class industry adjustment
- Fewer "slow" characteristics

There are numerous ways to overlay a profitable systematic portfolio with an ESG mandate and sacrifice (close to) nothing:

- Sharpe ratios and average returns can remain high and statistically significant
- ESG screened portfolios are net-long, have high diversification, and higher ESG score than tangency portfolio Properties Portfolios

Results: Integrate ESG in the model

In alpha or beta



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In alpha or beta

ESG integration *only* in β:

- $r_{n,t+1} = \beta'_{n,t} f_{t+1} + \varepsilon_{n,t+1}$, where $\beta_{n,t} = \Gamma'_\beta z_{n,t}$
- $\zeta = 0$, z is non-ESG *and* ESG

ESG measure	Mean		Skewness	Kurtosis
Tangency	19.97	(7.18)	−0.28	0.78
Panel A: ESG-integrated tangency				
Asset4	20.15	(7.25)	−0.26	0.77
KLD	19.99	(7.18)	−0.28	0.80
MSCI	19.99	(7.18)	−0.28	0.78
RepRisk	20.02	(7.21)	−0.28	0.77
S&P	19.95	(7.18)	−0.28	0.78
Sustainalytics	20.07	(7.21)	−0.27	0.79
Trucost	20.23	(7.20)	−0.16	0.61
All	20.22	(7.23)	−0.19	0.58

Results: Integrate ESG in the model

In alpha or beta

ESG integration in *only* α (beta-neutral):

- $r_{n,t+1} = \alpha_{n,t} + \beta'_{n,t} f_{t+1} + \varepsilon_{n,t+1}$, where $\alpha_{n,t} = \Gamma'_{\alpha} \zeta_{n,t}$ and $\beta_{n,t} = \Gamma'_{\beta} z_{n,t}$
- ζ is ESG, z is non-ESG

ESG measure	Mean		Skewness	Kurtosis
Tangency	0			
Panel B: Beta-neutral				
Asset4	2.55	(0.96)	−0.36	0.17
KLD	4.73	(1.34)	0.26	−0.18
MSCI	3.88	(1.13)	0.86	1.08
RepRisk	2.41	(0.88)	0.03	0.44
S&P	0.19	(0.06)	−0.45	2.75
Sustainalytics	2.68	(0.87)	−0.01	0.16
Trucost	5.70	(1.89)	0.41	−0.16
All	6.70	(2.17)	0.26	−0.32

Robustness

ESG integration

No significant role for ESG in beta (robust across many other specifications)

But could be in alpha

Explore further

- Trucost marginal on its own: it is an E measure
- Combining ESG information leads to significance

$\Rightarrow$ explore subcomponents

$\Rightarrow$ explore combinations

Alpha: further results

ESG measure	Mean		Skewness	Kurtosis
Asset4, E	1.73	(0.65)	−0.31	0.05
KLD, E	4.55	(1.47)	0.56	0.68
MSCI, E	7.49	(2.19)	0.11	0.99
S&P, E	1.56	(0.58)	0.40	2.63
Sustainalytics, E	0.84	(0.31)	−0.19	−0.27
MSCI, E, FF3C	6.76	(1.90)	0.13	0.80
All*+, E	9.34	(2.71)	0.19	0.71
All*, E*	8.71	(2.62)	0.26	−0.25
MSCI IV	6.50	(2.00)	0.29	−0.42
MSCI IV, E	7.76	(2.41)	0.01	−0.30
All+, S	6.69	(2.04)	0.05	−0.46
All+, G	5.74	(1.85)	−0.01	−0.20

Notes – "E" means we use the environmental subcomponent index instead of the topline index.

The MSCI E component the only one significant: supports Pastor et al. [2022]

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Enhances 5.66% found in Pastor et al. [2022]

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Combined E information gives cleaner signal; recalls Berg et al. [2021]

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In fact, Berg et al. [2021]'s instrumental variables' approach works here.

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All*+, E	9.34	(2.71)	0.19	0.71
All*, E*	8.71	(2.62)	0.26	−0.25
MSCI IV	6.50	(2.00)	0.29	−0.42
MSCI IV, E	7.76	(2.41)	0.01	−0.30
All+, S	6.69	(2.04)	0.05	−0.46
All+, G	5.74	(1.85)	−0.01	−0.20

Notes – "All+" excludes Trucost. "S" uses the social subcomponent index, "G" uses the governance subcomponent index.

Combining S information can also work.

Relation to theory

We can improve the optimal portfolio's ESG-performance without it costing return-performance

- But if every investor does this, what is the equilibrium effect?
- Won't 'bad' ESG stock prices fall, expected returns rise, and the ESG mandate's cost increase?

No, not necessarily

- Our extensive results show: no one way to "do ESG"
- Different investors may use *different measures* and have *different ESG mandates*
- Extension of Pastor et al. [2021] model: expected returns may be unaffected by ESG concerns when ESG scores are uncorrelated ⏩ Pastor et al. (2021a) extension

Relation to theory

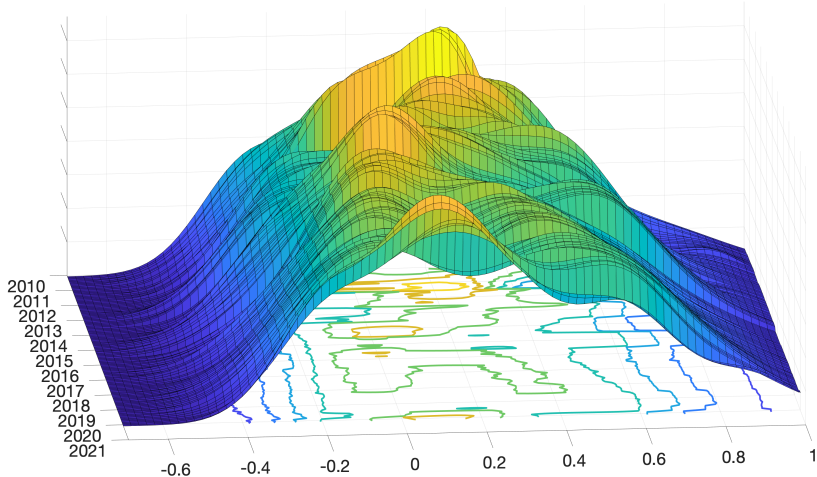
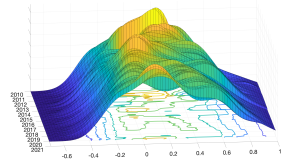


Figure: Densities of cross-sectional rank correlations

Relation to theory



- ESG measures are often randomly related—don't agree
- In a Pastor et al. [2021] type model: no equilibrium effect on $E(r)$

  $\Rightarrow$ Even if investors act as promised, the plethora of ESG metrics and ESG mandates can lead to negligible equilibrium effects

Going forward?

Disagree Professional portfolio-managers have incentives to advertise good ESG performance

$\Rightarrow$ One might *expect* many ESG measures and measure-providers to flourish

Agree Regulators enter with proposed standards

Relation to theory

Yet...

- Trucost defined significant alpha; so did MSCI E
- Within ESG, some measures could be *more objective*, less subject to disagreement
- *These scores* would be related to equilibrium returns
  - Interesting to monitor this going forward

Conclusions

- **Yes we can** adjust portfolios to improve ESG performance without sacrificing return performance
  - Screened tangency portfolios, or responsible-investing model portfolios
- ESG can deliver alpha from *careful integration*
  - Certain measures, combinations [connects to Pastor et al., 2022, Berg et al., 2021]

  within the context of *rich* conditioning information available to investors
  (find no role in beta)
- Consistent with equilibrium theory
  - as different ESG-minded investors use different ESG measures, and those measures disagree

Appendix Slides

ESG screening and responsible-investing models

Overlay: adjust portfolio for an ESG-investing mandate, not as part of mean/cov estimation

Unadjusted Tangency

- Factor portfolios: $W_{f,t} = (\beta_t'\beta_t)^{-1}\beta_t'$
- Factor tangency portfolio: $w_{factan} = \frac{1}{\iota_K' S^{-1} m} S^{-1} m$ $\quad (E(f) = m, Cov(f) = S)$
- $\Rightarrow w_{tan,t}' = w_{factan}' W_{f,t}$

1. Screened tangency
   - Zero-out $w_{i,tan,t}$ where firm i's ESG is below p_Q $\quad$ (e.g. $Q = 50\%$)
   - In either leg, or only in long leg
2. Pedersen et al. [2020] optimal portfolio
   $w_{PFP,t} = \Sigma_t^{-1}(\mu_t + \pi_t(s_t - \iota_{N_t}\bar{s}))$
   for s_t ESG scores, $\bar{s}$ avg, $\mu = E(r), \Sigma = Cov(r)$, π_t function of parameters
3. Pastor et al. [2021] optimal portfolio
   $w_{PST,t} = \Sigma_t^{-1}(\mu_t + ds_t)$, for $d \geq 0$ ESG taste

Model estimates: $\mu_t = \beta_t E(f), \Sigma_t = \beta_t \Sigma_F \beta_t' + \Sigma_\epsilon$

◂ IPCA model

ESG integration

Like any other characteristic

- Is ESG in $\beta_{n,t}$?
- Is ESG in $\alpha_{n,t}$?
- How does ESG data *change* the estimates?

$\alpha_{n,t}$ makes a profitable "pure-alpha" portfolio (no factor exposure)? [Kelly et al., 2019]

Just in α

- Modified estimator:
  $r_{n,t+1} = \zeta'_{n,t}\Gamma_\alpha + z'_{n,t}\Gamma_\beta f_{t+1}$ for ESG ζ *not* in z
- Define a "beta-neutral" portfolio (no factor exposure)

◂ IPCA model

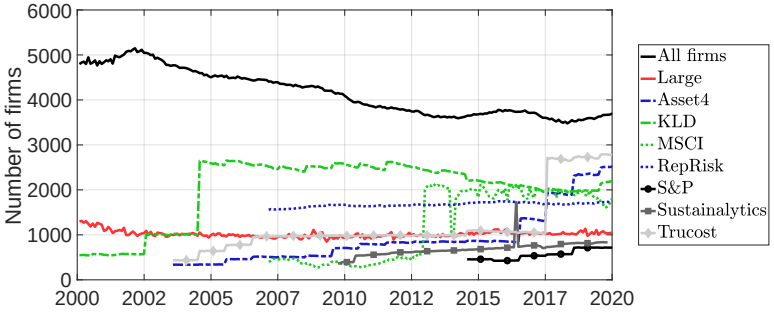
Non-ESG Data

CRSP and Compustat via the codes provided by [Jensen et al., forthcoming]

- 50 characteristics, based on those that provide the greatest firm-month coverage
- market_equity and assets
- cash-flow variables net_income, sales
- pay-out ratios eqnpo_1m, eqnpo_3m, eqnpo_6m, eqnpo_12m, ni_at
- change in shares chcsho_1m, chcsho_3m, chcsho_6m, chcsho_12m
- valuation ratios div3m_me, div6m_me, div12m_me, at_me, ni_me, nix_me, sale_me, xido_at
- leverage ratios debt_me, netdebt_me, debt_at
- turnover, trading, and volume variables tvol, zero_trades_21d, zero_trades_126d, dolvol_126d, turnover_126d, dolvol_var_126d, turnover_var_126d, zero_trades_252d, bidaskhl_21d, rvolhl_21d
- past return variables ret_1_0, ret_2_0, ret_3_0, ret_3_1, ret_6_0, ret_6_1, ret_9_0, ret_9_1, ret_12_0, ret_12_1, ret_12_7
- quality-minus-junk qmj_safety, qmj_prof
- other variables seas_1_1an, age, mispricing_perf.

Data

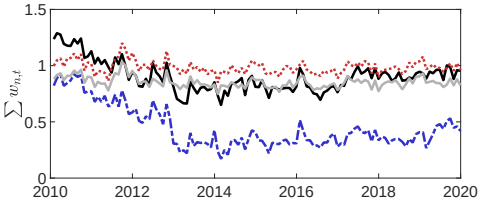
Available ESG observations over time



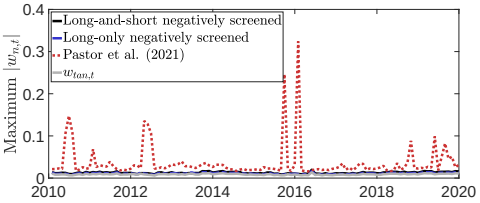
Data

Properties of overlaid portfolios

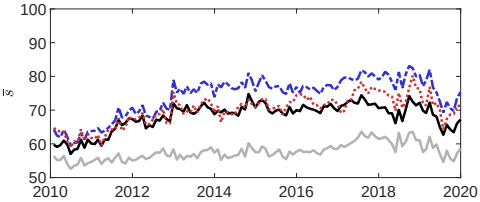
Panel A



Panel B



Panel C



◂ Robustness Overlays

Relation to theory

Pastor et al. [2021]: investor i forms the portfolio

$$w_{i,PST} = \Sigma^{-1}(\mu + d_i \tilde{g}_i)$$

ESG-taste $d_i \geq 0$, agent-specific ESG-measure vector $\tilde{g}_i$. Market clearing implies

$$\mu = \Sigma w_{mkt,PST} - \bar{d} g$$

- $\bar{d} = \int_i \omega_i d_i di$: wealth-weighted average of d_i, $\bar{d} > 0$ if any mass have ESG tastes
- $g = (1/\bar{d}) \int_i \omega_i d_i \tilde{g}_i di$: wealth- and ESG-taste-weighted average of $\tilde{g}_i$
- If $\mu = \Sigma w_{mkt,PST}$, then in the ordinary CAPM world

If $g = 0$, expected returns can be unaffected by ESG tastes, even if agents have them.

Relation to theory

Relation to theory

$$g = E_\omega(\tilde{g}_i) + Cov_\omega(d_i/\bar{d}, \tilde{g}_i)$$

- Pastor et al. [2021]: Plausible to assume the covariance is zeroPastor et al. [2021]: Plausible to assume the covariance is zero
- If $E_\omega(\tilde{g}_i) = 0$, we are saying that the wealth-weighted *average* ESG score does not distinguish between firms

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◂ Relation to theory

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