ESG's Evolving Performance:
First, Do No Harm

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1. INTRODUCTION

ESG Has — and Is — Changing

Acronyms

- ESG = Environmental, Social and Governance.
- SRI = Socially Responsible Investing.

More companies are reporting ESG data & metrics

- In 2011, only 20% of the companies in the S&P 500 Index reported ESG Metrics.
- The percentage now is well over 80%.

Mandated ESG regulation is replacing voluntary ESG regulation

- Coal divestment bill in California.
- The French energy transition law for green growth.
- Europe has a growing number of ESG regulations.
- There have been calls for the SEC to develop mandatory rules for disclosing ESG data*.

* "SEC must say no to ESG regulation," *Pensions & Investments*, Oct 15, 2018.

ESG Investment Growth

SRI Assets by Region

Region	2014	2016
Europe	$ 10,775	$ 12,040
United States	$ 6,572	$ 8,723
Canada	$ 729	$ 1,086
Australia/New Zealand	$ 148	$ 516
Asia ex Japan	$ 45	$ 52
Japan	$ 7	$ 474
Total	$ 18,276	$ 22,891

Asset values in billions USD.

Proportion of SRI Relative to Total Managed Assets

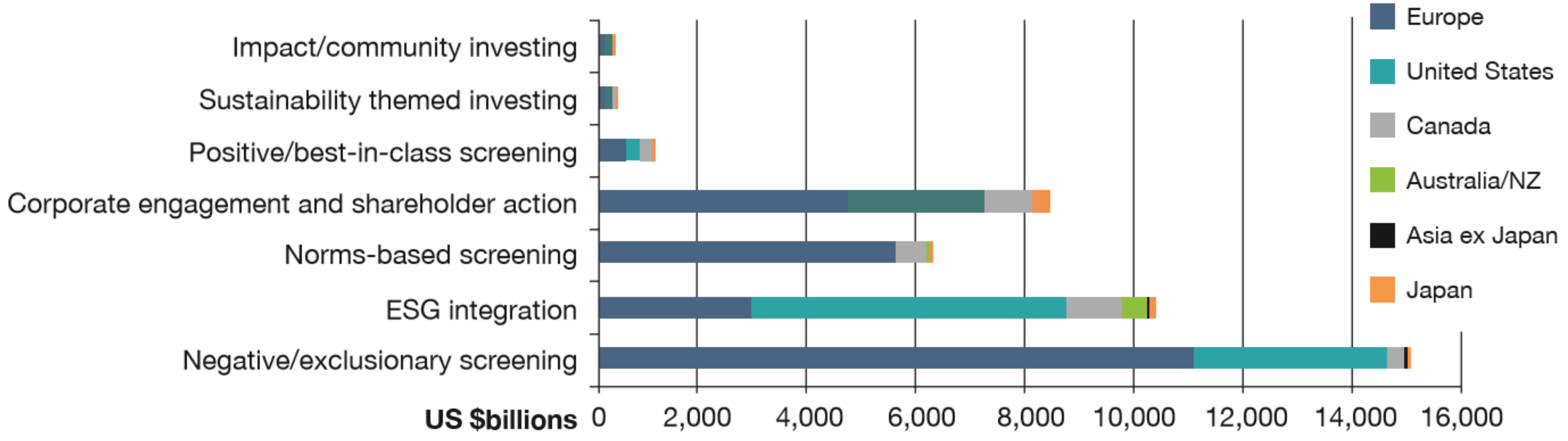
Region	2014	2016
Europe	58.8%	52.6%
United States	17.9%	21.6%
Canada	31.3%	37.8%
Australia/New Zealand	16.6%	50.6%
Asia ex Japan	0.8%	0.8%
Japan		3.4%
Global	30.2%	26.3%

- Europe has the largest ESG allocation, which continues to grow.
- The US and Canada are not far behind.
- While Japan has historically had the least investment, it is growing the fastest.

Source: Global Sustainable Investment Review 2016

ESG: Dominated by Negative Screening

SRI Assets by Strategy and Region



<u>Negative/Exclusionary Screening</u>

- Easy to understand: tobacco, firearms, etc.
- Any performance drag can be traced to excluded negative ESG companies with outperformance—an explicit, easy-to-understand trade off.

Key Questions for This Webinar

What has been ESG's performance as an "alpha" signal and how has it evolved?

- Our focus will be ESG Integration, not ESG Screening.
- Has recent performance been notably different from past performance?
- Most ESG data sets go back 10 to 15 years, so limited history.

How are ESG scores different from the factors found in traditional risk models?

Overlap is unavoidable:

- ESG scores tend to be correlated with **size** (large cap companies have better scores).
- Some **industries** have inherently poor social scores: tobacco, alcohol, weapons, gambling.
- Some **industries** have more impact than others:
  - E is usually more relevant for Utilities than Banking.

How will an ESG tilt affect an existing investment process?

2. The Data:

OWL Analytics ESG Data

OWL ANALYTICS

OWL Analytics offers global coverage of equities on a monthly basis beginning on March 31, 2009.

Score are published with a two-month lag (scores “as of” July 2018 are published in Sep 2018).

OWL uses a consensus approach for ESG scoring that aggregates data from hundreds of sources.

- This reduces the subjectivity of the scores.

A number of recent articles has highlighted ESG inconsistency & subjectivity:

“Is Tesla or Exxon More Sustainable? It Depends Who You Ask,” The Wall Street Journal, 9/17/2018.

“The Big Problem With 'Environmental, Social And Governance' Investment Ratings? They're Subjective,” Investor’s Business Daily, 8/9/2018

“Ratings That Don't Rate: The Subjective World of ESG Rating Agencies,” Real Clear Policy, 7/30/2018.

“The Shortcomings of Sustainability Rating Agencies,” Weekly Standard, 3/2/2018.

ESG Coverage

We evaluate the OWL Analytics ESG scores for five different equity universes described by ***Axioma's Market Portfolios***, choosing universes that span the globe with a relatively large number of names.

Universe Ticker	Universe Description	Ave Names Held
US-LMS	Axioma United States All Cap	2475
JP-LMS	Axioma Japan All Cap	1168
DMxUS-LM	Axioma Developed Markets ex USA Core	1198
EM-LMS	Axioma Emerging Markets All Cap	2333
EUDM-LMS	Axioma Developed Europe All Cap	1394

Axioma's Market Portfolios: tradeable, cap-weighted, equity universes.

Stocks are selected using screens and rules similar to major index providers.

Closely track other well-known indices (tracking errors of 10's of bps).

ESG Coverage

Axioma Emerging Markets All Cap (EM-LMS) 2009:

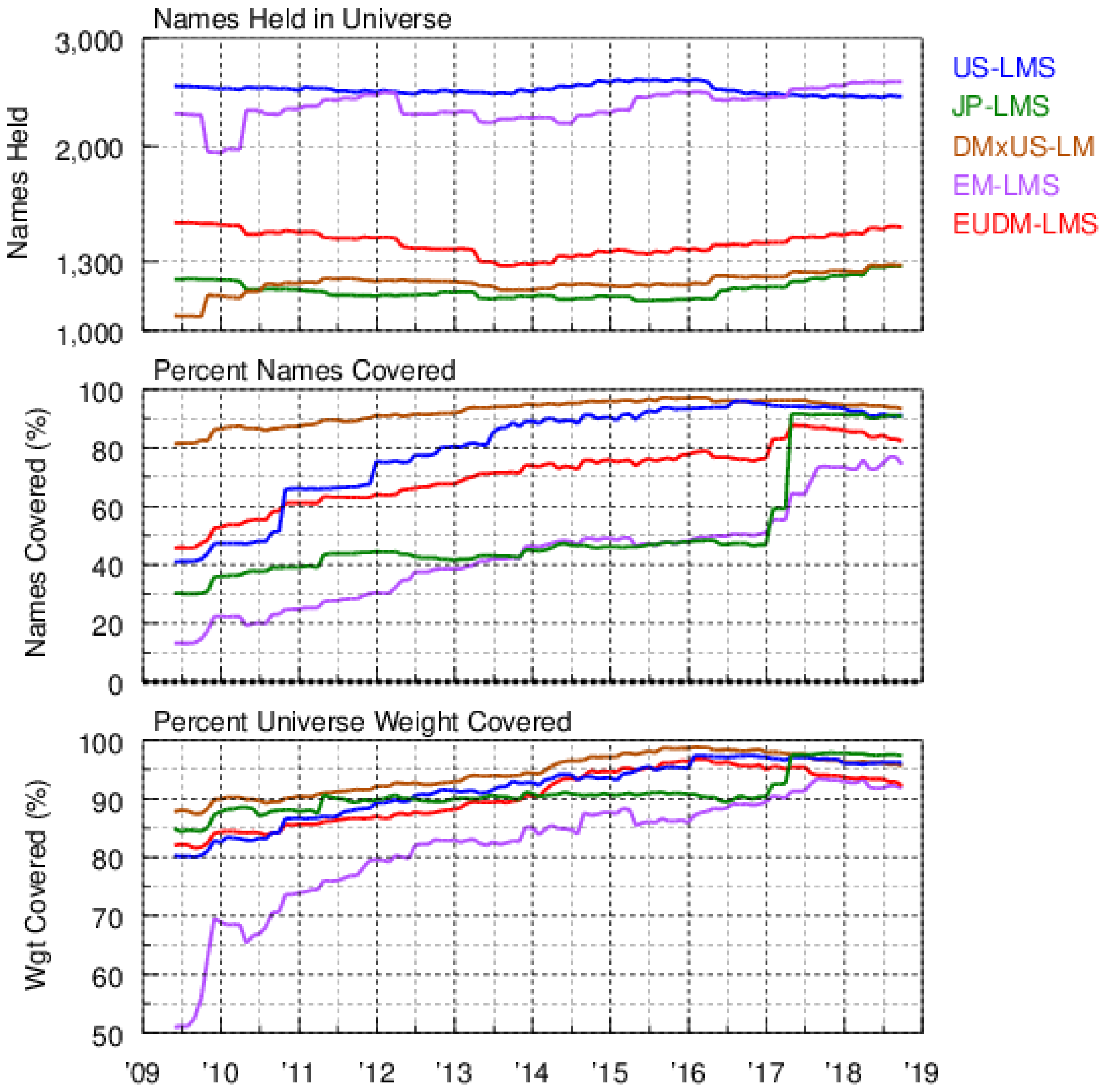
- Covered 13% of the names and 51% of the cap weight.

2018:

- Covered 74% of the names and 91% of the cap weight.

Changing coverage makes evaluating performance challenging:

- ***If performance changes, was it driven by the ESG signal or by the change in asset coverage?***



Source: Axioma, OWL Analytics

ESG Overlap with Traditional Risk Model Factors

We regress the ESG scores against the non-currency factors found in Axioma's Equity Fundamental Factor Risk Models.

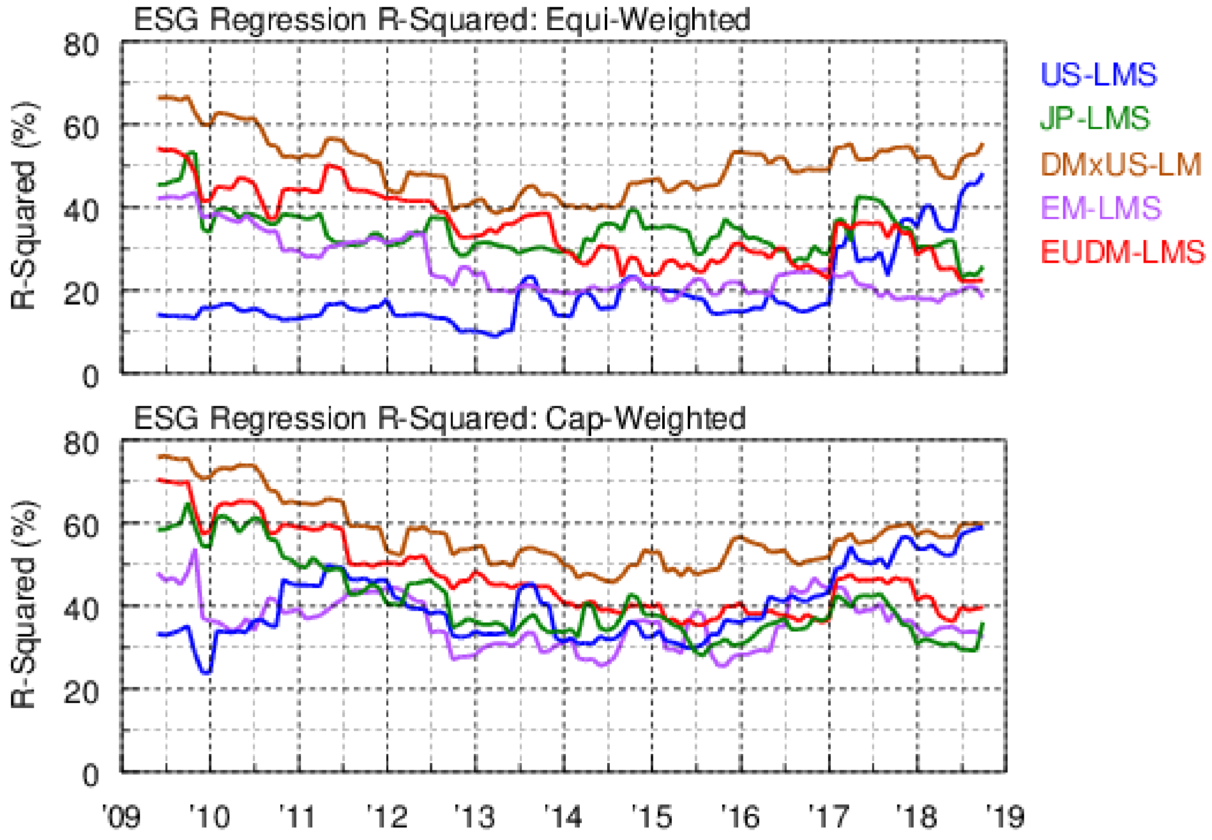
- Style, Industry, and Country Factors.

Two regressions: equal wgt and cap wgt.

Plot R-Squared (Percent Variance Explained) over time.

R-Squares range from:

- A low of 8% (US)
- A high of 76% (DMxUS).



The relatively high R-Squared values confirm that there is *substantial overlap* between ESG scores and traditional risk model factors (as expected).

Source: Axioma, OWL Analytics

3. Performance of ESG

Is ESG an Alpha Signal?

Measuring ESG Performance

Difficulty:

- What to do with the uncovered names (stocks without an ESG score)?
- GOAL: a performance metric that is nominally unaffected by uncovered names.

Solution:

- Focus on Active Return and hold uncovered names at the benchmark weight.

Initial Backtest Design:

- Maximize ESG exposure.
- Hold any uncovered names at the benchmark weight; otherwise, max active asset bet of 2.5%.
- Maximum 3% tracking error.

Backtest from 2009 to 2018 (the entire Owl Analytics ESG data set).

Use Axioma's Portfolio Construction tools and Equity Factor Risk Models.

ESG PERFORMANCE – ORIGINAL STRATEGY

Original Strategy

Three Out-Performers:

- DMxUS, EM, EUDM

One Small Out- Performer:

- US

One Small Under-Performer

- JP

Strong active ESG tilts…

Original Strategy from 2009 to 2018

Maximize ESG Full Time Period	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	37%	34%	32%	47%	30%
Ave Act Size Exposure	-22%	-18%	-12%	-34%	-32%
Real Act Ret (% Ann)	0.51%	-0.58%	2.17%	1.89%	2.71%
Real Act Risk (% Ann)	2.86%	3.33%	2.87%	3.48%	3.69%
Information Ratio	0.18	-0.17	0.76	0.54	0.73

BUT(!!!): Significant Size Under-Weights

Is the performance due to ESG or small Size?

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Source: Axioma, OWL Analytics

Modified Backtest Design:

- Maximize ESG exposure.
- Hold any uncovered names at the benchmark weight; otherwise, max active asset bet of 2.5%.
- Maximum 3% tracking error.
- **Active SIZE exposure > 0%** (e.g., greater than or equal to the benchmark universe cap exposure).

ESG PERFORMANCE: SIZE > 0% STRATEGY

With SIZE > 0:

3 Out-Performers:

- DMxUS, EM, EU.

2 Under Performers

- JP and US.

Strength of ESG Tilt not strongly affected,

but performance is weaker.

Original Strategy from 2009 to 2018

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Size > 0% Strategy from 2009 to 2018

Maximize ESG with Size > 0% Full Time Period	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	34%	31%	31%	38%	26%
Ave Act Size Exposure	0%	0%	0%	0%	0%
Real Act Ret (% Ann)	-0.41%	-0.62%	1.40%	1.83%	1.27%
Real Act Risk (% Ann)	3.03%	3.28%	2.75%	2.76%	3.03%
Information Ratio	-0.13	-0.19	0.51	0.66	0.42

Recent, Size > 0% Performance

For backtests since 2014, 4 out 5 out-perform, and the fifth is neutral.

"First, Do No Harm"

Original Strategy from 2009 to 2018

Maximize ESG Full Time Period	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
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Size > 0% Strategy from 2014 to 2018

Maximize ESG with Size > 0% Last Four Years	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	31%	32%	28%	36%	25%
Ave Act Size Exposure	0%	0%	0%	0%	0%
Real Act Ret (% Ann)	1.46%	-0.08%	1.20%	1.75%	1.45%
Real Act Risk (% Ann)	3.16%	3.52%	3.26%	2.70%	3.11%
Information Ratio	0.46	-0.02	0.37	0.65	0.47

Rolling Three-Year Active Returns

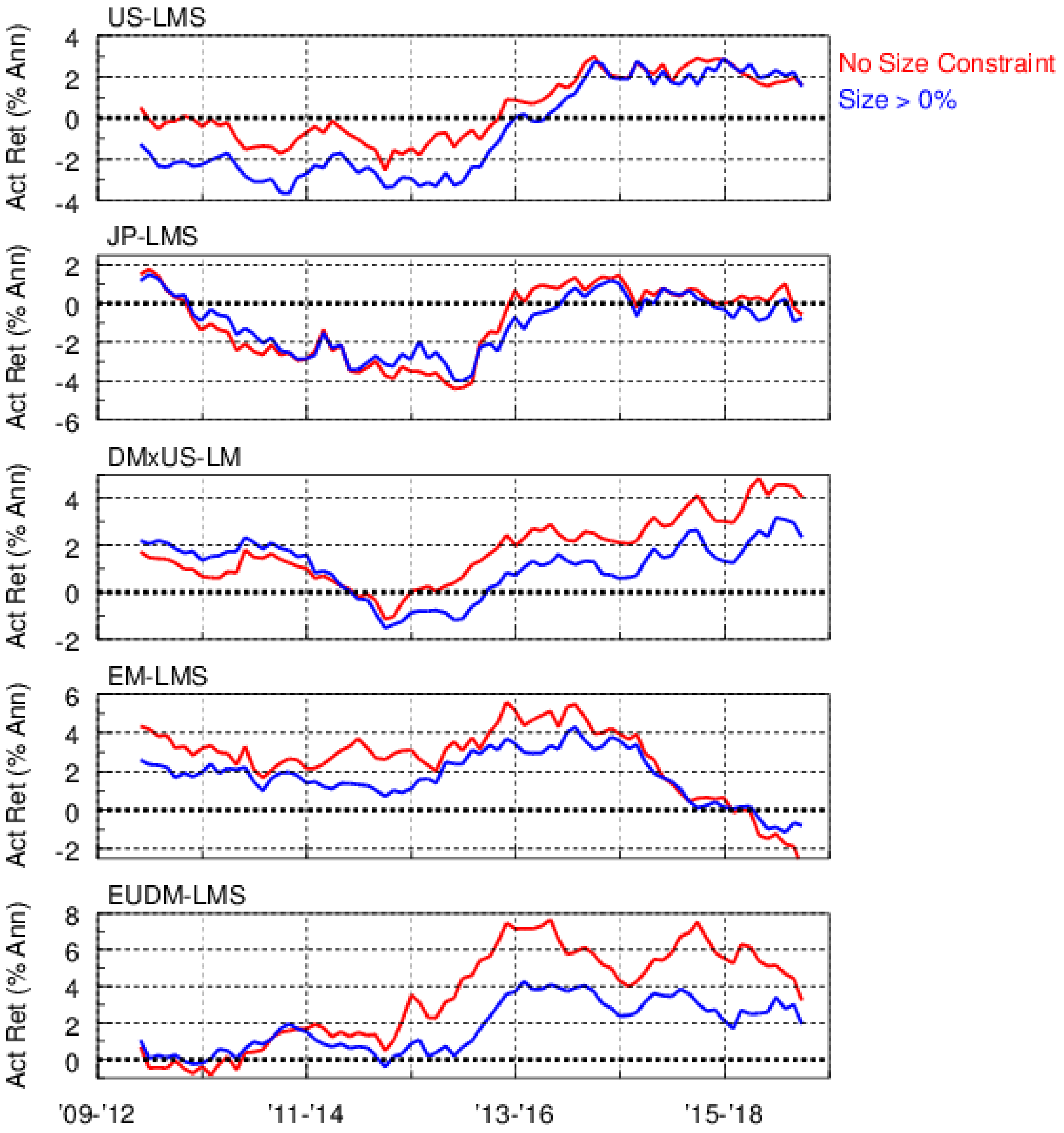
Performance

Looking at rolling three-year active returns:

- US, DMxUS, and EU have been strong since 2013/2016.
- EM was strong historically, but has been close to zero recently.
- JP has been zero since 2013/2016.

Effect of Size

- Size underweighting makes a notable difference only for DMxUS and EUDM.



Source: Axioma, OWL Analytics

4. ESG Overlap with Traditional Risk Model Factors

ESG Is Correlated with Several Risk Model Factors

We expect overlap with Size and Industries

Many, if not all, ESG scores contain normalizations to account for known factor biases:

- MSCI supplies industry-adjusted ESG scores.
- RobecoSAM's Smart ESG scores remove biases in Size, Quality, and Industries.
- OWL Analytics, like many providers, uses "Peer Comparisons" in its aggregation.

Decomposing ESG

(ESG) = (Factor ESG) + (Residual ESG)

ESG:

- The original or raw score.
- Used and reported in the previous slides.

Factor ESG:

- The part of the original ESG score that overlaps with a set of risk model factors*

Residual ESG:

- The part of the original ESG score that does not overlap with a set of risk model factors

*Mathematically, the original ESG score that spans the vector space defined by the risk model factors.

THERE IS EXTENSIVE RESEARCH ON ALPHA MISALIGNMENT

- ***Aligned/Factor:*** An alpha signal that spans the factors in a risk model (e.g., Factor ESG), produces both factor risk and specific risk (as measured by the risk model).

- ***Misaligned/Residual:*** An alpha signal that is orthogonal to the risk model factors (e.g., Residual ESG) produces only specific risk.

- Any optimized portfolio with a tight risk constraint (e.g., Tracking Error < 3%) tends to **hold too much of the unaligned/residual alpha and not enough of the aligned/factor alpha**.

Risk (Aligned Alphas) = Factor Risk & Specific Risk ➡ ***Less Attractive, Under-Weighted***

Risk (Misaligned Alphas) = Only Specific Risk ➡ ***More Attractive, Over-Weighted***

The "usual" approach is to require the portfolio to hold more of the aligned/factor alpha. For example:

- Constrain specific risk or specific tracking error.
- Axioma's Alpha Alignment Factor (adds a "missing" factor to the risk model on the fly).

Factor ESG is the aligned signal that must hold more.

We already saw that when the optimizer maximized ESG, it was mostly Residual ESG.

Exposures: Maximizing ESG, Factor ESG, and Residual ESG

Size > 0% Strategy from 2009 to 2018:

- Maximize ESG.
- Maximize Factor ESG.
- Maximize Residual ESG.

Maximize ESG	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	34%	31%	31%	38%	26%
Ave Act Factor ESG Exposure	14%	-36%	-5%	-5%	-7%
Ave Act Residual ESG Exposure	20%	67%	36%	43%	33%

Maximize Factor ESG	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	4%	5%	4%	0%	5%
Ave Act Factor ESG Exposure	108%	145%	97%	231%	156%
Ave Act Residual ESG Exposure	-103%	-140%	-93%	-231%	-151%

Maximize Residual ESG	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	5%	9%	8%	8%	0%
Ave Act Factor ESG Exposure	-138%	-183%	-116%	-136%	-178%
Ave Act Residual ESG Exposure	142%	192%	124%	144%	178%

Without explicit constraints, Factor ESG and Residual ESG are "antagonistic" (increasing one decreases the other).

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Source: Axioma, OWL Analytics

PERFORMANCE: MAXIMIZING ESG, FACTOR ESG, AND RESIDUAL ESG

Size > 0% Strategy from 2009 to 2018:

- Maximize ESG.
- Maximize Factor ESG.
- Maximize Residual ESG.

Maximize ESG	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Real Act Ret (% Ann)	-0.41%	-0.62%	1.40%	1.83%	1.27%
Real Act Risk (% Ann)	3.03%	3.28%	2.75%	2.76%	3.03%
Information Ratio	-0.13	-0.19	0.51	0.66	0.42

Maximize Factor ESG	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Real Act Ret (% Ann)	-1.29%	0.46%	0.79%	-0.32%	-0.36%
Real Act Risk (% Ann)	3.18%	2.62%	3.00%	3.22%	3.45%
Information Ratio	-0.40	0.18	0.27	-0.10	-0.11

Maximize Residual ESG	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Real Act Ret (% Ann)	-2.15%	-0.32%	0.45%	0.93%	-0.50%
Real Act Risk (% Ann)	3.28%	2.87%	2.72%	2.93%	3.14%
Information Ratio	-0.65	-0.11	0.17	0.32	-0.16

In general, ESG performs better as an alpha signal than either Factor ESG or Residual ESG.

ROLLING THREE-YEAR ACTIVE RETURNS

Considerable Performance Variation:

DMxUS:

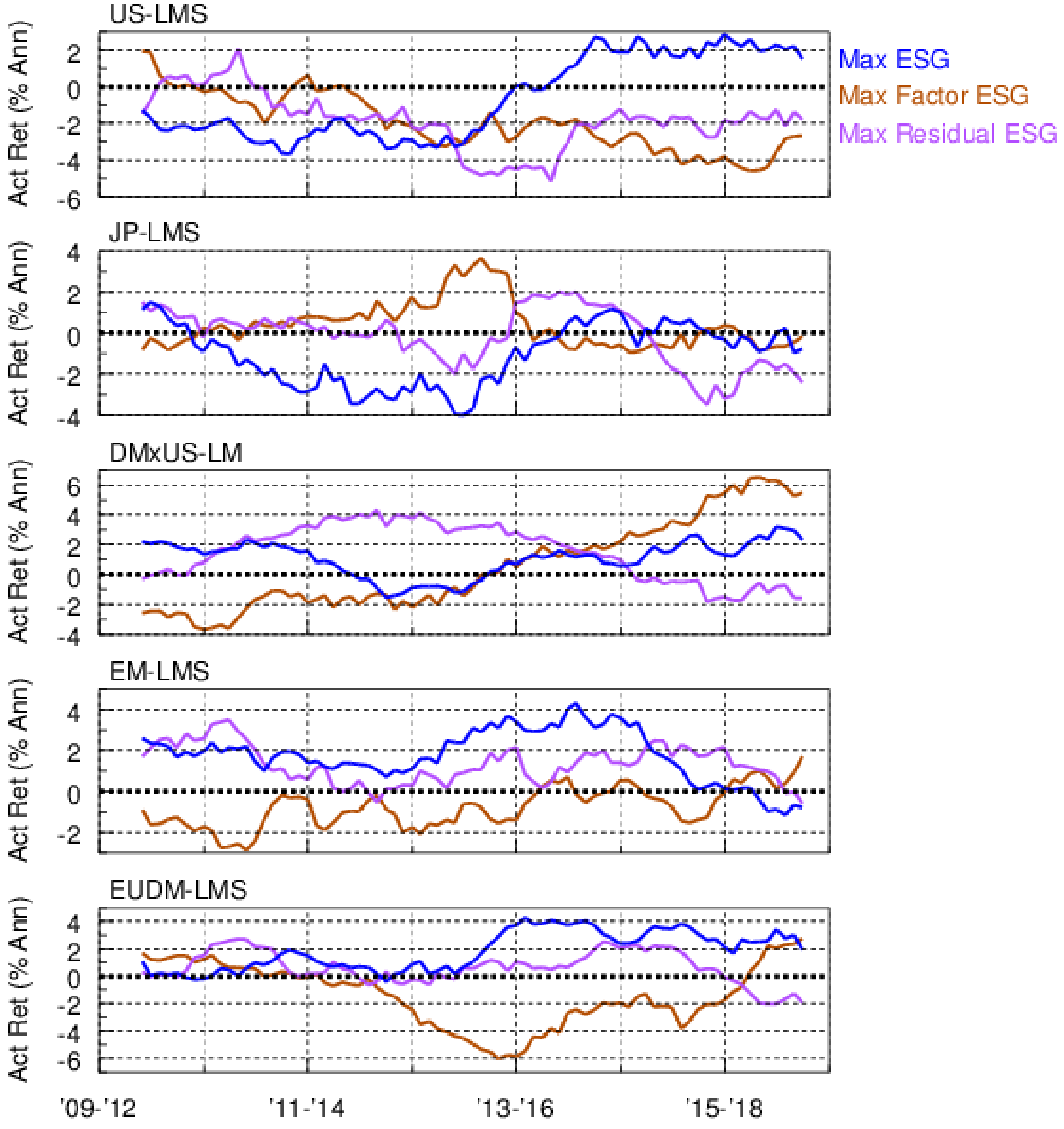
- There has been a strong transition from Factor ESG to Residual ESG out-performance, starting in 2013-16.

EUDM-LMS

- Factor has underperformed for quite a while until recently.

Two Thoughts:

- ESG score normalizations may have more impact than expected.
- Returns appear negatively correlated. Is that true?



FACTOR ESG AND RESIDUAL ESG RETURNS ARE NEGATIVELY CORRELATED

Correlations of Monthly Active Returns (2009 to 2018) of the two backtest portfolios:

Maximize Factor ESG Portfolios &
Maximize Residual ESG Portfolios

	Correl
US-LMS	-0.24
JP-LMS	-0.38
DMxUS-LM	-0.23
EM-LMS	-0.50
EUDM-LMS	-0.28

Does tilting on BOTH Factor and Residual ESG improve performance by diversifying the risk of the portfolio?

Source: Axioma, OWL Analytics

Third Backtest Design:

- Maximize ESG exposure.
- Hold any uncovered names at the benchmark weight; otherwise, max active asset bet of 2.5%.
- Maximum 3% tracking error.
- Active SIZE exposure > 0%.
- **Factor ESG Exposure = Residual ESG Exposure.**

EQUAL FACTOR/RESIDUAL TILT PERFORMANCE

Not a lot of difference from the Size > 0% results (not shown), BUT some modest improvements.

Diversification not obvious—realized risk isn't always less for the Equal Tilt strategy.

<u>A second case of "Do No Harm"?</u> Equal Tilt ESG not much different from tilting just on ESG.

Equal Tilt Strategy from 2009 to 2018

Maximize ESG Equal FactorResidual Tilts	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	33%	30%	30%	37%	25%
Ave Act Factor ESG Exposure	17%	15%	15%	18%	13%
Ave Act Residual ESG Exposure	17%	15%	15%	19%	13%
Real Act Ret (% Ann)	-0.58%	-0.76%	1.44%	1.60%	0.95%
Real Act Risk (% Ann)	2.92%	3.32%	2.83%	2.90%	3.29%
Information Ratio	-0.20	-0.23	0.51	0.55	0.29

Equal Tilt Strategy from 2014 to 2018

Maximize ESG Equal FactorResidual Tilts	US-LMS	JP-LMS	DMxUS-LM	EM-LMS	EUDM-LMS
Ave Act ESG Exposure	30%	30%	28%	36%	24%
Ave Act Factor ESG Exposure	15%	15%	14%	18%	12%
Ave Act Residual ESG Exposure	15%	15%	14%	18%	12%
Real Act Ret (% Ann)	0.73%	0.07%	2.02%	1.42%	1.18%
Real Act Risk (% Ann)	2.96%	3.26%	3.30%	2.95%	3.59%
Information Ratio	0.25	0.02	0.61	0.48	0.33

5. Summary

SUMMARY

Be wary of studies that treat historical data in a uniform manner.

- ESG performance has changed substantially over time.
- Currently, the US, Global (DMxUS), and Europe (EUDM) are performing well.
- EM was performing well, but that has tapered off.
- JP has not shown significant out-performance.

ESG has had very few periods of under-performance and none recently, so adding an ESG tilt to a portfolio construction process is "safe". In some regions, ESG performance has been strong, especially recently.

Factor ESG vs Residual ESG:

- Tilting on Factor ESG or Residual ESG is not the same as tilting on ESG.
- This result raise questions about the Industry and other bias adjustments often performed by ESG data providers.

"ESG's Evolving Performance: First, Do No Harm"

Axioma research paper No. 120, available at https://axioma.com/insights/research/

Differences from the paper:

- Added four more months of data (from 3/31/18 to 7/31/18).
- ESG scores are lagged two months (July 2018 ESG scores released in September 2018).

NOTE:

- ESG scores reported here and in the paper are inverse cumulative normal of OWL scores, which range from 0% to 100%.

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