Can machine learning shed light on ESG investing?

For Alpha

Our Technology

Ai 360 Allocations based on market regime

Market Signals (Equity, Multi - Assets)
Understand key market drivers at any time

BNP Paribas AIFA investable index
Invest in the signals with best in class execution

BNP PARIBAS
SOCIETE GENERALE

Tailor-made strategies
Equity, Bonds, Commodities, Cross assets

Ai 360 Strategy decoding

Risk Analysis & Portfolio Visualization
Heatmap by markets, factors and macro risks exposures

Smart Filter
Fund selection based on investment criteria

Replication of successful strategies
CTA, Global Macro Funds

BNP PARIBAS
SOCIETE GENERALE

Predict market regime and/or invest in the strategy

Decode major strategies and capture market trends

Awards and recognition

Peers recognition

SOCIETE GENERALE — GLOBAL MARKETS INCUBATOR

- **Selected** within the Global Markets Incubator in September 2021

BNP PARIBAS

- **Selected** for the quantitative index platform BRIO

J.P.Morgan

- **Selected** to present at ICAPS workshop 2020 and AAAI KDF workshop 2021 by JP Morgan AI data scientists

Awards

LOMBARD ODIER INVESTMENT MANAGERS — eit Digital

- Granted **Technology champion** 2020 in AI by EIT Digital, body of European Union
- Partnership with **Lombard Odier**

AM TECH AWARDS

- **Startup award** at the 2022 edition of the AM TECHDAY Awards

Best Paper Award SSRN Top 1%

- World wide open research gathering over 500 000 researchers
- **Best research** in finance, machine learning and economics

Decoding from the SRI point of view

For Alpha

Technology behind the scene: Graphical models

Old world
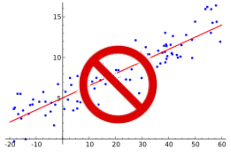
Regression or convex optimization **does not work**

X Very noisy

X Perform poorly due to non linearity of factors

Using Holding reports **does not work**

X Lagged

X Incomplete

X Inhomogeneous

New world
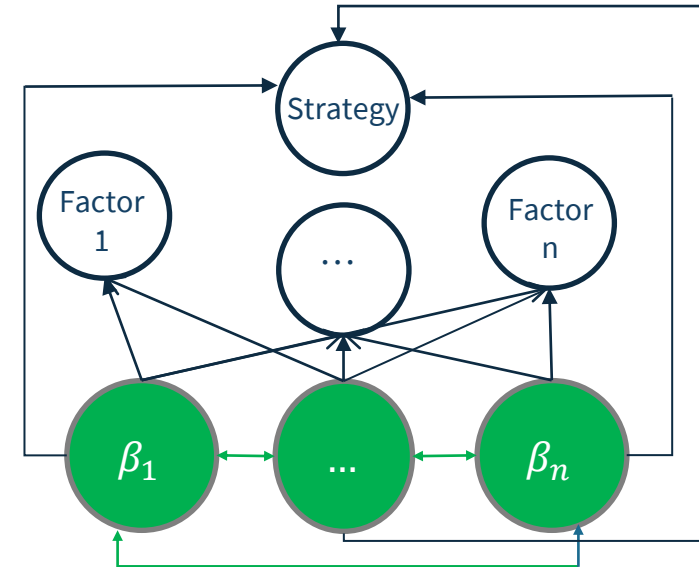
Strategy and Factors are observable variables

Betas are hidden variables to be estimated

Works

✓ Filtering of relevant factors

✓ Dynamic evolution of betas

✓ Noise reduction

Reinforcement learning using graphical models takes into account the dynamic evolution of betas to produce meaningful information on any strategy

Selection of Factors and Smart Filter

The investor has the ability to select the funds based on his criteria and risk profile

Performance	Asset Class	Sectors	Region	Global Macro	SRI
❏ Performance	❏ Equity	❏ Tech	❏ Europe	❏ US 10Y Rate	❏ Climate
❏ Sharpe	❏ Bond IG	❏ Biotech	❏ US	❏ EUR 10Y Rate	❏ Sustainable growth
❏ Drawdown	❏ Bond HY	❏ Luxury	❏ Emerging	❏ Dollar	❏ Social & Governance
❏ Volatility	❏ Commodity	❏ Oil & Gas	❏ China	❏ Inflation	❏ Biodiversity
		❏ Automotive			
		❏ Financials			

The list of criteria can be adapted to the investors profile and requirement

SRI Benchmarks mainly rely on MSCI ratings

	MSCI World Index	MSCI ESG Screened Index	MSCI ESG Enhanced Focus Index	MSCI ESG Universal Select Business Screens	MSCI ESG Leaders Index	MSCI SRI Index
ESG Controversy exclusions:		Companies that fail to comply with UN Global	Companies with a score of 0 (severe)	Companies with a score of 0 (severe)	Companies with a score below 3	Companies with a score below 4
Exclusions in addition to tobacco, controversial weapons, civilian firearms and nuclear weapons		Thermal coal, oil sands	Thermal coal, oil sands	Thermal coal, oil sands, conventional weapons, cannabis (recreational)		Conventional weapons, oil and gas sector, fossil fuel reserves, thermal coal, nuclear power, GMOs, alcohol, adult
ESG Trend (momentum)		No	No	Yes, use for weighting	No	No
Best-in-class selection		No	No	No	Yes, target sector coverage of 50%	Yes, target sector coverage of 25%
# constituents	1,561	1,472	1,469	1,407	725	380
Tracking error		0.52%	0.63%	1.16%	1.25%	2.21%
ESG Quality Score	6.2	6.2	7.5	7.7	8.0	9.7
Carbon Intensity	136	93	99	91	80	60

Sources: Invesco, Bloomberg and MSCI, as at 30 June 2021.

Nine Over the ten main ESG ETFs are based on MSCI indices

Alternative ESG indices have been developed

Stoxx Indices based on Sustainalytics ratings

	ESG X	ESG Soc	ESG Env	ESG Gov	ESG Ldr
ESG Controversy exclusion	No	Yes	Yes	Yes	Yes
Exclusions	UN Global Compact	UN Global Compact	UN Global Compact	UN Global Compact	UN Global Compact
Best in class selection	No	Yes	Yes	Yes	Yes
# constituents	586/600	298/600	282/600	280/600	425 / 600
Tracking Error	0.5%	2.5%	2.5%	2.5%	2.5%

European Commission – Climate Benchmarks

[EU Climate Benchmarks and ESG Disclosures](#)

ESG scores differ across rating agencies

Aggregate Confusion: The Divergence of ESG Ratings, Berg et al. (2022)

Correlations between ESG Ratings (2017)

Calculation procedure and data equivalent to Table 2, except that the underlying data is from 2017 instead from 2014. SA, SP, MO, RE, KL, and MS are short for Sustainalytics, S&P Global, Moody's ESG, Refinitiv, KLD, and MSCI, respectively.

	SA MO	SA SP	SA RE	SA MS	MO SP	MO RE	MO MS	SP RE	SP MS	RE MS	Average
ESG	0.77	0.65	0.53	0.53	0.62	0.6	0.49	0.42	0.4	0.37	0.54
E	0.7	0.66	0.59	0.33	0.69	0.59	0.35	0.61	0.26	0.19	0.5
S	0.67	0.57	0.52	0.29	0.62	0.58	0.27	0.55	0.27	0.28	0.46
G	0.55	0.48	0.36	0.34	0.7	0.7	0.43	0.68	0.38	0.34	0.5

Ambiguity around ESG ratings

- The research found the correlation among six prominent ratings agencies (KLD/MSCI Stats, Sustainalytics, Vigeo Eiris/Moody's, RobecoSAM/S&P Global, Asset4/Refinitiv, and MSCI) was on average 0.61.

- In comparison, mainstream credit ratings from Moody's and Standard & Poor's are correlated at 0.99.

- Measurement contributes 56% of the divergence, scope 38%, and weight 6%.

- Further analyzing the reasons for measurement divergence, we detect a rater effect where a rater's overall view of a firm influences the measurement of specific categories. The results call for greater attention to how the data underlying ESG ratings are generated.

SRI Benchmarks have clear factors biases

Beta to Factors - equity factors

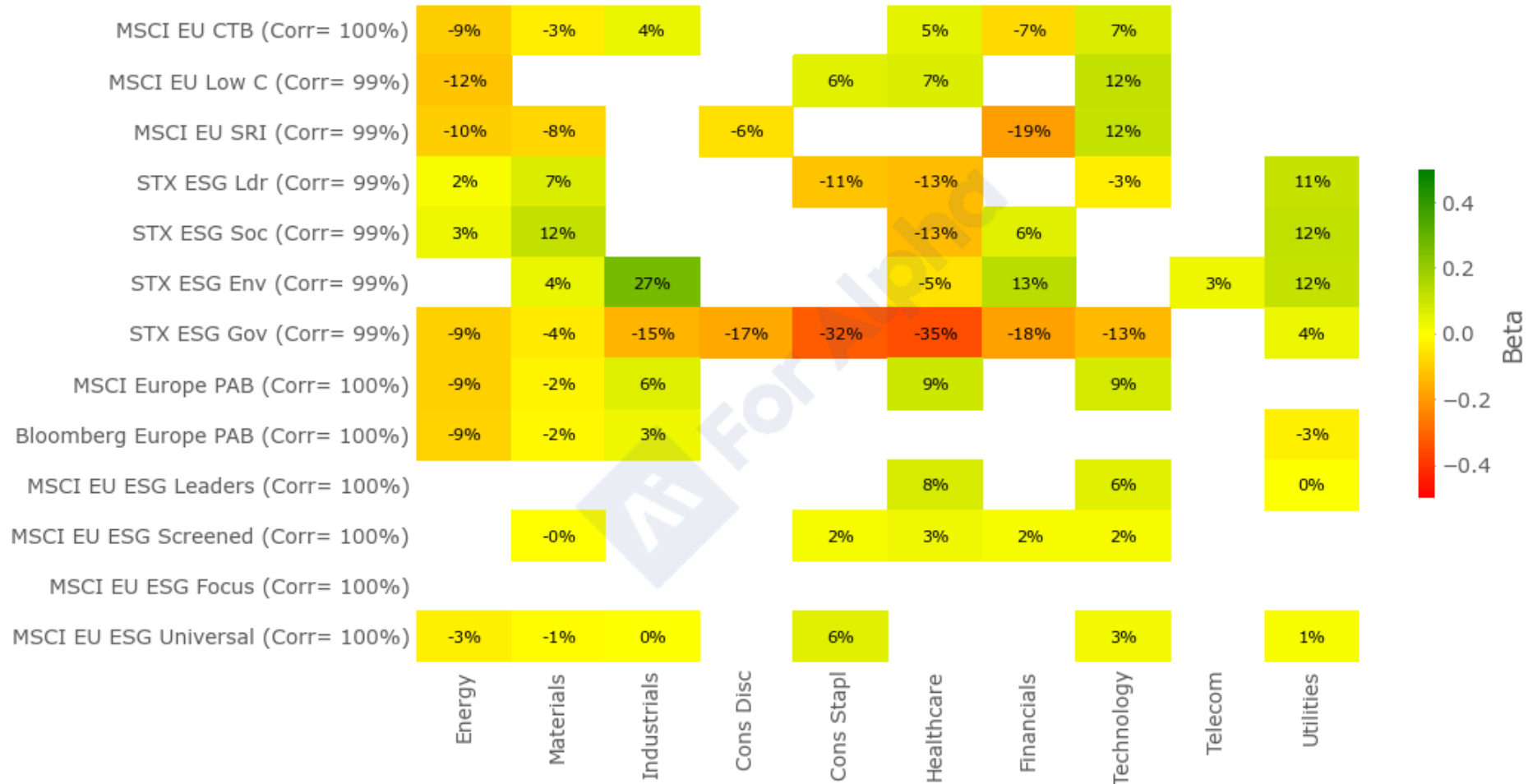|	US Quality	EU Quality	US Momentum	EU Momentum	US Value	EU Value	US Low Vol	EU Low Vol	US Small	EU Small
MSCI EU CTB (Corr= 100%)						-56%				
MSCI EU Low C (Corr= 99%)						-65%		19%		
MSCI EU SRI (Corr= 99%)						-71%		17%		-13%
STX ESG Ldr (Corr= 99%)					17%	31%		11%	8%	38%
STX ESG Soc (Corr= 99%)					16%	30%			11%	37%
STX ESG Env (Corr= 99%)					11%	12%				40%
STX ESG Gov (Corr= 99%)					26%	40%		13%		39%
MSCI Europe PAB (Corr= 100%)						-57%				
Bloomberg Europe PAB (Corr= 100%)						-34%				
MSCI EU ESG Leaders (Corr= 100%)						-19%		9%		-7%
MSCI EU ESG Screened (Corr= 100%)						-8%				-5%
MSCI EU ESG Focus (Corr= 100%)										3%
MSCI EU ESG Universal (Corr= 100%)						-11%		6%		-4%

With the notable exception of Stoxx indices, SRI Benchmarks are mostly Short Value or Long Growth

What about sectors biases?

## Beta to Factors - equity sectors

	Energy	Materials	Industrials	Cons Disc	Cons Stapl	Healthcare	Financials	Technology	Telecom	Utilities
MSCI EU CTB (Corr= 100%)	-9%	-3%	4%			5%	-7%	7%		
MSCI EU Low C (Corr= 99%)	-12%				6%	7%		12%		
MSCI EU SRI (Corr= 99%)	-10%	-8%		-6%			-19%	12%		
STX ESG Ldr (Corr= 99%)	2%	7%			-11%	-13%		-3%		11%
STX ESG Soc (Corr= 99%)	3%	12%				-13%	6%			12%
STX ESG Env (Corr= 99%)		4%	27%			-5%	13%		3%	12%
STX ESG Gov (Corr= 99%)	-9%	-4%	-15%	-17%	-32%	-35%	-18%	-13%		4%
MSCI Europe PAB (Corr= 100%)	-9%	-2%	6%			9%		9%		
Bloomberg Europe PAB (Corr= 100%)	-9%	-2%	3%							-3%
MSCI EU ESG Leaders (Corr= 100%)						8%		6%		0%
MSCI EU ESG Screened (Corr= 100%)		-0%			2%	3%	2%	2%		
MSCI EU ESG Focus (Corr= 100%)										
MSCI EU ESG Universal (Corr= 100%)	-3%	-1%	0%		6%			3%		1%

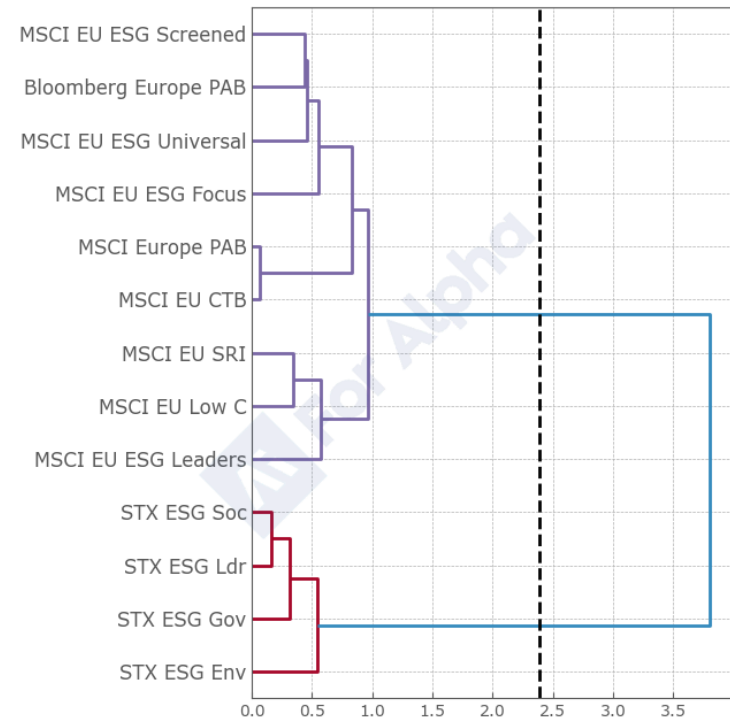*Beta scale: 0.4 / 0.2 / 0.0 / -0.2 / -0.4*

Most SRI Benchmarks are Short Energy, Long Technology & Long Healthcare, except STX indices

SRI Benchmarks are far from being homogeneous

Correlation of SRI Benchmarks Excess Returns
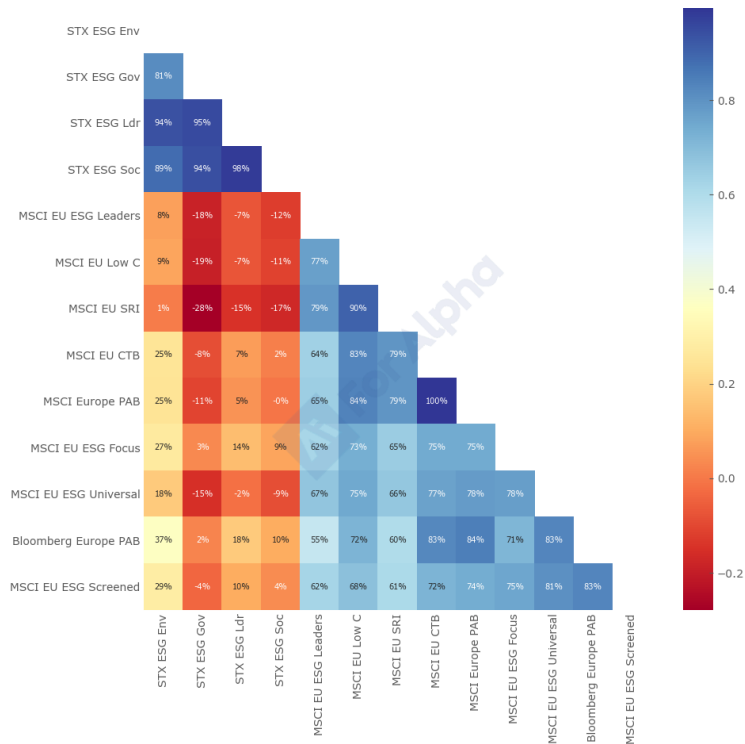
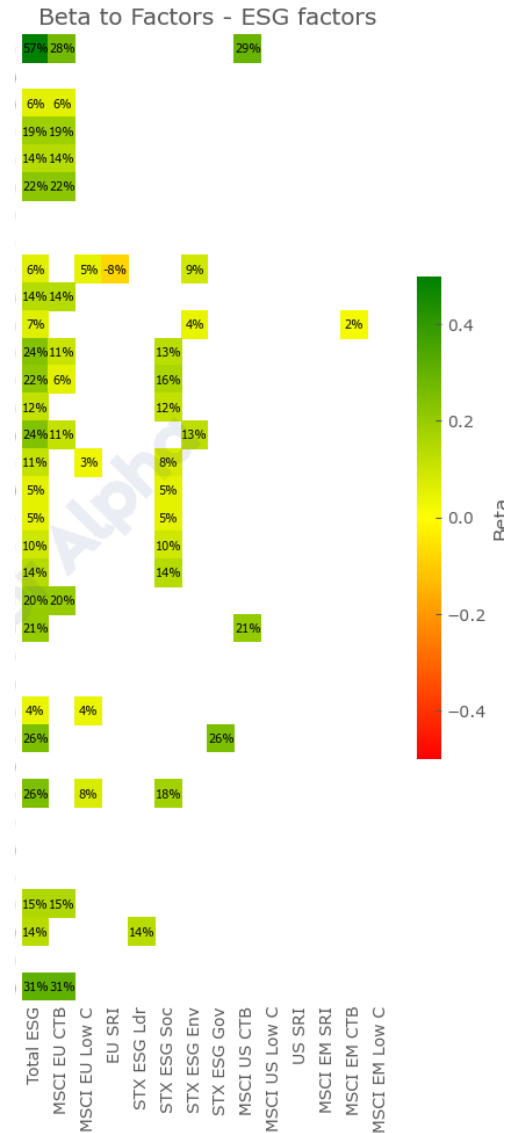

Classification of SRI Benchmarks (dendrogram)

Mapping of various French life insurance asset allocation strategies on SRI Factors

Beta to Factors - ESG factors

Various Insurance Life Asset Allocation Strategies

Names have been anonymized

Main findings on ESG exposure of life insurance allocations

- 71% of strategies have mapping on ESG Factors

- 37% among so-called "ESG" allocations have not been mapped on classical SRI factors

- The most represented SRI Benchmarks are:

  ✓ EU CTB (or PAB): 35%

  ✓ STX ESG Social Leaders: 26%

  ✓ MSCI EU Low Carbon: 11%

- Some of the strategies have significant ESG exposure and use it as a marketing asset

Conclusion

Ai For Alpha provides comprehensive decoding of Funds and Strategies on various macro and equity factors, and specifically on the ESG dimension.

As ESG asset management gets increasingly scrutinized, SRI Benchmarks are essential

There seems to be a controverse across the definition of what represents ESG within the criteria themselves

SRI benchmarks display significant style and sector biaises

Most Asset Allocation funds, even those sold to retail investors, have a mapping on SRI Benchmarks

The most used benchmarks are EU Climate Transition (or PAB), Low Carbon, and the social dimension of ESG

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