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Environmental Impact and Outperformance:

A data-driven approach to integrating Carbon Footprinting into the Investment Process

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Environmental, social and governance issues are at the forefront of many, if not all, corporations' minds as we enter the new decade. The rise of ESG awareness amongst corporate management, and the investors who finance them, has been undeniable, with some $137.3 billion allocated specifically to ESG-focused investments funds as of the start of 2020[1].

Whether due to an increasing frequency of climate-related events, focused international regulation and initiatives such as the Paris Agreement (2016) and TCFD Reporting, or the increasing availability of data detailing company climate impact, the 'E', or *environmental issues*, have come to the forefront of recent ESG discussions. Nowhere was this more concisely evidenced than by the January 2020 release of 'A Fundamental Reshaping of Finance'[2], Larry Fink's letter putting forth BlackRock's expectations for company environmental disclosures, advising effect from this year.

Still, even when dealing with a more focused set of environmental metrics, the jury is still out on the optimum method of integrating ESG into the investment process. Here, we outline an approach that expands a traditional method of portfolio construction with factors based on environmental data *directly linked* to companies' financial performance. We conclude that:

a) An integrated carbon-friendly approach to portfolio construction need not necessarily involve a trade-off between prioritizing risk-adjusted returns and environmental impact. *Environmental costs*, as an increasingly important factor of business performance valued by investors, can potentially enhance performance across a global investment strategy while significantly reducing portfolio carbon intensity.

b) Implementing an integrated carbon-friendly investment process by adding an environmental factor overlay to a simple 'growth at a reasonable price' strategy exhibits incremental historic outperformance, while also significantly reducing portfolio carbon intensity relative to the benchmark. We pose that many existing strategies can benefit from an environmental factor overlay.

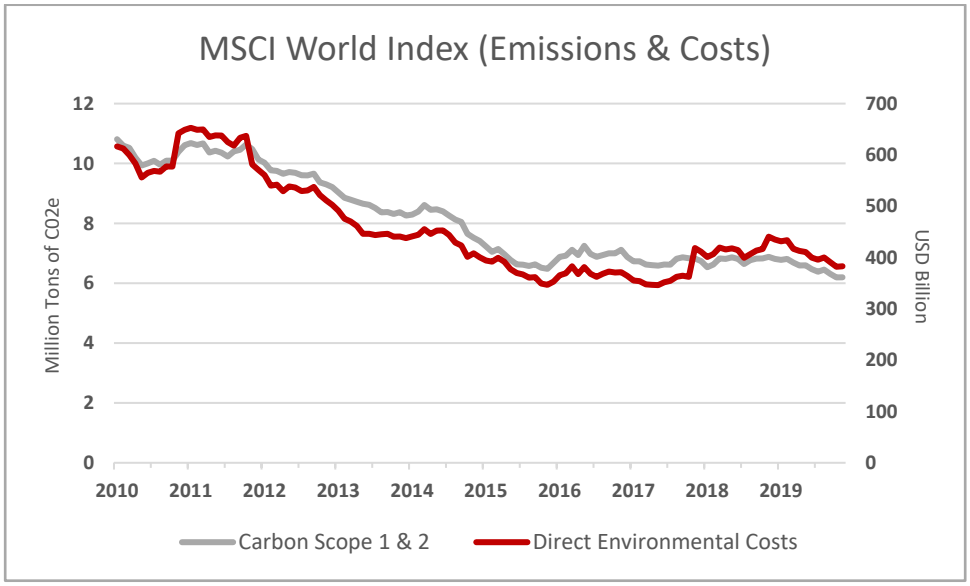
1. Economic Rationale and Environmental Damage Costs

To avoid the pitfalls associated with data mining – an area where ESG data analysis has historically fallen – it is always advisable to ground any factor selection on sound economic theory. Here, drawing parallels to the economic rationale underpinning well-documented traditional factors such as dividend yield, momentum and volatility, our hypothesis is that *environmental damage costs* act as an 'anchor' on company financial performance, either by requiring additional spend to offset and sustain or, more likely, being 'penalized' by investors for exposures to legal or environmental liabilities. The analysis is made possible by leveraging the expansive Trucost environmental dataset, which collates and calculates categorized environmental damage costs for over 15,000 global companies.

What are environmental damage costs and how should we interpret them? 'Damage costs' are estimates of the negative externality associated with the use of a resource or the emission of a pollutant. They reflect the environmental impact of nearly 500 business activities that the Trucost dataset tracks in monetary terms. Damage costs reflect that the cost of maintaining an environmental benefit is a reasonable estimate of its value. They are calculated by multiplying company data on the quantity of resources used or pollutants emitted (i.e., tCO2e, m^3 of water use, kg of waste generated etc.) by the Trucost *environmental valuation coefficients*.

An externality, or external cost, is a consequence of an industrial or commercial activity that affects other parties (such as society or the environment) but is not reflected in market prices. An 'environmental damage cost' is the quantification of the negative externalities caused by a company's use of a resource or emission of a pollutant across all 'impact categories', which cover the company's greenhouse gases, water use, waste generated, land, water and air pollutants generated, and natural resources used. Trucost data allows for the distinction that environmental damage costs can be either *direct* or *indirect*. Direct damage costs are those associated with a company's direct operations, while indirect damage costs are those that are borne in the company's supply chain. *Total damage costs* are the sum of both of these. Total damage costs are a useful measure of a company's overall environmental impact, since they are denominated in a common unit (US$ million) and bring together a range of environmental impacts with different units (for example, greenhouse gas emissions are measured in tCO2e, while water used is measured in cubic meters). Damage costs can also be used alongside other financial metrics, since they are based on a US$ unit.

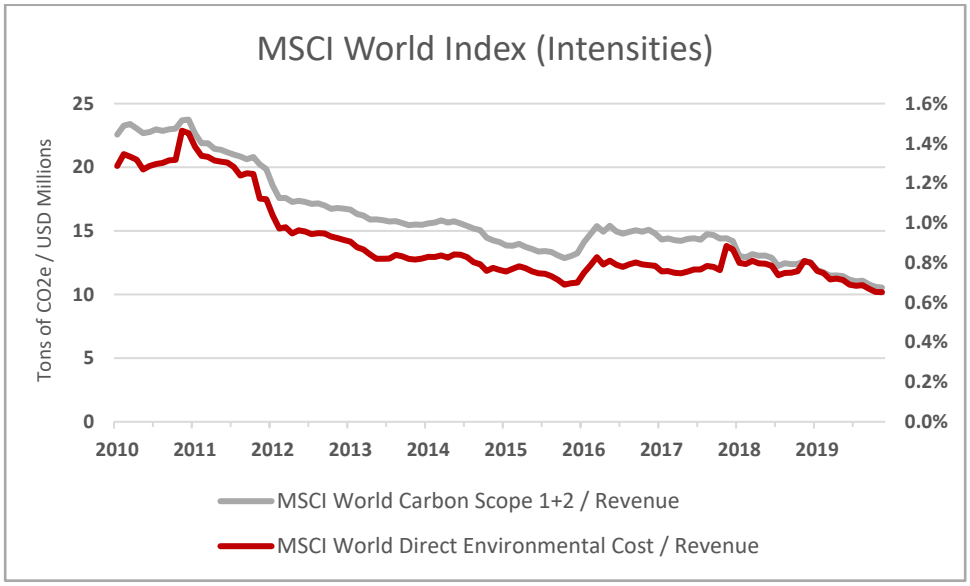
Given the Trucost environmental dataset's global coverage of 15,000+ corporations, representing 98% of global market capitalization, we can test the validity of our hypothesis with a global strategy, selecting the MSCI World as our universe and benchmark for testing. While different markets and geographies, subject to localized regulation, might increase or decrease the intensity of these environmental damage costs on company performance, it continues with a principle of underpinning our approach with sound economic theory to observe global results. To that end, we can set the scene by observing that the MSCI World universe exhibits downward trends in both *Direct Environmental Costs* and *Carbon Scope 1 & 2 – Direct & Indirect* (an important metric capturing carbon emissions and increasingly a focus of investors) over the past decade.



Source: S&P Market Intelligence, Trucost, ClariFI, MSCI, as of 12/31/2019

To reflect this data in another manner often material to portfolio managers, we can examine these Direct Environmental Costs and Carbon Emissions as *intensities*, i.e. denominating them by a normalizing factor. Trucost's standard intensity metrics, and those most widely used across the industry, are to denominate environmental metrics by a company's annual consolidated revenues in millions of US dollars (e.g. for Carbon Emissions, tCO2e/US$ million revenues).

Intensities are useful in comparing companies both within and across different sectors and can control for different company characteristics (i.e. size). This makes it possible to assess the environmental efficiency of a company. Company revenues and market capitalization are widely used as a normalizing factor, as it is generally deemed desirable for the intensity metric to be in some way linked to a company's financial performance, underlining the relationship between environmental impact and financial risk. Hence, for example, the tCO2e/revenue metric indicates the dependency on the generation of greenhouse gas emissions a company has in generating revenues. Again, by this measure, we can see that global companies have been making efforts to reduce the environmental impact relative to revenues over the last decade.



Source: S&P Market Intelligence, Trucost, ClariFI, MSCI, as of 12/31/2019

2. The Evolution of ESG Portfolio Construction

ESG portfolio construction remains a developing field for investors. Typically, ESG considerations have been input into an investment process in two forms – *exclusionary* (stemming from historical trends such as *socially responsible investment*), or on a *portfolio construction basis* to optimize (or minimize) certain environmental exposures. The S&P 500 ESG Index is a positive example of how exclusionary metrics can be valued by investors, with one-year annualized returns in its first year of 28.7%, outstripping its S&P 500 counterpart's performance by 226 bps *(year to 1/28/2020)*, and complimented by $8.6 billion of inflows into ETFs tracking this and other ESG indices in 2019[3]. Key works from Serafeim et al[4] have taken an approach to analyze the 'alpha' aligned with environmental outputs via a framework of 'materiality' (to business performance, but also, critically, to investors) stemming from SASB frameworks. Additionally, recent output from AQR entitled The ESG Efficient-Frontier[5], describes the balance a portfolio manager faces between optimizing risk-adjusted return profiles with environmental impact.

Here we describe an approach that leverages factor-based stock selection signals using Trucost data to demonstrate that including this Trucost factor into an existing multi-factor model can further enhance returns alongside an overall improved environmental impact profile.

3. Introducing Trucost Factors

Economic rationale suggests that companies sustaining high environmental costs per dollar of revenue may see these costs act as a 'drag' on equity performance. While this paper stops short of modelling the specific form of this impact, reasons may include (1) heightened tangible financial spend required to offset environmental impact (which might include 'clean' initiatives, increased investment in operations to reduce externalities, marketing programs to counter higher environmental impact, or similar), or (2) an increasing trend for investor preference in lower environmental impact companies (meaning higher environmental cost companies remain 'unloved' and 'unbought' by investors in comparison).

We create the 'Trucost Factor' by considering two simple environmental cost factors:

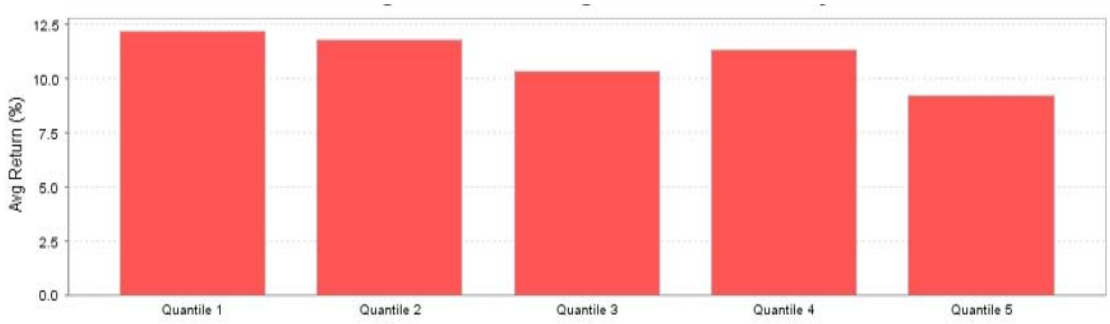
1. Direct Environmental Costs as a percentage of revenues, and
2. Direct Environmental Costs as a percentage of market capitalization.

The resultant factor is a ranking that reflects the *worst case* of the two component factors' country and sector neutral ranking, i.e. a company's final score is the worst of the two component factor scores.

The Trucost Factor as defined does not explicitly measure carbon emissions, but the vast majority of the environmental costs that the factor does measure is in fact related to the externalities of carbon emissions and the rank correlation between Direct Environmental Cost and Carbon Scope 1 & 2 emissions is 91% (cross-sectionally throughout the analysis period on average). For the Trucost Factor, we choose to focus on the greater scope of externalities captured by the Direct Environmental Cost, but we can still demonstrate the effect of the factor by studying the Carbon Scope 1 & 2 intensity of the portfolios generated using the Trucost Factor.

For the historical back-testing and simulations, we use the MSCI World Index (developed markets). When sorting the MSCI World universe and historical constituents into five *quintiles* by way of ranking by the Trucost Factor every month, we can observe an initial indication of the efficacy of this factor by looking at the quintile return difference between the top-ranked (i.e. lowest environmental cost intensity) 20% of companies and the bottom-ranked (highest environmental cost intensity) 20% of companies. The Trucost Factor achieved a 25 bps monthly spread between the top and bottom quintile on average over the 10-year period, on a country and sector neutral basis.

Annualized Average Monthly Return by Quintile, MSCI World, Jan. 2010 – Dec. 2019



Avg. IC: 0.013*; T-Stat: 2.8; Monthly Top-Bottom Spread: 0.25%

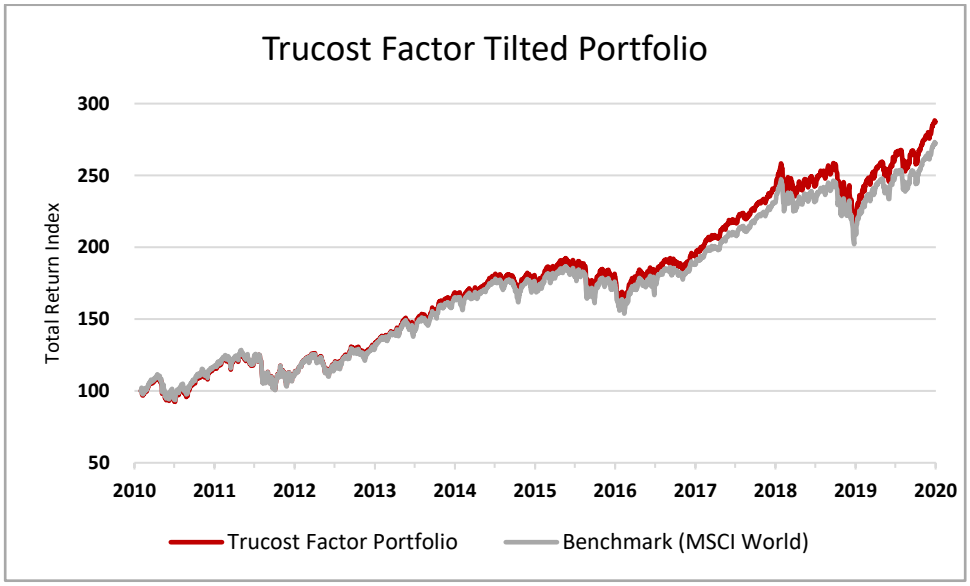
Source: S&P Market Intelligence, Trucost, ClariFI, MSCI, as of 12/31/2019

Please note that all historical back-test performance figures in this brief exclude fees and transaction costs.

4. Portfolio Implementation

4.1 Trucost Factor Tilted Portfolio

In order to appraise the stand-alone performance of the Trucost Factor in a long-only portfolio construction context, we simulate the performance of a series of portfolios optimized monthly for the Trucost Factor score, subject to the customary constraints of benchmark (MSCI World) neutrality with respect to beta and country and sector weights. We apply looser constraints to holding weights of 50% (*min*) to 200% (*max*) of benchmark weights to provide room to maximize the Trucost Factor score at the portfolio level.

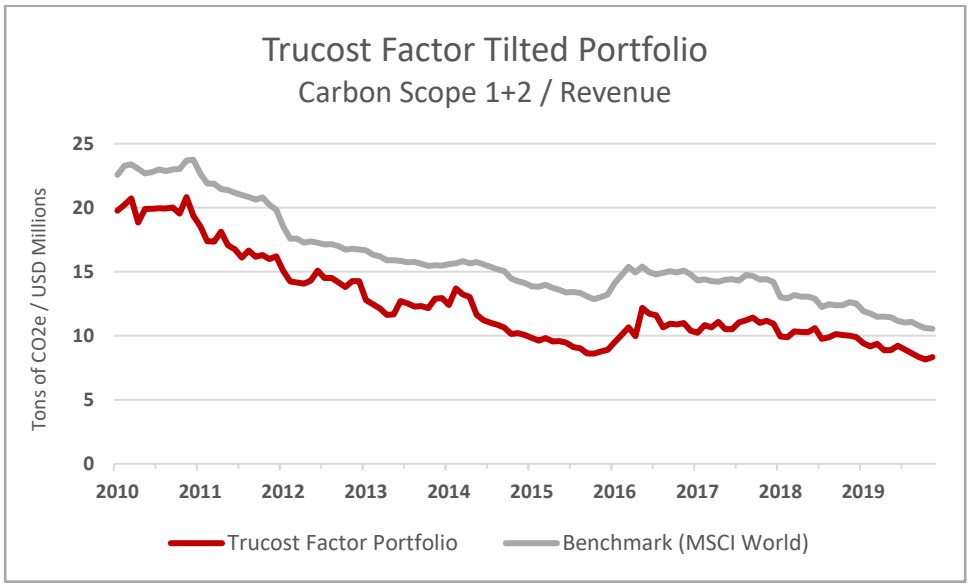


Annualized Spread to Benchmark: +0.6%; One-way annual T/O: 28%; Tracking Error: 0.9%

Source: S&P Market Intelligence, Trucost, ClariFI, MSCI, as of 12/31/2019

The simulated portfolio construction strategy yields returns in excess of the benchmark over the 10-year period analyzed. The equity curve above indicates an acceleration of excess performance from 2016 onwards – results that might be linked to initiatives such as the Paris Agreement (November 4th, 2016) increasing investor focus on climate-related impact.

Notwithstanding sector and country neutrality, this strategy still exhibits significantly and consistently lower carbon intensity profile for the portfolio versus its benchmark.



Source: S&P Market Intelligence, Trucost, ClariFI, MSCI, as of 12/31/2019

4.2 Environmental Factors as an Overlay to Existing Strategies

To illustrate an alternative approach to incorporating the Trucost environmental data, we start with an existing strategy and then use the Trucost Factor as an overlay. We pose that the existing strategy is based on a simple two-factor model of Book-to-Price and 6-Month Historical Revenue Growth. We call this 'existing' strategy the 'GARP Strategy', based on the idea of capturing 'growth at a reasonable price'. We simulate the performance of the GARP Strategy using the same setup as for the Trucost Factor Tilted Portfolio (i.e. monthly rebalancing, same period, universe and constraints) and calculate a historical performance of +0.4% annualized relative to the MSCI World benchmark with average Carbon Intensity broadly in line with the benchmark.

We then construct an augmented universe (the 'Trucost Universe') where we exclude the bottom 20% of stocks from the MSCI World with reference to the lowest scoring companies using the Trucost Factor every month. The GARP Strategy is then run on the Trucost Universe using the same constraints as previously but with a couple of important changes: (1) Direct Environmental Costs / Revenue is explicitly constrained at the portfolio to ensure that the GARP strategy doesn't make adverse carbon intensity selections within the Trucost Universe, and (2) the holdings constraint is now between 50% and 200% of the Trucost Universe weight as opposed to the benchmark weight (the Trucost Universe weight is simply the MSCI World weight reweighted to account for the excluded stocks). We refer to this strategy as the 'Trucost Enhanced GARP Strategy'.

In addition, we run a version of the Trucost Enhanced Strategy (as well as for the Trucost Factor Strategy) where country and sector constraints are relaxed from being strictly benchmark neutral, to allow a departure from the benchmark allocation to country and sector of +/-20% of the original benchmark weight, referred to as 'Wide' constraint strategies.

While representing just one example of an overlay approach, this example provides a framework for portfolio managers to either dial up or dial down the preference of weighting to our 'Trucost Factor' in relation to traditional inputs, and/or control the degree of adherence by way of stricter portfolio construction constraints.

The performance and carbon intensities of these strategies are summarized below along with additional simulation results using the S&P 500 and MSCI EAFE universes. In general, it appears that the Trucost Enhanced GARP Strategy improves on the performance of the standalone GARP Strategy while significantly lowering the carbon intensity, similar to how the Trucost Factor Strategy compares to the benchmark. The Wide version of the strategies generally provide even deeper reduction in carbon intensity without trading off performance.

4.3 Summary of Performance & Characteristics

Portfolio Construction Examples Beta, Country*, and Sector* Neutral Jan. 2010 – Jan. 2020	Benchmark	Annual Spread to Benchmark	Tracking Error	Annual Turnover (1-way)	Avg. Benchmark Relative Carbon / Revenue
Trucost Factor Portfolio	MSCI World	+0.6%	0.9%	28%	-22%
Trucost Factor Portfolio, *Allow Max 20% Sector & Country tilts	MSCI World	+1.0%	1.2%	25%	-37%
Trucost Factor Portfolio	S&P 500	+0.6%	1.2%	29%	-25%
Trucost Factor Portfolio, *Allow Max 20% Sector & Country tilts	S&P 500	+1.0%	1.4%	29%	-38%
Trucost Factor Portfolio	MSCI EAFE	+0.3%	1.2%	26%	-15%
Trucost Factor Portfolio, *Allow Max 20% Sector & Country tilts	MSCI EAFE	+0.2%	1.4%	26%	-25%
GARP Portfolio	MSCI World	+0.4%	1.1%	79%	-2%
Trucost Enhanced GARP Portfolio, Turnover & Tracking Error Constrained	MSCI World	+0.6%	1.2%	51%	-19%
Trucost Enhanced GARP Portfolio, Turnover & Tracking Error Constrained, *Allow Max 20% Sector & Country tilts	MSCI World	+1.3%	1.9%	57%	-36%

Source: S&P Market Intelligence, Trucost, ClariFI, MSCI, as of 12/31/2019

5. Conclusion

We aim to have demonstrated here a sample framework for integrating environmental factors into the portfolio construction process, highlighting that these environmental considerations need not necessarily be distinct from thinking about financial performance.

Attempting to underpin the approach with an economic rationale, we observe some evidence that optimizing portfolio construction around the idea of 'environmental cost headwinds' may in fact enhance performance. Furthermore, we highlight evidence that combining this Trucost (Environmental) Factor with traditional factor strategies may add incremental performance in excess of these strategies in isolation.

Irrespective of performance, the carbon intensity of an investment strategy can likely be meaningfully reduced without significant tracking error or turnover.

Data Used

Trucost Environmental Data

Trucost, part of S&P Global, provides robust and standardized environmental data on more than 15,000 listed companies. Trucost's data and analysis provides insights relating to climate change, water use, waste disposal, fossil fuel exposure, land, water & air pollution, and the over-exploitation of natural resources. Trucost also specializes in forward-looking datasets on transition risk such as future carbon pricing scenarios and physical risk.

Fundamental Data

All research presented in this paper was performed with S&P Global data via Xpressfeed™. In addition to the Trucost Environmental Data, US data was obtained from the Compustat® point-in-time database and international data was obtained from the S&P Capital IQ Premium Financials point-in-time database.

Solutions Used

ClariFI®

ClariFI® represents S&P Global Market Intelligence's advanced solution for a quantitative investment management workflow. Accessible as both a locally-installed or hosted solution, ClariFI offers a full integration of S&P Global's Xpressfeed data, unlimited computational scalability and a rich library of computational algorithms, allowing clients to;

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- Run quantile analysis on multiple factors using the Factor Backtest module
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Quantamental Research: The 'Trucost' of Climate Investing : Managing Climate Risk in Equity Portfolios

References

[1] Morningstar, source, CNBC https://www.cnbc.com/2020/01/14/esg-funds-see-record-inflows-in-2019.html

[2] 'A Fundamental Reshaping of Finance', Larry Fink, https://www.blackrock.com/us/individual/larry-fink-ceo-letter

[3] Source ETF.com https://www.etf.com/sections/features-and-news/esg-etfs-2019-institutions-buy?nopaging=1

[4] Corporate Sustainability: First Evidence on Materiality
https://www.sustainablefinance.ch/upload/cms/user/CorporateSustainability_Firstevidenceonmateriality_Khan_Serafeim_Yoon_February2015.pdf

[5] AQR ESG Efficient Frontier https://www.aqr.com/Insights/Research/Working-Paper/Responsible-Investing-The-ESG-Efficient-Frontier

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