PROBABILITY & PARTNERS

How to measure and improve a portfolio's contribution to your own sustainability goals?

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White paper
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Summary

Sustainable investing is currently the main theme in the investment industry. Sustainability of a company or a stock portfolio is often measured in relation to the well-known ESG criteria (Environmental, Social and Governance). Several data providers (such as Refinitiv, Sustainalytics and Moody's) publish E, S and G scores for thousands of firms.

But what if your sustainability goals differ from those three broad definitions of E, S and G? Many asset managers and pension funds formulate their own sustainability goals and criteria, which are often more narrow and specific than E, S and G. For example, some Dutch asset managers would like their investments to contribute to clean oceans and clean water, given long relationship of The Netherlands with water. Others would like to pay attention to gender equality or education.

With existing sustainability scoring data, is it possible to measure a company's or a portfolio's contribution to such specific goals, and if yes, then how? This is the question we answer in this paper. For that, we use the example of UN Sustainable Development Goals. We describe how to choose sustainable portfolios in a diversified way and examine whether choosing stock portfolios according to specific sustainability goals significantly compromises their financial performance. Finally, we draw parallels between US and European firms and look at the similarities and differences in these two regions.

In broad lines, we show that

- Many specific sustainability goals can be measured using granular ESG variables, such as those used in Refinitiv ESG scores. But not all such goals can be measured equally well, due to lack of suitable variables. Also, not all providers of ESG data deliver variables that are granular enough to measure specific sustainability goals.

- There are several ways, ranging from excluding badly performing companies to including only well-scoring ones, to select stock portfolios that perform well (and better than benchmark) in terms of tailor-made sustainability goals. In all such suggested portfolio construction methods, we pay specific attention to sector diversification, so that we obtain well-diversified portfolios that are also superior in terms of your sustainability goals.

- Such portfolios do not compromise on financial performance, and in many cases outperform the benchmark, in terms of either return or volatility (or Sharpe ratio).

- EU investors can pursue a more aggressive sustainability strategy without sacrificing their returns, compared to investors in US firms. This is possibly the result of the fact that sustainability issues are higher on the agenda of both investors and regulators in EU than in US.

To find out more about our data, methodology and the details of the above findings, please read the full paper here: <link to the full paper on the website>

White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

1 How E, S and G are measured?

ESG data providers such as Sustainalytics, Refinitiv or Moody's continuously monitor publicly available sources to infer a company's performance on various sustainability issues. They gather such data for thousands of publicly traded firms, across many sustainability-related measures. Quantitative ESG measures are obtained also from unstructured data such as text, by means of Natural Language Processing, expert judgement and a multitude of other resources. These quantitative measures are then combined across E, S and G categories and the companies are ranked with respect to their peers. It is this ranking that determines their E, S and G scores. Often, sustainability-related controversial events or announcements are also incorporated into these scores.

In this paper, we will use Refinitiv ESG scores, as Refinitiv works with over 400 ESG-related measures from which the end scores are composed (in comparison: Moody's uses only 45 such measures). This high granularity of sustainability-related measures will be the key element in measuring a company's score for nonstandard, tailor-made sustainability goals.

Figure 1 presents the sub-categories of E, S and G scores. For instance, Environmental category consists of Resource use, Emissions and Innovation sub-categories. These sub-categories in turn consist of a high number of relevant variables: 19 for Resource use, 22 for Emissions and 20 for Innovation. Overall, there are over 400 individual ESG variables available and 178 of them are currently used to calculate the overall ESG score.

Figure 1: ESG categories and measures

2 Measuring specific sustainability goals: SDG example

In our conversations with asset managers and pension funds, we often come across specific sustainability goals: those that are "close to the heart" of a particular group of investors. For example, Clean Water is often a theme for Dutch asset managers, due to special relationship The Netherlands has with water. Other themes often mentioned are Gender Equality or Education. These sustainability goals are clearly much more specific than the E, S and G discussed above. With over 400 Refinitiv ESG variables at hand, can we also measure a company's or portfolio's score for such a specific sustainability goal? The answer is not straightforward, and it depends very much on a specific goal.

We will illustrate this on the example of the so-called Sustainable Development Goals of UN. Thesse seventeen goals are listed in Table 1 below. It turns out that, for many SDGs, we can find ESG variables (among 400 original ones) that reflect this particular goal.

For some SDGs this can be done better than for others. Table 1 shows the number of ESG

White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

categories and variables that can be used to measure each SDG, as well as gives the assessment whether a particular SDG goal can be well measured using Refinitiv ESG data.

Table 1: SDGs measures summary

SDG number	Description	Categories	Variables	Measurable
1	No poverty	0	0	No
2	Zero hunger	1	3	Partially
3	Good health and well-being	2	11	Well
4	Quality education	1	4	Partially
5	Gender equality	2	7	Well
6	Clean water and sanitation	2	4	Partially
7	Affordable and clean energy	2	5	Partially
8	Decent work and economic growth	1	7	Well
9	Industry, innovation and infrastructure	4	17	Well
10	Reduced inequalities	2	6	Partially
11	Sustainable cities and communities	0	0	No
12	Responsible consumption and production	2	10	Well
13	Climate action	3	18	Well
14	Life below water	1	1	No
15	Life on land	3	4	Partially
16	Peace, justice and strong institutions	4	16	Well
17	Partnerships for the goals	0	0	No

We can see that seven out of seventeen SDGs are well-measurable and four SDGs are impossible to measure using these data.

Let us zoom into three specific SDG goals: SDG 5 (Gender equality), SDG 12 (Responsible consumption and production) and SDG 13 (Climate action). All these can be well measured by ESG variables. The table below lists those ESG variables that we will use to measure goal-specific score of companies. As we can see, all the chosen variables have direct relations to the chosen sustainability goals.

Table 2: Mapping between ESG variables and SDGs scores

SDG5	SDG12	SDG13
Females on board	e-Waste Reduction	Environmental Assets
Policy diversity and opp	Total Waste	Environmental Products
Targets diversity and opp	Waste Reduction Ratio	Fleet CO2 emissions
Women employees	Hazardous Waste	Product Impact Minimiz
Women managers	Supply chain termination	PolicyEmissions
HRC Corporate Equality	Environmental Materials	TargetEmissions
Salary gap	Supply chain management	Flaring Gases
	Supply chain monitoring	Ozone Depleting Subst
	Policy supply chain	NOx and SOx Emmisions
	Policy sustainable packa	Emmisions Trading
		EMS Certified
		Environmental Restaurat
		Climate Change Risk Opp
		Self-Reported Env. Fines
		Estimated CO2 equiv
		VOC Emissions
		Environmental Expend

Having chosen the relevant ESG variables, we can calculate the corresponding SDG score as a

White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

weighted average of these ESG variables.

3 Sustainable portfolio: construction and performance

Next, we will demonstrate how to construct investment portfolios that perform "well" in terms of the chosen sustainability goals and show what financial performance of such portfolios can be. Our investment universe consists of stocks in S&P 500 and EURO STOXX 600 from 2010 to 2017. Furthermore, companies that we can invest in must satisfy the following conditions:

 (i) SDGs scores are available for a company in a certain year.

(ii) The trading days of a stock are more than 125 days in a certain year.

Given we impute many missing ESG variables using a robust methodology, we do not have to remove many companies from investigation. Table 3 shows the number of companies we consider as "investable".

Table 3: Number of qualified companies each year

	S&P 500							
Year	2010	2011	2012	2013	2014	2015	2016	2017
Number of companies	424	433	439	444	458	475	478	472
	STOXX 600							
Year	2010	2011	2012	2013	2014	2015	2016	2017
Number of companies	438	453	460	465	488	507	527	555

First, we can calculate scores for our three SDGs for the entire stock universe. An interesting observation is that these SDG scores are only weakly correlated. Table 4 shows the correlations between the three SDGs scores. A possible consequence of this weak correlation is that when an investor selects stocks based on just one SDG, it does not necessarily improve (but can, in fact, diminish) the performance with respect to the other two SDGs. This is not the case for SDGs 12 and 13, whose scores are more correlated (0.4) - in this case, optimizing the portfolio with respect to SDG 12 would also improve its performance with respect to SDG 13. This is not surprising as SDGs 12 and 13 are related to each other in terms if relevant sustainability issues.

This observation holds more generally, so also for other sustainability goals and their combinations. For example, if your goals are "Elimination of poverty" and "Reducing CO_2 emissions", the investment portfolio clearly cannot be optimized with respect to both, as achieving these two goals simultaneously is almost impossible in practice.

Table 4: Correlation matrix of SDGs scores

	S&P 500			STOXX 600		
	SDG 5	SDG 12	SDG 13	SDG 5	SDG 12	SDG 13
SDG 5	1,000			1,000		
SDG 12	0,261	1,000		0,263	1,000	
SDG 13	0,055	0,411	1,000	0,120	0,311	1,000

To evaluate the effect of the SDGs screening on portfolio performance, we construct and compare a number of portfolios based on the SDGs scores and market capitalization. The core idea

White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

of the portfolio construction is that we keep the same sector allocation in our portfolios as the benchmark index, and then select 10% of stocks by certain sustainability criteria within each sector. In this way we mimic the same diversification as the benchmark, and hence, can compare the performance between portfolios and the benchmark.

If we did not pay attention to sector diversification, but only to SDGs performance, we could get a significant sector tilt. This can be seen in Figure 2, which shows the distribution of sector-specific SDG scores in S&P 500. The horizontal red lines represent the proportion of each sector in the benchmark. Note that the distribution of SDG scores varies significantly across sectors. For example, if we select stocks according to the performance on SDG 5 (gender equality), then Communications, Energy, Industrials, Materials and Utilities sectors would be excluded.

This is further confirmed in Table 5, which presents the sector allocation if SDG portfolios were formed by a simple inclusion, i.e., selecting the top 10% of stocks in terms of their performance with respect to the corresponding SDG. For individual sustainability goals (SDG5, 12 or 13), the sector concentration is quite high. Combining the three sustainability goals (ASDG row below in the table) shows improved sector diversification, but still far away from that of the benchmark - for example, Energy sector is still completely excluded.
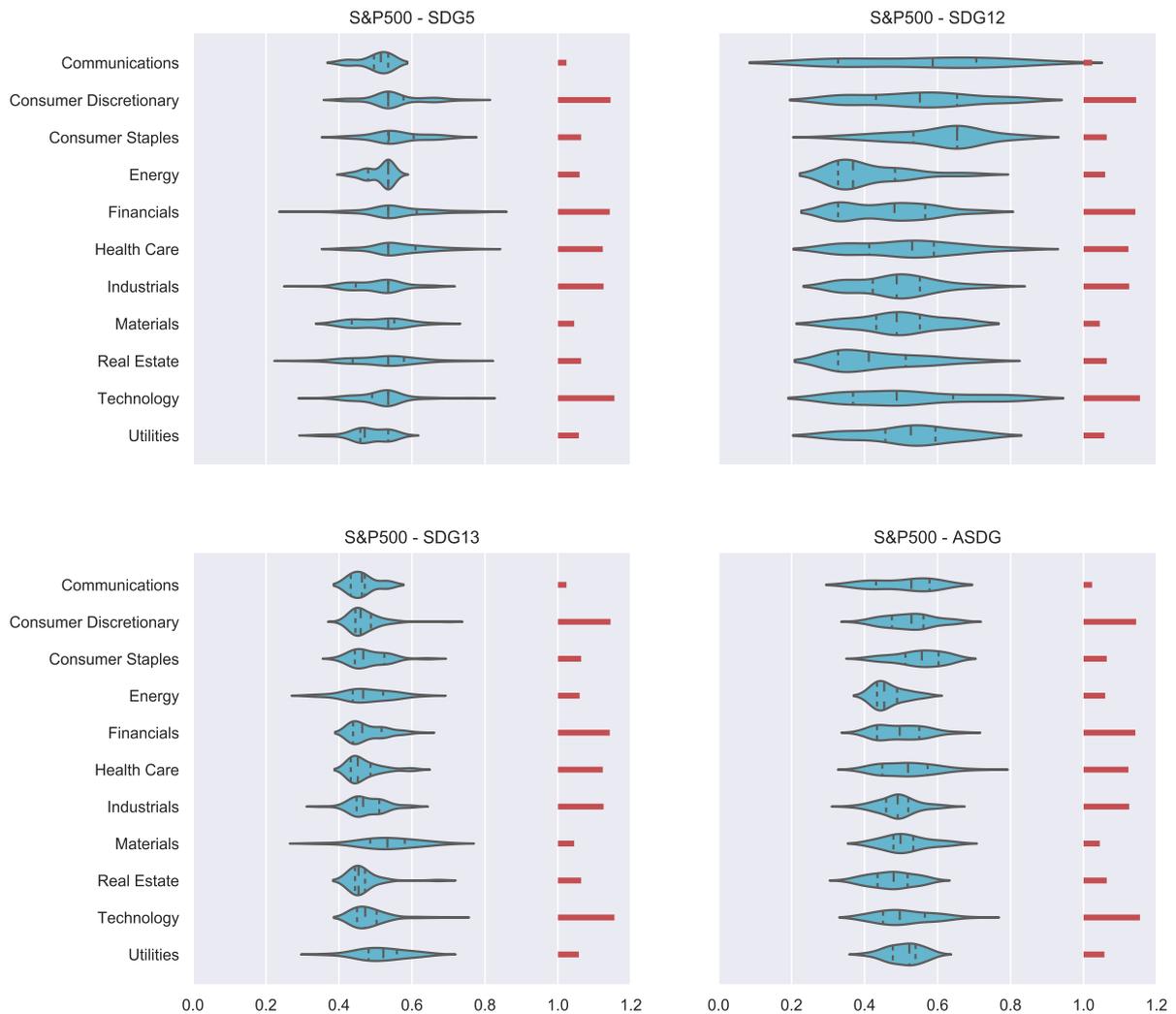

Figure 2: Violin plots of sector's SDGs scores in S&P 500, 2017

White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

Table 5: Sector allocation in simple inclusion portfolios

	S&P 500		STOXX 600	
Portfolio S - SDG 5	Health Care	23,30%	Banks	22,33%
	Financials	21,36%	Health Care	15,53%
	Consumer Discretionary	17,48%	Insurance	13,59%
	Consumer Staple	9,71%	Retail	10,68%
	Technology	8,74%	Personal & Household Goods	8,74%
Portfolio S - SDG 12	Consumer Discretionary	22,33%	Personal & Household Goods	13,59%
	Technology	19,42%	Industrial Goods & Services	12,62%
	Consumer Staple	18,45%	Health Care	8,74%
	Health Care	12,62%	Retail	8,74%
			Food & Beverage	8,74%
			Automobiles & Parts	6,80%
			Technology	6,80%
Portfolio S - SDG 13	Financials	15,53%	Banks	12,62%
	Technology	13,59%	Utilities	9,71%
	Utilities	13,59%	Industrial Goods & Services	9,71%
	Materials	12,62%	Automobiles & Parts	8,74%
	Industrials	9,71%	Chemicals	7,77%
			Oil & Gas	7,77%
Portfolio S - ASDG	Technology	18,45%	Banks	14,56%
	Health Care	16,50%	Health Care	12,62%
	Consumer Discretionary	15,53%	Personal & Household Goods	11,65%
	Consumer Staple	14,56%	Retail	8,74%
	Financials	12,62%	Insurance	7,77%
			Automobiles & Parts	6,80%

In sustainable investment, there are two main ways of constructing portfolios: either by inclusion or by exclusion. In inclusion portfolios, the top performers (in terms of some sustainability criterion) are chosen. In exclusion portfolios, the botton performers are excluded. In our investigation, we will consider both. So we consider the following market cap-weighted portfolios for both S&P 500 and STOXX 600 (we make sure that each considered portfolio, except the benchmark, consists of the number of stocks equal to 10% of the number of stocks in the considered universe, to allow for fair comparison):

(i) Benchmark: the typical passive benchmark portfolio comprising all stocks of the relevant stock universe.

(ii) Portfolio unscreened: the 10% of stocks are selected from investment universe only by top market capitalization.

The following four portfolios are *inclusion portfolios:*

(iii) Portfolio - ASDG: stocks are selected by the top 10% average score over the three SDGs.

(iv) Portfolio - SDG 5: stocks are selected by the top 10% of SDG 5 score.

(v) Portfolio - SDG 12: stocks are selected by the top 10% of SDG 12 score.

(vi) Portfolio - SDG 13: stocks are selected by the top 10% of SDG 13 score.

The following four portfolios are *exclusion portfolios:*

(vii) Portfolio - SDG with $q = 0.2$: the stock universe is screened by the SDGs scores. Stocks with any of three SDGs scores lower than the 20% quantile are excluded, and then the necessary number of stocks are selected by market capitalization.

White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

(viii) Portfolio - SDG 5 with $q = 0.2$: same as previous portfolio, only screening is done with respect to SDG 5.

(ix) Portfolio - SDG 12 with $q = 0.2$: same as previous portfolio, only screening is done with respect to SDG 12.

(x) Portfolio - SDG 13 with $q = 0.2$: same as previous portfolio, only screening is done with respect to SDG 13.

To compare portfolios, we use several risk-adjusted return measures: Sharpe ratio, Treynor ratio, Modigliani–Modigliani measure and Information ratio.

The Sharpe ratio (Sharpe, 1966) is the best-known performance measure, which evaluates the additional amount of return per unit of risk, compared to a risk-free investment. An alternative of the Sharpe ratio is the Treynor ratio (Treynor, 1966). While the Sharpe ratio consider the total risk, the Treynor ratio considers the excess returns with respect to systematic risk, i.e., with respect to market beta instead of volatility. For the benchmark, the Treynor ratio becomes the average excess return. Another extension is the Modigliani–Modigliani measure (M^2) (Modigliani & Leah, 1997), which adjusts the portfolio volatility to be equal to the volatility of the benchmark portfolio. For the benchmark, the M^2 ratio is also the average return. Information ratio ignores risk free rate and compares the performance of a portfolio with the benchmark directly.

We use the $3-$month Treasury Bill rate and $3-$month Euro Yield as the risk-free rates for S&P 500 and STOXX 600, respectively.

Figures 3 and 4 show four performance measures of all considered portfolios for S&P 500 and STOXX 600 universes, respectively. Dashed vertical lines represent the corresponding ratios of the benchmark.
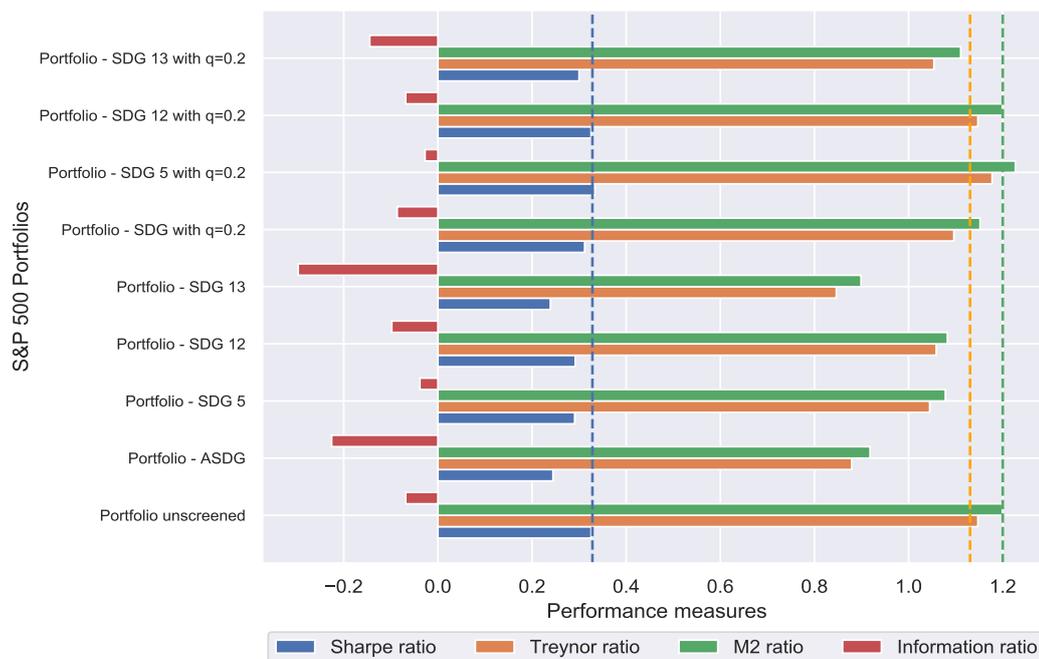

Figure 3: Measures of risk-adjusted returns of portfolios in S&P 500

White paper
How to measure and improve a portfolio's contribution
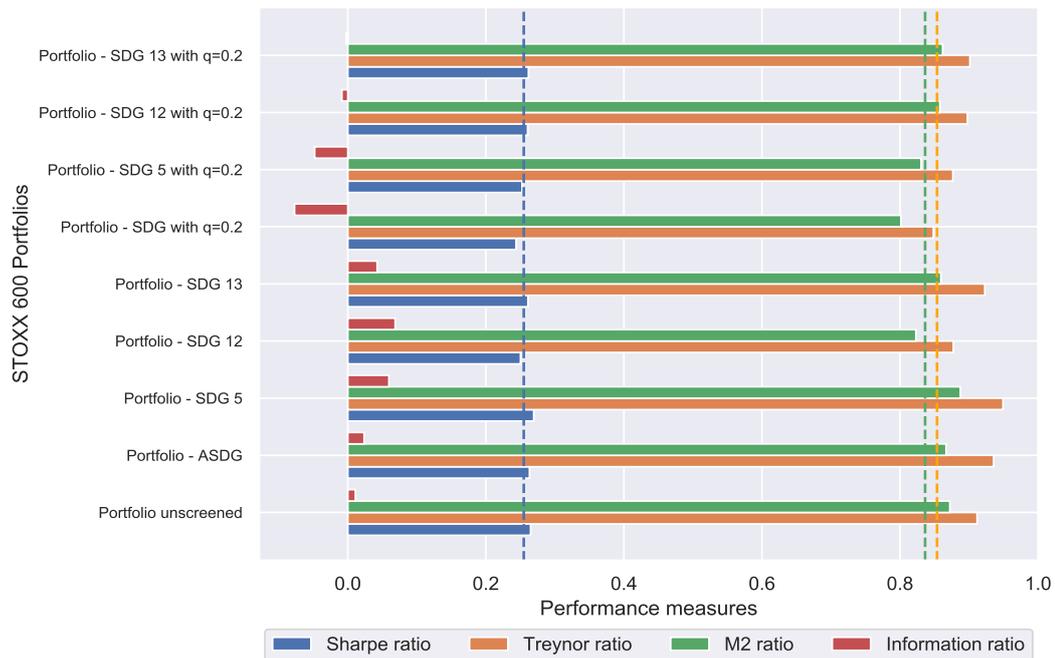to your own sustainability goals?

Figure 4: Measures of risk-adjusted returns of portfolios in STOXX 600

We see that the SDG-based investment strategies do not necessarily lower the portfolio performance. For example, for S&P500, exclusion portfolio with respect to SDG5 (Gender Equality) slighlty outperforms the benchmark. Performance of several other SDG portfolios are close to the benchmark. Optimizing the portfolio with respect to SDG 13 (Climate Action) leads to lowest performance in the US.

In Europe, the advantages of SDGs screening are more obvious. Almost all SDG-screened portfolios outperform the benchmark or are on par with it. In general, it shows that the investors in Europe can take a more aggressive sustainability strategy than US investors.

4   Concluding remarks

Here we demonstrated, on the example of Sustainable Development Goals, how specific sustainability goals can be measured by using granular ESG variables and how they can be incorporated in portfolio construction. Through multiple portfolio measures, our analysis confirms that, for a variety of goals, sustainable investors do not necessarily compromise on performance, and in some scenarios they can expect an outperformance of their portfolio over the benchmark. European investors can take a more aggressive sustainability strategy when constructing their portfolios, as for EU stock universe, sustainable portfolios perform better or on par with the benchmark. This is not necessarily the case in the US, where climate and environmental advantage often comes at cost of the financial performance. But this might change in the future, as US government and investors become more environmentally friendly and more aware of climate and environmental issues.

White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

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White paper
How to measure and improve a portfolio's contribution
to your own sustainability goals?

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