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In This Issue: **Sustainability and Shareholder Value**

ESG for All? The Impact of ESG Screening on Return, Risk, and Diversification

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One of the most important trends in portfolio management over the past decade has been the incorporation of environmental, social, and governance (ESG) data. According to the Global Sustainable Investment Alliance (2015), $21.4 trillion was being managed through some form of socially responsible investing (SRI) at the start of 2014, representing about 30% of total global assets under management. From 2012 to 2014, SRI assets under management (AUM) increased by over 60%, as compared to 15% for conventional strategies. Total investments in SRI are the largest in Europe ($13.61 trillion), with the U.S. now experiencing the most rapid growth (76% from 2012 to 2014, as compared to a global average of about 50%). Most SRI investments continue to be made by institutional investors, but retail investors are swiftly moving forward (as reflected in the 97% growth in their SRI assets between 2012 and 2014).

Historically, portfolio management has relied on two sets of information to build investment strategies. Fundamental information, which relies heavily on a company's financial statements, provides insights into the intrinsic value of a company and its growth prospects. Technical information, which can be derived from a company's past performance in the stock market, provides indicators of the current momentum or movement in stock prices and the extent to which the trend is likely to extend into the future. While these two sets of information have helped investors make sound investment decisions for decades, the widespread availability of such data and the technology to process it has made it increasingly challenging to create superior performance in the form of above-market returns.

In addition to fundamental and technical information, which mostly represent the past performance of a company, ESG information presents itself as an extra set of intelligence that can also provide insight into future performance. Think about the importance of managing carbon emissions in response to the growing regulatory and social pressure arising from the threat of climate change. Another prominent issue concerns corporate efforts to strengthen relationships with employees with the aim of maintaining high levels of customer service. And on the governance front, a well-structured and independent board of directors, and well-designed incentive pay plans, could help management maintain its focus on and commitment to carrying out the company's long-run strategy for creating value.

While ESG has been under a certain level of scrutiny with regard to its links with performance,[1,2] an increasing number of studies find a positive relationship between ESG (sometimes referred to as "nonfinancial") performance and financial performance. In a recent study, Ioannis Ioannou, George Serafeim, and one of the present writers[3] reported finding that "High" sustainability companies outperform "Low" sustainability companies in terms of stock market and accounting performance. And in a forthcoming study, Mozaffar Khan, George Serafeim, and Aaron Yoon[4] present the first evidence that attempts to distinguish "material"[5] from less important ESG factors. In so doing, they find a significant positive correlation between performance on material ESG factors and financial performance.

What's more, the findings of these two recent studies are largely consistent with the fairly large body of research that has accumulated over the past decade. For example, one recent review by Arabesque and Oxford University of over 200 studies[6] reports that 90% of those studies found a positive link between ESG and the cost of capital—and that 88% of the studies showed a positive correlation between various indicators of a company's social responsibility, like workforce diversity and board independence, and various measures of its operating performance (such as return on assets and operating income). Finally, 80% of the studies reviewed provide evidence of a positive association of various ESG measures with stock price performance.[7]

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1. Friedman M., "The social responsibility of a business is to increase its profits," *New York Times Magazine*, 1970, p. 32-33.

2. Rudd A., "Social responsibility and portfolio performance," *California Management Review*, Vol. 23, No. 4, 1981, p. 55-61.

3. Eccles R., Ioannou I. and Serafeim G., "The impact of corporate sustainability on organizational processes and performance," *Management Science*, Vol. 60, No. 11, 2014, p. 2835-2857.

4. Khan M., Serafeim G. and Yoon A, "Corporate sustainability: First evidence on materiality," *Accounting Review,* 2016, forthcoming.

5. According to the U.S. Supreme Court, information is material when there is a substantial likelihood that a reasonable investor would consider the information to have significantly altered the total mix of information made available. Note that other definitions exist as well.

6. Clark G., Feiner A. and Viehs M., "From the stockholder to the stakeholder: How sustainability can drive financial outperformance," March 2015, www.arabesque.com/oxford, accessed February 2016.

7. In another review of over 2,000 studies, Gunnar Friede, Timo Busch and Alexander Bassen report a non-negative relationship between corporate ESG and financial performance in roughly 90% of the research. Friede G., Busch T. and Bassen A., "ESG and financial performance: Aggregated evidence from more than 2,000 empirical studies," *Journal of Sustainable Finance & Investment*, Vol. 5, No. 4, 2015, p. 210-233

As a result of growing attention in both the corporate community and investment community to ESG factors, the global asset management industry has witnessed the rise of SRI as an alternative to conventional investing. And most studies to date have reported no significant differences in the performance of SRI or ESG-related funds and conventionally managed funds. [8,9]

Although such performance comparisons may be of interest in and of themselves, our aim in this article is to explore the possibility that the incorporation of ESG information presents opportunities for all investment approaches and fund managers, even those with no interest in sustainability. To that end, we have devised a series of tests to investigate whether any fund manager would be at a disadvantage by starting with an investment universe that has been screened for some ESG criteria. Comparing the performance of a global unscreened universe with that of a global portfolio to which two different ESG screens have been applied, we are able to draw some conclusions about the effects of such screening on rates of return, downside risk, and portfolio diversification. By so doing, we are able to determine whether, and the extent to which, such screening involves a sacrifice of risk-adjusted returns. [10]

In the pages that follow, we begin by describing the data and applied methodology used in our study. Then, after presenting our main findings, we discuss their implications for portfolio management. Summarized as briefly as possible, our findings provide almost no evidence that ESG screening reduces returns, but considerable evidence of reductions in risk.

Data and Methodology

In conducting our analysis, we began by defining two different investment universes:

• "Global All," which consists of large and mid-cap stocks in 23 developed[11] and 23 emerging countries[12] and represents roughly 85% of global investable equities.

• "Global Developed Markets (DM)," which consists of large and mid-cap stocks in 23 developed countries[13] and represents roughly 85% of developed markets equities.

We rebalance the investment universes two times a year (in May and November) and assume that they are the starting

point for fund managers before performing further analysis to do their stock selection.

To measure the effects of ESG screening on investors' risks and returns, we look at the different measures or indicators of corporate performance against ESG criteria:

Best-in-class ESG score: Using data provided by Sustainalytics,[14] we computed best-in-class ESG scores for all companies that make up the respective investment universe described above. After ranking the companies' overall ESG scores against the scores of their peers in the starting universe, we then created two ESG-screened portfolios by excluding, first, the companies in the bottom 10% of ESG rankings (relative to their competitors) and then the bottom 25%.

United Nations Global Compact (Global Compact) compliance: We also checked[15] whether a company is complying with the 10 principles of responsible business, as defined by the United Nations.[16] The principles are based on human rights, labor rights, environment, and anti-corruption. Companies in violation of any of the 10 principles were excluded from the screened universes.

ESG momentum: Companies putting in significant efforts to improve their ESG performance, even if still among the worst performers in their peer group, were also included in screened universes in the third phase of testing. More specifically, companies excluded in the first phase that showed ESG score improvements over both the last three and six months are included again.

From the two defined investment universes, and using these different ESG criteria, we constructed six portfolios:

1. *Global All Investment Universe*: an unscreened version of the Global All investment universe.

2. *Global All Screened Universe (with a 10% threshold)*: a screened version of the Global All investment universe applying the three ESG criteria with a best-in-class threshold of 10% (i.e., the bottom 10% ESG performers per industry are excluded).

3. *Global All Screened Universe (with a 25% threshold)*: a screened version of the Global All investment universe applying the three ESG criteria with a best-in-class threshold of 25% (i.e., the bottom 25% ESG performers per industry are excluded).

8. Bauer R., Koedijk K. and Otten, R. "International evidence on ethical mutual fund performance and investment style, *Journal of Banking & Finance*, Vol. 29, No. 7, 2005, p. 1751-1767

9. Revelli C. and Viviani J., "Financial performance of socially responsible investing: What have we learned? A meta-analysis," *Business Ethics: A European Review*, Vol. 24, No. 2, 2015, p.158-185

10. Our article adds to the findings of earlier studies (e.g. Zakri Bello, 2005), which already compare performance characteristics and diversification benefits at the fund level, and find no significant differences. Approaching portfolio diversification from a theoretical perspective (Andreas Hoepner, 2010), it has been argued there is no loss of diversification when incorporating ESG criteria. The current paper further adds to the existing literature by performing empirical research that goes to the stock level to measure the impact of ESG screening on returns, downside risk, and portfolio diversification in more detail.

11. Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States of America.

12. Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Qatar, South Africa, Taiwan, Thailand, Turkey and the United Arab Emirates.

13. Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States of America.

14. The authors would like to thank Sustainalytics for providing the data for this paper. Please note that Arabesque has its own proprietary ESG scores, which were not used in this analysis.

15. Please note that we use the Sustainalytics Global Compact Compliance data here, which is not to be confused with other proprietary Global Compact signals calculated by Arabesque.

16. United Nations Global Compact, "The ten principles of the UN Global Compact," https://www.unglobalcompact.org/what-is-gc/mission/principles, accessed February 2016.

Table 1   **Summary statistics for the six portfolios (2010 – 2015)**

	Global All	Global All (10%)	Global All (25%)	Global DM	Global DM (10%)	Global DM (25%)
			# of Stocks			
Avg	2,267	1,644	1,388	1,542	1,279	1,084
Min	1,947	1,088	916	1,316	1,069	900
Max	2,512	1,983	1,661	1,725	1,424	1,202
			% of market capitalization excluded vs. unscreened universe			
Avg		18.7%	25.6%		12.7%	20.1%
Min		10.7%	19.3%		10.0%	18.1%
Max		32.8%	39.3%		15.9%	24.9%

Figure 1   **Cumulative returns (2010-2015)**
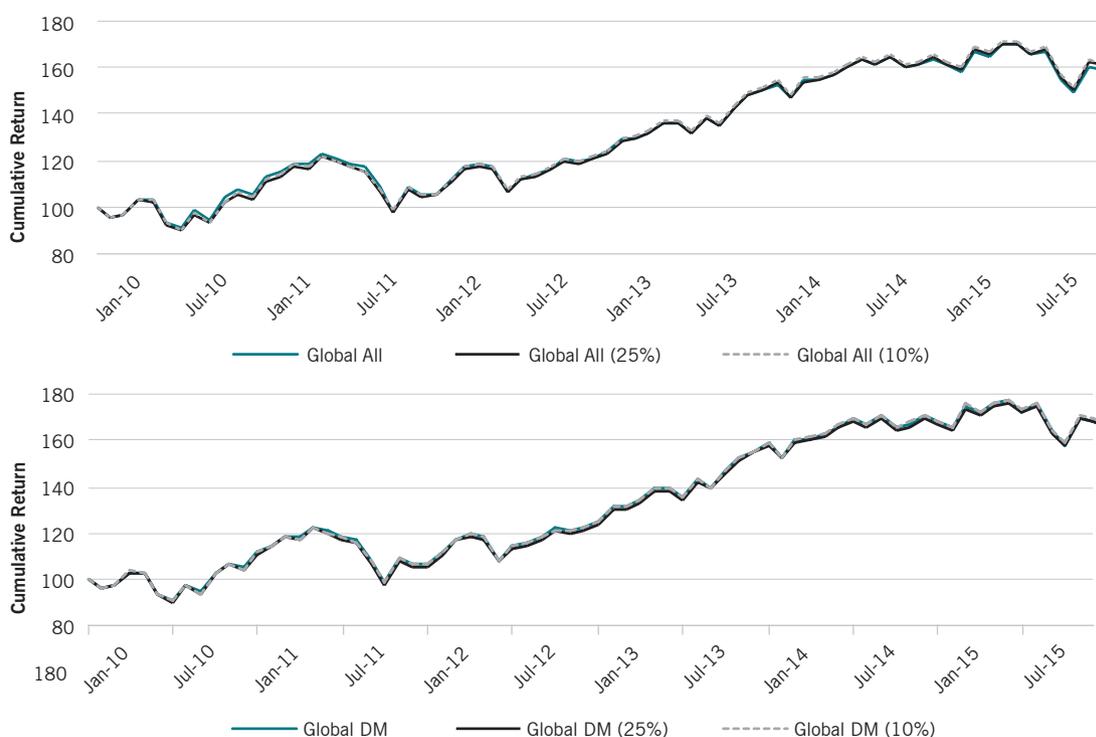
4. *Global DM Investment Universe*: an unscreened version of the Global DM investment universe.

5. *Global DM Screened Universe (with a 10% threshold)*: a screened version of the Global DM investment universe applying the three ESG criteria with a best-in-class threshold of 10%.

6. *Global DM Screened Universe (with a 25% threshold)*: a screened version of the Global DM investment universe applying the three ESG steps with a best-in-class threshold of 25%.

As a general rule, we also excluded all companies for which the necessary ESG information is not available. Before 2010, a large number of stocks (more than 20%) had to be excluded from the investment universe because of a lack of data. As a consequence, we decided to conduct our analysis on the six years of available data between 2010 and 2015. Table 1 presents summary statistics for the six portfolios over the six-year period.

As can be seen in Table 1, our 10% ESG screen ended up excluding stocks that, on average, represented 19% (in terms of market capitalization) of the Global All universe and 13% of the Global DM universe. The 25% ESG screened portfolios

Table 2   **Portfolio level risk-return characteristics (2010-2015)**

	Global All	Global All (10%)	Global All (25%)
	Absolute risk-return characteristics		
% p.a.	7.7%	8.0%	7.9%
Vol p.a.	14.4%	14.3%	14.4%
Sharpe Ratio	0.52	0.54	0.53
Max Drawdown	-20.3%	-19.6%	-19.9%
95% CVaR	-7.8%	-7.7%	-7.8%
95% CDaR	-12.0%	-12.6%	-12.7%
	Relative performance against the benchmark		
Excess % p.a.		0.3%	0.2%
Tracking Error p.a.		0.8%	0.9%
Beta		0.98	0.99
	Global DM	Global DM (10%)	Global DM (25%)
	Absolute risk-return characteristics		
% p.a.	8.8%	8.9%	8.7%
Vol p.a.	14.1%	14.1%	14.2%
Sharpe Ratio	0.60	0.61	0.60
Max Drawdown	-19.4%	-19.3%	-19.7%
95% CVaR	-7.6%	-7.6%	-7.6%
95% CDaR	-12.1%	-12.2%	-12.3%
	Relative performance against the benchmark		
Excess % p.a.		0.2%	0.0%
Tracking Error p.a.		0.4%	0.6%
Beta		1.00	1.00

eliminated 26% and 20% of stocks from the Global All and Global DM universes, respectively.

To answer our central question about the effects on investment performance of ESG screening, we conduct an analysis on three levels.

Universe risk and return: For each of the six portfolios, we summarize risk-adjusted performance over the six-year period under investigation. We further decompose performance based on region and industry.

Stock level tail risk: We next measured the downside, or tail risk of the underlying stocks in all portfolios over time to detect any risk-reducing effects of ESG screening.

Portfolio diversification: Finally, we measured the impact of ESG screening on portfolio diversification.

Findings
Universe risk and return
As can be seen in Figure 1, the most striking finding of our examination of the six different portfolios is the remarkably high correlation among their returns. For example, the correlation of monthly returns between the Global All universe

and the 10% and 25% screened ESG alternatives was 99.83% and 99.80%, respectively. For Global DM, the correlations were even higher, at 99.96% and 99.92%, respectively.

What's more, as reported in Table 2, the 10% and 25% Global All ESG screened universes actually outperformed their unscreened counterparts, by 0.30% and 0.21%, respectively on an annualized basis. For the Global DM, the 10% ESG universe outperformed by 0.15% annually—but in the case of the 25% variant, there was an underperformance of 0.01% per annum.

What's more, the risks of the screened and unscreened portfolios, whether measured by volatility of returns,[17] maximum drawdowns,[18] 95% CVaR,[19] or 95% CDaR,[20] also turned out to be very close to one another. As a result, when evaluated on a risk-adjusted basis (using the Sharpe ratio),[21] three out of four of the screened universes outperformed the unscreened starting universes. The sole exception was the Global DM 25% screened universe, which, because of its 0.01% per annum underperformance, had a Sharpe ratio that is 0.005 lower than the Global DM universe. Annualized tracking errors[22] with the unscreened universe fell within 0.4% and 0.9%. And the betas[23] of the four screened portfolios all came in

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17. Standard deviation of monthly returns.
18. The maximum difference between a portfolio's cumulative return at any day and its previous maximum cumulative return.
19. The expected monthly return in the worst 5% of months.
20. The expected maximum monthly drawdown in the worst 5% of months.

21. The excess annualized return of the portfolio over the risk-free annualized return, divided by the annualized volatility of portfolio returns.
22. Standard deviation of the monthly excess returns over the underlying unscreened universe.

between 0.98 and 1, further confirming that the ESG screening has only slight effects on performance, and mostly for the better.

When looking further into the breakdown of returns, we found that the outperformance of the Global All (both 10% and 25%) and the Global DM 10% screened portfolios can be attributed to the stocks of companies based in Europe and North America—the two regions for which the most ESG data is available. For companies in other parts of the world, which typically have more limited ESG data coverage, ESG screening appears to have no detectable effects on financial performance. The 0.1% per annum underperformance for the Global DM 25% ESG screened universe can be partly explained by a poorer performance in North America, suggesting that a more strict way of performing ESG screening does not always improve returns. On an industry level, the ESG screening seems to have the most positive effects in the case of the consumer non-durables and health technology industries. By contrast, when applied to the energy minerals industry, the ESG screening has consistently underperformed. In the case of the financial services industry, a 10% screening leads to uniformly positive results—whereas excluding the bottom 25% of financial service firms has resulted in underperformance for both the Global All and Global DM universe.

After the ESG screening, fewest companies get excluded from the Pacific Rim region (which consists of just Australia and New Zealand), followed by Europe and North America. The exclusions in these regions are also relatively stable over the six years under study. For Africa, Asia, the Middle East, and South America, the median exclusion rate is remarkably higher, and also more dispersed over the years. A straightforward explanation here is the relatively modest availability of ESG data for emerging market regions. Following the ESG screening, the communications industry has the fewest exclusions (market capitalization weighted), while the energy and non-energy minerals industries have the most. The explanation for the wide differences between industries, despite the best-in-class approach whereby companies get compared with their industry peers, can be found in differences in Global Compact compliance, ESG momentum, and ESG data availability.

The findings of our portfolio level risk-return analysis summarized earlier showed that the ESG screening has very little impact on the original universe, with returns being slightly higher but strongly correlated, while risk is slightly lower. But when we break down the results further, we find that ESG screening has larger positive effects on the portfolios for the European and North American regions, where ESG data coverage and quality is the highest—and such positive effects are also larger in the case of consumer non-durables and health technology industries. In terms of relative changes in region and industry allocation, ESG screening has the biggest impact on emerging markets and the (non-)energy minerals industry. The difference of such effects between a 10% and a 25% threshold is also modest, with the latter naturally excluding more stocks, leading to a slightly worse overall risk-adjusted performance.

Stock-level Tail Risk

In addition to portfolio-level results, we also looked at the daily returns of all underlying stocks in the portfolios over time. By aggregating all of these daily returns, we were able to draw the overall return distribution and compare it with a widely used measure of downside risk that is known as the "3 sigma tail."[24]

As summarized in Table 3, our findings show that both the average and standard deviation of the full daily return distribution of returns was practically identical between ESG-screened and unscreened universes. Nevertheless, the 25% ESG-screened universes, for both Global All and Global DM, had the effect of excluding the worst daily performing stock over the six-year period between 2010 and 2015, in comparison to the unscreened and 10% ESG-screened universes. The ESG-screened universes show more of their distribution leaning toward the positive return side, which reflects the fact that stocks in the unscreened universes are more likely to experience negative daily returns. The tests using the 95% CVaR showed that downside risk was also slightly higher for the unscreened universes.

Moreover, our findings with respect to the 3 sigma tail of daily returns corroborate our findings about reduced daily return risk in the ESG-screened universes. Whereas the average returns for the screened universes were slightly higher, standard deviations were slightly lower for the daily returns in the tails of the screened versus the unscreened alternatives. More of the tail of the unscreened universes was tilted towards more negative returns, and the mass of the negative tail was also larger relative to the ESG-screened universes.

In sum, all the parts of our analysis of stock-level tail risk suggests that ESG screening reduces the downside risk of stock portfolios.

Portfolio Diversification

Finally, we take a look at the impact of ESG screening on portfolio diversification. According to modern portfolio theory,[25] it is impossible for an ESG-screened universe to be more diversified than a conventional universe, since the former is a subset of the latter. And this raises the possibility

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23. Throughout the paper, we obtain beta (β) and alpha (α) from the following four-factor model estimation: $r_{p,t} - r_{f,t} = \alpha + \beta(r_{M,t} - r_{f,t}) + \beta_{HML}HML_t + \beta_{SMB}SMB_t + \beta_{UMD}UMD_t + \varepsilon_t$; with $r_{p,t}$ the portfolio return, $r_{f,t}$ the risk-free return, $r_{M,t}$ the return of the respective unscreened universe, HML_t the value factor portfolio return, SMB_t the size factor portfolio return, UMD_t the momentum factor portfolio return. t represents the month in which the return is observed. Factor portfolio data (global developed markets) is obtained from the Kenneth French data library. We use a heteroscedasticity and autocorrelation consistent

estimation approach to allow for robust statistical inference. More details can be found in Carhart (1997).
24. The subset of daily returns that are more than three standard deviations away from the mean.
25. Markowitz, H., "Portfolio selection," *Journal of Finance*, Vol. 7, No. 1, 1952, p. 77-91

Table 3 Stock level daily return statistics (2010-2015)

	Global All	Global All (10%)	Global All (25%)
	Full Return Distribution		
#	3,541,490	2,554,986	2,157,748
Average	0.0%	0.0%	0.0%
Standard Deviation	2.0%	1.9%	1.9%
Minimum	-67.4%	-67.4%	-65.3%
Skewness	0.21	0.15	0.09
Kurtosis	17.00	19.27	15.49
95% CVaR	-4.7%	-4.4%	-4.4%
	3σ Tail of Return Distribution		
#	25,213	17,816	15,068
% of Full	0.7%	0.7%	0.7%
Average	-8.3%	-8.0%	-7.8%
Standard Deviation	3.0%	3.0%	2.9%
Minimum	-67.4%	-67.4%	-65.3%
Skewness	-4.66	-4.90	-4.91
Kurtosis	43.07	48.90	48.30

	Global DM	Global DM (10%)	Global DM (25%)
	Full Return Distribution		
#	2,404,292	1,992,816	1,690,751
Average	0.0%	0.0%	0.0%
Standard Deviation	1.9%	1.9%	1.8%
Minimum	-67.4%	-67.4%	-65.3%
Skewness	0.14	0.00	0.01
Kurtosis	19.18	15.92	15.72
95% CVaR	-4.3%	-4.2%	-4.2%
	3σ Tail of Return Distribution		
#	17,073	14,262	12,083
% of Full	0.7%	0.7%	0.7%
Average	-7.8%	-7.6%	-7.5%
Standard Deviation	3.0%	2.9%	2.8%
Minimum	-67.4%	-67.4%	-65.3%
Skewness	-5.13	-5.44	-5.36
Kurtosis	52.85	61.77	58.05

that ESG screening could entail an increase in risk through a loss of diversification.

Finance scholars such as Andreas Hoepner[26] have responded to this argument by breaking portfolio diversification into three components: number of selected stocks, correlation between selected stocks, and average specific risk of selected stocks. ESG screening naturally decreases the number of available stocks and hence reduces diversification; also, fewer stocks with higher ESG ratings tend to be more heavily correlated than unscreened stocks and thus further decrease diversification. However, Hoepner points to evidence that stocks with higher ESG scores also tend to exhibit significantly lower specific risk[27]

(third component), suggesting that the overall effect of ESG screening on portfolio diversification might not be negative after all.

To investigate the diversification argument more closely, we conduct both a portfolio and stock-level comparison of the returns of the ESG-screened universes versus the unscreened universes. As reported in Table 4, we found that the main part of the risk in the ESG-screened portfolios is coming from their strong correlation with the unscreened underlying universe, but that the specific risks of such stocks and portfolios are relatively small in comparison. What's more, by further decomposing risk we calculate the return required to justify any specific risk taken.

26. Hoepner A., "Portfolio diversification and environmental, social or governance criteria: Must responsible investments really be poorly diversified?," March 2010, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1599334, accessed February 2016.

27. Bauer R., Derwall, J. and Hann, D., "Employee relations and credit risk," October 2009, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1483112, accessed February 2016.

Table 4   **Portfolio-level diversification statistics**

	Global All (10%)	Global All (25%)	Global DM (10%)	Global DM (25%)
	Risk Decomposition[29]			
Specific Risk	2.0%	2.1%	1.1%	1.6%
Systematic Risk	14.1%	14.2%	14.1%	14.2%
Total Risk	14.3%	14.4%	14.1%	14.2%
	Fama (1972) Decomposition[30]			
Beta	0.98	0.99	1.00	1.00
Alpha	0.5%	0.4%	0.1%	0.0%
Diversification[31]	0.1%	0.1%	0.0%	0.1%
Net Selectivity	0.4%	0.3%	0.1%	-0.1%

Table 5   **Summary finding**

	Global All 10%	Global All 25%	Global DM 10%	Global DM 25%
Return	+	+	+	-
Risk	+	+	+	=
Diversification	+	+	+	-

This required return enabled us to calculate a measure of "net selectivity," which was computed as the difference between alpha—the risk-adjusted return[28]—and the required return to justify specific risk. In cases where net selectivity is positive, any loss of diversification by taking on specific risk is offset by a sufficient amount of alpha. If net selectivity is negative, the loss of diversification is not sufficiently justified by an excess risk-adjusted return over the benchmark.

As also reported in Table 4, when we compare our ESG-screened universes with the unscreened alternatives, we found that net selectivity is positive in three out of four cases. In only the case of the Global DM 25% ESG-screened portfolio did we find net selectivity to be negative (-0.1%). Hence, in three out of four cases, we conclude that ESG screening has a net positive impact on portfolio diversification, in the sense that the amount of specific risk taken was justified by a more than large enough alpha.

In addition to the portfolio level analysis of diversification, through decompositions of risk and return, we also examine the decomposed risks and returns of the individual stocks in the different portfolios through time. From modern portfolio theory,[32] we know that a portfolio's total return variance is equal to the weighted sum of the underlying stock return variances plus the diversification effect.[33] Whenever there is a perfect correlation between all of the underlying assets, portfolio variance will simply equal the weighted sum of individual variances. When underlying stocks are not perfectly correlated, a diversification effect occurs and portfolio variance will be lower than the weighted sum of underlying stock return variances. From this principle, Choueifaty and Coignard[34] proposed a diversification ratio to gauge the extent to which a portfolio is benefiting from imperfect return correlations to drive down total risk.[35] Theoretically, the ESG screened universes can never have a higher diversification ratio than the unscreened universes, as they simply consist of a subset of stocks. However, to further our understanding of the impact of ESG screening on portfolio diversification, we compute one-year rolling monthly diversification ratios for the six portfolios (Figure 2).

As anticipated (and can be seen in Figure 2), the unscreened universes consistently show a higher diversification ratio. But as is also clear from the figure, the difference with the ESG screened universes seems very small, and is not subject to great variability over time.[36] Together with the results from computing net selectivity, we find that ESG screening, on average, does not lead to large diversification losses.

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28. Please refer to the details described in footnote 23.
29. We decompose the risk of ESG screened universes versus the unscreened alternatives: Total Risk^2 = Specific Risk^2 + Systematic Risk^2 or $\sigma_{rp}^2 = \beta^2\sigma_{rm}^2 + \sigma_e^2$, with σ_{rp}^2 the variance of ESG screened portfolio returns, β the beta between the ESG screened portfolio excess return (above the risk-free rate) and the respective unscreened universe excess return (above the risk-free rate). σ_{rm}^2 is the variance of the unscreened universe returns and σ_e^2 is the variance of the residuals when regressing the excess ESG screened portfolio returns on the respective excess unscreened universe returns. Please refer to footnote 23 for more detail on the estimation.
30. Fama E., "Components of investment performance," *Journal of Finance*, Vol. 27, No. 3, 1972, p. 551-567
31. Diversification (d) = $\left[\left(\frac{\sigma_{rp}}{\sigma_{rm}}\right) - \beta\right] * \left(r_m - r_f\right)$

32. Markowitz, H., "Portfolio selection," *Journal of Finance*, Vol. 7, No. 1, 1952, p. 77-91.
33. $\sigma_{rp}^2 = \sum_i w_i^2\sigma_{ri}^2 + \sum_i\sum_{(j\neq i)}w_i w_j\sigma_i\sigma_j\rho_{ij}$, with w_i the average weight of stock i, σ_{ri}^2 the variance of stock i's returns and ρ_{ij} the correlation between returns of stock i and j.
34. Choueifaty, Y. and Coignard, Y., "Toward maximum diversification," *Journal of Portfolio Management*, Vol. 35, No. 1, 2008, p. 40-51
35. Diversification Ratio (DR) = $\frac{\sum_i w_i^2\sigma_{ri}}{\sigma_{rp}^2}$
36. Note that the spike in DR around May of 2013 is coming from a significant drop in σ_{rp}^2. The pushing out of the May 2012 return, which was strongly more negative than the subsequent months, in the one-year rolling window leads to a reduction of annualized volatility for the window by 50%. Over the next couple of months, the DR moves back closer to previously established levels.

Figure 2   **One-year rolling diversification ratios (2010-2015)**
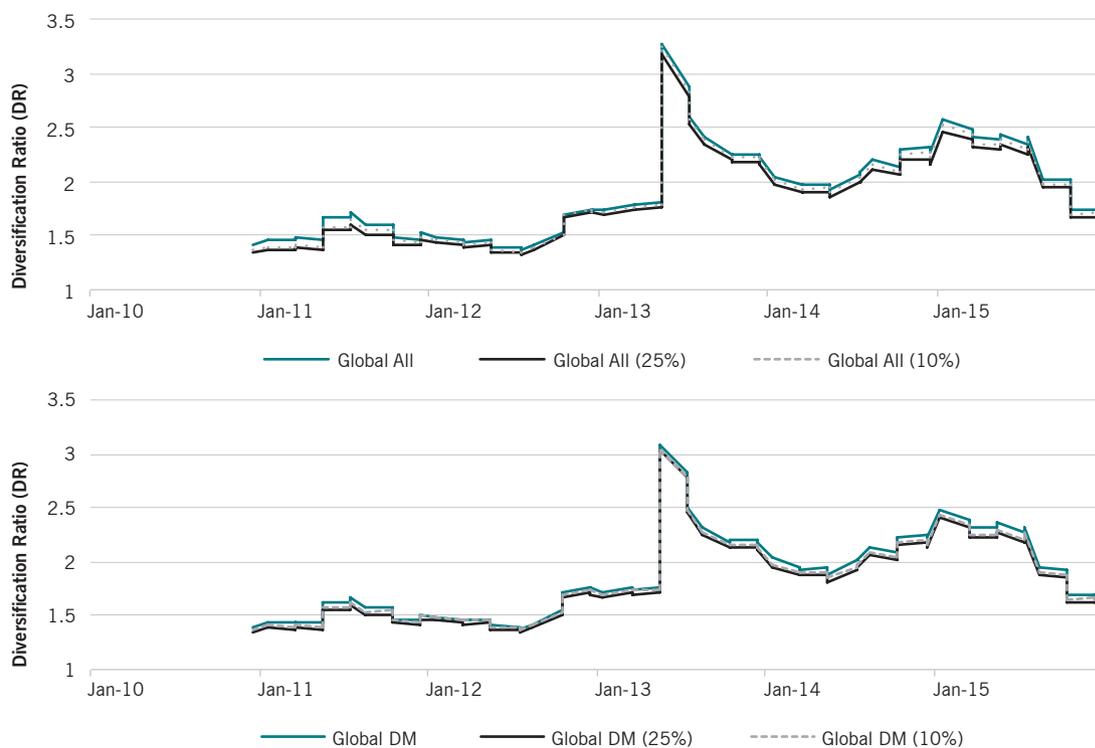
Discussion and Conclusion

Having presented our findings, we now return to our original research question. As reported in Table 5, we find that for three out of the four universes we have created, ESG screening not only does not hurt performance, but actually improves risk-adjusted returns. There is a positive effect originating from ESG screening, rather than any negative effect. On the return side, ESG screening adds about 0.16% in annual performance, on average. From a risk perspective, we find volatility, drawdowns, and CVaR to be lower than for the unscreened universe. Looking into the individual daily return distributions, we find that ESG screening reduces tail risks, lowering the likelihood of a severely negative daily return. Finally, for three out of four universes, we are able to challenge the classical argument that ESG screening sacrifices portfolio diversification. Rather, we find that the amount of specific risk introduced by ESG screening is more than offset by the excess risk-adjusted returns it provides relative to the unscreened universe. Nevertheless, we do find that the 25% Global DM screened universe is associated with a lower annualized return—of -0.01%.— with roughly the same overall risk and specific risk that is not entirely offset by alpha.

In this paper, we have focused on the process that precedes the actual picking of individual stocks that is typically carried out by fund managers—namely, the establishment of the universe of stocks from which the selections are made. The findings of our study suggest that a preliminary ESG screening can make sense for *any* investment strategy, even when there is no specific goal to address sustainability. That is to say, instead of starting with an unscreened universe, an ESG filter can effectively create a universe of stocks with improved risk-return characteristics and diversification. When the fund manager is entirely uninterested in sustainability by itself, a low-threshold ESG filter like our 10% configuration is most recommended, as it seems most robust in improving an investment universe's quality without negatively impacting diversification potential. More stringent ESG configurations might still work,[37] although they increase the likelihood of significantly altering the universe and hence impacting the subsequent investment decision-making process.

Besides improving the risk-return tradeoff of stock portfolios through exclusions (which has been the traditional approach of SRI), ESG information can also be used in a more integrated and active way to help fund managers

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37. For example, the 25% filters managed to exclude the biggest individual daily underperformer in the unscreened universe.

create risk-adjusted outperformance. One such integrated approach, which is sometimes referred to as "ESG Quant," considers a multitude of nonfinancial factors with the aim of more actively transforming the investment universe towards companies that are better positioned for long-term outperformance.[38]

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38. A further definition of ESG quant can be found at https://en.wikipedia.org/wiki/ESG_Quant.