The Alpha, Beta, and Sigma of ESG: *Better Beta, Additional Alpha?*

Brian Jacobsen, Wai Lee, and Chao Ma

Brian Jacobsen
is a senior investment strategist on the Multi-Asset Solutions team at Wells Fargo Asset Management in Menomonee Falls, WI.
brian.jacobsen@wellsfargo.com

Wai Lee
is the global head of research on the Multi-Asset Solutions team at Wells Fargo Asset Management in London, UK.
wai.lee@wellsfargo.com

Chao Ma
is a global portfolio and quantitative strategist at Wells Fargo Investment Institute in St. Louis, MO.
chao.ma@wellsfargo.com

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ABSTRACT: *Rather than treat investments as statistical objects to be optimally combined into portfolios, investors are increasingly interested in the environmental, social, and corporate governance (ESG) dimensions of their investments. Analysts traditionally evaluated these dimensions in qualitative ways, but many data providers are attempting to score these dimensions, effectively quantifying what was qualitative. For developed market equities, on the basis of one popular data provider's ESG assessment, we evaluate the evidence on whether portfolios of highly rated ESG stocks are materially different from their complements (non-ESG stocks) in their investment opportunity sets. It is obvious that ESG stocks differ from non-ESG stocks in their ESG dimensions, but we show that ESG stocks returns are also different. Although the total return-to-total risk of ESG stocks may be lower than that for non-ESG stocks, after factor-adjusting the returns and risks, portfolios of ESG stocks with positive alpha have return-to-risk features comparable to those of portfolios of non-ESG stocks with positive alpha. For portfolios without statistically significant alpha, the portfolios of ESG stocks have lower residual volatility than portfolios of non-ESG stocks. It should be possible, by factor-neutralizing portfolios, to build better beta with comparable alpha portfolios by using ESG factors.*

TOPICS: ***ESG investing, equity portfolio management, portfolio management/multi-asset allocation****

Modern portfolio theory tends to treat investments as statistical objects that need to be combined in optimal ways to achieve risk and return objectives. In the past few decades, investors have seemed to be more interested in treating securities as more than just statistical objects—equities represent ownership interests in companies that interact with a variety of stakeholders (in the present and the future), and investors have preferences over how the companies behave and how their securities' prices behave. Investors also believe that company behaviors affect returns.

Although it has gone through a few incarnations, an increasingly popular rubric for many of these dimensions of investments is ESG—the environmental, social, and governance dimensions of the companies in which investors invest. Branch, Goldberg, and Hand (2019) provided a nice illustration of a few ways in which ESG considerations can be reflected in portfolios. ESG considerations, broadly, are used in two ways:

1. ESG to reflect investors' values. Just as consumers value different dimensions of goods and consider more than just price when making purchase decisions, investors can consider more than just the statistical properties of their investment universe. Consumers enjoy consumer

surplus when they value an item more than they value the money they part with to purchase a good. Investors can also enjoy an investor surplus when there is a wedge between the value they place on an investment—which may transcend the volatility and expected return dimensions of the investments—and the price they pay in the market for the investment (Jacobsen 2011). ESG investors can avoid certain securities, deliberately include certain securities, and make overweight/underweight decisions based on the ESG characteristics of firms to reflect or advance the investors' values.

2. ESG as a form of risk management. There may also be risk and return implications of the ESG features of a company. Portfolio managers and financial analysts spend a good deal of their time on financial statement and market analysis to uncover favorable risk–return opportunities, but they also evaluate other risks that may be more qualitative in nature. Limkriangkrai, Koh, and Durand (2017) showed that (at least for Australian companies) E, S, and G can be indicators of future financing decisions of firm management, which affects risks. Within the Ellsberg (2016) risk framework, the quantitative analysis assists with uncertainty management, and the qualitative analysis assists with ambiguity management. Even if the ESG quality of a company is not reflected in traditional risk measures such as return volatility, it is possible that ESG quality is inversely related to the ambiguity risk of an investment. This could be why Amel-Zadeh and Serafeim's (2018) survey showed that more than 63% of institutional investors use ESG information because they believe the information is material to investment performance.

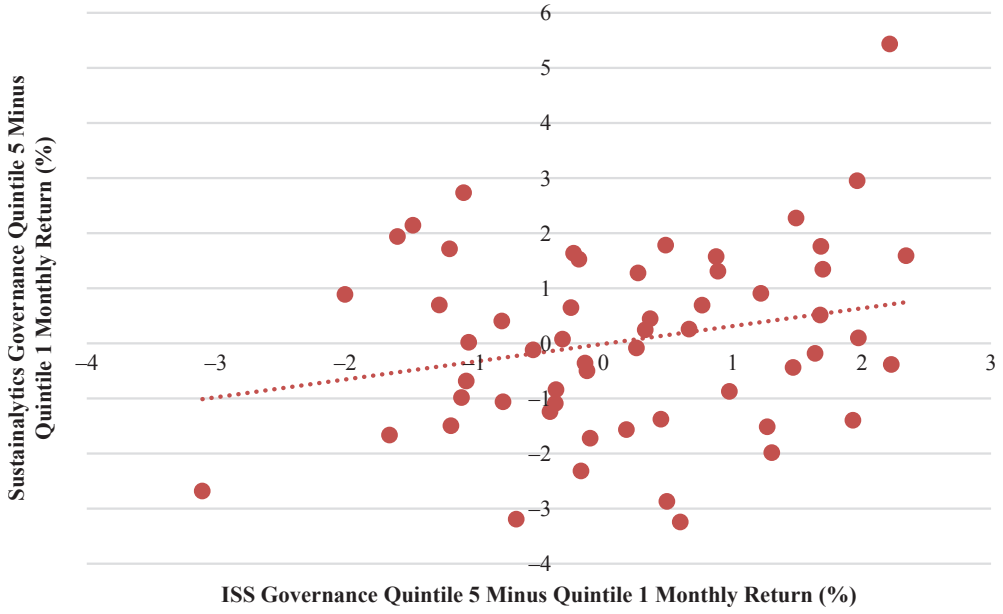
Whether for ambiguity management or as a reflection of investors' preferences, there are many qualitative dimensions to investment management. Data providers have also been attempting to better quantify what was traditionally qualitatively evaluated. They have been refining the way they score these various ESG dimensions to assist investors in making better investment decisions. Depending on the data provider, they rely, to various degrees, on financial statements, corporate disclosures, government filings, interviews, natural language processing of news and social media, and many other sources of data. Given how nascent the field of quantitative-ESG analysis is, it may be many years before anything definitive can be said about the merits of ESG investing in a purely mean–variance framework or before hypotheses around extreme value measures of risk are tested (e.g., avoiding "blow-up" risks), although Clark, Krieger, and Mauck (2019) provided compelling evidence that a good ESG score lowers the probability of extreme security returns. What we show in this article, using developed market equities and one data provider's ESG scoring, is that the value of ESG scores is enhanced when portfolios are factor-neutralized.

THE SIGNIFICANCE OF ESG AND RESIDUAL VOLATILTY

Creation and Use of ESG Scores

Different data providers can provide different quantitative scores of the ESG dimensions of companies. The providers differ in terms of scope of coverage, frequency of updating scores, and sources of data as inputs into the scores. Part of this is due to use of different data sources (public filings, news analysis, or interviews with management), differences in how these sources are weighted, and even which specific issues or key performance indicators are considered. To illustrate how different data providers can give different answers to the question about the quality of the ESG dimensions of a company, we consider the governance rating from Sustainalytics and ISS. Using Bloomberg's factor backtest (FTST) feature, we compared the investment implications of relying on the different governance scores by creating a fifth quintile minus first quintile portfolio for each set of scores, with the best companies in the fifth quintile and the worst companies in the first quintile. The underlying universe is the Russell 3000, with each quintile portfolio market-capitalization-weighted and neutralized to the Global Industry Classification Standard sector. The portfolios were rebalanced monthly with the portfolio constituents recalculated annually. As Exhibit 1 shows, despite putatively measuring the same thing—governance quality—the correlation of monthly returns is only 0.23 for the April 2014 through December 2018 time period. This difference in scores may be one reason asset managers are moving to combine scores from vendors and integrate them with proprietary information gathered by analysts.

EXHIBIT 1
Governance Scores Quantile Portfolio Comparison



Relying on different data providers can yield different portfolios and different returns. Filbeck, Filbeck, and Zhao (2019) showed how relying on Sustainalytics scores can outperform the S&P 500, but not on a risk-adjusted basis. Disaggregating the ESG score into E, S, and G can be useful because investors seem to reward positive governance scores, but not positive environmental scores.

The coverage of ESG issues for the investable universe is also limited. Firms are using big data and machine learning to impute ESG scores. Henriksson et al. (2019) presented a novel method for imputing ESG scores by saying the ESG items should be industry-relevant and relative and that imputation can be done via determining factor loadings on a new "good minus bad (GMB)" factor. This method seems very promising because it is a way to crowdsource from measured market returns an ESG score in a factor framework that is familiar to most practitioners.

In addition to disaggregating ESG scores being an area of active research, portfolio managers also attempt to anticipate changes in ESG scores. Just as the rise of credit rating agencies gave rise to the opportunity to develop a proprietary view of the credit rating of an issuer and position portfolios in anticipation of upgrades or downgrades, portfolio managers may decide to try to add value by anticipating when data providers will upgrade or downgrade the ESG score of a company. This could bring new meaning to the term *fallen angel* compared with how it is currently used in the high-yield markets. Tripathi and Bhandari (2016) showed that managers may benefit from paying attention to the relationship between how highly rated ESG companies' stocks perform during different parts of the economic cycle.

Residual Volatility and Diversification

Idiosyncratic, or residual, volatility is an important metric in investing. As Bali et al. (2005) demonstrated, economic theory has generally empirically validated that investors should not expect to be compensated for being exposed to idiosyncratic risk. As a result, the ability to diversify away idiosyncratic risk with fewer securities can result in a lower-cost way to get market beta exposure. Correlations among idiosyncratic risks are also an important determinant of the extent of diversification possible from a given subset of securities. If an investor is focusing on only a subset of securities with average low individual idiosyncratic risks, but those risks are highly correlated, then the residual volatility

in the portfolio could be uncompensated. To tease the following results, we show how after adjusting for factor exposures, the residual risks of ESG stocks are lower than those for non-ESG stocks. In the United States, the average residual volatility of ESG stocks is 5.13%, and the average residual volatility of non-ESG stocks is 5.75% (they differ at the 0.0% level of significance). The average pairwise correlation of the residuals of the ESG stocks is 0.025. The average pairwise correlation of the residuals of the non-ESG stocks is 0.02, which is lower but not substantially so, where it would be harder to diversify the idiosyncratic risks of ESG stocks compared to non-ESG stocks.

DATA AND DISCUSSION

For the sake of consistency in comparisons and because of the availability of investable products, we use MSCI ESG data for our analysis of alpha, beta, and sigma opportunities within the broader MSCI USA Index and the MSCI EAFE (Europe, Australasia, and the Far East) Index. Combining scores from various sources—vended and proprietary—or transforming scores (e.g., calculating momentum) will give rise to different investment opportunities. We focus on whether partitioning the investment universe on the basis of the level of the ESG score of a company discriminates between different types of alpha, beta, or sigma features of investment returns. We perform a separate analysis for US equities and for EAFE equities. The evidence of ESG and market performance on a country-by-country basis is an area for further study. Sahut and Pasquini-Descomps (2015) found mixed evidence for the United States, United Kingdom, and Switzerland and that changes in scores may be more meaningful than the level of the score.

We present a point-in-time analysis of the holdings of the MSCI US ESG Leaders Index, the broader MSCI USA Index from which the Leaders Index is constructed, the MSCI EAFE ESG Leaders Index, and the broader MSCI EAFE Index from which the Leaders Index is constructed. The holdings are as of November 30, 2018. We perform a separate time series analysis of the monthly holdings of the iShares MSCI USA ESG Select ETF from January 2006 through November 2018, which we describe but do not address in detail because the results are similar to the point-in-time analysis (shown in Exhibit 2). The exhibit shows the interquartile range of possible portfolio outcomes (bars) and the time series volatilities. The ESG stocks have a lower time series volatility than do the non-ESG portfolios. Because of the greater degree of homogeneity of the ESG stocks compared to the non-ESG stocks, ESG portfolios start with a narrower range of possible portfolio outcomes, but the range of outcomes stops shrinking quicker than for the non-ESG stocks.

This article first explains the individual equity features of ESG and non-ESG (the complement within the parent indexes) equities in a Fama–French (2015) framework in which the five factors (market, size, value, profitability, and investment patterns) are augmented with a momentum factor. For the factors, we use the data available on Ken French's website, using the monthly data on the US five factors and momentum from November 2014 through November 2018 for US equities and then the monthly data on the global ex US five factors and momentum for EAFE equities.

The MSCI USA ESG Leaders Index, as of January 30, 2019, has 354 constituents, whereas the parent index—the MSCI USA Index—has 627 constituents. We partition the parent index into ESG and non-ESG universes based on whether the MSCI USA Index constituents are in the ESG Leaders Index or not. For each universe, we then eliminate those securities without at least four years of monthly return data. This leaves us with 332 stocks in the ESG universe and 263 in the non-ESG universe.

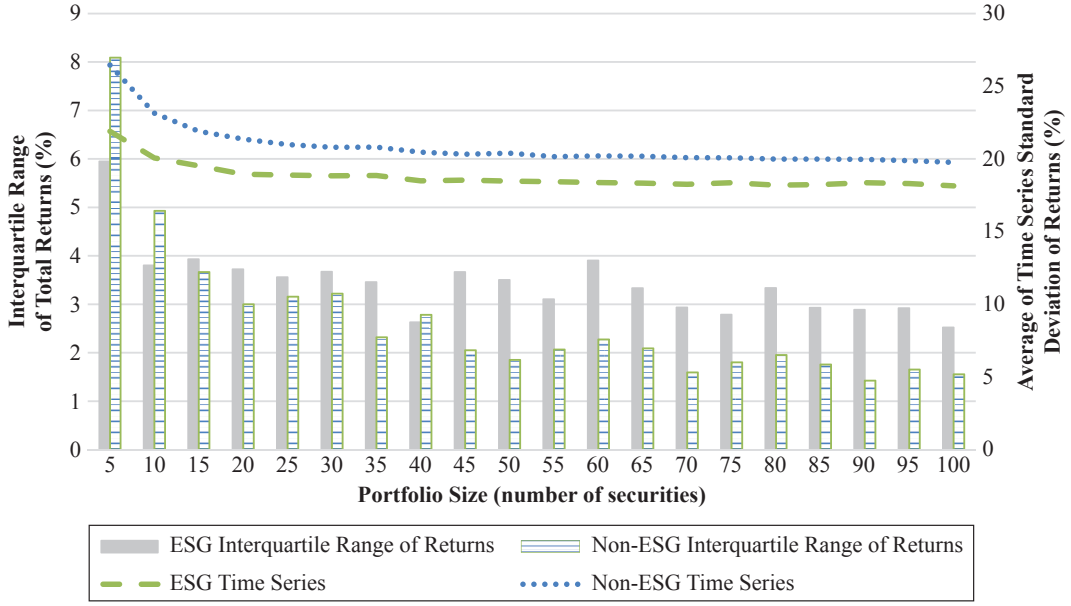
The MSCI EAFE ESG Leaders Index, as of January 30, 2019, has 453 constituents, whereas the parent index—the MSCI EAFE Index—has 921 constituents. Just as for the US market, we partition this into ESG and non-ESG universes and filter out holdings without at least four years of monthly return data available. This leaves us with 340 and 546 stocks in the ESG and non-ESG universes, respectively.

Individual Equities

For the four years of monthly returns, the average monthly return to standard deviation of returns for the average US ESG stock is 0.15, whereas that for the non-ESG stock is 0.17. According to a heteroskedasticity-robust *t*-test, these averages differ at the 8% level of significance. Superficially, it looks as if ESG stocks in the United States have a lower return-to-risk ratio than

EXHIBIT 2

Interquartile Range of Total Returns and Time Series of Returns for ESG and Non-ESG Stocks



non-ESG stocks. For the EAFE stocks, the average ratio for ESG stocks is 0.108, and the average for the non-ESG stocks is 0.11. They differ only at the 84% level of significance, so they are effectively the same.

Although the ESG indexes are similar to the parent indexes in terms of sector exposures, they have different factor exposures in the Fama–French five factor plus momentum framework. Breedt et al. (2019) found that ESG stock return differences from non-ESG stocks can be explained by a large capitalization and low volatility bias. We find that in the United States, ESG stocks tend to have a larger proportion of equities with statistically positive loadings on the size, value, and profitability premiums than non-ESG equities, but a larger proportion with negative loadings on the investment policy premium and momentum. In non-US developed market equities, ESG stocks have a higher proportion with negative exposure to size (the large cap bias), a negative exposure to investment policy (more aggressive investment policies), and less exposure to momentum than do non-ESG stocks.

Exhibit 3 shows that after controlling for the securities' factor exposures, the residual volatilities for ESG equities are statistically lower than for non-ESG equities. For US equities, ESG stocks have a residual volatility, on average, of 5.49%, and non-ESG equities have an average residual volatility of 6.15%. These averages are statistically different at the 0.0% level of significance. The magnitudes and statistical significance are similar for non-US equities. The average total volatility of ESG stocks is 7.05% in the United States and 7.5% for non-ESG stocks. Total volatilities differ at the 3% level of significance.

Exhibit 4 shows whether the alphas for individual securities are statistically different from zero at the 5% level of significance. For non-US ESG stocks, 10.88% have positive alpha, and 0.88% have negative alpha. For non-US non-ESG stocks, 8.42% have positive alpha, and 1.65% have negative alpha. In the United States, 6.33% of ESG stocks have positive alpha, whereas 2.11% have negative alpha. For US non-ESG stocks, 8.75% have positive alpha, and 2.28% have negative alpha. Factor-adjusting the investment opportunity sets reveals alpha opportunities in non-US developed markets that simple sector-adjusting might obscure.

Portfolios of Equities

Portfolio managers select individual securities, but investors get bundles of securities in the form of portfolios. To evaluate the different investment opportunities from portfolios, we created portfolios from each

EXHIBIT 3
Residual Volatility

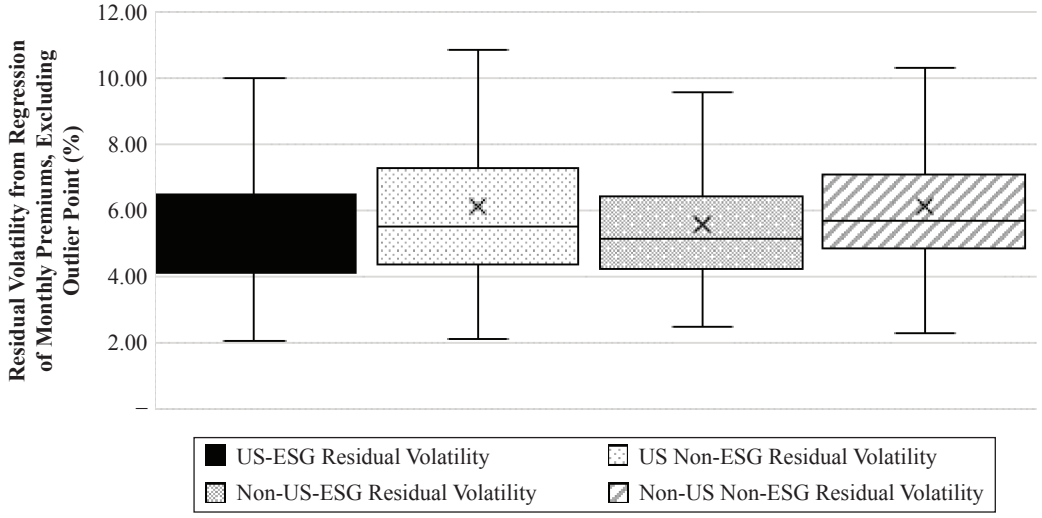
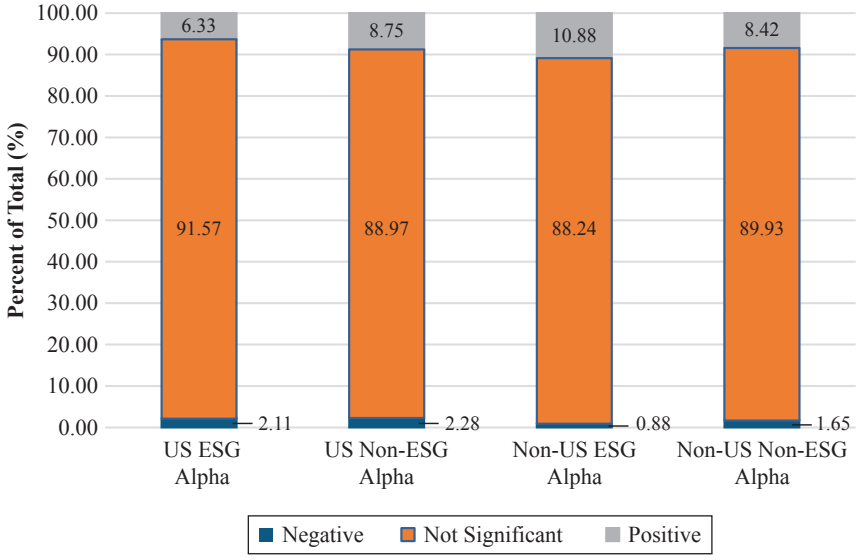


EXHIBIT 4
Statistical Significance of Alpha



universe (US ESG, US non-ESG, non-US ESG, and non-US non-ESG) and did a factor analysis and risk contribution analysis to compare portfolios of different sizes (ranging from 5 to 100 securities). For each size, we created 200 randomly selected portfolios to compare the distributions of the statistics.

For US equities, the average return-to-risk ratio for any given size of portfolio is lower for ESG equities than for non-ESG equities. This seems to support the idea that ESG is no free lunch: If you restrict your investment universe (by any indicator), there must be a cost associated with it.

The lower return-to-risk ratio for ESG stocks does not necessarily mean that non-ESG stocks are superior or preferred. For one thing, this measure is based on realized returns rather than expected returns or risks. Investors

EXHIBIT 5

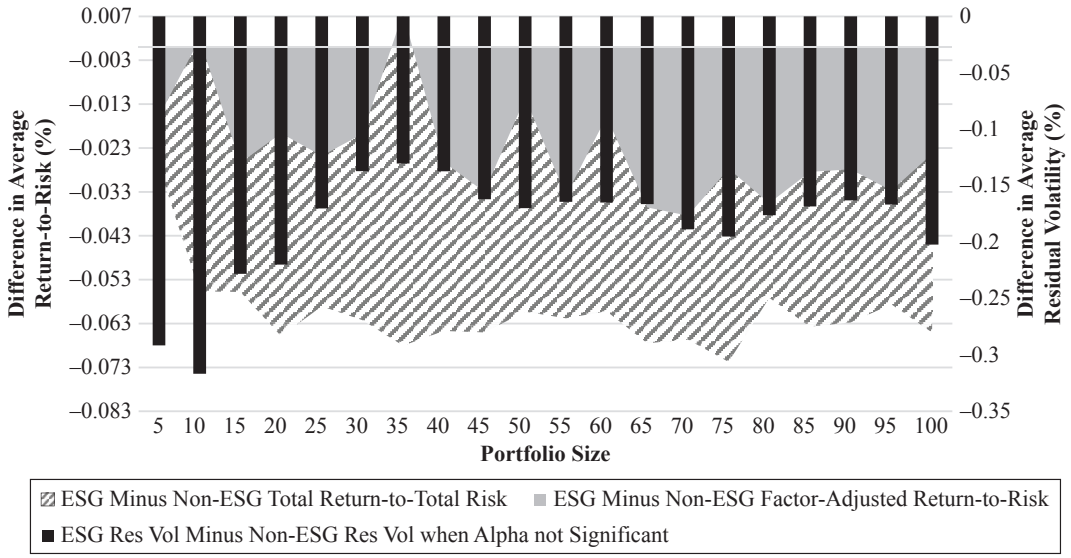
Percentage of Universes with Statistically Significant (5% Level) Betas

	US ESG	US Non-ESG	Non-US ESG	Non-US Non-ESG
Market Beta Deviates from 1	10.24	7.22	10.59	12.09
	16.57	19.77	12.35	7.69
Small Minus Big (size)	15.66	11.41	6.76	10.62
	10.24	6.08	14.41	8.24
High Minus Low (value)	15.66	7.60	10.00	10.81
	13.25	13.69	10.29	6.59
Robust Minus Weak (profitability)	15.66	10.65	11.76	10.07
	9.64	4.56	7.65	5.31
Conservative Minus Aggressive (investment policy)	12.35	12.17	9.12	10.44
	14.16	9.89	16.47	13.55
Momentum	8.73	11.03	9.41	8.06
	14.46	7.98	5.88	5.49

Note: Top number is the percent positive and bottom is the percent negative.

EXHIBIT 6

US Equities Return-to-Risk Differences and Residual Volatility Differences



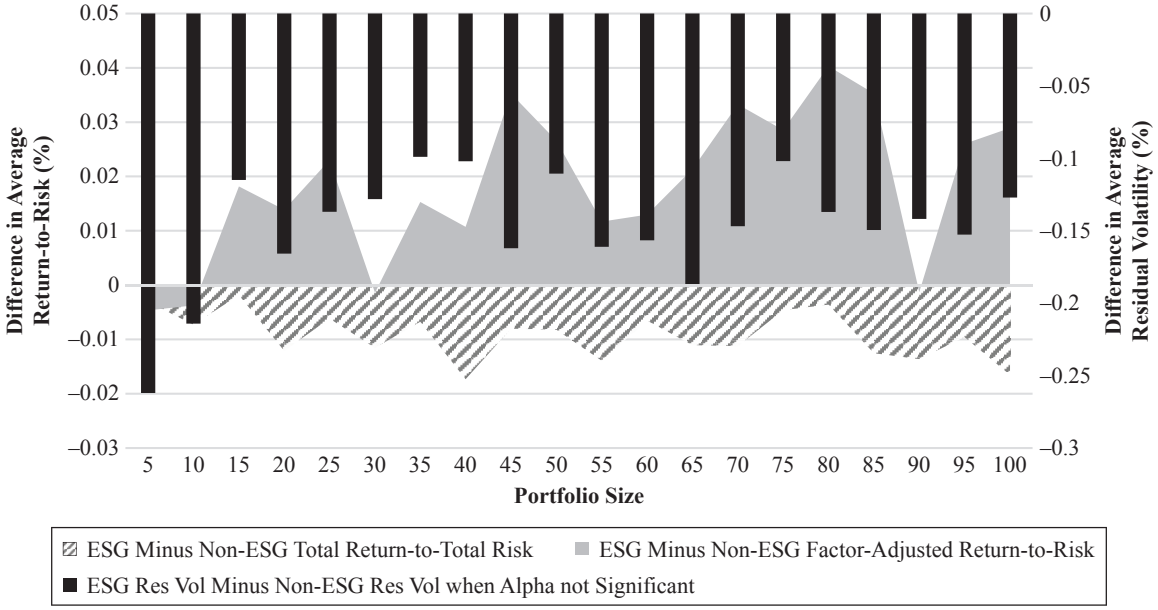
may value the ESG characteristics of the ESG stocks such that the value-to-risk (rather than return-to-risk) ratio is at least equalized. Investors also may perceive the ambiguity risks of non-ESG stocks as being higher than the ESG stocks such that the return-to-risk, with risk measured by volatility plus ambiguity risk, is at least equalized between the ESG and non-ESG stocks. Comparing these adjustments—whether to the return, to the risk, or to a combination of the two—is beyond the scope of this article, but it does provide an interesting area to research whether the adjustments to at least equalize the return-to-risk ratios are reasonable and consistent with investors' preferences.

There is an alternative explanation: factor risk. Exhibit 5 provides a summary of the percentage of securities within each universe that have statistically positive or negative beta coefficients for each factor.

Exhibit 6 shows the difference in return-to-risk for any given size of portfolio (the diagonal-marked

EXHIBIT 7

Non-US Equities Return-to-Risk Differences and Residual Volatility Differences



area in the chart, which is always negative) and two important measures of return and risk. The first is to factor-adjust the returns and risks. For those securities with statistically positive alpha (6.33% of the US ESG universe and 8.75% of the non-ESG universe), the alpha-to-residual volatility ratios are almost indistinguishable. For those securities without statistically significant alpha, returns are explained by factors, so it is appropriate to simply compare the differences in residual volatility. For those (91.57% of the US ESG universe and 88.97% of the US non-ESG universe), the average ESG portfolio has a lower residual volatility than the non-ESG portfolio.

Exhibit 7 reveals a similar relationship among the non-US equities. A major difference is that whereas the alpha-to-residual volatility measure in the United States is still marginally unfavorable for US ESG equities, it is almost everywhere positive for non-US equities.

CONCLUSION

ESG investing has been growing in popularity and can be used in a variety of ways. There are also a variety of ways to evaluate the "ESG-ness" of a company. Many portfolio managers are using ESG information as one of many inputs into the portfolio construction process. One criticism of ESG stocks relative to non-ESG stocks is that the ESG stocks tend to have lower return-to-risk ratios, suggesting investors are giving up something by focusing on the ESG dimensions of their investments. This is despite the evidence about how corporate financial performance can be correlated with ESG ratings, as shown by Friede, Busch, and Bassen (2015). Corporate financial performance is not the same as investment returns, which is what investors and portfolio managers tend to focus on more. What we show is that after factor-adjusting the returns of ESG and non-ESG stocks, the return and risk profiles are—at worst—comparable. When building portfolios of ESG stocks, although sector neutralization seems to be a popular approach to making ESG portfolios more similar to non-ESG portfolios, it is more important to factor-adjust the ESG portfolios to match non-ESG portfolios.

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ADDITIONAL READING

Pest Control: *Eliminating Nuisance Allocations through Empirical Asset Class Identification*

Chao Ma, Brian Jacobsen, and Wai Lee

The Journal of Financial Data Science
https://jfds.pm-research.com/content/early/2019/06/11/jfds.2019.1.006

ABSTRACT: *There is a seemingly infinite number of ways to partition the investment universe into asset categories. Too fine a partition can lead to very small allocations to certain categories in asset allocation models. When populating those categories with actual strategies, costs increase because due diligence and reporting are not costless activities. The right number of asset categories for building allocations should depend on balancing the marginal benefits and marginal costs of a finer partitioning of the investment universe. In this article, the authors use different machine learning techniques to help quantify these trade-offs. Two unsupervised learning techniques—exploratory factor analysis and hierarchical cluster analysis—are used to identify asset classes. A supervised learning technique—a regression tree—then is used to identify the most important basis for US equities, a specific asset class identified by the unsupervised learning techniques.*

Multi-Asset Volatility Premiums or Anomalies?

Brian Jacobsen, Eddie Cheng, and Wai Lee

The Journal of Portfolio Management
https://jpm.pm-research.com/content/45/2/47

ABSTRACT: *Investors demand excess returns for assuming risk, but across many asset classes, there is mixed evidence that more volatile assets realize higher returns than do assets with lower volatility. This is the volatility anomaly. By analyzing equities, fixed income, foreign exchange, and commodities, the authors show which asset classes have volatility premiums and which have volatility anomalies. For those with volatility anomalies, they provide evidence that the anomaly may be well explained by either a time-varying volatility premium or by a premium for higher-order moments such as skew or kurtosis. The authors also show that across asset classes, a skew premium diversifies other well-known premiums. From a portfolio*

management perspective, this means that harvesting higher-order moment premiums can improve risk-adjusted returns in multi-asset portfolios. Their research also shows that the frequency of the signal matters for its efficacy. For volatility and skew, monthly signals may be less valuable than annual signals.

Factors Timing Factors

Wai Lee

The Journal of Portfolio Management
https://jpm.pm-research.com/content/43/5/66

ABSTRACT: *It is common practice to refer to a factor premium's current valuation when assessing its attractiveness—in effect using a single-value-factor model to gauge whether the factor is rich, fairly valued, or cheap. Meanwhile, studies have investigated how some factor premia are exposed to other factor premia in order to characterize their behavior over time. This article questions the utility of employing factors to time factors by examining the issue through the lenses of both normative and positive asset pricing theory, while also shedding some light on the potential impact of crowding on factor attractiveness. The author believes that attempting to time factors using other factors is generally of limited value and that factor timers would be better served by focusing on the underlying rationale believed to give rise to these premia.*