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## The Socially Responsible Quant

### A foray into the world of Socially Responsible Investing

In this report, we take readers on a journey into the world of Socially Responsible Investing (SRI).

### A walk through the SRI Landscape

Initially, we discuss the latest trends within the broader SRI industry and examine the amount AUM, investor base, and investor demand associated with SRI.

### Introducing the Environmental, Social, and Governance (ESG) dataset

Next, we introduce an interesting company-specific ESG dataset and perform an in-depth analysis. We show how to create various stock selection strategies based on this ESG data.

### ESG tilted and optimized portfolios

Lastly, we backtest the performance of ESG tilted portfolios within the US and global markets. We also show the performance results of long only, optimized ESG strategies.



Source: gettyimages.com

Deutsche Bank Securities Inc.

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# A letter to our readers

The infamous buzz words: “The Financial Crisis” has been associated with almost any and every recent economic event from the bankruptcies of giant global financial institutions to the debt crisis plagued by European nations. Politicians, lobbyists, senators, government officials, and regulators use these words as a punching bag to cast blame for the calamitous events that ensued as a result of “The Financial Crisis”. Undoubtedly, this blame has been pointed towards large financial institutions and to some extent investors.

These buzz words have also given rise to potentially more “socially minded” public interest groups. Through national and even international public rallies and demonstrations, the intent of such organizations is to stem public outcry and push public interests to the forefront of government mandates. Government officials have responded by ratcheting up regulation on executive compensation and wider governance and social issues.

At the same time, a paradigm shift is occurring amongst socially minded consumers, entrepreneurs, companies, leaders, and investors. These groups are demanding that large public companies integrate socially minded values and principles into their culture, operations, and business practices. As such there has been exponential growth in the popularity for Socially Responsible Investing (SRI). As a global quant research team, we have seen a significant increase in client demand among quant funds, hedge funds, mutual funds, and pension funds for SRI performance metrics and products.

As such, in this report, we take an in-depth look at SRI. We begin by an examination of the broader SRI industry and discuss the various growing trends and segments. Next, we describe an interesting environmental, social, and governance (ESG) dataset provided by MSCI ESG Research. We employ this ESG dataset to analyze the performance and efficacy of ESG based factors and portfolio strategies. Lastly, we discuss how to create and implement ESG tilted portfolios.

In this report, we do not touch upon the ensuing debate to whether public companies should be responsible for pursuing ESG efforts or whether these companies should solely focus on maximizing shareholder value? Or whether these two initiatives are naturally one and the same? Although, this would make an interesting and hotly debated discussion, we take a more pragmatic and empirical approach and allow our readers to form their own opinions. We hope you enjoy the remainder of the report.

Regards,

Yin, Rocky, Miguel, Javed, John, and Sheng  
**Deutsche Bank North American Quantitative Strategy**



# The World of Socially Responsible Investing

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## An introductory note by the President, Deutsche Bank Americas Foundation

Socially Responsible Investing (SRI) has come of age as a distinct asset class. A new generation of individual and institutional investors is increasingly recognizing the responsibility and opportunity; they have put their capital to work to affect positive social and environmental change. This momentum is not only being led by sympathetic mission driven institutions like universities, foundations and pension funds but high net worth individuals, as well, many of whom have generated their own wealth and are keen to support others' entrepreneurial efforts that can lead to positive outcomes for society.

The backdrop for this new form of "conscience capitalism" is an appreciation for the limitations of government and traditional charity to meet the demands of increasingly complex world. Challenges ranging from poverty to climate change are now being tackled by entrepreneurial initiatives, which like more conventional enterprises; require access to capital to reach sustainability and scale.

In my role as head of the Deutsche Bank's Community Development Finance Group I have had the opportunity to participate in helping to grow a remarkable portfolio of social enterprises that are bringing educational opportunities to the poor in Africa, reliable solar lighting to displacement camps in Haiti, access to small loans for woman entrepreneurs throughout Latin America and creating fresh food outlets in areas of high concentrated poverty in the United States. We have placed more than \$2 billion in capital and are profoundly impressed with the credit quality of these loans and investments as well as the impact they are having in improving communities and lives.

This report is a welcome addition to the literature that can make this industry better known and understood.

**Gary Hattem**  
**Managing Director, Deutsche Bank Community Development Finance Group**  
**President, Deutsche Bank Americas Foundation**

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## The ABC's of ESG

ESG (Environmental, Social, and Governance) is an investment approach that takes into account the environmental, social and governance impact when making investment-related decisions. The ESG philosophy can take on many forms. It can be as simple as screening out companies from an investor's universe that rank poorly on ESG criteria. Or the ESG philosophy can take on a much more rigorous approach where investors incorporate specific ESG data towards companies or industries as an integral component of their investment analysis and decision process. The acronym SRI (Social Responsible Investing) is often coined with ESG. The areas concerned with SRI can typically be summarized under environment, social, and governance pillars. In this research, we use SRI and ESG interchangeably.



ESG or SRI is not a new investment philosophy albeit ESG investing has gained increasingly popularity from investment managers during the past five years. This is undoubtedly due to the multitude of governance issues faced by the financial industry as a result of the financial crisis. In fact, the origins of the ESG philosophy date back to the 17th century. During this time, the roots of ESG were primarily religiously motivated. Interestingly, back in the 17th century, a religious movement known as the Quakers or Friends preached the basic tenants of ESG. The Quakers were known for their refusal to participate in war, opposition to slavery, and the opposition to alcohol. Some Quakers went on to form institutions exemplifying such principles.

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## Investors are rethinking ESG

Fast forwarding to more recent times, many cataclysmic events have made investors reconsider or revisit their approach to ESG. On April 26, 1986, reactor four at the Chernobyl Nuclear Power Plant in the Ukraine exploded causing one of the worst nuclear accidents in history. Large quantities of radioactive particles rose into the atmosphere and spread to Western Soviet Union and Europe. Some studies have stated that the Chernobyl accident caused a major public health impact lasting 20 years after the explosion. On March 24, 1989 an Exxon Valdez oil tanker bound for Long Beach, California struck the Bligh Reef and caused 11 million gallons of oil to spill affecting approximately 1,300 miles of shoreline. These and other events arguably caused the onset of the ESG uprising when investors began to rethink SRI. Proponents of ESG investing would argue that avoiding such companies or industries would not only boost investment returns, but also, in turn, force companies to be more diligent towards environment, social and governance matters. Understandably, this is a hotly debated subject area. The aim of this report is to illustrate more empirical and objective evidence on ESG investing so that investors can better assess the merits of ESG investment adoption.

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## Common ESG screening criteria

What does a typical ESG screen look like? Figure 1 shows some of the most commonly cited ESG criteria used for screening companies. As you can see, this list spans a wide array of criteria from sustainability, nuclear power, tobacco to animal testing, human rights, and affordable housing. A criterion likely exists for almost any type of ESG concern. Most of these criteria are relatively self explanatory; however, it's worthwhile to point out a few, more notable ones.



Figure 1: Common ESG screening criteria



Source: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States, MSCI ESG Research

**Executive Compensation:** Since the financial calamity in 2008, the general public as well as government bodies are increasingly scrutinizing the level of employee bonuses and compensation. This screen would avoid companies that offer egregious levels of compensation to its executives.

**MacBride:** This screen focuses on companies that abide by the MacBride doctrines. The MacBride Principles are a corporate code of conduct for American companies conducting business in Northern Ireland. The principles focus on fair hiring practices in North Ireland. In particular, the principles outline increased representation of under-represented religious groups in the workforce. The principles were formed in 1984 by Sean MacBride, a Nobel Peace Prize winner. The MacBride Principles are passed in 18 US states.

**Repressive Regimes:** This screen exclude firms that conduct business, or have a substantial business operation in a country or region that fails to observe a certain standard of liberal democracy. This screen may also avoid countries and state-sponsored or controlled companies that mistreat workers. Certain countries where insurgent or rebel organizations are formed may also be screened excluded by this screen.

**Labor Relations:** This screen would focus on companies that have strong union relations and a framework in place for the fair and equitable treatment of its employees. Companies that mistreat or exploit employees (i.e. so called "sweatshops") are





screened out. In addition, companies that endanger the health and safety of its workforce are also excluded.

**Diversity:** This screen searches for companies that actively encourage fair practices and recruitment for minorities, LGBT employees, disabled workers, veterans, women and under-represented individuals.

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## ESG regulation is in flavour

The regulatory umbrellas governing the global investment community has been slowly tilting in favor of socially responsible investors. Several countries in Europe (including the United Kingdom) have passed laws requiring pension funds to disclose ESG related policy and information.

More recently, in 2010, the Dodd-Frank Financial Reform Law allows shareholders to hold an advisory vote on executive compensation packages. The law further stipulates that public companies must provide disclosure around pay disparity, payments made to foreign governments, mine safety and other ESG related issues.

Beyond regulatory bodies, other organizations have formed that advocate SRI principles. The Carbon Disclosure Project (CDP) was established in the United Kingdom in 2000. They work alongside 3000 companies (and on behalf of 600 institutional investors) to measure, disclose and reduce their carbon footprint. Such data is made available to institutional investors and policy makers.<sup>1</sup>

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## ESG investing is advancing

Like most quantitative and fundamental strategies, the ESG investment approach has evolved over time. Initially, ESG strategies involved excluding companies that belonged to a particular industry or sector from an investable universe. For example, Green Funds may exclude oil and mining companies from their investable universe. Similarly, Faith-based funds may exclude companies that sell pork products or companies associated with abortion practices.

Over time, ESG strategies evolved into more inclusion based screening. This means that investment managers would seek out companies that rated well based on ESG criteria. For example, funds investing in nuclear energy may seek out companies that exemplify strong governance, safety, operational, and environmental principles. This is of course accompanied alongside rigorous financial analysis. More recently, more sophisticated and systematic investors are attempting to use ESG datasets to potentially uncover hidden alpha.

Another growing and popular trend within the ESG investment community is shareholder activism and resolution. Many faith-based investment funds, labor funds and endowments engage in discussions with portfolio companies on ESG related initiatives. Proposals by shareholders can be submitted for a vote at the company's annual meeting. Typically, shareholders submit resolutions regarding governance, social responsibility or executive compensation. Shareholder resolutions allow investment managers to willfully engages and influence companies ESG policy. One of the most famous shareholder resolution cases was with Dow Chemical in 1972 to protest the use of napalm, a petroleum jelly used in warfare.

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<sup>1</sup> See US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States



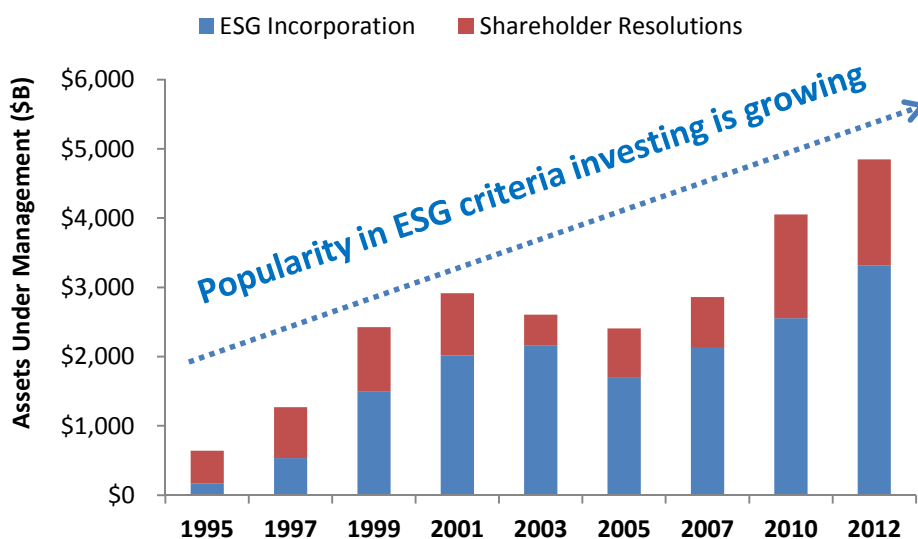
# The Latest Trends and Styles

## Major trends in ESG investments

As some of our readers may be unfamiliar with the entirety of the SRI industry, here we temporarily diverge from traditional quantitative analysis and look to analyze the broader SRI landscape. "Today, more than one out of every nine dollars under professional management in the United States is invested according to strategies of sustainable and responsible investing".<sup>2</sup> Assets tied to ESG strategies represent a large and significant portion of the total investable AUM, and therefore, may be important for investment managers to explore ESG investment strategies. In this section, we explore the current trends within the ESG investment community. This will allow investors to better gauge the potential growth prospects and opportunities within ESG investment strategies.

Figure 2 shows the amount of AUM tied to some form of ESG investment strategy. As shown, AUM affiliated with ESG strategies has experienced accelerated growth since the mid 1990s. In 2012, approximately \$3.3 trillion and \$1.5 trillion of AUM was tied to ESG incorporation and Shareholder resolution respectively, in the US. After eliminating double counting due to assets involved in both strategies, AUM affiliated with ESG strategies still represents approximately \$3.7 trillion. This is approximately 11% of the \$33.3 trillion of AUM tracked by Thomson Reuters Nelson, a provider of detailed information on investment management firms. Undoubtedly, AUM tied to ESG strategies reflects a significant portion of the total available investable AUM.<sup>3</sup>

Figure 2: AUM tied to some form of ESG criteria investing in the United States



Source: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States

<sup>2</sup> US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States

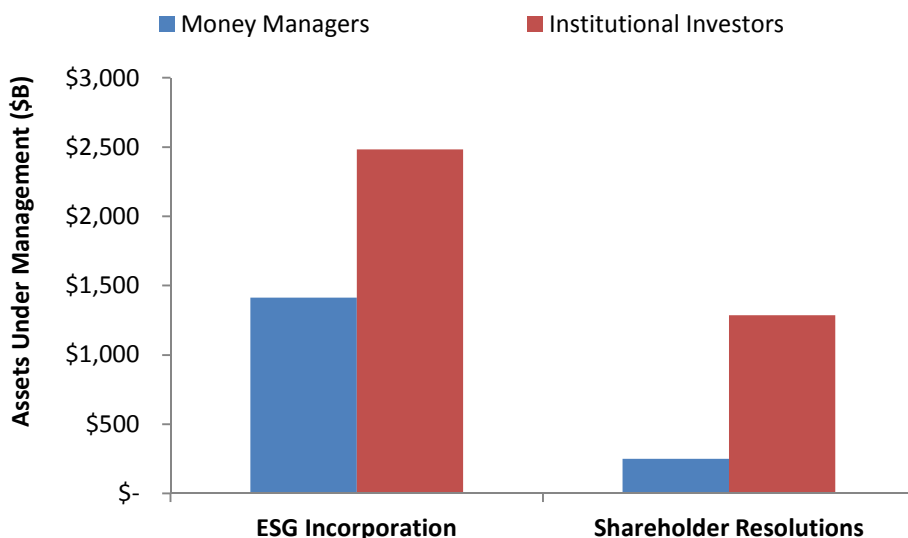
<sup>3</sup> More information on ESG trends can be found in: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States





Figure 3 shows the AUM associated with ESG strategies by investor type (i.e. money managers versus institutional investors). As shown in the figure, the bulk of ESG assets are managed by institutional investors.

Figure 3: AUM distribution for ESG investing for 2012 in the United States by investor type



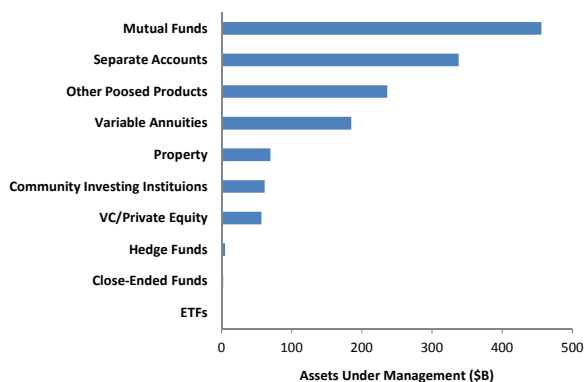
Source: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States

Our research into the arena of ESG investments has exposed us to several different types of investment vehicles. ESG strategies can be implemented through traditional investment vehicles such as mutual funds, hedge funds, annuities, venture capital funds, etc. In addition, such strategies can be implemented using less conventional investment vehicles such as faith-based funds, philanthropic funds, angel funds, community investing institutions, microfinance and emerging depository institutions. Figure 4 shows the AUM associated to ESG by investment vehicle. In the US, mutual funds are the predominant investment vehicle for implementing ESG strategies by money managers.

Our readers often ask us the reasons investors choose to invest in ESG-based strategies. Figure 5 shows the results of a survey conducted by the US SIF foundation on the reasons Money Managers choose to incorporate ESG investment strategies. Interestingly, client demand, values, and social benefit ranked among the top three reasons whereas investment returns ranked among the bottom three reasons.

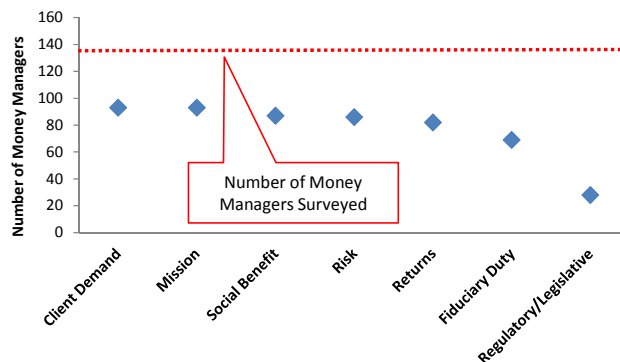


Figure 4: AUM by investment vehicles utilizing ESG criteria by Money Managers in the US for 2012



Source: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States

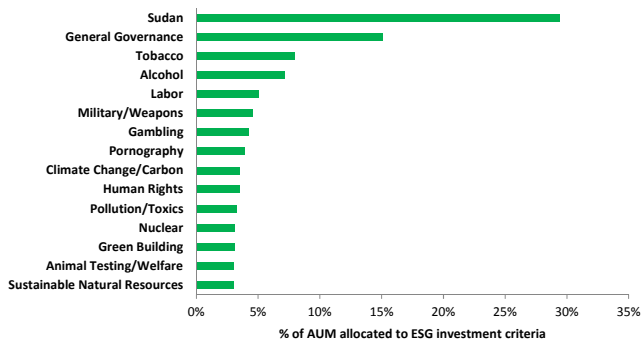
Figure 5: Reasons cited by Money Managers in the US for incorporating ESG criteria (survey results)



Source: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States

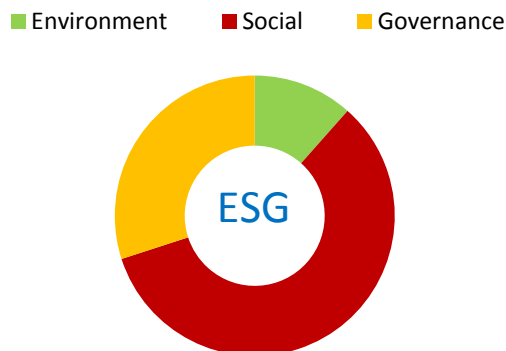
Figure 6 shows the percentage of AUM allocated to ESG investment criteria for money managers. Interestingly, the top ESG criteria include Sudan, corporate governance, tobacco, alcohol, and labor policies. Lastly, Figure 7 shows the allocation of AUM to three ESG pillars: Environmental, Social, and Governance. As shown in the figure, most of the AUM with ESG investments is dedicated towards social screening. Environment screening encapsulates the smallest portion of ESG AUM investment.

Figure 6: Percentage of AUM allocated to ESG investment criteria in the US



Source: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States

Figure 7: Percentage of AUM allocated to ESG buckets



Source: US SIF Foundation: 2012 Report on Sustainable and Responsible Investing Trends in the United States

## The ongoing ESG debate

The ultimate question that we want to address in this report is whether it's worthwhile for investors to pursue ESG compliant investment strategies. This is somewhat of a broad question. ESG investment strategies can be viewed from many lenses.

Firstly, from the viewpoint of a "purist" investor, one would argue that there lies a conflict of interest for companies between maximizing shareholder value and ESG prudence. The sole objective of a public company is to grow shareholder value rather than dedicate resources to other externalities irrespective of its potential worldly impact. And the costs allocated to ESG based process improvements outweigh any benefits. In addition, limiting an investment universe to ESG compliant companies may also limit an investor's breadth of investment choices and alpha opportunities.



An opposing viewpoint would argue that ESG prudence by companies can reduce their overall risk exposure and thereby increase shareholder value by mitigating large drawdowns. Furthermore, ESG investors can directly impact company specific behavior towards ESG awareness and accountability thereby improving long-term economic conditions.

As quants, we take on a more pragmatic viewpoint. The ESG dataset contains an overwhelming number of unique data points that are typically not previewed at by traditional investors. Does the ESG dataset contain any untapped sources of alpha? Or have these measures already been incorporated into a company's financial statements through quality and risk metrics? This report seeks to address these questions.

We must also keep in mind that the threshold level to assess the performance of ESG strategies may be different from that of traditional quantitative strategies. It may be somewhat unrealistic to expect superior performance while investing in socially minded companies. This would seem too altruistic. However, if performance results between ESG strategies are "in line" with other investment strategies, then ESG strategies may be a viable investment opportunity to explore. In this publication, we hope to address many of these questions and discuss many of the viewpoints from this hotly debated topic.

## A topical SRI literature review

Before proceeding further with the analysis of the ESG dataset, we want to briefly summarize the academic literature on SRI. As we progressed with this research, we had the opportunity to review and analyze numerous academic journals and articles on SRI. Here we wanted to highlight a few interesting academic articles that we came across (Figure 8). By no means is this a complete and comprehensive list of SRI research topics and academic studies.

Figure 8: Literature review

Paper Title	Author(s)	Key Excerpts and Findings
The Impact of Corporate Social Responsibility on Firm Value: The Role of Customer Awareness	Servaes H. and Tamayo A. [2012]	This paper shows that corporate social responsibility (CSR) and firm value are positively related for firms with high customer awareness, as proxied by advertising expenditures. For firms with low customer awareness, the relation is either negative or insignificant. In addition, we find that the effect of awareness on the value-CSR relation is reversed for firms with a poor prior reputation as corporate citizens.
Is There a Cost to Being Socially Responsible In Investing	Guerard J. B. [1996]	Should an investor expect different returns in socially-screened and unscreened universes? Should a composite model combining traditional value factors with a consensus growth variable produce different returns for socially-screened and unscreened portfolios? We find that returns in socially-screened and unscreened universes do not differ significantly. We also find that a composite model using value and growth variables produces an expected return ranking list that generates equivalent excess returns in socially-screened and unscreened portfolios.
Active Ownership	Dimson E., Karakas O. and Li X. [2013]	We analyze an extensive proprietary database of corporate social responsibility engagements with US public companies over 1999–2009. Engagements address environmental, social, and governance concerns. They are followed by a one-year abnormal return that averages +1.8%, comprising +4.4% for successful and zero for unsuccessful engagements. We document outperformance following environmental/social, as well as governance, engagements.
Does corporate social responsibility affect the cost of capital?	El Ghouli S., Guedhami O., C.Y. Kwokb C. and R. Mishra D. [2011].	We examine the effect of corporate social responsibility (CSR) on the cost of equity capital for a large sample of U.S. firms. Using several approaches to estimate firms' ex ante cost of equity, we find that firms with better CSR scores exhibit cheaper equity financing. In particular, our findings suggest that investment in improving responsible employee relations, environmental policies, and product strategies contributes substantially to reducing firms' cost of equity.
Monitoring the Monitor: Evaluating CalPERS' Activism	Barber B. [2006]	Many public pension funds engage in institutional activism. These funds use the power of their pooled ownership of publicly traded stocks to affect changes in the corporations they own. I review the theory and empirical evidence underlying the motivation for institutional activism. In general, I argue that institutional activism should be limited shareholder activism where there is strong theoretical and empirical evidence indicating the proposed reforms will increase shareholder value.

Source: Deutsche Bank



Figure 8: Literature review (Cont'd)

Corporate Environmental Management and Credit Risk	Bauer R. and Hann D. [2010].	This study analyzes environmental management and its implications for bond investors. Poor environmental practices influence the credit standing of borrowing firms through the legal, reputational, and regulatory risks associated with environmental incidents. Our findings suggest that firms with environmental concerns pay a premium on their cost of debt financing and are assigned lower credit ratings. In contrast, firms with proactive environmental engagement benefit from a lower cost of debt financing. The results are robust to numerous controls for company and bond specific characteristics, alternative model specifications, and industry membership.
The Economics and Politics of Corporate Social Performance	Baron D. P., Harjoto M. A. and Jo H. [2009]	This paper estimates a three-equation structural model based on a theory that relates corporate financial performance (CFP), corporate social performance (CSP), and social pressure. CFP is found to be independent of CSP and decreasing in social pressure, and CSP is independent of CFP and increasing in social pressure. Social pressure is increasing in CSP and decreasing in CFP, which is consistent with social pressure being directed to soft targets.
Does the Stock Market Fully Value Intangibles? Employee Satisfaction and Equity Prices	Edmans A. [2010]	This paper analyzes the relationship between employee satisfaction and long-run stock returns. A value-weighted portfolio of the "100 Best Companies to Work For in America" earned an annual four-factor alpha of 3.5% from 1984-2009, and 2.1% above industry benchmarks. The results are robust to controls for firm characteristics, different weighting methodologies and the removal of outliers. The Best Companies also exhibited significantly more positive earnings surprises and announcement returns.
The Economic Value of Corporate Eco-Efficiency	Guenster N., Derwall J., Bauer R. and Koedijk K. [2006]	This study adds new insights to the long-running corporate environmental-financial performance debate by focusing on the concept of eco-efficiency. Using a new database of eco-efficiency ratings, we analyze the relation between eco-efficiency and financial performance from 1997 to 2004. We report that eco-efficiency relates positively to operating performance and market value. Moreover, our results suggest that the market's valuation of environmental performance has been time variant, which may indicate that the market incorporates environmental information with a drift.
International Evidence on Ethical Mutual Fund Performance and Investment Style	Bauer R., Koedijk K. and Otten R. [2002]	Using an international database containing 103 German, UK and US ethical mutual funds we review and extend previous research on ethical mutual fund performance. By applying a multi-factor Carhart (1997) model we solve the benchmark problem most prior ethical studies suffered from. After controlling for investment style, we find little evidence of significant differences in risk-adjusted returns between ethical and conventional funds for the 1990-2001 period.
Do Corporate Global Environmental Standards Create or Destroy Market Value?"	Dowell G., Hart S., and Yeung B. [2001]	This paper refutes the idea that adoption of global environmental standards by multinational enterprises constitutes a liability that depresses market value. On the contrary, the evidence from our analysis indicates that positive market valuation is associated with the adoption of a single stringent environmental standard around the world.
The Effect of Socially Activist Investment Policies on the Financial Markets: Evidence from South African Boycott	Hong Teoh S., Welch I. and Wazzan C. P. [1995]	This paper studies the effect of the most important legislative and shareholder boycott to date, the boycott of South Africa's Apartheid regime. We find that corporate involvement with South Africa was so small that the announcement of legislative/shareholder pressure of voluntary divestment from South Africa had little discernible effect either on valuation of banks, and corporations with South African operations or on the South African financial markets

Source: Deutsche Bank



# The ESG Dataset Symposium

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## Understanding the underlying ESG scoring process is critical

There are several vendors that provide ESG data. Although there are some commonalities in the collection and rating process of ESG data, each vendor typically employs a somewhat different methodology and framework. As a result, ESG ratings and findings can differ depending on the selected vendor. An ESG vendor's ability to tap into unique ESG data sources or informational sets may be a competitive advantage. As such, it is critical that investment managers understand the process by which a vendor gathers and rates companies based on ESG metrics. In this section, we conduct an in-depth analysis on how MSCI ESG Research collects, constructs and rates companies based on ESG data.<sup>4</sup>

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## How are companies rated?

MSCI ESG scores are designed to assist investment managers with the screening and analysis of companies based on sustainability factors as opposed to conventional financial metrics. MSCI ESG scores attempt to gauge a company's impact on environmental, social, and governance pillars. MSCI provides overall ESG industry adjusted scores for companies that are predominantly apart of the MSCI World Index with data commencing from 1999 onwards. In addition, MSCI provides more granular scores and weights for each sustainability pillar: Environmental, Social, and Governance.

Figure 9 shows a snapshot of the MSCI ESG score for 3M Company. MSCI provides an overall ESG numeric and letter score. The overall score is based on a scale of 0 (i.e. CCC) to 10 (i.e. AAA) where the highest ranked companies receive a rating of 10 and lowest ranked companies receive a rating of 0. The overall score is industry adjusted and compares how well a company ranks among its industry peers in terms of ESG criteria. The overall ESG score is derived from the underlying ESG pillars (i.e. Environmental, Social, and Governance). Each underlying ESG pillar is given a score and a weight.

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<sup>4</sup> More detailed information on the MSCI ESG methodology can be found in: Intangible Value Assessment (IVA) Methodology, November 2012



Figure 9: MSCI ESG rating for 3M Company as of September 25 2012

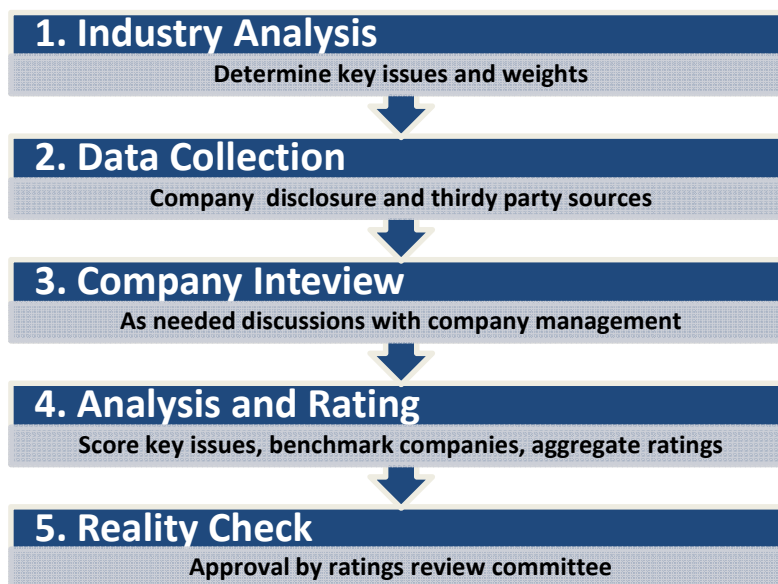
<b>Company Information</b>	<b>Latest Company ISIN:</b>	<b>US88579Y1010</b>
	<b>Company Ticker:</b>	<b>MMM</b>
	<b>Company Name:</b>	<b>3M Company</b>
	<b>Company Industry:</b>	<b>Industrial Conglomerates</b>
	<b>Rating Date:</b>	<b>September 25th, 2012</b>
<b>Overall Score</b>	<b>Letter Rating</b>	<b>AAA</b>
	<b>Final Industry Adjusted Score</b>	<b>9.8</b>
<b>E</b>	<b>Environmental Pillar Score</b>	<b>8.2</b>
	<b>Environmental Pillar Weight</b>	<b>59.8%</b>
<b>S</b>	<b>Social Pillar Score</b>	<b>2.4</b>
	<b>Social Pillar Weight</b>	<b>17.6%</b>
<b>G</b>	<b>Governance Pillar Score</b>	<b>8.7</b>
	<b>Governance Pillar Weight</b>	<b>22.6%</b>

Source: MSCI Research

ESG scores are typically provided on a yearly basis when all companies in an industry are reviewed. However, on an exceptional basis, a company's rating may be reviewed and updated between annual updates. Such a mid-cycle review can be precipitated based on several reasons including a severe financial impact faced by a company due to an extraordinary ESG event.

MSCI has a rigorous five-step methodological framework through which they construct a company's overall ESG scores. Figure 10 shows a summary of the major steps in the MSCI ESG rating process. We take a closer look at each step next.

Figure 10: MSCI Research Framework



Source: MSCI Research

## The five step process

### Step 1: Identifying Industry Key Issues

In the initial phase, MSCI research analysts and sector experts conduct a comprehensive analysis of each industry to identify "key ESG issues". Up to five key issues are selected that have a material impact for companies in an industry. Key issues



are identified on the basis of generating a significant ESG impact and posing potential future risk to companies. As such, key issues are identified within an industry and classified under the three ESG pillars: Environmental, Social, and Governance. For example, under the Governance pillar, a key issue for the financial industry is unsurprisingly: Financial System Instability. Figure 11 shows the underlying assessment criteria used to derive the Financial System Instability key issue. The underlying assessment criteria include for example: the cost to taxpayers to shore up the financial system and the level of systemic importance or “too big to fail” status based on size and interconnectedness.

Figure 11: Key Issues under Governance pillar for Financials	
<b>Pillar:</b>	Governance
<b>Industry Group:</b>	Financials
<b>Key Issues:</b>	Financial System Instability
<b>Underlying Criteria:</b>	• Cost to taxpayers to shore up financial system
	• Economic losses to society due to financial instability through loss of savings, loss of equity, and limited liquidity
	• Bankruptcy or forced merger/acquisition
	• Level of systemic importance or "too big to fail" status based on size, interconnectedness etc..
	• Controversies, bribery, fraud and governance structure

Source: MSCI Research

The identification of key issues faced by companies in a particular industry forms the foundation of the ESG scoring framework. The finalized set of key issues must be approved by MSCI sector leads and the Ratings Review Committee.

## Step 2: Company Data Collection

Once the key issues have been identified for an industry, ESG analysts scour several sources of information to measure the exposure of a particular company to their key industry issues. Company specific information is gathered from a multitude of sources including:

- **Corporate Documents:** This includes annual reports, security filings, environmental and social reports etc.
- **Government Data:** This encompasses central bank data, US Toxic Release Inventory data, Comprehensive Environmental Response and Liability Information System (CERCLIS), RCRA Hazardous Waste Data Management system etc.
- **Trade and Academic Journals:** This would entail organizational websites, subscriptions, academic archives, online database such as Factiva or Nexis
- **Relevant Organizations and Professionals:** This includes reports and interviews with trade groups, industry experts, and organizations familiar with company specific operations.





Figure 12 shows some examples of the data sources used to obtain company specific exposures to the key industry issues identified in the previous step. The underlying data sources span a wide spectrum of information archives including sources such as: US Food and Drug Administration (FDA), Greenpeace Greener reports, World Health Organization (WHO), World Wildlife Fund, International Monetary Fund etc. Understandably, access to a breadth of abundant and specialized data sources can likely be a key differentiator among ESG data providers. Could these data sources contain any hidden, untapped alpha? We will address this in subsequent sections.

Figure 12: Examples of data sources for company exposure to key issues

Environmental	Social	Governance
Carbon Disclosure Project Environmental regulatory agencies (EPA, EEA) Comprehensive Environmental Data Archive (CEDA) Eurostat - Air Emissions Accounts by Activity Textile Exchanges Sustainable Apparel Coalition US Energy Information Agency Center for International Earth Science Information Network (CIESEN) National Oceanic and Atmospheric Administration (NOAA) Center for Research on the Epidemiology of Disasters (CRED) Yale and Columbia, Water Scarcity and Water Stress Indexes UN Statistics Division, UNEP, and UNESCO World Wildlife Fund Rainforest Alliance US Consensus Bureau US EPA Toxic Release Inventory (TRI) NGOs Greenpeace's Greener Electronics reports	US Bureau of Labor Statistics World Health Organization (WHO) International Labour Organizations US Occupational Safety & Health Administration Interbrand's Top 100 Global Brands Declaration of Fundamental Principles and Rights at Work US Food and Drug Administration (FDA) International Chemical Secretariat (ChemSec) International Monetary Fund Verizon data breach investigations report World Bank Socioeconomic Data and Applications Center Global Footprint Network Transparency International United Nations Principle for Responsible Investing Nutrition Business Journal Consultative Group to Assist the Poor European Medicines Agency (EMA)	Transparency International Corruption Perception Index (CPI) Transparency International: Bribe Payer Index (BPI) World Bank Metrics: Voice and Accountability Political Stability and Absence of Violence/Terrorism Government Effectiveness Regulatory Quality Rule of Law Control of Corruption Moody's S&P Fitch ISS Governance Risk Indicators (GRiD) SNL Financial MSCI ESG Impact Monitor Institutional Shareholder Service Company disclosure News searches

Source: MSCI Research

### Step 3: Company interviews

In certain instances, MSCI analysts are unable to collect the necessary data for a particular company in order to render an ESG score. In this situation, MSCI analyst may meet and interview company management to obtain the missing information. In order to maintain the integrity and objectivity of the ESG ratings, company interviews are typically done on an exceptional basis and only when data is missing that is pertinent to rendering a rating score.

### Step 4: Analysis and Rating

Once the company specific data is collected from the various data sources, analysts score each company on a scale from 0 (worst-in-class) to 10 (best-in-class). Company scores are then adjusted by their industries. This is achieved by normalizing company scores such that the highest scored company in a particular industry is given a rating of 10 and the lowest scored company in a particular industry is given a rating of 0. All other companies in an industry are then scaled accordingly. Additionally company scores are mapped to a letter rating scale using scale outlined in Figure 13. At this point in the rating process, all companies have an overall industry adjusted score, individual ESG pillar scores, and individual ESG pillar weights.



Figure 13: MSCI ESG scale converter

Letter Rating	Industry Adjusted Company Score
AAA	8.6 - 10
AA	7.1 - 8.6
A	5.7 - 7.1
BBB	4.3 - 5.7
BB	2.9 - 4.3
B	1.4 - 2.9
CCC	0.0 - 1.4

Source: MSCI ESG Research

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## Step 5: Reality Check

Next, the ESG Ratings Review Committee (RRC) will review the underlying key issues, the ESG pillar weights, the ESG pillar scores, and the overall industry adjusted rating. The RRC scrutinizes each company rating and they pay particular attention to companies rated as best and worst in class within their associated industry. This is a fairly intensive step in the process where, in fact, analysts must defend their ratings to the RRC. The RRC has the authority to override ratings in certain circumstances. For instance, companies that receive a “red flag” in the MSCI Impact Monitor or is the ISS Governance Risk Indicators which are two underlying data sources for company information, typically cannot be granted ‘AAA’ rating. In such case the company rating may be changed to ‘AA’.

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## Ongoing monitoring

ESG ratings are typically reviewed and updated on an annual basis. However, in certain exceptional circumstances, ESG scores may be reviewed midway through the rating cycle. A mid cycle rating review can be precipitated based on an extraordinary ESG event (e.g. the earthquake in Japan in March 2011) or if a company is downgraded to a “red flag” in ESG Impact Monitor. Any interim ratings updates must be approved by the RRC. Next, we take a closer look at the underlying ESG dataset.

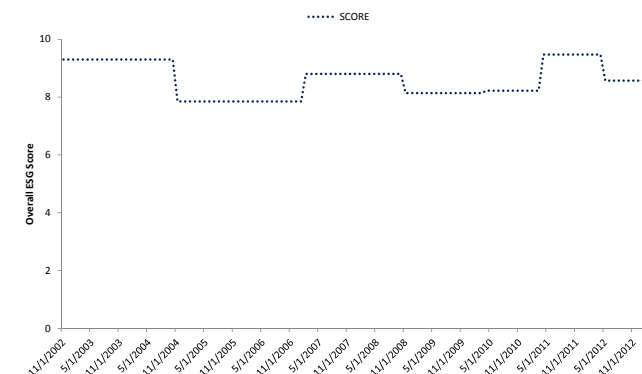


# An Exposition into ESG

## A snapshot of the dataset

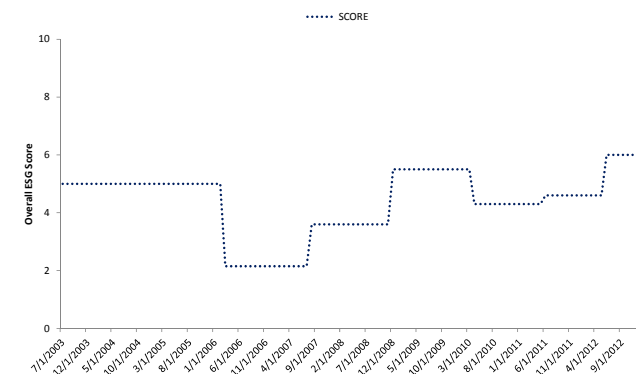
Some of our readers may be unfamiliar with ESG datasets. As such, to better familiarize our readers, in this section we perform an in-depth analysis into the ESG dataset. For this research, we prefer to take a more elaborate and thorough approach to understanding the ESG dataset. Before delving into the entirety of the ESG dataset, it may be helpful to review a few company specific examples. Figure 14 and Figure 15 below shows the overall ESG score for IBM and FIAT respectively. Recall that companies are assigned an overall ESG score between 0 and 10. As shown in the figure, IBM boasts a strong ESG rating. In addition to the overall score, each company is also assigned an ESG pillar score (between 0 and 10) and weight (between 0% and 100%).

Figure 14: IBM overall ESG score



Source: Deutsche Bank

Figure 15: FIAT overall ESG score

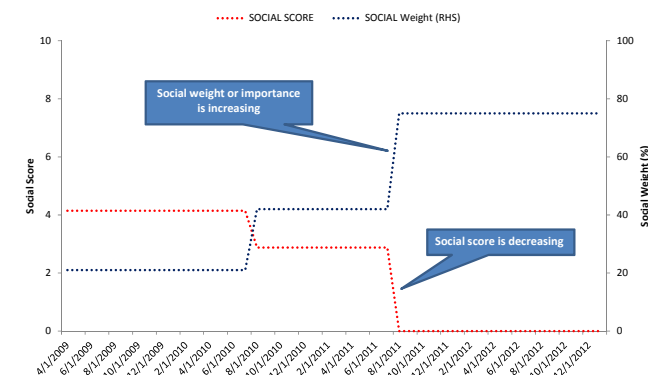


Source: Deutsche Bank

Figure 16 shows the time series social score and weight for Phillip Morris. Although, the social weight or importance has been increasing for Phillip Morris, this is underpinned by a steadily declining social score. Lastly, we look at the environmental pillar rating of Exxon Mobil (Figure 17). The environmental score for Exxon Mobil has been steady to slightly rising. Similarly, the environment weight or importance for Exxon Mobil has also been on the rise.

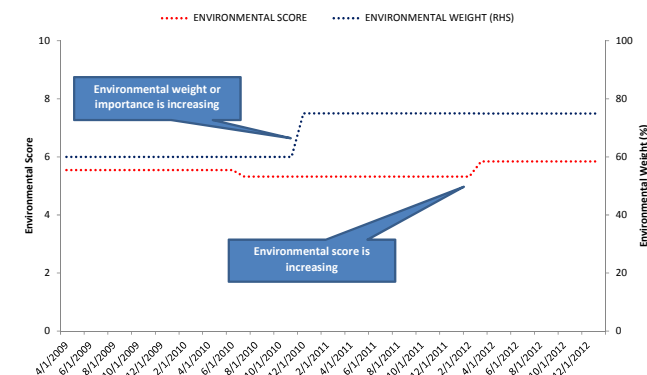


Figure 16: Phillip Morris Social score and weight



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 17: Exxon Mobil Environmental score and weight

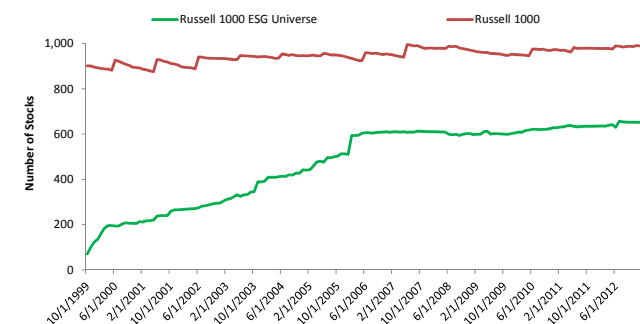


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

## The ESG coverage is expansionary

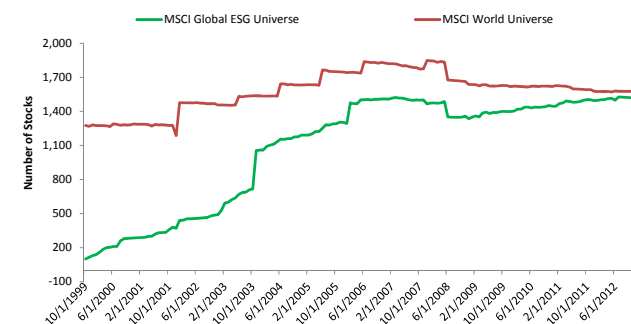
As previously stated, the ESG data used in this study is sourced from MSCI ESG Research. The first step when exploring a new dataset is to review and compare the coverage. Figure 18 and Figure 19 show the time series coverage of the ESG universe for the US and Global markets. This represents the coverage of the overall ESG score and letter rating. The coverage is fairly reasonable when compared to the Russell 1000 and MSCI Global index constituents. For the US market, the ESG universe grows from approximately 200 stocks in 2001 to over 650 stocks currently. Additionally, the coverage of the global ESG universe closely aligns with the MSCI Global universe in more recent years.

Figure 18: Coverage of ESG Universe in the United States



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 19: Coverage of ESG Universe Globally

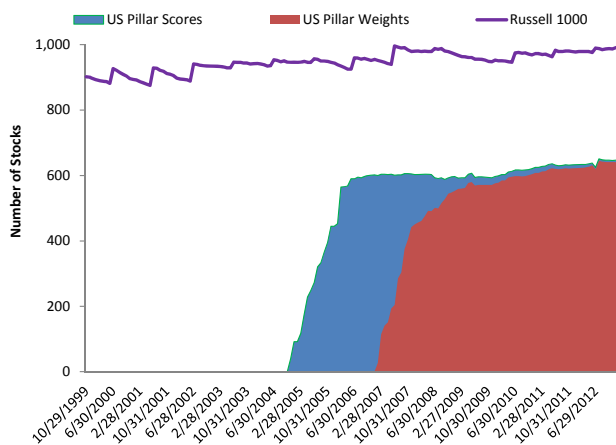


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

The coverage for the individual ESG pillar scores and weights (Figure 20 and Figure 21) commences in 2004 and 2007 respectively, for both the US and Global universes. The overall letter and rating scores, individual pillar scores, and pillar weights are all available collectively from 2007 onwards.

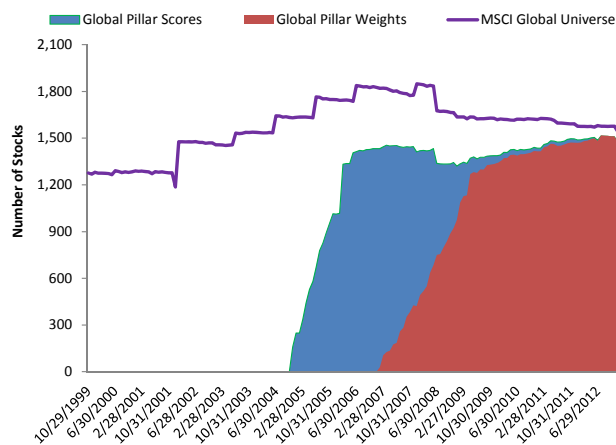


Figure 20: Coverage of US ESG pillar scores & weights



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

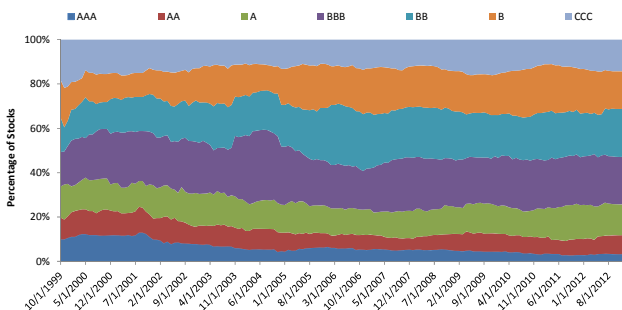
Figure 21: Coverage of Global ESG pillar scores & weights



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

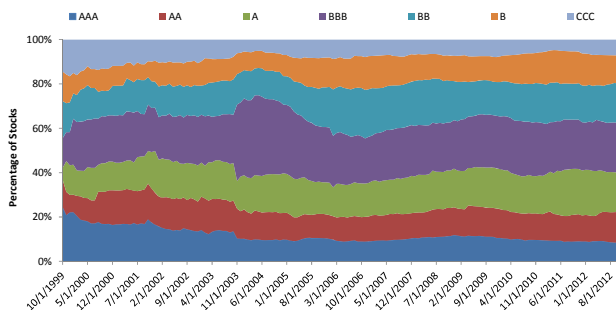
Digging deeper into the dataset, Figure 22 and Figure 23 show the time series distribution of the ESG letter ratings for the US and Global universe. Essentially, these figures depict the number of stocks in each letter rating on a time series basis. Peering closely at both figures, we notice a slight difference between the US and Global ratings distribution. At first glance, for the US universe, there appears to be more CCC companies than AAA companies. This imbalance does not exist for the Global universe.

Figure 22: Time series ratings distribution of ESG US



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 23: Time series ratings distribution of ESG Global

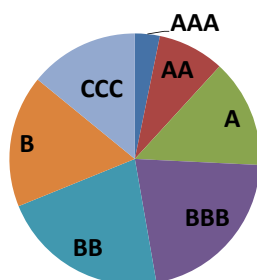


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

This distinction becomes more apparent if we look at a snapshot of the ratings distribution at a single point in time. Figure 24 and Figure 25 show a snapshot of the ratings distribution as of January 31, 2013. We can clearly see that for the US universe, there is disproportionate number of CCC rated stocks when compared against the Global universe. This is not limited to just one point in time.

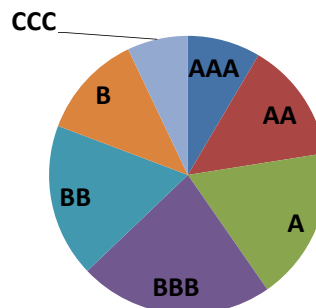


Figure 24: US ratings coverage on January 31, 2013



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

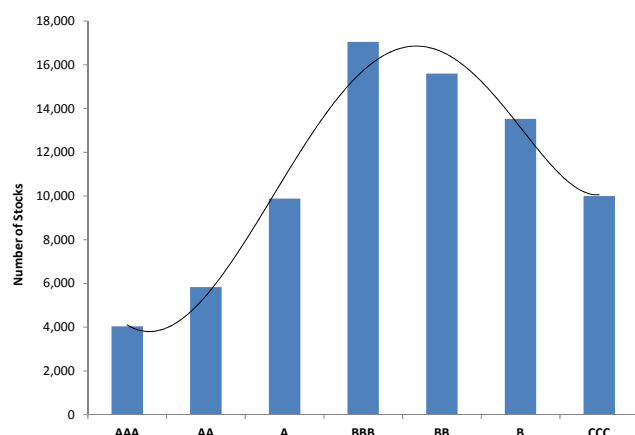
Figure 25: Global ratings coverage on January 31, 2013



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

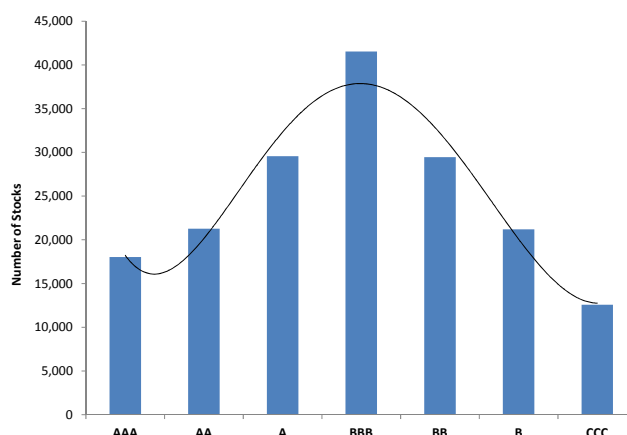
Figure 26 and Figure 27 show a histogram of letter ratings distribution from 1999 to 2013. Here we see that the US universe is skewed towards lower ESG rated companies when compared to the Global universe. This is an intriguing finding as it implies regional effects in ESG ratings.

Figure 26: US ratings distribution over entire history



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 27: Global ratings distribution over entire history



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Academic articles and forums suggest that the presence of ESG practices and principles is more prolific with European and Japanese companies. For example, recent research by Allianz Global Investors suggest that “Generally speaking, the new SRI approach, sometimes referred to as sustainability investing, seems to be more common in Europe than in the United States, where greater emphasis is put on the social purpose of SRI and personal values. Whereas the main SRI actors in the United States are retail investors and exclusionary screens are popular, the focus in Europe is on financial objectives and the main actors are institutional investors that promote quantitative measurements.”<sup>5</sup> Moreover, “The level of corporate disclosure of environmental practices is higher for European countries, in general, and for France and Germany, in particular. Countries in North America have the lowest ratings on

<sup>5</sup> “Doing Good by Investing Well? Pension Funds and Socially Responsible Investment: Results of an Expert Survey”, Allianz Global Investors International Pension Papers No. 1|2010. January 15, 2010



environmental measures, implying lower disclosure and/or lower adherence to environmental standards.”<sup>6</sup>

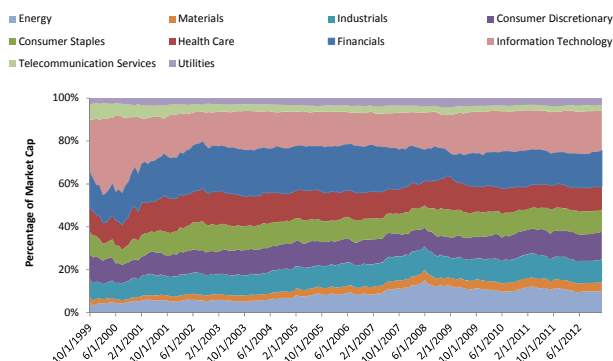
These finding also holds merit on an intuitive basis. Japanese auto and technology manufacturing tends to be associated with high quality, long lasting, and technically modern and mainstream. The principles of ISO 9000, Six Sigma, Total Quality Management (TQM), lean manufacturing tend to be associated with Japanese production systems. Additionally, European cars tend to be associated with high quality, sturdiness and ergonomically built. This may help explain the distinction in the distribution of ratings between the US and Global universe. At this stage, we merely point out this natural regional effect. As an aside, regional or country exposures can be dealt with during the factor or portfolio construction phase. We discuss this in more detail in subsequent sections.

## Some colour on ESG sectors

Building upon our previous analysis, here we look for any sector associated effects within our ESG dataset. This is important because in general ESG datasets tend to have strong industry tilts. For example, tobacco companies tend to be viewed and judged differently than solar companies. The MSCI ESG dataset is industry adjusted to take into account these aspects. However, here we look at the data from a sector perspective.

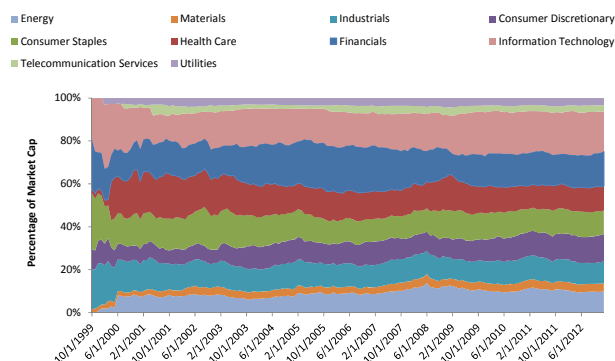
We start off by comparing the sector weights in our ESG universe against the Russell 1000 universe (Figure 28 and Figure 29). The ESG dataset seems to be fairly representative and comparable to the Russell 1000 universe from a sector perspective.

Figure 28: Sector weights in the Russell 1000



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 29: Sector weights in the US ESG universe



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

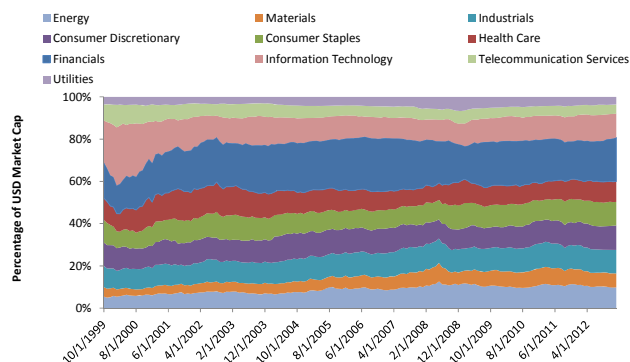
Running the same analysis on the Global ESG universe yields similar results. Albeit there are understandably some patchy differences in earlier periods as the ESG dataset expanded and evolved.

<sup>6</sup> Kamath R., “ESG Practices Across Developed Markets”, Thomson Reuters Research, August 17, 2010



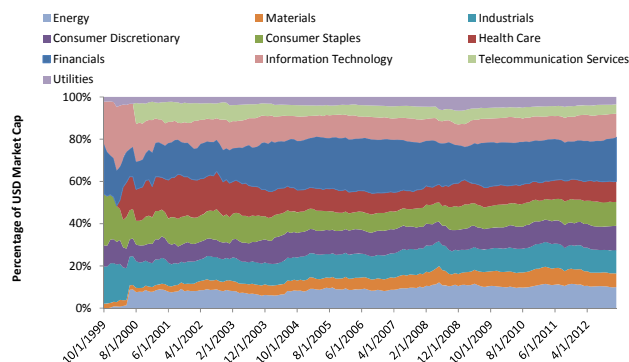


Figure 30: Sector weights in the MSCI Global



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

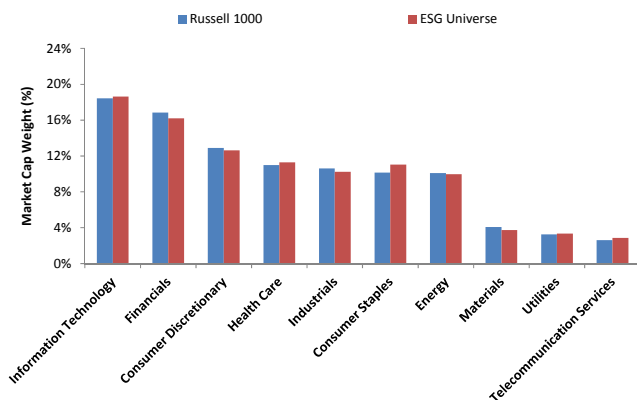
Figure 31: Sector weights in the Global ESG universe



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

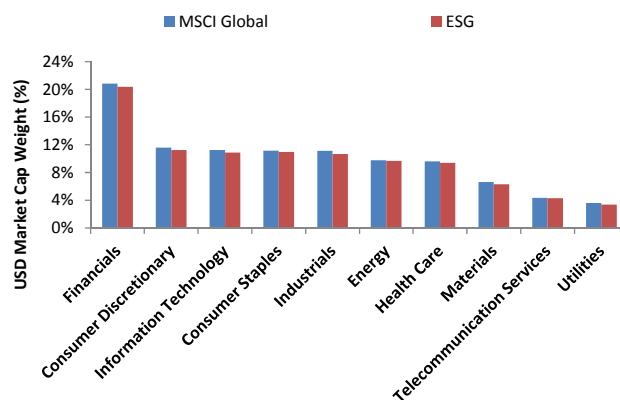
However, in recent periods, there are no apparent sector biases. This can be seen by observing the sector weights at one point in time. Figure 32 and Figure 33 show the sector weights for the US and Global ESG universes compared to the Russell 1000 and MSCI Global index as of January 31, 2013. The ESG sectors are fairly balanced with their counterpart indices. This is in fact a good finding as it suggests that the ESG universe is not taking on any unintended sector positions.

Figure 32: US sector weights on January 31, 2012



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 33: Global sector weights on January 31, 2012

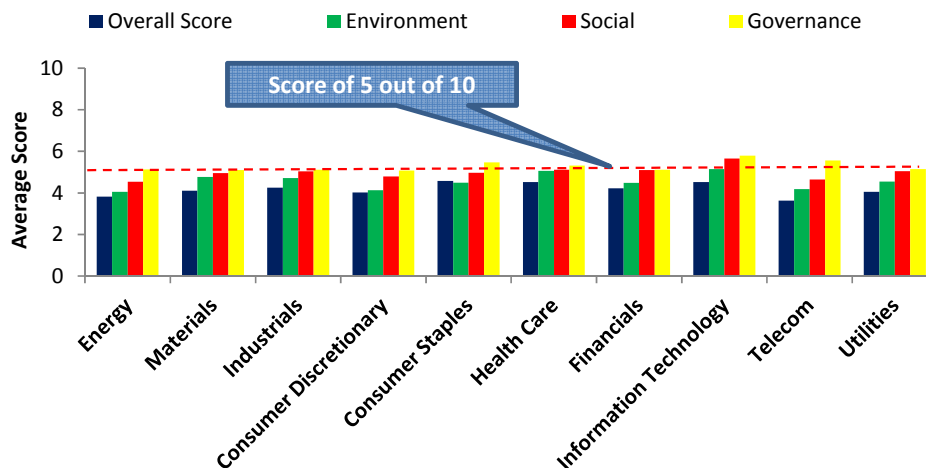


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

After examining the ESG universe for any sector effects, we look for sector tilts in the overall ESG score. Recall that the overall ESG scores range on a scale from 0 to 10 and are normalized at the industry level. Figure 34 shows the average rating of each ESG metric for each sector within the US universe. Again, the scores are on average neutral from a sector perspective. In fact, no one sector dominates.



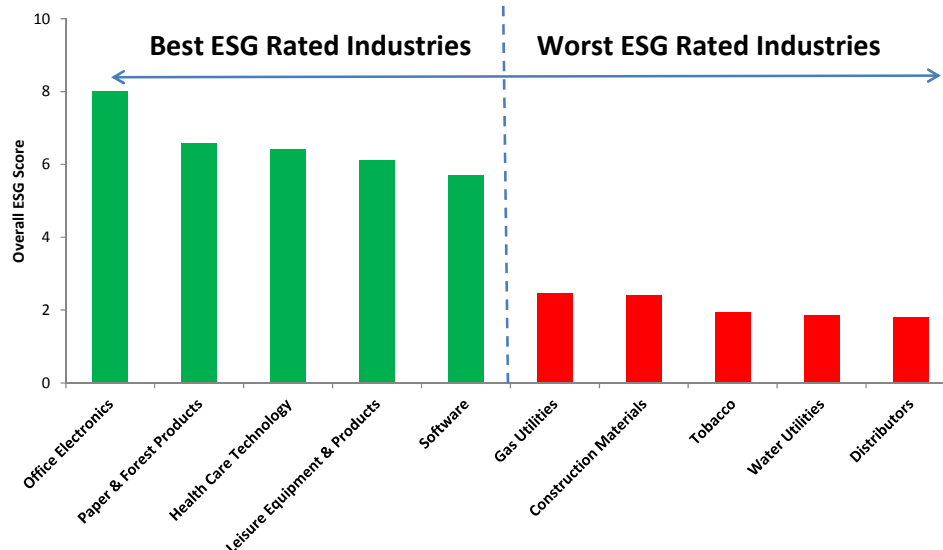
Figure 34: Average score for each ESG pillar by sector for US universe



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Lastly, it's interesting to note what specific industries are on average ranked the highest and lowest. Figure 35 shows the best and worst ranked industries as measured by the overall ESG score within the US universe. Not surprisingly, the Utilities and Tobacco industries tend to have poor ESG scores. Utilities tend to utilize coal, natural gas, oil or nuclear energy to power steam turbines and thus this causes their environmental practices to come under more scrutiny. On the other end of the spectrum, software and technology companies in general had the highest ESG scores. Technology companies tend to have minimal negative environmental impact and carbon footprint. In general, technology companies build automated systems promoting efficiency and reliability for various other industries.

Figure 35: Best and worst ranked industries by overall ESG score for US universe



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

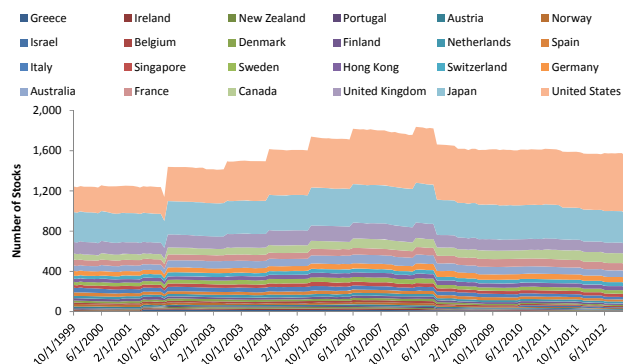
## Country coverage

Here we look for any specific country associated effects within our ESG dataset. This again is important because as we saw in the previous section, the ESG dataset can take on some natural regional effects. We start off by comparing the country coverage in our



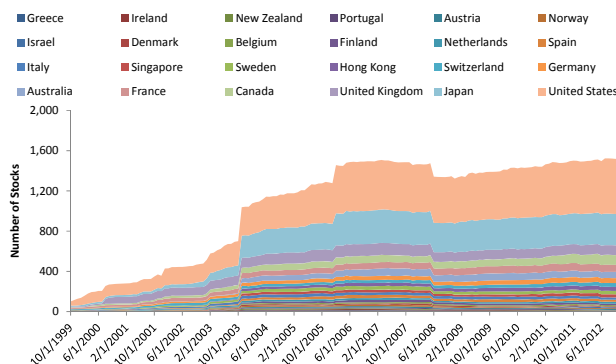
ESG universe against the MSCI World index (Figure 36 and Figure 37). The ESG dataset seems to be fairly representative and comparable to the MSCI World index from a country distribution perspective.

Figure 36: Country coverage in the MSCI World



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

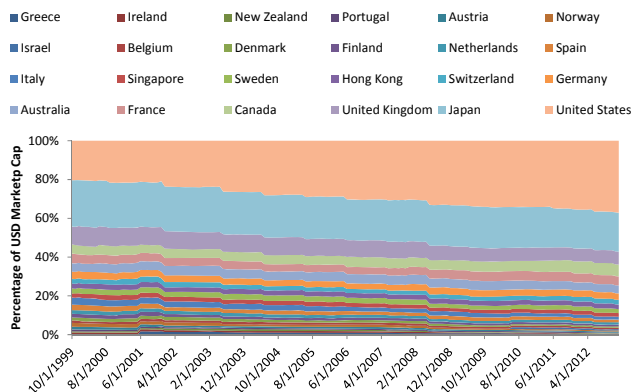
Figure 37: Country coverage in the Global ESG universe



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

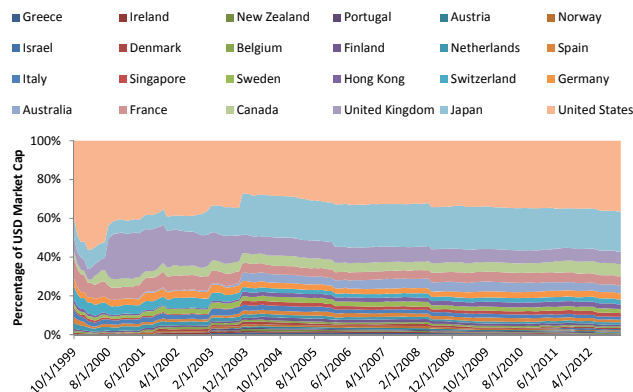
We can see this more clearly by comparing the country weights in our ESG universe against the MSCI Global universe (Figure 38 and Figure 39). On a relative basis, the ESG dataset is comparable to the MSCI Global for countries, albeit there are a few patchy differences during earlier periods.

Figure 38: Country weights in the MSCI Global



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 39: Country weights in the Global ESG universe

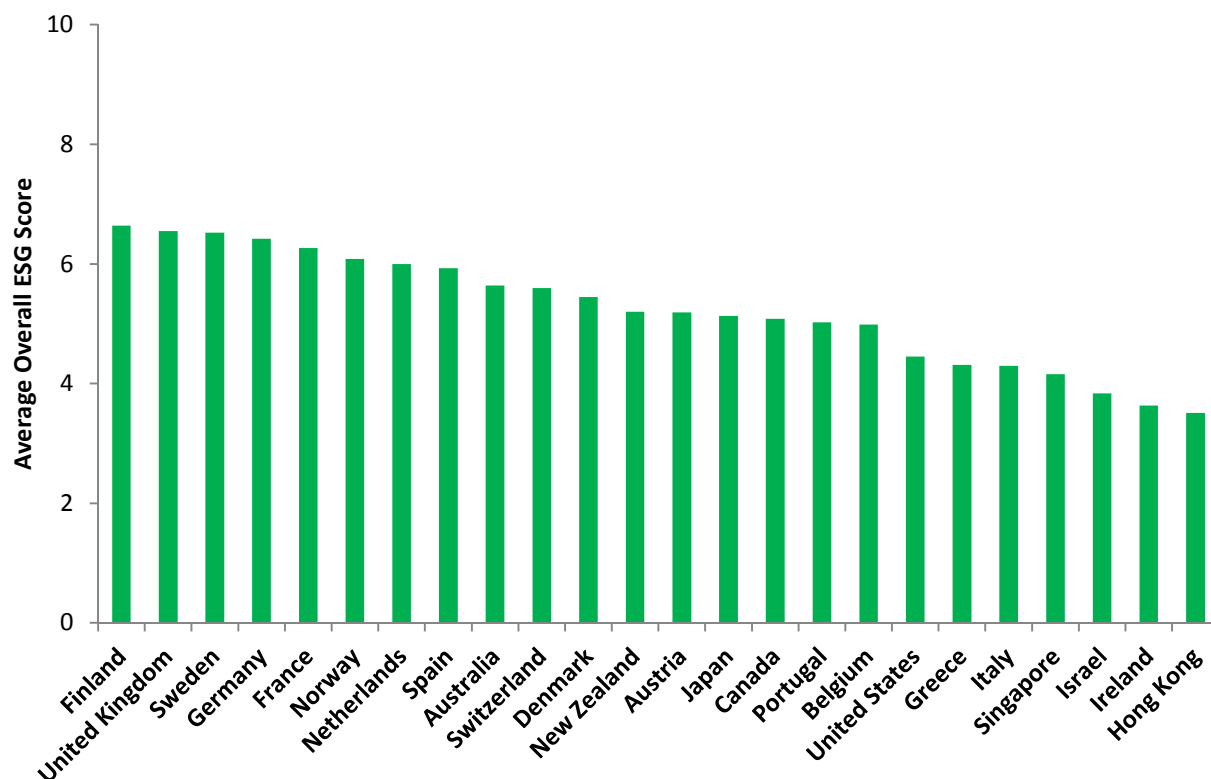


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Lastly, we look at the average overall ESG score by country (Figure 40). It is interesting to note that European countries, Australia, and Japan tend to be at the front of the pack. Countries like the US and Hong Kong tend to have lower overall ESG scores on average. These findings again line up with the academic evidence as well as our own intuition. Now let's move forward and construct some ESG factors.



Figure 40: Average overall ESG score by country



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

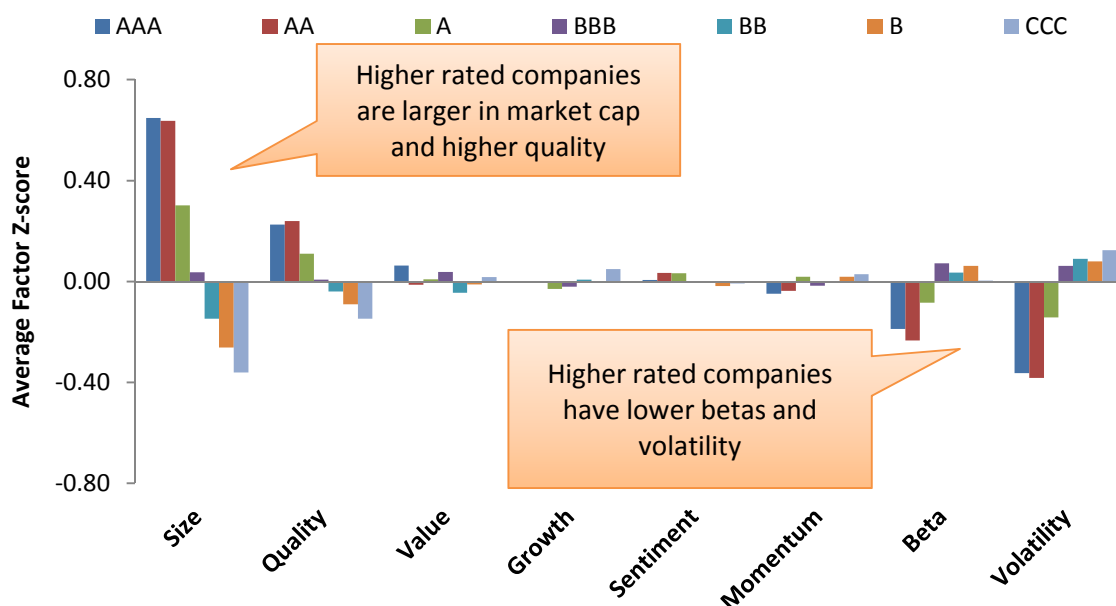


# Forming ESG Alpha Factors

## ESG prudence comes at a price

After an extensive exposition into the ESG dataset, we are at a point to begin constructing ESG based factors. As with any new dataset, constructing factors requires some careful thought. Let's start off by first analyzing the factor exposure by ESG letter rating. Figure 41 shows the average ESG factor exposure grouped by company letter rating within the US universe. This analysis gives us a sense of the fundamental makeup and characteristics of top and bottom rated ESG companies. In general, we find that on average highly rated ESG companies are larger in market cap, higher in quality, have lower betas and are less volatile. This is an interesting finding and shows that highly rated ESG companies have a strong quality tilt. Conversely, we find that on average lower rated ESG companies are smaller in size, lower in quality higher in beta and higher in volatility.

Figure 41: ESG factor exposure



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

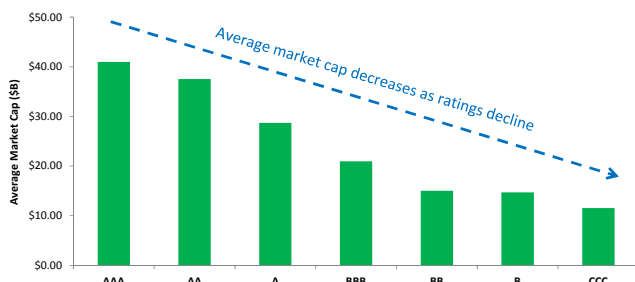
Next, let's dig deeper into the size exposure, the most pronounced characteristic. Let's start off by computing the average market cap of each ESG letter rating (Figure 42 and Figure 43). As stated previously, we undoubtedly notice a clear and discernible pattern: larger cap companies tend to have better ESG scores. Academic articles and discussion forums suggest that larger companies have the capital, resources, and processes to put in place towards ESG practices and procedures. For example, Nagy et al. cited that "Companies with smaller market capitalizations and lower price-earnings ratios also had lower average ratings in the IVA data set"<sup>7</sup> In addition, larger companies are likely under more pressure by the media, analysts, non-governmental organizations (NGOs) and advocacy groups to better improve their ESG practices and carbon footprint.

<sup>7</sup> Nagy, Z., Cogan, D. and Sinnreich, D., "Optimizing Environmental, Social and Governance Factors in Portfolio Construction: Analysis of three ESG-tilted strategies". MSCI ESG Research, September 2012.



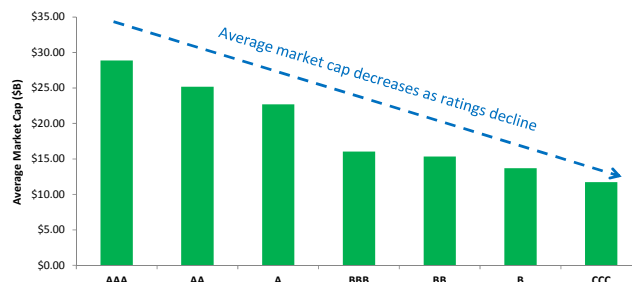
Dimson et al. cited that “Compared to matched firms, companies with greater reputational concerns and higher capacity to implement CSR changes are more likely to be targeted, and are more likely to be successful in achieving the activist’s objectives.”<sup>8</sup> Larger companies likely have more of an impact on the overall environment and the economy and therefore their ESG practices are more scrutinized by the general public. As such, we are not too surprised by these findings.

Figure 42: Market cap by overall ESG letter rating for US Universe



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

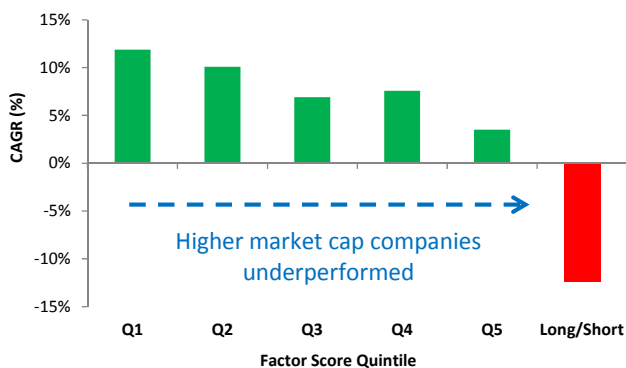
Figure 43: Market cap by overall ESG letter rating for Global Universe



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

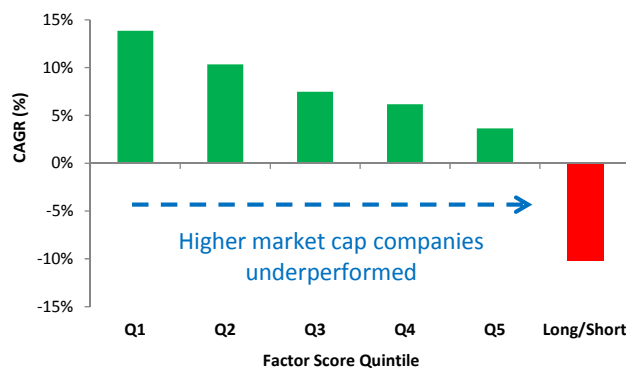
However, simply forming factors based upon the overall ESG scores will lead to a natural yet unintentional size bias. This is problematic because between 1999 and 2013 (the history of our ESG dataset) smaller cap companies outperformed larger cap companies (Figure 44 and Figure 45) in the US and Globally. Simply backtesting raw ESG scores could likely result in lower ESG rated companies outperforming higher ESG rated companies solely due to this size bias. Assuming that the ESG scores were not size normalized, this also may explain why some academic evidence finds that lower ESG rated companies outperform. So next we discuss a simple technique to neutralize our ESG dataset to this unintended size tilt.

Figure 44: CAGR by market cap within Russell 1000 from 1999 to 2013



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 45: CAGR by market cap within MSCI World from 1999 to 2013



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

## Controlling for factor tilts

To account for the natural size bias within the ESG scores, we adjust for this by simply running a cross-sectional regression. On a monthly basis, we regress the ESG score of

<sup>8</sup> Dimson, E., Karakas, O. and Li, X., “Active Ownership”. December 17, 2012



each company onto its market cap (equation 1). The residual of the regression forms our size adjusted ESG factor (i.e. the portion of the ESG score unexplained by the market cap). Additionally, we also adjust for other factor bias by running a similar cross-sectional regression but including more independent variables such as market cap, volatility, and beta (equation 2). Again, we use the residual of this equation to form our size, volatility, and beta adjusted ESG factors.

Equation 1:

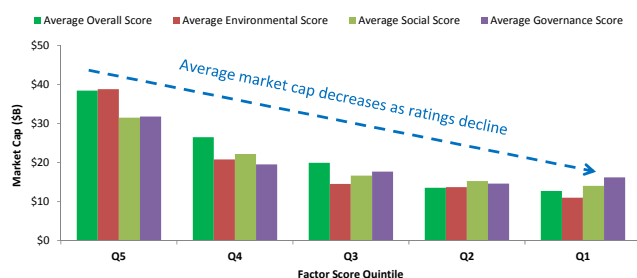
$$Overall\_SCORE_{i,t} = \alpha_i + \beta_i * Size_{i,t} + \varepsilon_{i,t}$$

Equation 2:

$$Overall\_SCORE_{i,t} = \alpha_i + \beta_i^1 * Size_{i,t} + \beta_i^2 * \sigma_{i,t} + \beta_i^3 * Beta_{i,t} + \varepsilon_{i,t}$$

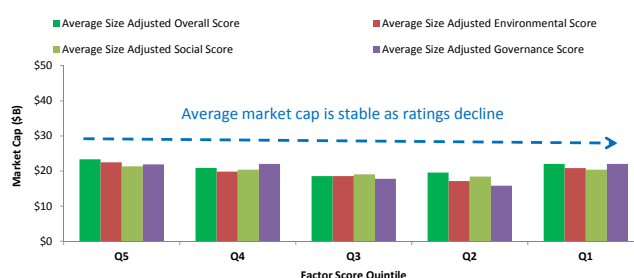
To better grasp the effects of these factor adjustments, Figure 46 and Figure 47 shows the average overall ESG and pillar scores prior and subsequent to the adjustments. As shown, the adjusted ESG factors have minimal size effects thereby forming a purer ESG factor.

Figure 46: Scores prior to size adjustment for US



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 47: Scores after size adjustment for US



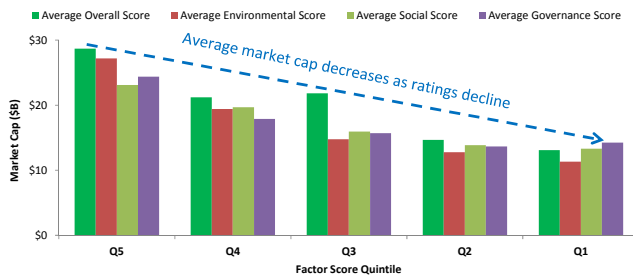
Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

We run the same adjustment within our Global ESG universe (Figure 48 and Figure 49). Again, the adjusted ESG factors have minimal size effects. Now that we have employed these adjustments, let's preview our final ESG factor universe.



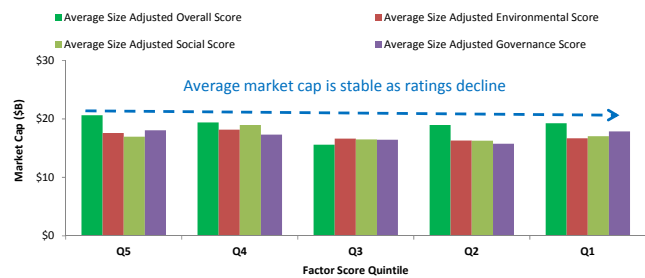


Figure 48: Scores prior to size adjustment for Global



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 49: Scores after size adjustment for Global



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

## A preview of our ESG factor universe

Here we want to briefly summarize the factors that we constructed from our ESG dataset. We constructed various buckets of factors (Figure 50). Firstly, we included the raw ESG scores into our factor universe. This includes factors like the overall ESG score (i.e. the SCORE factor) as well as the three ESG pillar scores and weights. Next we formed size adjusted factors based on the raw ESG factors. For example, the Size\_AdjSCORE factor is the size adjusted version of the raw ESG score factor (i.e. SCORE). We also formed factors by adjusting for size, volatility and beta. For example, the SizeBetaVol\_Adj\_SCORE is the size, beta, and volatility adjusted version of the raw ESG score factor (i.e. SCORE).

Additionally, we formed various momentum factors based on the ESG dataset. We wanted to test whether the momentum or the year over year change in an ESG score contains any predictive power. We simply computed the year over year change in the raw ESG scores (i.e. Mom\_SCORE) as well as the three ESG pillar scores and weights. Next we computed the momentum of our size adjusted ESG factors (i.e. MOM\_Size\_Adj\_SCORE) as well our size, beta and volatility adjusted ESG factors (i.e. MOM\_SizeBetaVol\_Adj\_SCORE). The final list of our ESG factor universe is shown in Figure 50 along with backtesting starting date and periods.



Figure 50: ESG US factor universe

Factor Mnemonic	Description	Factor Groups	Start Date	Backtesting Period (months)
SCORE	Overall ESG Score	Raw Factors	10/29/1999	160
NUMERIC_RATING	Numeric Rating such (7=AAA, 6=AA ... 1=CCC)		10/29/1999	160
ENV_WGT	Environmental Weight		1/31/2007	73
ENV_SCORE	Environmental Score		11/30/2004	99
SOCIAL_WGT	Social Weight		1/31/2007	73
SOCIAL_SCORE	Social Score		11/30/2004	99
GOV_WGT	Governance Weight		1/31/2007	73
GOV_SCORE	Governance Score		11/30/2004	99
Size_Adj_NUMERIC_RATING	Size Adjusted Numeric Rating	Size Adjusted Factors	10/29/1999	160
Size_Adj_SCORE	Size Adjusted Overall ESG Score		10/29/1999	160
Size_Adj_ENV_SCORE	Size Adjusted Environmental Score		11/30/2004	99
Size_Adj_SOCIAL_SCORE	Size Adjusted Social Score		11/30/2004	99
Size_Adj_GOV_SCORE	Size Adjusted Governance Score	Size, Volatility, & Beta Adjusted Factors	11/30/2004	99
SizeBetaVol_Adj_NUMERIC_RATING	Size, Vol, & Beta Adjusted Numeric Rating		10/29/1999	160
SizeBetaVol_Adj_SCORE	Size, Vol, & Beta Adjusted Overall ESG Score		10/29/1999	160
SizeBetaVol_Adj_ENV_SCORE	Size, Vol, & Beta Adjusted Environmental Score		11/30/2004	99
SizeBetaVol_Adj_SOCIAL_SCORE	Size, Vol, & Beta Adjusted Social Score		11/30/2004	99
SizeBetaVol_Adj_GOV_SCORE	Size, Vol, & Beta Adjusted Governance Score		11/30/2004	99
Mom_NUMERIC_RATING	Momentum of Numeric Rating	Momentum of Raw Factors	10/31/2000	148
Mom_SCORE	Momentum of Overall ESG Score		10/31/2000	148
Mom_ENV_SCORE	Momentum of Environmental Score		11/30/2005	87
Mom_SOCIAL_SCORE	Momentum of Social Score		11/30/2005	87
Mom_GOV_SCORE	Momentum of Governance Score	Momentum of Size Adjusted ESG Factors	11/30/2005	87
Mom_Size_Adj_NUMERIC_RATING	Momentum of Size Adjusted Numeric Rating		10/31/2000	148
Mom_Size_Adj_SCORE	Momentum of Size Adjusted Overall Score		10/31/2000	148
Mom_Size_Adj_ENV_SCORE	Momentum of Size Adjusted Environmental Score		11/30/2005	87
Mom_Size_Adj_SOCIAL_SCORE	Momentum of Size Adjusted Social Score		11/30/2005	87
Mom_Size_Adj_GOV_SCORE	Momentum of Size Adjusted Governance Score		11/30/2005	87
Mom_SizeBetaVol_Adj_NUMERIC_RATING	Momentum of Size, Vol, & Beta Adjusted Numeric Rating	Momentum of Size, Volatility, & Beta Adjusted Factors	10/31/2000	148
Mom_SizeBetaVol_Adj_SCORE	Momentum of Size, Vol, & Beta Adjusted Overall ESG Score		10/31/2000	148
Mom_SizeBetaVol_Adj_ENV_SCORE	Momentum of Size, Vol, & Beta Adjusted Environmental Score		11/30/2005	87
Mom_SizeBetaVol_Adj_SOCIAL_SCORE	Momentum of Size, Vol, & Beta Adjusted Social Score		11/30/2005	87
Mom_SizeBetaVol_Adj_GOV_SCORE	Momentum of Size, Vol, & Beta Adjusted Governance Score		11/30/2005	87

Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy



# The Backtesting Results

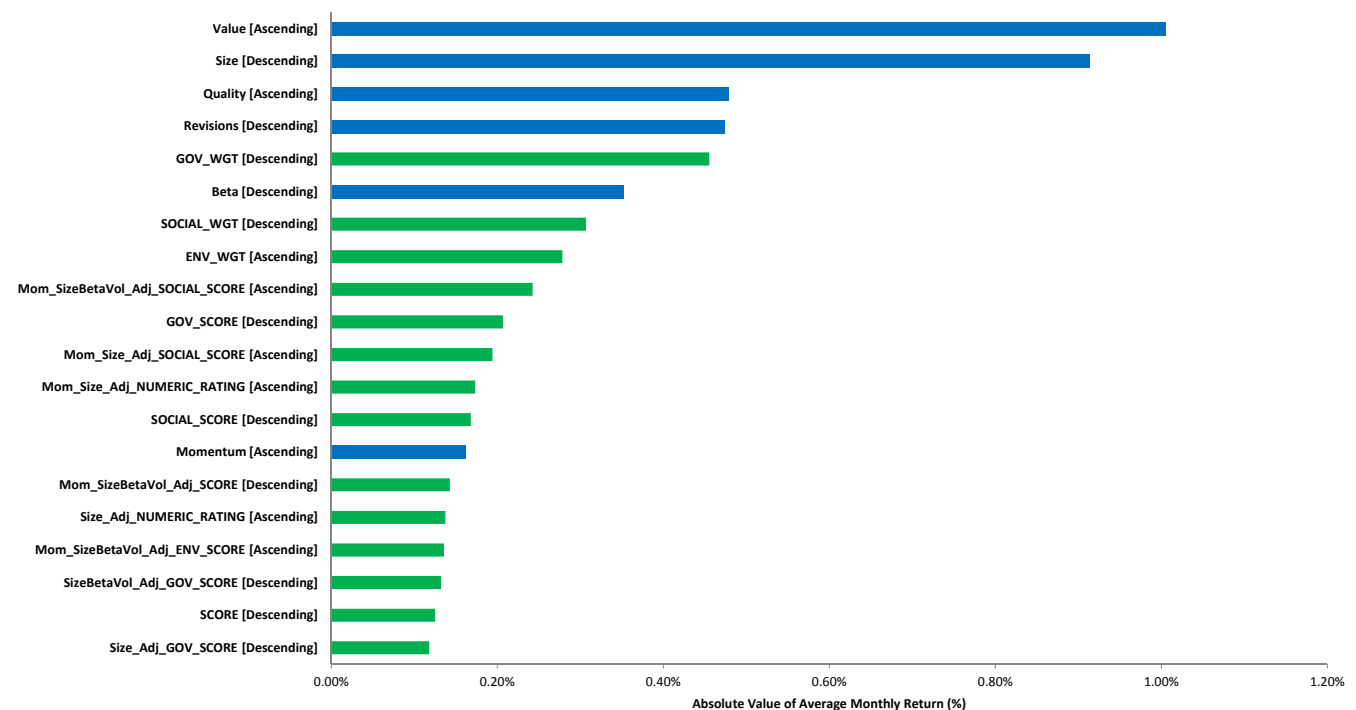
## Monthly back testing performance of the US market

We are finally at the stage to discuss the ESG factor backtesting results. For the backtesting, we formed long/short quintile portfolios on a monthly basis based on the ESG factor universe. Our backtesting period is from 1999 to 2003 but recall that not all ESG factors start in 1999. Some ESG factors commence in later periods. We backtested our pool of ESG factors and compared the results to some standard fundamental quantitative factors such as value, growth, momentum, etc.

Figure 51 compares the backtesting results of the top 20 ESG factors (in green of course) against some common quantitative factors (in blue). This figure shows the average long/short quintile monthly portfolio performance over the entire backtesting period.<sup>9</sup> We take the absolute value of the long/short quintile portfolio returns to better compare the performance of all the factors.

The ESG factors perform moderately well over the backtesting period although most of the standard quantitative factors have relatively strong performance.

Figure 51: Average monthly factor performance for fundamental and ESG factors over various time periods



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

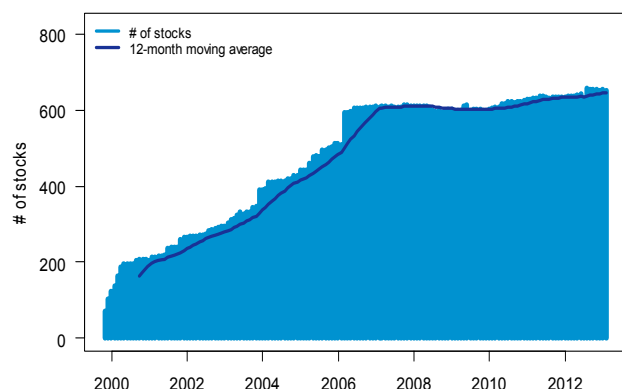
<sup>9</sup> Ascending order means higher factors scores are likely to be associated with higher subsequent stock returns, and vice versa for descending order.



The backtesting results warrant a more in-depth look at the ESG factors. Here we examine the properties of one ESG factor in more detail: Size\_Adj\_SCORE. Recall that this factor is the size adjusted overall ESG score. We chose to focus on this factor because it is intuitive and easy to understand. Additionally, it has the most extensive history and coverage. In order to avoid look ahead bias, we avoid choosing any factors based purely on their backtesting results. In fact, Size\_Adj\_SCORE did not even make the previously reported top 20 list.

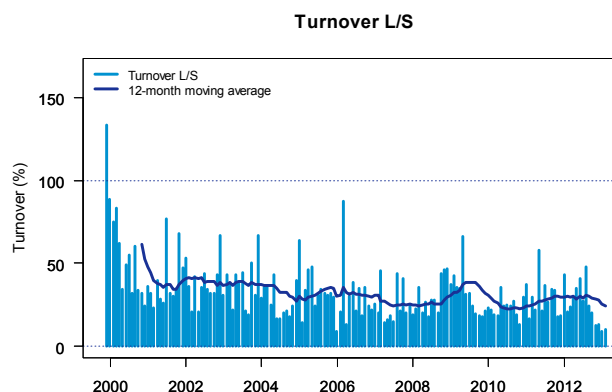
Figure 52 shows the time series coverage of Size\_Adj\_SCORE. As we stated previously, this factor has the most extensive history and coverage. Figure 53 shows the monthly two way factor turnover. Since most of the ESG factors are captured on annual basis we would expect the factor turnover to be low. This is a promising result as it implies that transactions costs will not be too prohibitive.

Figure 52: Coverage of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 53: Monthly turnover of size adjusted ESG score

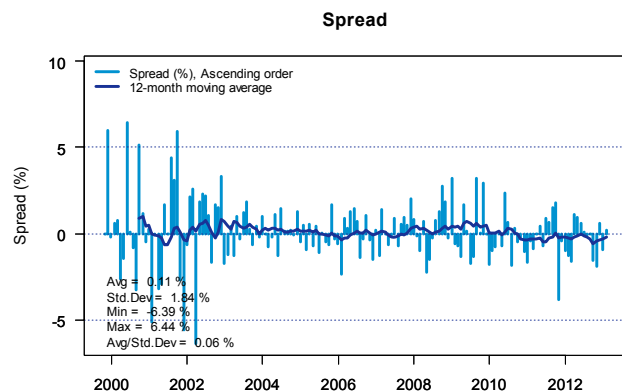


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 54 shows the time series monthly long/short quintile spread. The spread appears to be fairly monotonic except during more recent periods when most standard quantitative factors experienced volatile performance. Figure 55 shows the average annualized performance of each quintile. This is a very interesting chart. We see that most of the performance comes from the best ESG quintile (i.e. stocks that rank strongly based on the size adjusted ESG score tend outperform poorly or mediocre ranked stocks). This hints that there is some outperformance to be gained by investing in socially and environmentally responsible companies.

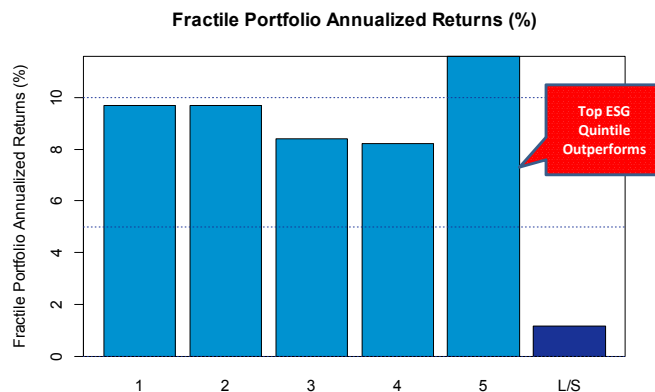


Figure 54: Average monthly return of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

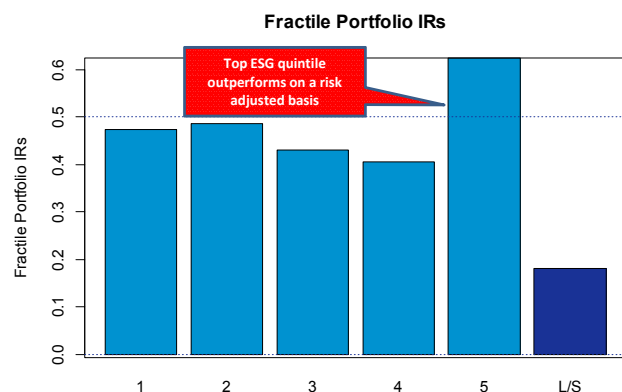
Figure 55: Average monthly quintile return of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

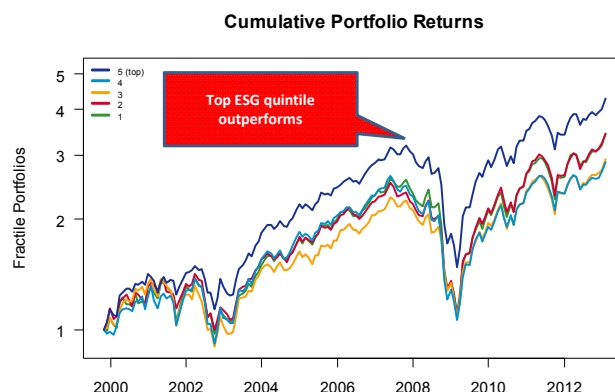
This premise holds true even on a risk adjusted basis. Figure 56 shows the information ratio for each quintile portfolio. Again, we see a strong pop in top quintile portfolio consisting of highly ranked ESG stocks. The information ratio of the top quintile portfolio outperforms other quintile portfolios by approximately 20%. The wealth curve of the quintile portfolios is shown in Figure 57. The top quintile portfolio clearly outperforms other quintile portfolios.

Figure 56: IR of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 57: Quintile wealth curves of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Next we investigate whether this payoff pattern holds for a global stock universe.

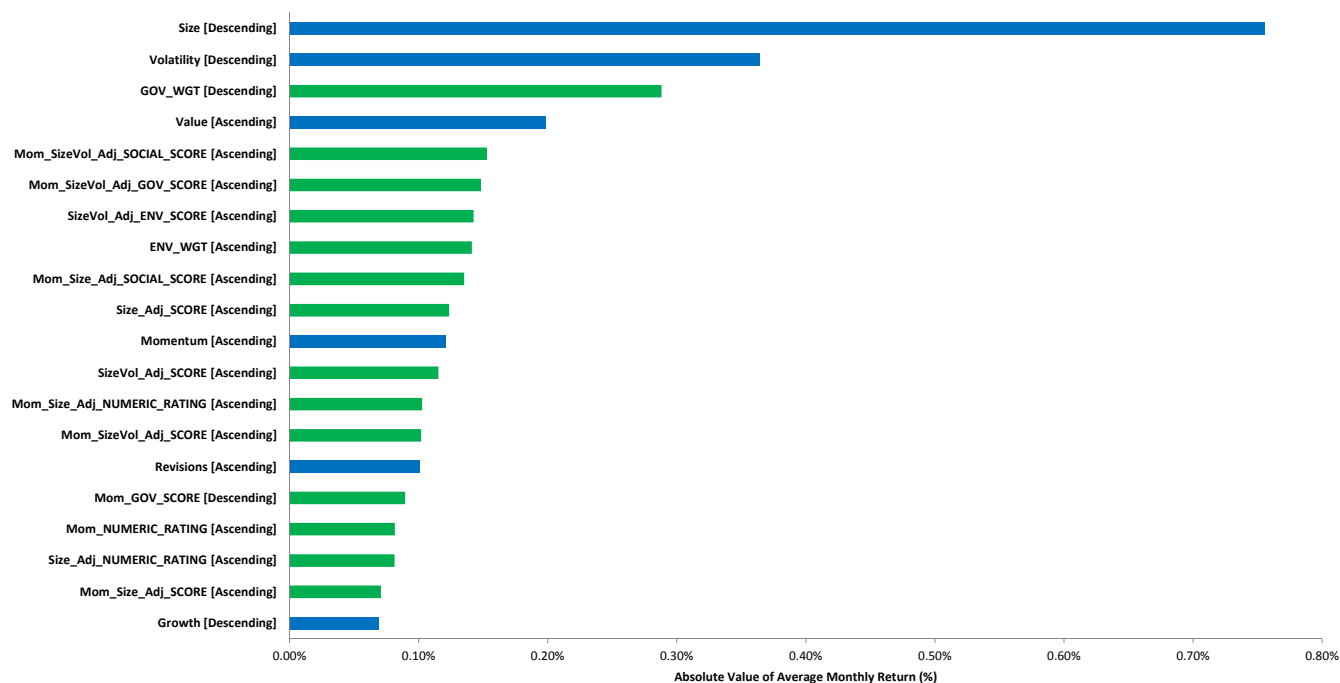
## Monthly back testing performance of the Global market

Figure 58 compares the backtesting results of the top 20 ESG factors (in green) against some common quantitative factors (in blue) for the global universe. This figure shows the average long/short quintile monthly portfolio performance over the entire backtesting period. We again take the absolute value of the long/short quintile portfolio returns to better compare the performance of all the factors. In order to obtain a more



substantial universe, we commence the backtesting from 2003 onwards. Interestingly, the ESG factors perform moderately well over the backtesting period although some of the standard quantitative factors have relatively stronger performance.

Figure 58: Average monthly factor performance for fundamental and ESG factors over various time periods

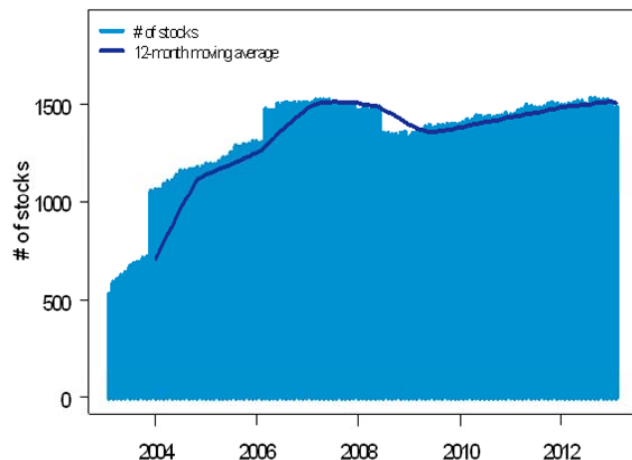


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 59 shows the time series coverage of Size\_Adj\_SCORE. As we stated previously, this factor has the most extensive history and coverage. What we are most interested in determining is whether the same payoff pattern that exists for the US holds for a global stock universe. Figure 60 shows the average annualized performance of each quintile portfolio. We again see that most of the performance comes from the best ESG quintile (i.e. stocks that rank strongly based on the size adjusted ESG score tend to outperform poorly or mediocre ranked stocks). This again hints that there is some outperformance to be gained by investing in socially and environmentally responsible companies globally.

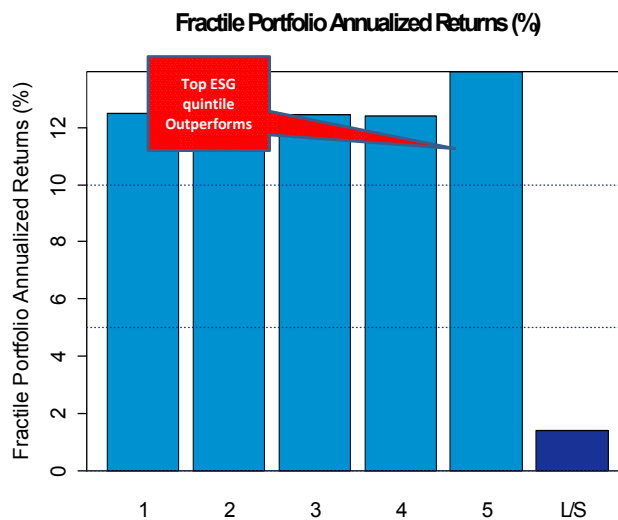


Figure 59: Coverage of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

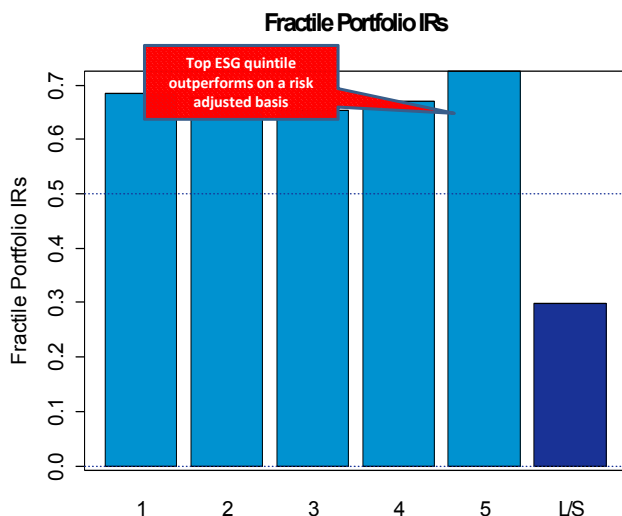
Figure 60: Average monthly quintile return of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

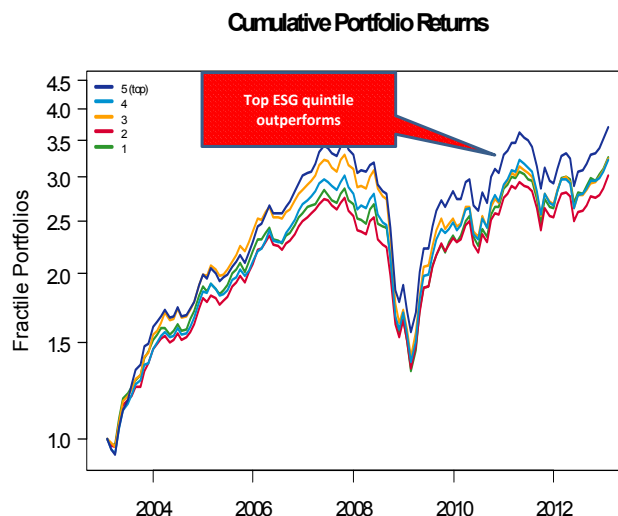
This premise again holds even on a risk adjusted basis. Figure 61 shows the information ratio for each quintile portfolio. Again, we see a strong pop in top quintile portfolio consisting of highly ranked ESG stocks. The wealth curve of the quintile portfolios is shown in Figure 62. The top quintile portfolio outperforms other quintile portfolios.

Figure 61: IR of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 62: Quintile wealth curves of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Next we investigate whether this payoff pattern holds for longer horizon portfolios.

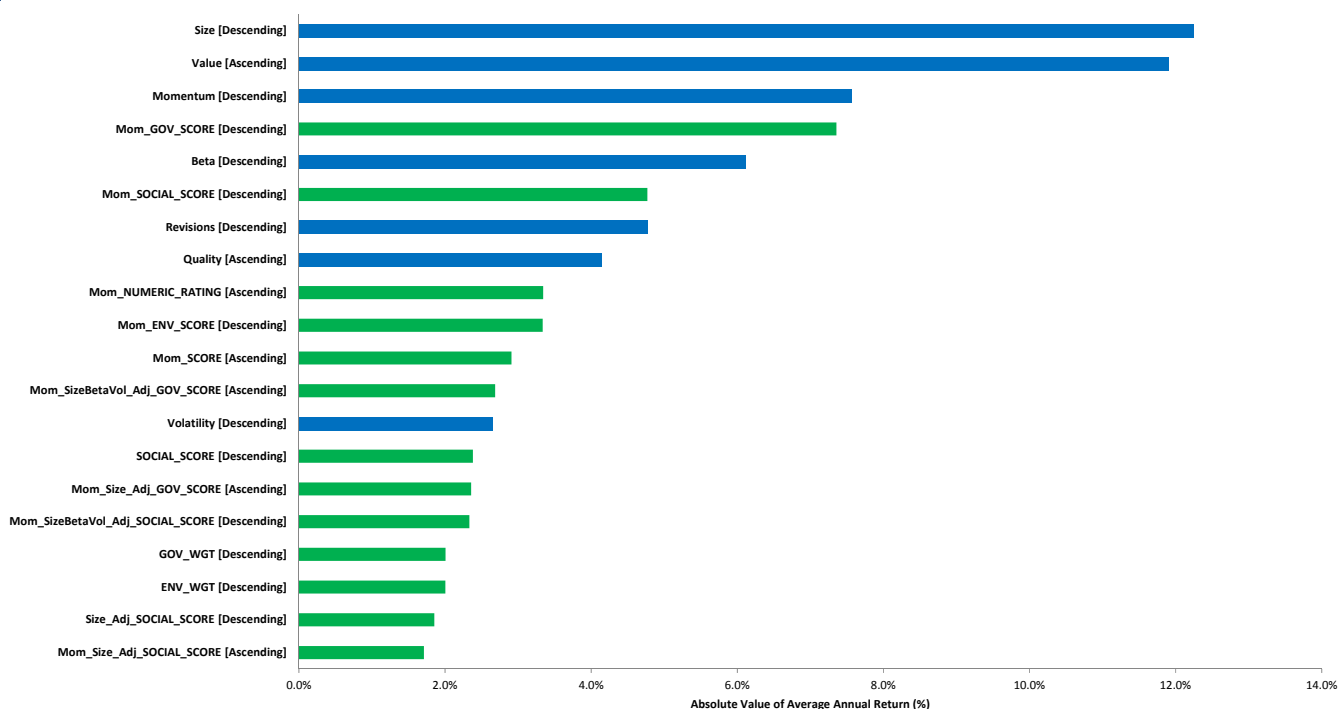




## Does ESG perform better for longer holding periods?

Here we backtest the same ESG factors but on an annual basis for the US universe. The availability of the ESG data is typically provided on an annual basis. As such, backtesting the ESG factors on an annual basis is likely the next logical step. Figure 63 compares the annual backtesting results of the top 20 ESG factors (in green) against some common quantitative factors (in blue). The figure shows the average long/short quintile annual portfolio performance over the entire backtesting period. We take the absolute value of the long/short quintile portfolio returns to better compare the performance of all the factors. Similar to the monthly backtesting results, ESG factors backtested annually performed moderately well over the backtesting period although most of the standard quantitative factors have relatively strong performance.

Figure 63: Average yearly US factor performance for fundamental and ESG factors over various time periods

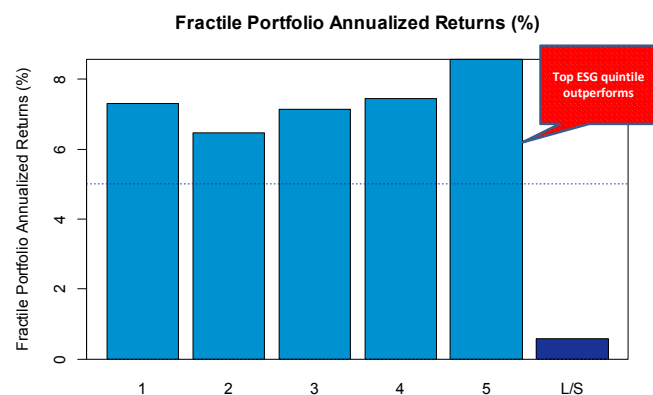


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

However, interestingly we find the best ranked ESG companies outperform poor or mediocre ranked companies on an absolute basis (Figure 64) as well as a risk adjusted basis (Figure 65). These findings substantiate that ESG factors can potentially best be used in the context of a tilted, long only portfolio rather than a traditional long/short quant portfolio. We explore this idea next.

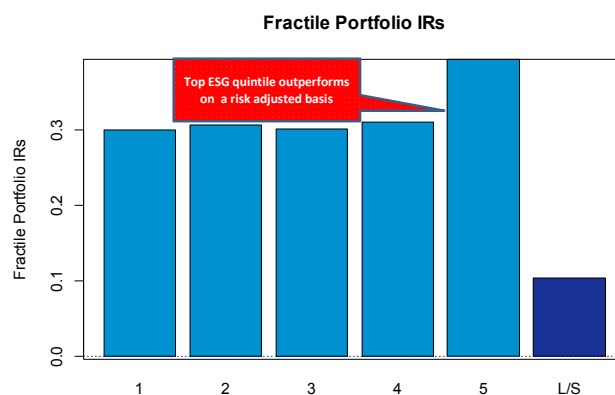


Figure 64: Average annual quintile return of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 65: IR of size adjusted ESG score



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

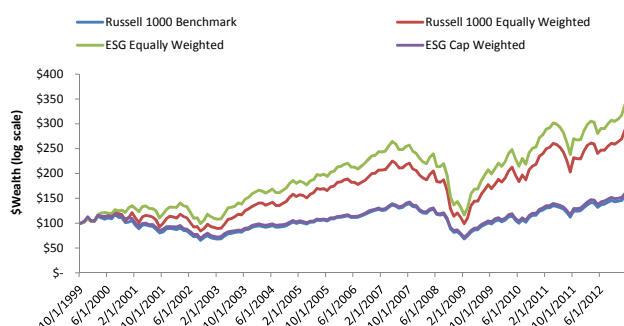


# ESG Titled Portfolios

## Performance of the universe

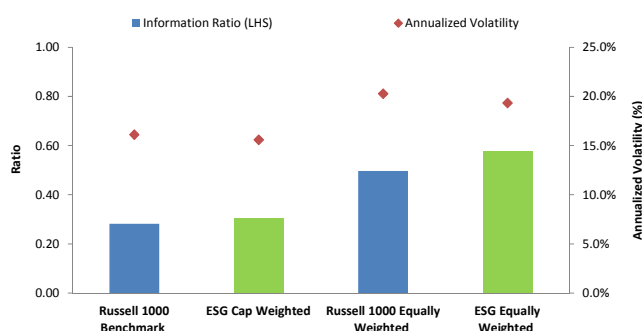
Here we discuss how to best setup an ESG tilted portfolio. Since the ESG dataset is an expanding and growing universe, we need to be vigilant about the portfolio construction process. The first step is to simply compare the wealth performance of an equally and market cap weighted ESG universe against the Russell 1000 (Figure 66). Just to clarify, this is merely the performance of the raw universe absent of any alpha factors. The result of the wealth performance is intriguing. Although the market cap weighted ESG universe performs in line with the Russell 1000, we notice that the equally weighted ESG universe outperforms the equally weighted Russell 1000, the comparable benchmark. This outperformance also persists on a risk adjusted basis (Figure 67). This is somewhat puzzling as it shows that the raw ESG universe is simply better than the benchmark. Let's investigate this further.

Figure 66: Wealth curve comparison over entire history



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 67: IR comparison over entire history

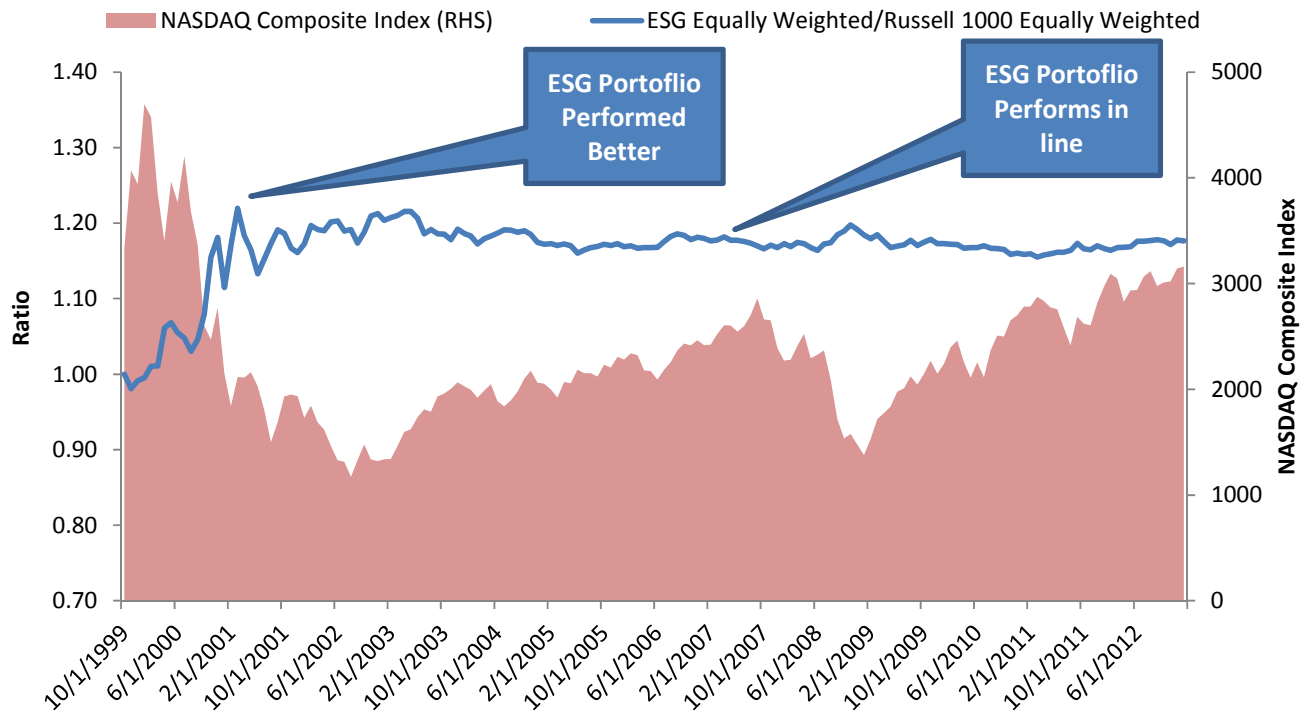


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 68 shows the time series wealth ratio of the equally weighted ESG divided by the Russell 1000 universe. This figure will help us gauge when the equally weighted ESG universe outperformed the equally weighted Russell 1000. It shows that the bulk of the ESG universe outperformance (i.e. approximately 20%) came during earlier years, between 1999 and 2003. This time period represented the bursting of the technology bubble when the NASDAQ index suffered sharply. Following this period, the ESG and Russell 1000 equally weighted universes performed in line.



Figure 68: Performance of ESG is penetrated in early periods



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

The period between 1999 and 2003 also represented a time when the ESG universe was expanding and evolving. In fact, many of the technology companies that suffered during the internet bubble were absent from the ESG universe during this time. For example, Figure 69 lists some of the technology and telecommunication companies within the Russell 1000 but absent from the ESG universe as of March 31, 2000.



Figure 69: Companies missing as of March 31st- 2000 from ESG universe

Company Name	GICS Sector	Company Name	GICS Sector
Microsoft Corp	Information Technology	Brocade Communications Sys	Information Technology
Intel Corp	Information Technology	3Com Corp	Information Technology
At&T Corp	Telecommunication Services	I2 Technologies Inc	Information Technology
Oracle Corp	Information Technology	Ciena Corp	Information Technology
Intl Business Machines Corp	Information Technology	Xerox Corp	Information Technology
Sun Microsystems Inc	Information Technology	Linear Technology Corp	Information Technology
At&T Inc	Telecommunication Services	Gateway Inc	Information Technology
Dell Inc	Information Technology	Adc Telecommunications Inc	Information Technology
Hewlett-Packard Co	Information Technology	Applied Micro Circuits Corp	Information Technology
Emc Corp/Ma	Information Technology	E-Tek Dynamics Inc	Information Technology
Texas Instruments Inc	Information Technology	Verisign Inc	Information Technology
Qualcomm Inc	Information Technology	Vitesse Semiconductor Corp	Information Technology
Verizon Communications Inc	Telecommunication Services	Sdl Inc	Information Technology
Yahoo Inc	Information Technology	Comverse Technology Inc	Information Technology
Bellsouth Corp	Telecommunication Services	Teradyne Inc	Information Technology
Jds Uniphase Corp	Information Technology	Blucora Inc	Information Technology
Gte Corp	Telecommunication Services	Seagate Technology-Old	Information Technology
Sprint Pcs Group	Telecommunication Services	Computer Sciences Corp	Information Technology
Veritas Software Corp	Information Technology	Adobe Systems Inc	Information Technology
Broadcom Corp	Information Technology	Voicestream Wireless Corp	Telecommunication Services
Sprint Nextel Corp	Telecommunication Services	At Home Corp	Telecommunication Services
Nextel Communications Inc	Telecommunication Services	Bmc Software Inc	Information Technology
Compaq Computer Corp	Information Technology	Citrix Systems Inc	Information Technology
Qwest Communication Intl Inc	Telecommunication Services	Bea Systems Inc	Information Technology
Level 3 Communications Inc	Telecommunication Services	Intuit Inc	Information Technology
Ca Inc	Information Technology	Lexmark Intl Inc -CI A	Information Technology
Moduslink Global Solutions	Information Technology	Rf Micro Devices Inc	Information Technology
Automatic Data Processing	Information Technology	DoubleClick Inc	Information Technology
Electronic Data Systems Corp	Information Technology	Atmel Corp	Information Technology
Pmc-Sierra Inc	Information Technology	Network Solutions Inc	Information Technology
Tellabs Inc	Information Technology	Qlogic Corp	Information Technology
Netapp Inc	Information Technology	Scientific-Atlanta Inc	Information Technology
Exodus Communications Inc	Information Technology	Novell Inc	Information Technology
Ebay Inc	Information Technology	Portal Software Inc	Information Technology
Siebel Systems Inc	Information Technology	Vignette Corp	Information Technology
Apple Inc	Information Technology	Realnetworks Inc	Information Technology
Inktomi Corp	Information Technology	Tw Telecom Inc	Telecommunication Services
Alltel Corp	Telecommunication Services	Unisys Corp	Information Technology
Compuware Corp	Information Technology	Allegiance Telecom Inc	Telecommunication Services

Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

As such, we think that the ESG universe outperformance is due to the underlying universe selection. Just to be clear, this absence of companies is not by design or by construction. As a dataset naturally expands, the coverage will evolve. In fact, these absences likely exist in any dataset that gradually evolves its coverage yet it is rarely discussed by academics or practitioners. Figure 70 shows the evolving coverage of the ESG universe and the Russell 1000.

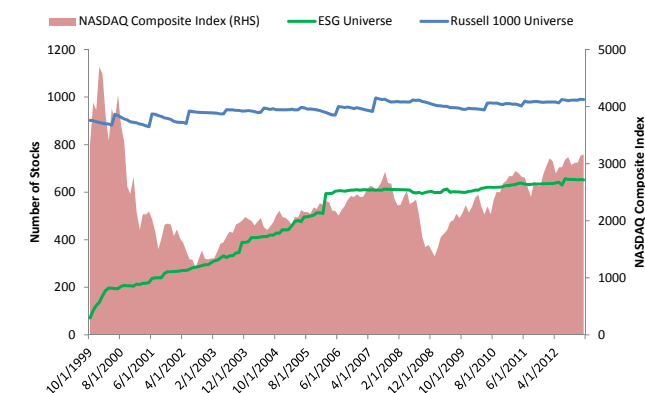
There are several techniques that we can employ to tackle absent companies. First, we can merely give missing companies the average or median cross-sectional ESG score. This will ensure that our universe is expansive but, at the same time, force a potentially



unwarranted ESG score on stocks. Another method is to simply begin your portfolio analysis from 2003 onwards. This will reduce the backtesting period but also ensure a more representative universe

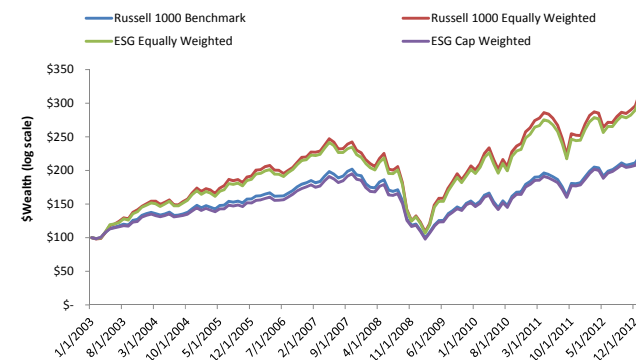
Figure 71, compares the wealth performance of an equally and market cap weighted ESG universe against the Russell 1000 from 2003 onwards. During this time period, we see that that the ESG and Russell 1000 universe perform in line. In summary, with this analysis, we wanted to point out the importance of universe selection, breadth, and coverage. If we had not taken the universe selection into account in this analysis, the ESG portfolio would have outperformed the Russell 1000 benchmark due to an unintended universe and sector tilt. With this analysis in mind, let's forge ahead and examine how we can create tilted ESG portfolios.

Figure 70: Russell 1000 and ESG universe comparison



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 71: Wealth curve comparison from 2003 onwards



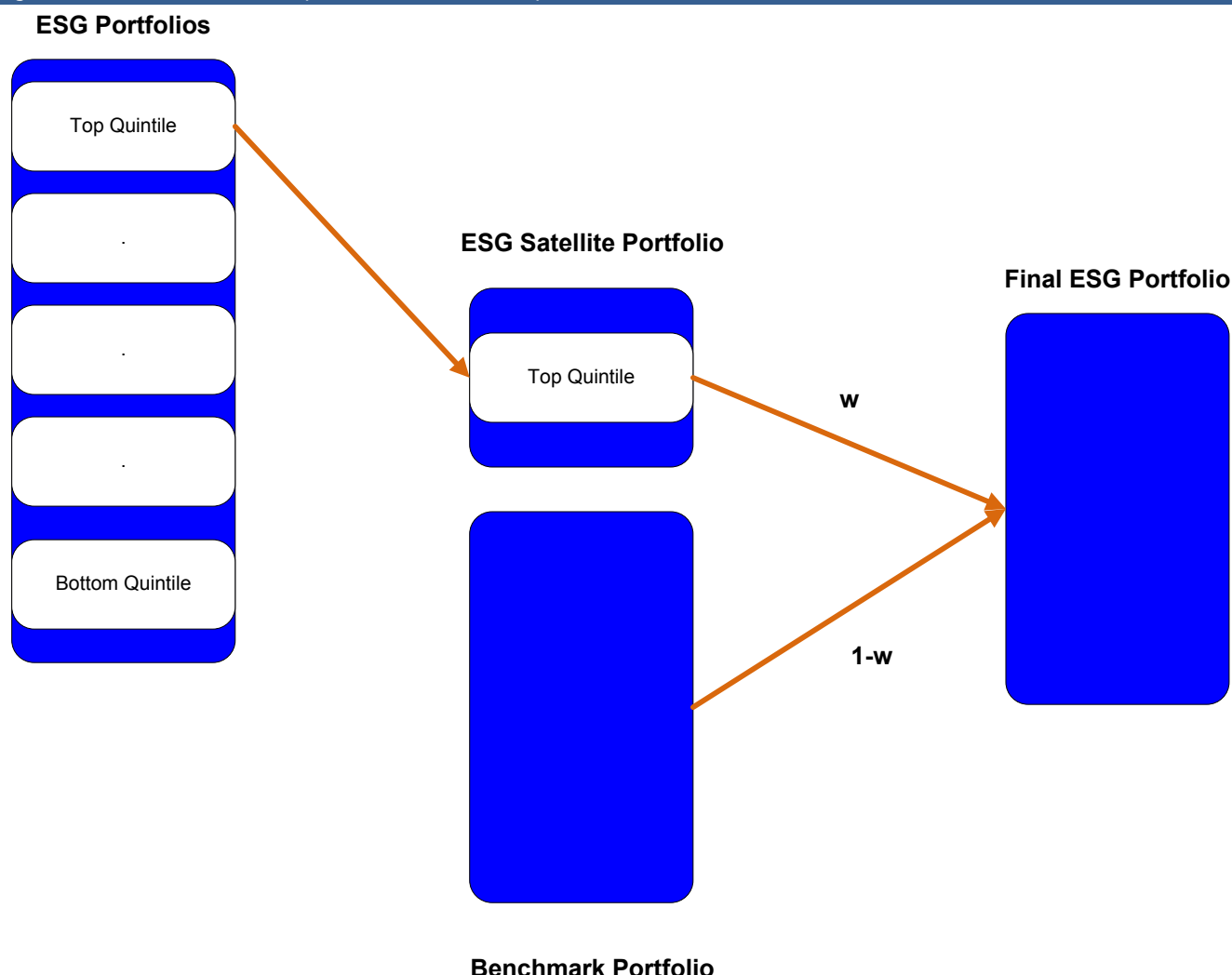
Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

## Performance of tilted ESG portfolios

We utilize a simple strategy where we leverage the information contained in the ESG dataset by lining up an ESG satellite portfolio alongside the benchmark index with the goal of outperforming the benchmark. We can then fine tune the weight of the ESG satellite portfolio to a given tracking error. The portfolio construction process is outlined in Figure 72.



Figure 72: Schematic view of portfolio construction process



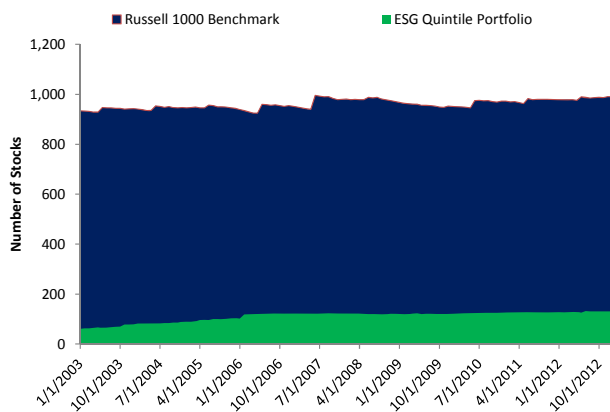
Source: Deutsche Bank Quantitative Strategy

Essentially, we take the top quintile of stocks from the ESG universe based on the size adjusted overall ESG score factor (i.e. Size\_Adj\_SCORE) and use these stocks to form our satellite portfolio. The top quintile of ESG stocks can be either equal or market cap weighed. We then combine this satellite portfolio with our benchmark portfolio to form an ESG tilted portfolio. For this exercise, our benchmark portfolio is the Russell 1000 benchmark and the equally weighted Russell 1000. For the satellite portfolio we specify a conservative yet modest weight of 30% (i.e.  $w=30\%$ ). This leads to a relatively small tracking error of less than 2%. Such a strategy encompasses high conviction ESG stocks into a tilted portfolio. Our analysis is conducted from 2003 onwards.

Figure 73 shows the number of ESG stocks as a subset of the Russell 1000 universe that we overweight using the described portfolio construction technique. Note that we typically overweight less than 10% of the Russell 1000 universe. Figure 74 shows the information ratio of the tilted ESG portfolio compared to their respective benchmarks. The market cap weighted ESG tilted portfolio performs in line with the benchmark. However, the equally weighted ESG tilted portfolio beats the benchmark by approximately 5%. Now this may not seem that sizeable at first but let's reiterate what we have achieved. We are investing in high conviction, environmental and socially responsible companies and performing in line or slightly better than our benchmark.

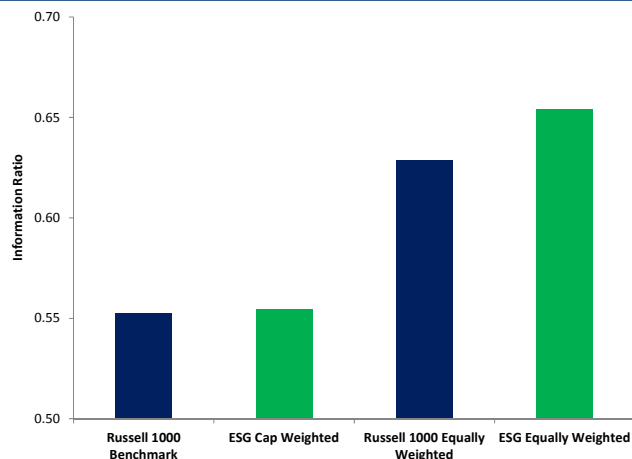


Figure 73: US ESG stocks over-weighted



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

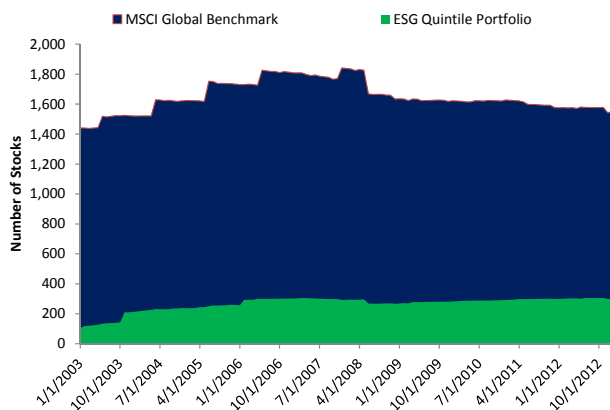
Figure 74: Performance of US ESG tilted portfolios versus benchmark



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

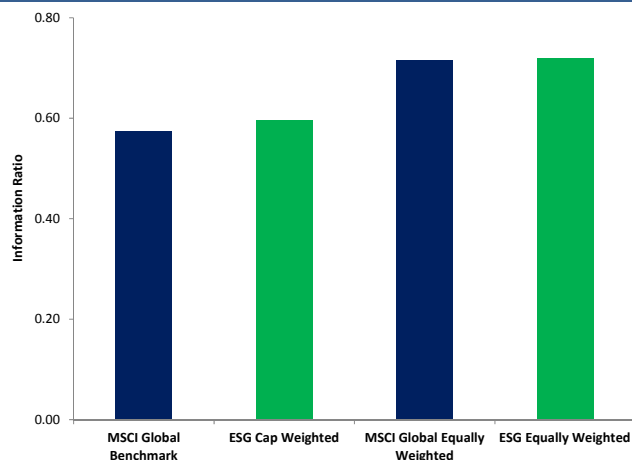
In terms of the global universe, Figure 75 shows the number of ESG stocks as a subset of the MSCI Global universe that we overweight using the described portfolio construction strategy. Figure 76 shows the information ratio of the tilted ESG portfolio compared to their benchmarks. Both ESG tilted portfolios perform predominantly in line with their benchmarks which is in fact a good result considering we are overweighting socially and environmentally responsible companies. However, the ultimate test is whether ESG can generate alpha after all the typical institutional constraints and transaction costs are taken into account. We explore this next.

Figure 75: Global ESG stocks over-weighted



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy

Figure 76: Performance of Global ESG tilted portfolios versus benchmark



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy





# Optimal ESG Portfolios

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## US portfolio performance

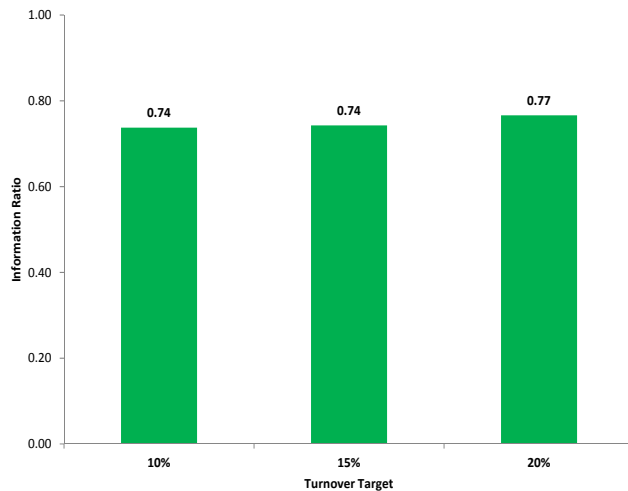
In this section, we perform a real world portfolio simulation that encompasses all the typical institutional constraints and transaction costs. We form our portfolio based on the size adjusted overall ESG score factor (i.e. Size\_Adj\_SCORE). We utilize the Axioma optimizer and risk models to simulate a long only portfolio and compare the results to the Russell 1000 and MSCI World. We assign the median ESG score for stocks that do not have an overall size adjusted ESG score. We employ the following constraints in the optimization:

- Long only.
- 20bps transaction cost per trade.
- Maximum & minimum active asset weight differential of 3% and -3% respectively.
- Maximum & minimum active beta differential of 10% and -10% respectively.
- Maximum & minimum active sector weight differential of 10% and -10% respectively.
- Target tracking error is 5%.
- Maximum & minimum active country weight differential of 10% and -10% respectively (for global portfolio only).
- Two way turnover constraint of 10%, 15%, and 20% per month.

The results are very interesting. On a risk adjusted basis, the US ESG portfolio outperforms the benchmark (Figure 77) with an information ratio of 0.77. This is persistent even at a very low two-way turnover constraint of 20% per month. In addition, the US ESG portfolio outperforms a standard quality portfolio based on ROE on a risk adjusted basis (Figure 78). A standard quality portfolio is a good benchmark to compare against an ESG strategy.

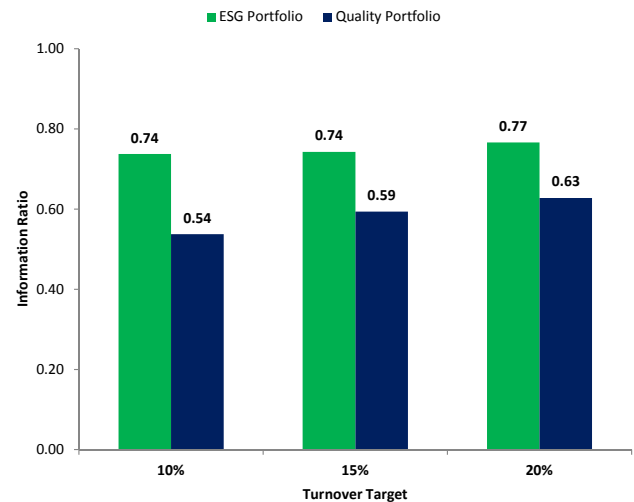


Figure 77: ESG portfolio US performance



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy, Axioma

Figure 78: ESG & Quality portfolio US performance

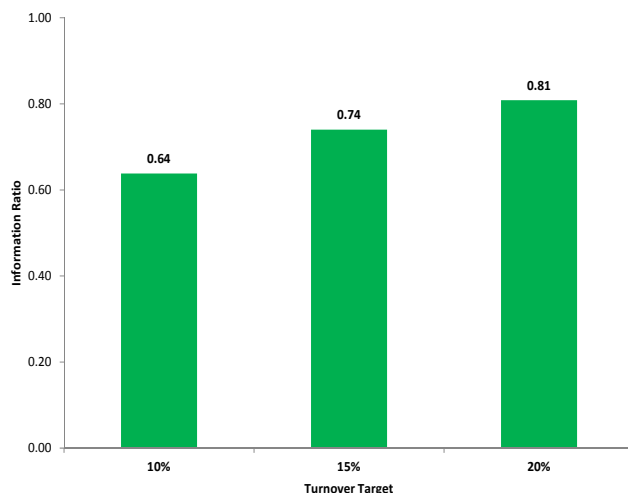


Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy, Axioma

## Global portfolio performance

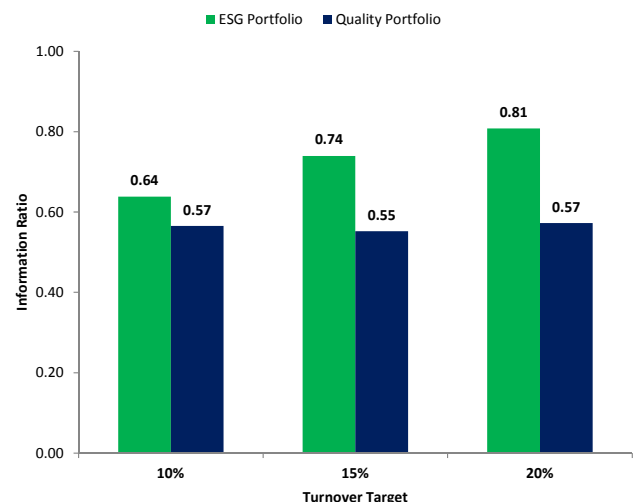
The global results are equally interesting. On a risk adjusted basis, the global ESG portfolio outperforms the benchmark (Figure 79) with an information ratio of 0.81. This again is persistent even at a very low two-way turnover constraint of 20%. In addition, the global ESG portfolio outperforms a standard quality portfolio based on ROE on a risk-adjusted basis (Figure 80).

Figure 79: ESG portfolio Global performance



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy, Axioma

Figure 80: ESG & Quality portfolio Global performance



Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy, Axioma

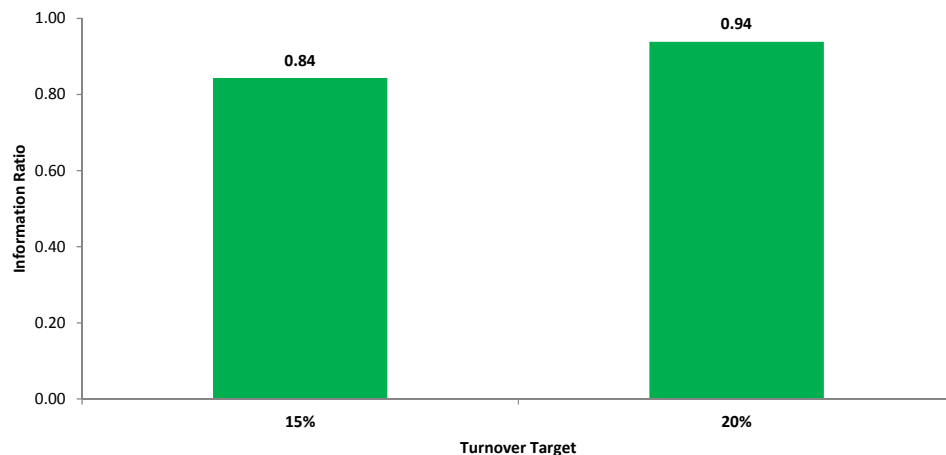
## ESG and low volatility strategies

Lastly, we want to show the performance of a combined ESG and low volatility strategy within a global universe. We form our portfolio based on the size adjusted overall ESG score factor and a low volatility factor equally weighted. We utilize the Axioma



optimizer and risk models to construct a long only portfolio and compare the results to the MSCI World. We use the same constraints as applied above and the objective function is set to maximize forecasted return while penalizing the forecasted risk. Figure 81 shows the results of the optimization. This figure shows that combining the low volatility with the ESG signal improves the performance on a risk-adjusted basis.

**Figure 81: Information ratio of combined ESG and low volatility strategy**



*Source: MSCI ESG Research, Compustat, IBES, Russell, S&P, Thomson Reuters, MSCI, Deutsche Bank Quantitative Strategy, Axioma*



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