Materiality matters
Targeting the ESG issues that can impact performance – the material ESG score
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Materiality matters
Targeting the ESG issues that can impact performance – the material ESG score

Emily Steinbarth, Quantitative Analyst

ABSTRACT

Russell Investments has developed a new way to measure a company’s ESG (environmental, social and governance) score. Drawing from the metrics developed by industry leaders Sustainalytics and SASB (Sustainability Accounting Standards Board), our new material ESG scores are designed to identify and evaluate only those issues that are financially important to a company.

The new material score allows us to differentiate between companies in a way that the “traditional” aggregated ESG score does not facilitate. We can now distinguish between companies who score highly on ESG issues that are financially material to their business, from those who score highly on issues that are not financially material to their business. Our research suggests that the Russell Investments’ material ESG scores are better predictors of investment return compared to “traditional” ESG scores.

Introduction

Not all ESG issues matter equally

In assessing the relationship between a company’s performance on environmental, social and governance (ESG) issues with financial performance, not all ESG issues matter equally. For example, fuel efficiency has a bigger impact on the bottom line of an airline, than it does for an investment bank. We are not alone in seeking a connection between sustainability and materiality, and our research builds on a growing library of literature on the topic. In addition to the academic literature (summarized in the appendix), the concept is also being applied in practice. Rather than adopt a one-sized-fits-all approach, industry groups such as the Task Force on Climate-Related Financial Disclosures (TCFD) and sustainability reporting organizations expend considerable resources developing standards that are specific to business lines. ESG data providers weight subcategories differently based on their relevance to different industries. At Russell Investments, our manager research analysts identify ESG issues that are relevant to the success of a given strategy when evaluating the ESG awareness of asset managers.

Our work follows a recent study by Khan, Serafeim and Yoon (2016), where the authors present evidence that investment in sustainability issues can lead to financial outperformance, but only when the investment is in sustainability issues that are financially material to the firm. In contrast to this, they find that investment in immaterial sustainability issues does not lead to better financial performance, and may in fact detract from performance.

1 From here on referred to as KSY (2016)
Applying the notion of ‘materiality’ from financial accounting

The notion of materiality used in this study is borrowed from financial accounting. The Financial Accounting Standards Board defines materiality as: “information which would be considered decision-relevant to an investor”. As the airline versus the investment bank example above highlights, decision-relevant issues depend on the company’s business and also varies with industry.

In this study, we leverage the work of the Sustainability Accounting Standards Board (SASB) to determine what is a material ESG issue in each industry. As outlined in their mission statement:

“SASB sets industry-specific standards for corporate sustainability disclosure, with a view towards ensuring that disclosure is material, comparable and decision-useful for investors”.

In this study, we have used the SASB materiality map that explicitly identifies the material ESG issues to industry groups. The map is included in Appendix 1.

Mapping Sustainalytics data with SASB guidance

We seek to build on this evidence by differentiating between firm performance on material and immaterial ESG issues within “traditional” ESG scores, such as those created by data provider Sustainalytics. In this study, we map performance on ESG sub-issues provided by Sustainalytics to an industry-level materiality map developed by SASB.

This allows us to separate the subcomponents of a “traditional” ESG score into two buckets:

- Material
- Immaterial

In doing so, we take a combined signal that was designed for a wide range of financial and non-financial purposes, and strip it down for our more specific goal: improving the quality of the ESG signal used for portfolio construction. The outcome of this exercise is a signal of firm characteristics on purely material sustainability issues.

Building a new ESG metric

Our study adds to the field by applying these principles to a specific task: building a new ESG metric. We extend the techniques established by others to a new sustainability dataset and a new expanded universe. Going further, we seek to understand how these scores differ from “traditional” ESG scores. As with other investment signals, we want to know how incorporating these scores is likely to impact investment performance.

We can further break this question down into two components.

1. **Correlation** – that is, correlation with other known drivers of returns, or factors.
2. **The alpha component**, or rather, the information not captured by our factors.

Specifically, we analyse how material ESG scores are correlated with known factor exposures, show that the correlations differ from “traditional” ESG scores, and provide high-level return profiles for the new scores over the short history where we have data available. We find that a high percentage of the underlying signals feeding into the traditional score are not considered material. While we do not believe our limited data history is sufficient for making claims about long-term performance, we find evidence that material ESG scores are better predictors of return compared to “traditional” ESG scores, even after adjusting for known drivers of equity returns (such as factor exposures).

In the rest of this paper, we describe the underlying data and methodology used to construct the Material ESG scores, summarise the new scores, compare these to other ESG metrics, and finally provide a sector-level case study to illustrate how the new scores can work in practice. An analysis of related literature can be found in the appendix.
Chapter 1: Data and Score Methodology

Sustainalytics data
The Sustainalytics data set provides sustainability data at the company-level for over 140 sustainability categories. These are divided into environmental (E), social (S) and governance (G) issues. Scores for these subcategories are then rolled up into aggregated E, S and G scores which are further rolled up into an aggregated ESG score for each company. Sustainalytics acknowledges that not every subcategory is relevant to every industry. To reflect this, data is not provided for each industry in each category. Additionally, even where subcategory scores do exist, the weight matrix used to roll up subcategories into an aggregate score varies by peer group. Sustainalytics ESG scores are constructed for a variety of financial and non-financial uses and reflecting this, these weightings do not necessarily focus on financial materiality.

SASB materiality guidance
To identify what subcategories are financially material we use materiality guidance from SASB. The mission of the SASB is to develop sustainability accounting standards that help companies disclose value-relevant information to investors via standardized filings with the U.S. Securities and Exchange Commission (SEC) such as a 10-K. The Board engages in a six-step process, described in the figure below, before making a final determination that a sustainability issue is material. This detailed process and the resulting materiality map represent precisely the work that we look to leverage in our study. The explicitness of linking industries to specific sustainability issues mean that SASB’s work can be more directly applied to this exercise compared to other sustainability reporting organizations.3

Step 1: Mapping Sustainability Subcategories
This first step in our process, mapping sustainability subcategories to SASB materiality, closely follows the process outlined by KSY (2016) in their study on materiality. We start by comparing the list of all 145 subcategories available from Sustainalytics to the 30 material sustainability issues identified by SASB. Construction of new Material ESG scores based on SASB materiality involves the following steps:

1. Identify ESG issue materiality for each industry
   This is performed using the SASB Materiality Map in Appendix 2
2. Map SASB ESG issues to related categories in the Sustainalytics data set
   See SASB to Sustainalytics Map in Appendix 4
3. Aggregate the material ESG issues into a single score per company. This process is described below.

Step 2: Score Construction
The distribution of raw Sustainalytics subcategory scores is not the same across the subcategories as shown in figure 2 over page.
This suggests that to fix the aggregation distortions coming from scale differences, standardization is required prior to aggregating into an overall ESG score.

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2 Form 10-K are annual reports required by the SEC, providing a comprehensive summary of a company’s financial performance
3 For more discussion on other providers such as the Global Reporting Initiative or Integrated Reporting, see Appendix 3.
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Figure 1: SASB research methodology

1. Surfacing Issues
   - Assessing materiality

2. Materiality Assessment
   - Testing the reasonableness of the materiality assessment

3. Characterizing Nature of Financial Impact
   - SASB identifies topics in each industry that would be of interest to a reasonable investor and:
     - Pose direct financial risks
     - Are or may be regulated in the near future
     - Are becoming industry norms and drive competitive best practices
     - Are raised by investors and other stakeholders and threaten brands or license to operate
     - Represent opportunities for innovation and growth

4. Vetting
   - Analysts conduct in-depth research to gather evidence on whether the topic affects the company's financial condition or operating performance. Analysts then map the sustainability topic to a specific impact on financial fundamentals:
     - Revenue Impacts
     - Operating Costs
     - Asset Impacts
     - Revenue Impacts
      - Revenue
      - Cost
      - Impact on Liabilities and/or Financing Costs

5. Verification
   - SASB hosts industry working groups with issuers, corporate experts, investors, and market intermediaries to vet the evidence and assess consensus regarding the materiality of the topic, with generally a 75% approval benchmark for inclusion in the standards.

6. Validation
   - Analysts perform quantitative analysis to assess the effect on price values. With better data, back-testing can be conducted in the future.


Discounted cash flow (DCF) is a valuation method used to estimate the attractiveness of an investment opportunity. Forms 10-K and 20-F are mandatory filings with the SEC. Form 20-F is the primary disclosure document required of foreign private issuers listing equity shares on exchanges in the United States.

Figure 2: Sustainability subcategory scores – box and whisker plots

Source: Russell Investments, Sustainalytics. Data as of June 30, 2017
Step 2 continued: The score construction process involves three steps:

1. Calculate the standardized subcategory score by z-scoring\(^4\) the raw Sustainalytics subcategory scores:

\[
\text{Subcategory Score} = \frac{\text{raw Sustainalytics score} - \text{Average} (\text{raw Sustainalytics score})}{\text{Standardized} (\text{raw Sustainalytics score})}
\]

Scores are standardized cross-sectionally at a given point in time for a given subcategory. There are 145 Sustainalytics subcategories.

2. Aggregate subcategories at the material issue level. Material issues are the categories identified by SASB and include, for example, categories such as Fuel Management and Supply Chain Management. In total, there are 30 issues. A material issue may be based on one or several of the Sustainalytics subcategories mentioned above. Suppose there are \(n\) subcategories related to a given material issue, the material issue score is the average subcategory score:

\[
\text{Material Issue Score} = \frac{1}{n} \sum_{i \in \text{Material Issue}} \text{Subcategory Score}_i
\]

The subcategory scores can be very industry specific so a subcategory is only used when a score is available (i.e. no substitution logic is applied).

3. Calculate the final material ESG score. Suppose there are \(m\) material sustainability issues for a given industry, the material ESG score for companies in that industry will be the average of the \(m\) issue scores:

\[
\text{Material ESG Score} = \frac{1}{m} \sum_{j \in \text{Industry}} \text{Material Issue Score}_j
\]

This final score is standardized and finally, scaled up so that it ranges between 0 and 10.

Note: A SASB Issue is always relevant to the industry (by definition of the materiality matrix) so substitution logic is applied if a score is null. Specifically, if a company has no SASB issue score for a material issue, the average score for that sector is used.

\(^{4}\) Z-scoring is a statistical measurement of a score relationship to the mean in a group of scores. Standardized scores are also known as z-scores and help in comparing different scores by converting them to standard scores.
Chapter 2: Characteristics of the ESG scores

At the company level, the material ESG score is discrete and ranges from zero to ten. The distribution of scores is approximately normal with a mean, median and mode of roughly five. For the Russell Global Indexes Developed Large Cap Index (RGI Global Large Cap), the cap-weighted index average is also five. The histogram for all securities in the coverage universe as well as summary statistics for the RGI Global Large Cap Index are provided for reference in Figure 3 below.

Figure 3: Material ESG score distribution and summary statistics

<table>
<thead>
<tr>
<th>RGI GLOBAL LARGE CAP</th>
<th>MATERIAL ESG SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>3399</td>
</tr>
<tr>
<td>Mean</td>
<td>4.87</td>
</tr>
<tr>
<td>St Dev</td>
<td>2.39</td>
</tr>
<tr>
<td>Min</td>
<td>0</td>
</tr>
<tr>
<td>Max</td>
<td>10</td>
</tr>
<tr>
<td>Mode</td>
<td>5</td>
</tr>
<tr>
<td>Median</td>
<td>5</td>
</tr>
<tr>
<td>Skew</td>
<td>0.28</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-0.43</td>
</tr>
<tr>
<td>Cap weighted Average</td>
<td>5.58</td>
</tr>
<tr>
<td>Cap weighted Coverage</td>
<td>96%</td>
</tr>
</tbody>
</table>

Source: Russell Investments, as of June 30th, 2017.

To what extent do these new material ESG scores resemble the original generic ESG scores?

While our goal is to build a different ESG signal, an obvious question is to what extent these new material ESG scores resemble the original generic ESG scores. In Figure 4 we report the correlation between our new score and Sustainalytics ESG scores. While we have no specific correlation threshold in mind, a very low or negative correlation with existing scores would be surprising, if not outright concerning, given the data used to construct our scores is a subset of the data used for the Sustainalytics scores. A very high correlation would suggest there is little to be gained by rebuilding the scores in the manner proposed here. At roughly 65% correlation, the new scores meet these criteria in that they are positively correlated, but meaningfully different from the existing scores.

In addition to considering how the scores are correlated with a “traditional” ESG score, we are also interested in how these scores may be related to other signals. To the extent that we believe certain factor exposures drive equity returns, these correlations are informative to answering the question of how incorporating these scores is likely to impact investment performance. In Figure 5 we report correlations between the Material ESG scores and Russell Investments Factor Scores for the RGI Global Large Cap universe over time.

5 Skew is the term used to describe asymmetry from the normal distribution in a set of statistical data.
6 Kurtosis is a statistical measure that is used to describe the distribution or skewness of observed data around the mean.
7 Barber, Bennett, Gvozdeva (2015)
8 Russell Investments Factor Scores are a proprietary measure of a company’s exposure to a particular factor exposure.
Correlation analysis

The largest correlation in terms of magnitude is a negative correlation to the size factor, or in other words, the scores display a large cap bias. This is consistent with the cap bias we identified in Ross, Song and Pearce (2014). Other relationships are quite modest. Scores are positively correlated with both value and quality. Momentum, low volatility and growth exposures are either inconsistent or close to zero over time. To help understand how these new material scores will be expected to perform relative to the Sustainalytics scores, below we report the correlations of both Material ESG and Sustainalytics scores.

Factors are separated into two charts for readability. Figure 6 below presents the factors where correlations are consistently higher for the Material score. Compared to the Sustainalytics ESG scores, the negative correlation to the size factor is smaller in magnitude. In other words, the new ESG Score exhibits less of a large cap bias than the Sustainalytics ESG score. Correlation with quality is higher for the Material ESG score and a negative correlation to growth associated with the Sustainalytics score is eliminated. Meanwhile, Figure 7 presents factors where there is either no distinguishable change in the exposure (value and momentum) or the exposure is reduced, as is the case for low volatility.
Digging deeper into ways in which the scores change under the new methodology, Figure 8 shows scatter plots with Material ESG scores on the x-axis versus Sustainalytics scores on the y-axis (organized by sector). Where points fall on a diagonal 45-degree line, the two methodologies led to the same scores. For illustrative purposes, we highlight some notable clusters of scores that do not fall on the diagonal and hence where the two methodologies are in the most disagreement.

The highlighted cluster in consumer discretionary, for example, includes a group of automobile manufacturers where our material ESG score is higher than the data provider’s score. This represents an industry where SASB and Sustainalytics disagree on what criteria matter, an example we will dig into deeper in the case study section of the paper.
Financials and real estate sectors

In the financials and real estate sectors, we see vertical clusters on Figure 8 where the material ESG score is the same and the Sustainalytics score differs. These represent key differences – Sustainalytics is differentiating between these companies and the material ESG score is not. This means that Sustainalytics is differentiating between companies on sustainability issues deemed not material and this is precisely the type of information that a Material ESG score looks to strip out from the signal. In the case of insurance companies, the data provider considers discrimination, employee incidents and financial inclusion as material to the industry.

While SASB includes these categories for other industries in the financial sector like lending, materiality in the insurance industry instead focuses on the impact of the environment on assets and operations, systemic risk management, lifecycle impacts of products and services, fair marketing and customer welfare.

Carbon and Green House Gas (GHG) Emissions

In utilities, the traditional score considers carbon emissions equally material for electric and gas utilities. Operations of electric utilities generate considerably higher carbon emissions relative to gas utilities – approximately six times as much on average – and SASB chooses to focus instead on downstream impacts of a gas utilities’ operations rather than their own carbon emissions (Scope 1)\(^9\).

In information technology, while both consider issues like data privacy and security, diversity and inclusion, and development and retention material, Sustainalytics again includes GHG emissions and disclosure whereas SASB focuses on resource management. These examples are consistent with the trends we saw in general, including finding that the “traditional” ESG score considers GHG emissions material to far more companies than our material scores.

Disclosures

We also observe that companies are heavily penalized in the traditional scores for failure to provide disclosures, even in areas the new scores are considered immaterial. We explore these nuances further in the sector case study that follows.

In each case, one could argue for the data provider’s approach of including more categories captures a wider range of issues. While this is certainly true, the key objective of our work is to focus on the sustainability issues that are considered most important to the firm’s business. We seek to avoid including less material issues that can obscure changes in material characteristics thereby eroding the descriptive value of the signal.

\(^9\) The Greenhouse Gas Protocol (GHG Protocol) defines Scope 1 as all direct emissions - emissions from sources that are owned or controlled by the reporting entity.
Figure 8: Sector scatter plots of Sustainalytics vs Material ESG scores

Source: Russell Investments. Data as of June 30, 2017. Colors represent industries within sectors. To facilitate comparison, all scores are z-scored. GIC refers to the sectors identified by Global Industry Classifications.
Chapter 3: To what extent do material ESG scores differ?

It is reasonable to ask to what extent does all this work really matter? Can we measure how much the materiality scores differ from the existing generic framework?

There is a difference and the difference is large

In Figure 9 below, we report the number of material issues compared to the immaterial issues constituting the “traditional” ESG score.

Where the blue line is above the orange line, there are more immaterial than material pieces of information feeding into the score. Often there are far more. In other words, immateriality appears to dominate the “traditional” ESG score. The grey line represents the percent of data items that are material for a given security. The dotted red line represents a threshold for 25% of items being material. For all securities under the red line, less than 25% of the issues considered in the “traditional” ESG score were material.

The main takeaway here is that the ESG scores we currently use are composed of a very large number of issues that are not material. Specifically, for 66% of all securities in the RGI Global Large Cap universe, less than 25% of the data items in the “traditional” ESG score were material.

Figure 9: Material vs Immaterial Issues in a “Traditional” ESG Score, RGI Global Large Cap Universe

Do these differences matter for investment performance?

Returns

The next natural question is – to what extent do these differences matter from a return standpoint? A major limitation for drawing conclusions about the investment performance of the new scores is limited data history that impedes testing over full market cycles. The underlying subcomponents used to build the new scores are available from December 2011. That is considerably less history than we need to draw robust conclusions about investment performance. For this reason, we stop short of advocating adoption of the scores based on historical performance. As referenced above, our work closely follows a methodology laid out in Khan, Serafeim, and Yoon (KSY) in 2016. Their study uses data with a longer history: 1991–2013. Our findings can serve as a rough out-of-sample test of their work.

Khan, Serafeim, and Yoon (2016) KSY (2016) use the historical MSCI KLD 400 Social Index (MSCI KLD) dataset that has a longer history than other sustainability datasets. The MSCI KLD dataset’s historical coverage is limited to the US. It assigns binary strength or concern flags to various sustainability issues including community engagement, governance structure, workforce diversity, and water stress, among others. The authors use these flags to build a material and immaterial score for each company. For their analysis, the

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10 As defined by SASB (Sustainability Accounting Standards Board) Materiality Map. See Appendix 2.
authors focus on change in these scores rather than levels in an attempt to isolate the unexpected level of sustainability outcomes. Changes in scores are regressed against changes in other firm characteristics that may be correlated with ESG scores such as size and value, to further isolate the sustainability signal. The residuals of the changes in both the material and immaterial scores that are not explained by the other characteristics, are used to construct high and low Material and Immaterial indexes based on quintiles. For example, a company with a (residual) material score in the top quintile will be included in the High Material index. A company with a (residual) material score in the bottom quintile will be included in the Low Material index.

Robust testing

Returns for the Material and Immaterial indexes are regressed on a Fama-French (Mkt-Rf, SMB, HML)\textsuperscript{11} plus momentum (UMD) factor model\textsuperscript{12}. The authors present various specifications and robustness checks, but here we summarize their findings to the most relevant for our purposes: the difference in alphas\textsuperscript{13} generated by high and low performance on material and immaterial issues as displayed in Figure 10.

Figure 10: Differences in the four-factor alphas of high and low portfolios formed on the basis of material and immaterial Sustainability issues (Khan, Serafeim, and Yoon, 2016), US Large Cap Universe, 1991 - 2013

<table>
<thead>
<tr>
<th>Differences in four-factor alphas (High – Low Quintile Performance)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Material Sustainability Issues</strong></td>
</tr>
<tr>
<td><strong>Immaterial Sustainability Issues</strong></td>
</tr>
</tbody>
</table>

Source: Russell Investments. Alphas refer to portfolio returns regressed on 4-factor models including Mkt-Rf, SMB, HML, and UMD. ***, **, * refer to significance at the 1%, 5%, and 10% levels respectively.

The positive sign on the spread between high and low alphas suggests firms in the top quintile of sustainability characteristics outperformed low sustainability on both material and immaterial issues. With an annualized difference in alphas of 4.98%, the spread was considerably larger for material sustainability issues than immaterial issues at 0.71%.

To further differentiate between performance on material and immaterial issues, the indices are double sorted into four buckets: firms that were high performers in both material and immaterial categories, high in one category and low in the other, or low performers in both. The authors isolate the relative performance of companies that had high investment in material issues and low investment in immaterial issues, as represented by quadrant 1 in Figure 11 below.

\textsuperscript{11} The Fama-French Three Factor Model is an asset pricing model that expands on the capital asset pricing model (CAPM) by adding size (SMB) and value (HML) factors to the market risk (Mkt-Rf) factor in CAPM. Source: Investopedia.com

\textsuperscript{12} Momentum (UMD) is an additional factor and, when added to the three factor Fama-French model, is referred to the four-factor alphas used in the research.

\textsuperscript{13} Alpha measures the difference between a portfolio’s actual return and expected performance, given its level of risk.
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**Figure 11: Mapping of performance of both material and immaterial categories. Double-sorted alphas and differences in four-factor alphas (Khan, Serafeim, and Yoon, 2016), US Large Cap Universe, 1991 – 2013**

<table>
<thead>
<tr>
<th>Four-factor alphas (1991-2013)</th>
<th>Annualized alpha</th>
<th>Difference in alphas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – High Material, Low Immaterial</td>
<td>6.01%</td>
<td></td>
</tr>
<tr>
<td>2 – Low Material, Low Immaterial</td>
<td>-2.90%</td>
<td>8.90%***</td>
</tr>
<tr>
<td>3 – Low Material, High Immaterial</td>
<td>0.60%</td>
<td>5.41%***</td>
</tr>
<tr>
<td>4 – High Material, High Immaterial</td>
<td>1.96%</td>
<td>4.05%***</td>
</tr>
</tbody>
</table>

Source: Russell Investments. Alphas refer to portfolio returns regressed on 4-factor models including Mkt-Rf, SMB, HML, and UMD. ***, **, * refer to significance at the 1%, 5%, and 10% levels respectively. Annualized alpha measures the fund’s value added relative to a benchmark, smoothed over a stated period.

High performance on material issues led to higher alphas than low performance (quadrant 1 vs 2 and quadrant 4 vs 3). Interestingly, after controlling for high performance in material issues, a portfolio of firms scoring low on immaterial issues generated higher alpha than the portfolio of high performance on immaterial issues. In other words, spending resources on immaterial issues appears to have been value detracting. This further suggests that differentiating between material and immaterial issues matters from an investment perspective.

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14 Double-sorted alphas refers to the mapping of the material and immaterial categories as high/low material and high/low immaterial as is shown in the four scenarios illustrated in Figure 11.
Chapter 4: Results for the material ESG score

Here we extend the scores’ analysis to the period December 2012 – June 2017 on a wider universe: the Russell Global Indexes Large Cap Index. Following the same methodology as KSY (2016) we report results for our sample in Figure 12 below.

Figure 12: Differences in the four-factor alphas of high and low portfolios formed on the basis of material and immaterial Sustainability issues (RGI Global Large Cap, Dec 2012-June 2017).

<table>
<thead>
<tr>
<th>Differences in four-factor alphas (High – Low Quintile Performance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Sustainability Issues</td>
</tr>
<tr>
<td>Immaterial Sustainability Issues</td>
</tr>
<tr>
<td>Traditional ESG Score</td>
</tr>
</tbody>
</table>

Source: Russell Investments. Alphas refer to high minus low portfolio returns regressed on four-factor models including Mkt-Rf, SMB, HML, and UMD. ***, **, * refer to significance at the 1%, 5%, and 10% levels respectively.

Material issues are the most promising signal

Consistent with KSY (2016), we find that the difference between high and low performers on material issues is larger than immaterial issues or the traditional scores. This suggests that material issues are the most promising signal among those we consider here for informing investment decisions based on ESG performance. The difference in alphas is statistically significant for material issues but not for immaterial issues.

This suggests that we can improve conviction by focusing on material characteristics, consistent with our goal of reducing noise and improving the information content of the signal. Again, these results have already controlled for differences in known return contributors such as firm size, value, and momentum. A higher spread and higher significance is supportive of the thesis that material sustainability issues provide a more robust investment signal than immaterial issues or the “traditional” ESG score.

Low performance on material issues is especially costly

Following the methodology of KSY (2016), we go one step further to isolate high performance on only material issues. We consider the same four double-sorted buckets that capture firms that are high performers in both categories, a high performer in one and low performer in the other or a low performer in both. Our analysis is performed on the RGI Global Large Cap universe over the period Dec 2012 – June 2017, results for which are presented in Figure 13 below.

Figure 13: Double-sorted alphas and differences in four-factor alphas (RGI Global Large Cap, Dec 2012-June 2017)

<table>
<thead>
<tr>
<th>Double-sorted buckets</th>
<th>Annualized alpha</th>
<th>Difference in alphas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - High Material, Low Immaterial</td>
<td>-1.18%</td>
<td></td>
</tr>
<tr>
<td>2 - Low Material, Low Immaterial</td>
<td>-4.60%</td>
<td>1.22%*</td>
</tr>
<tr>
<td>3 - Low Material, High Immaterial</td>
<td>-3.38%</td>
<td>2.20%*</td>
</tr>
<tr>
<td>4 - High Material, High Immaterial</td>
<td>-0.95%</td>
<td>-0.23%</td>
</tr>
</tbody>
</table>

Source: Russell Investments. Alphas refer to portfolio returns regressed on 4-factor models including Mkt-Rf, SMB, HML, and UMD. ***, **, * refer to significance at the 1%, 5%, and 10% levels respectively.
The first thing we notice is that alphas for all buckets are negative. This is not entirely surprising given we know the returns of any strategy are generally well explained by the standard factors that we’ve controlled for here. The key takeaway for us from these results is that low performance on material issues is especially costly. This appears to be true even if the firm is a high performer on other ESG issues. Specifically, for firms with low immaterial performance, a high material performer had a 1.22% annualized improvement in alpha relative to a low material performer. For firms with high immaterial performance, a high relative to low material performer had a 2.20% annualized performance improvement in alpha.

High performance on immaterial issues has a small but positive impact on alpha

We do not replicate the Khan et al. finding that high performance on immaterial issues is costly (quadrant 1 minus quadrant 4 is negative not positive) although the difference between these buckets is not statistically significant. Moving from low performance to high performance on immaterial issues has a small but positive impact on alpha of 0.23%.

On the one hand, we know from the results that material issues are still a better signal than immaterial issues. We are also cautious to avoid drawing too many conclusions from quadrants 1 and 2 (high performance in one category, low performance in the other) because these buckets tend to have very few companies. As pointed out in the analysis sections above, performance on material and immaterial issues is positively correlated. This means that there are more firms that are high performers on both material and immaterial issues than there are firms that are high in one category and low in the other. In fact, being a top quintile performer in one category and bottom in another is relatively rare: less than 20 names on average are represented in these off-diagonal buckets.

Should material ESG scores be treated as alpha signals?

While these findings are interesting, we do not necessarily have high conviction in their robustness and would not advocate, at this stage, that material ESG scores should be treated as alpha signals. Similarly, generating significant positive four-factor alphas is not necessarily the standard we would set to evaluate these scores. Our goal here is to provide a framework that is consistent with previous studies in order to leverage their longer history on results we found informative.

The robustness of our results is undermined by limited data history and an inability to replicate the results across a sufficient number of dimensions: regions, portfolio construction techniques, cut-offs and so on. However, we did gain valuable takeaways, most notably that material ESG performance appears to be a better signal than standard or immaterial ESG performance and that low performance on material issues is especially costly.
Material ESG Scores in action: Case Study – Tesla and Volkswagen AG

To provide a deeper understanding of how the material ESG scores work in practice, below we present a case of how the inclusion of materiality impacts the ESG score for a comparison between Tesla and Volkswagen.

Firstly, we identify the relevant mapping of SASB to Sustainalytics subcategories that reflects the five categories identified as financially material.

**Figure 14 SASB/Sustainalytics category mapping for the automotive industry**

<table>
<thead>
<tr>
<th>SASB Issue</th>
<th>Sustainalytics subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste and hazardous materials management</td>
<td>E.1.3.2 Hazardous Waste Management, E.3.1.16 Hazardous Products</td>
</tr>
<tr>
<td>Labor relations</td>
<td>S.1.1.1 Working Conditions Policy, S.1.5.1 Percentage of Temporary Workers</td>
</tr>
<tr>
<td>Lifecycle impacts of products and services</td>
<td>E.3.1.1 Sustainable Products &amp; services, E.3.1.2 Clean Technology Revenue, E.3.1.3 Fleet Emissions, E.3.1.4 Fleet Efficiency, E.3.1.6 Eco-Design, S.2.2.4 Fair Trade Products, S.1.6.2.1 Health and Safety Management Systems</td>
</tr>
<tr>
<td>Product quality and safety</td>
<td>E.3.2 Product &amp; service incidents, S.3.3 Customer Incidents, E.3.1.16 Hazardous Products, E.3.1.7 Product Stewardship Programs</td>
</tr>
<tr>
<td>Materials sourcing</td>
<td>S.2.1.3 Conflict Minerals Policy, S.2.1.3.1 Conflict Minerals Programs, E.2.2 Environmental Supply Chain incidents</td>
</tr>
</tbody>
</table>

Source: Russell Investments. The letters/numbers preceding the subcategory names above are reference numbers used by Sustainalytics for categorizing the subcategories.

---

15 All Sustainalytics subcategories are weighted scores.
We then take the Sustainalytics scores for each of the subcategories.

**Figure 15 Sustainalytics subcategory scores for the identified material ESG criteria**

<table>
<thead>
<tr>
<th>Sustainalytics Subcategory Description</th>
<th>Tesla Subcategory Score</th>
<th>Volkswagen Subcategory Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.1.1.1 Working Conditions Policy</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>S.1.5.1 Percentage of Temporary Workers</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>E.3.1.1 Sustainable Products &amp; Services</td>
<td>3.20</td>
<td>1.25</td>
</tr>
<tr>
<td>E.3.1.15 Sustainable Financial Services</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>E.3.1.2 Clean Technology Revenues</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>E.3.1.3 Fleet Emissions</td>
<td>3.70</td>
<td>0.76</td>
</tr>
<tr>
<td>E.3.1.4 Fleet Efficiency</td>
<td>3.08</td>
<td>0.83</td>
</tr>
<tr>
<td>E.3.1.6 Eco-Design</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>S.1.6.2.1 Health and Safety Management System</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>S.2.2.4 Fair Trade Products</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>E.3.1.16 Hazardous Products</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>E.3.1.7 Product Stewardship Programmes</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>E.3.2 Product &amp; Service Incidents</td>
<td>1.65</td>
<td>-2.09</td>
</tr>
<tr>
<td>S.3.3 Customer Incidents</td>
<td>-0.83</td>
<td>-2.06</td>
</tr>
<tr>
<td>E.2.2 Environmental Supply Chain Incidents</td>
<td>0.66</td>
<td>0.66</td>
</tr>
<tr>
<td>S.2.1.3 Conflict Minerals Policy</td>
<td>-0.02</td>
<td>1.48</td>
</tr>
<tr>
<td>S.2.1.3.1 Conflict Minerals Programs</td>
<td>1.35</td>
<td>-0.23</td>
</tr>
</tbody>
</table>

All subcategory scores are weighted. *no reporting available so default to industry standard
Source: Russell Investments analysis as of December 31, 2017.

The material issue score is then calculated based on the average subcategory score:

\[
Material\ Issue\ Score = \frac{1}{n} \sum_{i \in \text{Material\ Issue}} Subcategory\ Score_i
\]

To calculate the final material ESG score. Given there are eight material sustainability issues for the automotive industry, the material ESG score for companies in that industry will be the average of the eight issue scores:

\[
Material\ ESG\ Score = \frac{1}{m} \sum_{j \in \text{Industry}} Material\ Issue\ Score_j
\]
The material ESG score is then standardized and rescaled to range from 0 (worst) to 10 (best). The table below shows the variation from the Material score to the “traditional” ESG score (measure out of 100).

**Figure 16 Comparison of Tesla and Volkswagen AG scores using the material ESG score vs the “traditional” ESG score**

<table>
<thead>
<tr>
<th></th>
<th>Tesla</th>
<th>Volkswagen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material ESG Score</td>
<td>10/10</td>
<td>3/10</td>
</tr>
<tr>
<td>“Traditional” ESG Score</td>
<td>55/100</td>
<td>61/100</td>
</tr>
</tbody>
</table>

Data as of December 31, 2017.

Score commentary

As a leader in vehicle efficiency and clean vehicle technology, Tesla scores well above average on the issues of lifecycle impacts of products and services. Their lowest score was in the Material ESG subcategories related to product quality and safety where they received relatively lower scores due to consumer safety concerns surrounding self-driving functionality. The material ESG score differs meaningfully from the traditional score in which Tesla is significantly penalized for weak reporting of its own inhouse (corporate operations) carbon emissions. This is not identified as a material issue to the company’s growth and hence does not impact the material ESG score.

When reviewing the material score for Volkswagen AG, the company’s past action in cheating on vehicle emission testing leads to a well below average score on the issue relating to product quality such as product and service incidents. Concerns still exist that the company will be unable to meet its emission targets in the EU which would result in further legal risk to the company. Sustainalytics reports and overall negative view on the company’s governance and ability to meet emissions standards but continues to award high scores on (immature) issues like diversity, employee turnover and other human capital issues. Thus, Volkswagen AG's resulting traditional score is still higher than Tesla who was penalized for weak reporting on their inhouse emissions.

The result

The material vs “traditional” ESG scores led to very different rankings. Whereas, the material ESG score picked up that Tesla has a much stronger performance on the material issues of fleet emissions and product quality and safety relative to Volkswagen, the traditional score awards a lower ESG score to Tesla based on lower performance in issues that SASB did not consider material to the sustainability of companies in the automotive industry.\(^{16}\)

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\(^{16}\) Any stock commentary is for illustrative purposes only and is not a recommendation to purchase or sell any security. The case study is provided for discussion purposes only. Individual security results will vary based on individual circumstances and market events. There is no guarantee that all firms will experience the same results.
Chapter 5: Coverage and robustness

As outlined in the score methodology chapter above, our approach involves applying substitution logic\textsuperscript{17} to a material issue score when no data is available from Sustainalytics for that issue. It is not uncommon in ESG data for substitution logic to be applied to achieve high coverage for an index. However, we want to know what level of substitution logic we are relying on here. In the case of our new material ESG scores, we report the index coverage and percent use of estimation (i.e. substitution logic) for the RGI Global Large Cap index in the figure below.

Figure 17: Material ESG Scores: Percent of RGI Global Large Cap Index using substitution logic

Figure 14 presents several key findings:

- Coverage for the Material ESG scores for the RGI Global Large Cap universe is 96%.
- Very few companies have a Material ESG score based entirely on estimation (0.25% of the index).
- Most companies have substitution logic applied for at least one of the SASB issues that make up their SASB ESG score (80% of the index).
- Roughly 60% of the index has substitution logic applied. At most, 25% of these are SASB issues. By using a <50% substitution logic threshold, 93% of the index is covered.

By filling with averages, our substitution logic by design pushes companies with missing data closer to the center of the distribution. The center of the distribution represents a lower conviction in a company’s ESG signal on either the high or low side. In other words, we are less likely to tilt towards or away from a company based on the ESG signal in the center of the distribution and by extension based on an ESG signal that is predominantly estimated.

This fact, taken together with coverage rates that are at least in line with industry-standard ESG data practices, suggest neither coverage nor reliance on substitution logic are reasons for not adopting the methodology.

\textsuperscript{17} Substitution is a fundamental concept in logic. To apply a substitution to an expression means to consistently replace its variable, or placeholder, symbols by other expressions. The resulting expression is called a substitution instance of the original expression.
Chapter 6: Conclusions

Industry bodies and Russell Investments aligned
Industry bodies such as the Task Force on Climate-related Financial Disclosures (TCFD) and the United-Nations backed Principles for Responsible Investment (PRI) actively promote and recommend that companies need to focus more on the material ESG issues that directly affect their bottom line. With the help of SASB’s industry-level material map and data from Sustainalytics, we have been able to do just that, and construct a new ESG score that focuses solely on material issues.

How do we build an ESG score that is tailor made for informing investment decisions?
“Traditional” ESG scores contain both financially material and immaterial issues. This is not surprising given ESG scores are designed for a broad range of purposes. There are a multitude of reasons why ESG criteria are considered by investors, many of which are non-financial. Our focus here on financial criteria is not meant to imply that this is the only or most important dimension of ESG investing. Instead our goal is narrower: how do we build an ESG score that is tailormade for informing investment decisions?

We seek to pull out the information that is material to a firm’s performance and eliminate the nonmaterial data feeding into the signal. This supports existing literature by constructing a new score, examining the correlation with other known drivers of equity returns, analysing the commonality with generic ESG scores, and providing a high-level return analysis over the available history.

Overall, we have reached conclusions consistent with existing literature in this field. That is, when measuring sustainability performance, the separation of material issues from immaterial issues matters.

Ensuring robustness and risk management
We believe that the Russell Investments’ material ESG score represents a strong development in our understanding of ESG performance drivers.

Today, the scores are being used and measured in our research databases to help us chart further progress.

We are in the early stages of development and further research is required to integrate the Russell Investments’ material ESG score throughout our investment process.

Further research
Our study uncovered several potential areas for further research. Here we studied a global universe but given regional differences in ESG integration and our inability to fully replicate a prior study’s results from the United States, it is interesting to consider to what extent, if any, there should be a regional component to expectations for ESG investing. As noted above, there are many reasons to integrate ESG into an investment process.

While our study has largely focused on financial materiality, opportunities exist for developing cleaner signals based on other ESG-related goals, such as alignment with the UN Sustainable Development Goals (SDGs). Rather than mapping industries to key issues based on financial materiality, we could also focus on mapping industries to the SDGs that are relevant to their business line.

The material ESG score and returns
Our goal was to confirm whether we could improve the information content of a “traditional” ESG score for the tailored purpose of making investment decisions. Our analysis demonstrates this is possible. Specifically, we found that a high percentage of the underlying signals feeding into the traditional score are not considered material to the firm’s business; we observe correlations with factors that are modestly improved; and finally, our material ESG scores appear to be a predictor of returns when compared to the traditional score, even after adjusting for known factor exposures. Our results up to this point are encouraging, and we remain confident.
References


Barber, J., Bennett, S., & Gvozdeva, E. (Fall 2015). How to Choose a Strategic Multifactor Equity Portfolio. The Journal of Index Investing, 34-45.


Appendix 1: Literature on financial performance of ESG investing

are non-financial. Our focus for this literature study however is financial in that we surveyed the evidence on ESG investment performance. This is not meant to imply that this is the only or most important dimension of ESG investing. Rather our goal is to focus in on answering one specific question: what is the link between ESG and investment performance? The literature addressing the investment performance of ESG investing is extensive. The theoretical basis for arguing that ESG detracts from performance is largely connected to screening. The argument starts by assuming that investors maximize expected risk-adjusted returns. Absent an ESG constraint, investors will select an optimal unconstrained portfolio, $P^*$, that maximises the expected return for a given level of risk. Adding an ESG constraint, such as constraining the portfolio to not hold any tobacco stocks for example, means that the remaining portfolios are (weakly) inferior to $P^*$. After all, not holding tobacco was always an option in the unconstrained world and so $P^*$ is at least as good, if not better, as everything in a constrained subset.

In contrast, theoretical justifications for why ESG incorporation is return-enhancing can be based on market efficiency. Relative to financial data, proponents argue that ESG data is less widely available and comparative analysis of firms is challenged by a lack of standardized, comparable data. Whereas the market is largely efficient with respect to financial data, proponents argue that market inefficiencies may still exist for ESG information based on these limitations. Other arguments linking ESG incorporation to financial performance are based on lower costs of capital observed for high ESG firms and firm investment in ESG issues as a signal for long-term orientation as opposed to short-termism. Both of these characteristics have been shown to in turn lead to higher financial performance.

Cleaner conclusions

When it comes to summarizing literature on the value of ESG investing, the key is to be specific about what type of ESG investing we are talking about. When all of the different categories of ESG strategies are taken together, the literature on financial performance of ESG is mixed. By clearly distinguishing what category of ESG is being employed however, cleaner conclusions can be made.

ESG-related investing and the corresponding literature can be categorized into several groups:

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Values-based screening</td>
<td>Screening securities involved in certain activities based on a religious, moral or family view.</td>
<td>Weapons exclusion list</td>
</tr>
<tr>
<td>Traditional SRI^2^</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESG Integration</td>
<td>Systematic and explicit inclusion of data related to stewardship of the environment (E), workforce and communities (S), and/or long-term shareholder interests (G) as one factor in an investment process.</td>
<td>Portfolio composed of companies with high ESG characteristics</td>
</tr>
<tr>
<td>Impact Investing</td>
<td>Targeted investment in companies, assets or projects that meet specific “E” or “S” objectives, typically implemented via private investment.</td>
<td>Direct investment in sustainable agriculture project</td>
</tr>
<tr>
<td>Pure-play or Sustainability themed investing</td>
<td>Investment in specific themes such as renewable energy, typically without broad market exposure.</td>
<td>Renewable Energy Index</td>
</tr>
</tbody>
</table>

While a deep dive into the academic literature on impact investing and pure-play investing is outside the scope of this paper, we focus on two of the categories: screening and ESG integration. We have chosen to focus on these two because they have dominated both the literature and largest share of ESG-related assets under management.

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18 Hamilton and Jo (1993)
21 Benabou & Tirole (2009)
23 SRI refers to social, responsible investing
SRI screening

The first category to achieve widespread adoption was values-based SRI screening. This refers to excluding a group of companies from the investable universe because they are involved in products that the investor considers incongruous with their values. Common examples of SRI screens include tobacco, weapons or alcohol manufacturers. While the investor may have views on whether the excluded securities are going to add or detract from performance, financial performance is not the primary objective of the strategy.24

Unlike other forms of ESG-related information, involvement in the commonly screened SRI industries such as tobacco, alcohol or gambling is common knowledge, making it difficult to claim a market inefficiency exists. While the theoretical argument against ESG investing still holds (constrained universe is weakly inferior to the unconstrained universe), it is more difficult to see how the arguments in favor of ESG investing outlined above (i.e. market inefficiencies, long-termism and low cost of capital) apply to this category. This is echoed in investor surveys, which find that negative screening is perceived by investors to be the most detrimental to performance.25

The academic research on SRI value-based screening is mixed with weak consensus on the side of underperformance. Geczy, Stambaugh, Levin (2005) show that the SRI constraint is costly and that the size of the impact depends on the investor’s investment philosophy. They find the constraint ranges from costing a passive strategy a few basis points to a cost of 30 bps per month or more for investors who invest in factor exposures or believe in persistence of fund manager skills. Kahn, Lekander and Leimkuhler (2009) find negative returns from tobacco divesture and similarly, Hong and Kapcerczyk (2009) find that a portfolio that goes long sin stocks (alcohol, gambling, and tobacco) and short a group of comparable stocks generates positive and significant returns over the period 1965-2006 even after adjusting for a Fama-French plus momentum model. Renneboog, Horst, Zhang (2007) find SRI funds exhibit benchmark-like performance in US and UK regions but underperformed in Europe and Asia. In contrast, there are many other studies that suggest SRI screens have no impact on performance. D’Antonio, Johnsen and Hutton (1997) review research on the financial performance of socially screened equity portfolios finding that they performed as well as traditional investments over the period 1990-1996. Hamilton and Jo (1993) similarly found there was no statistically significant difference in performance of SRI screened mutual funds established in 1985 or earlier versus conventional mutual funds over the same period. It is also worth noting that research examining fund performance is subject to uncontrolled differences in manager skill even though these studies are prevalent and contribute to the formation of investor opinion and consensus on the topic of SRI performance.

ESG integration

ESG integration is a broader category than SRI screening. Specifically, it refers to explicit and systematic inclusion of ESG data into the investment process. Unlike SRI, which is characterized by implementation via exclusion lists, ESG integration is not characterized by one type of implementation. Instead it may include identifying positive opportunities, using ESG data as part of financial analysis, tilting towards companies with higher ESG characteristics or avoiding companies with weak sustainability performance. The academic evidence on this topic is again mixed, but unlike SRI, the consensus does not point to underperformance. In terms of investor perception, ESG integration is cited as the most beneficial, whereas survey evidence suggests negative screening is considered the most detrimental to performance.

Busch and Bassen (2015) provide a meta-analysis of over 2000 empirical studies and show that roughly 90% of the studies included in their paper show a non-negative relationship between ESG criteria and corporate financial performance, with the majority reporting positive findings. Renneboog et al (2008) argue that risk-adjusted returns of companies with good sustainability performance will only be persistently higher than those of companies with poor sustainability when the financial market doesn’t price this information efficiently. Derwal et al (2005) provide evidence to address this question, building equity portfolios based on an eco-efficiency dataset and finding that high-ranked portfolios significantly outperform low ranked portfolios over 1995-2003. Additionally, the outperformance they observe cannot be explained by other characteristics commonly linked to performance such as factors.

24 Amel-Zadeh and Serafeim (2017)
25 Amel-Zadeh and Serafeim (2017)
26 Amel-Zadeh and Serafeim (2017)
Cheng, Ioannou, and Serafeim (2017) show that firms with voluntary integration of social and environmental concerns in their companies’ operations and interaction with stakeholders faced significantly lower capital constraints over the period 2002 to 2009. Their study leverages connections between capital constraints and subsequent stock price outperformance from authors such as Lamont, Polk and Saa-Requejo (2001).

The recent Khan, Serafeim and Yoon (KSY) study in 2016 suggests that a potential cause of differences in financial performance of ESG investing is a lack of differentiating between companies investing in sustainability issues that are material to a company’s business versus issues that are nonmaterial. Their results show that firms with strong performance on material sustainability topics outperform firms with poor performance on material topics, consistent with a view that material investments are shareholder value-enhancing. They also show that firm performance on immaterial issues does not lead to higher performance, which taken together suggests financial performance of an ESG strategy may depend on the materiality of the underlying ESG signals.

This study has many important implications for our research here. Going back to our original example, learning that fuel efficiency is a poor signal for future outperformance of an investment bank does not imply that the same is true for an airline. This explains why using fuel efficiency as a signal across a universe could lead to inconclusive results even though it may be a valid signal for a subset.

To summarize, ESG investing is a broad category that covers many different investment styles and implementations. The literature on the topic is extensive and meta-studies are available that aggregate this body of work. A shortcoming that we see in the existing literature is that findings are aggregated regardless of the approach used without distinguishing between the many different objectives and implementations. Here we have separated findings into the distinct categories of ESG investing. In general, this is part of a broader effort to be more explicit about what we mean when we say ESG. This is useful not only in addressing investor expectations about ESG but also in drawing cleaner conclusions from the literature. We also have found in the literature several promising areas for future research. One of these is the recent work on materiality by KSY (2016) and this paper focuses on building out our understanding of that topic.

27 As we can see from investor surveys, perceptions about ESG investing vary considerably by the ESG approach adopted.
Appendix 2: SASB Materiality Map Sample

### SASB Materiality Map™

SASB’s Materiality Map identifies likely material sustainability issues on an industry-by-industry basis. This map serves as a snapshot of likely material sustainability issues at the time of our initial analysis and may be subject to change as issues and industries are more evolving. Click on a highlighted cell at the sector level and then on any highlighted cell at the industry level to see suggested accounting metrics and additional information for each issue.

### Environment
- GHG emissions
- Air quality
- Energy management
- Water and wastewater management
- Waste and hazardous materials management
- Biodiversity impacts

### Social Capital
- Human rights and community relations
- Access and affordability
- Customer welfare
- Data security and customer privacy
- Fair disclosure and labeling
- Fair marketing and advertising

### Human Capital
- Labor relations
- Fair labor practices
- Employee health, safety and wellbeing
- Diversity and inclusion
- Compensation and benefits
- Recruitment, development and retention

### Business Model and Innovation
- Lifecycle impacts of products and services
- Environmental social impacts on assets & operations
- Product packaging
- Product quality and safety

### Leadership and Governance
- Systemic risk management
- Asset and liability management
- Business ethics and transparency of payments
- Competitive behavior
- Regulatory capture and political influence
- Material sourcing
- Supply chain management

Source: [http://materiality.sasb.org](http://materiality.sasb.org). Above samples as of December 31, 2017. The SASB mapping is subject to change over time on the basis of SASB review of industry analysis.
Appendix 3: Why SASB?

In this paper, we leverage the standard setting work by SASB to identify materiality by industry. SASB is not the only organization engaged in building a sustainability reporting framework and a quick word is warranted on why our study leverages SASB work rather than another framework such as the Global Reporting Initiative (GRI) or Integrated Reporting (IR). For our study, the most relevant frameworks were SASB and GRI which both develop sustainable reporting standards with a focus on materiality. Our intention is not to make a judgement on the relative superiority of one reporting framework over the other. One consideration was practical: The Materiality Map produced by SASB allows us to translate insights on materiality to every company in our universe in a systematic way. To our knowledge, a comparable industry-level mapping is not readily available from GRI. Again, this is not necessarily a shortcoming of the framework, but for our purposes made SASB a more practical choice. The second consideration was methodological: each framework adopts its own definition of materiality and the SASB definition was modestly better aligned with our purpose.

**SASB:** Adopts the U.S. Supreme Court definition of information that presents “a substantial likelihood that the disclosure of the omitted fact would have been viewed by the reasonable investor as having significantly altered the “total mix” of information made available.”

**GRI:** Information that “may reasonably be considered important for reflecting the organization’s economic, environmental and social impacts, or influencing the decisions of stakeholders.”

Our goal was to build an ESG signal for investment decision making. SASB’s focus on shareholder materiality is most aligned with this purpose. This is not to say that the GRI definition which serves all stakeholders, not just shareholders, is less valid, and indeed in many other uses may be more appropriate. SASB and GRI themselves highlight the distinction in a recent jointly authored op-ed (Mohin & Rogers, 2017):

“Established in 1997, GRI developed the first corporate sustainability reporting framework. Today, GRI’s standards are used by the majority of companies reporting sustainability information. The standards are designed to provide information to a wide variety of global stakeholders ranging from civil society to investors. Consequently, the GRI standards include a very broad scope of disclosure. Typically, companies use them to develop and design their sustainability or corporate responsibility reports…

Investors have their own unique needs, different from those of suppliers, customers, communities, interest groups and other stakeholders. They demand reliable and comparable sustainability information with clear links to financial performance. Focused on this need, SASB standards identify the subset of sustainability issues that are reasonably likely to be material to investors. In order to preserve a focus on financial materiality as well as to attain comparability among peers, SASB standards are industry specific.

As you can see, GRI and SASB are intended to meet the unique needs of different audiences. The GRI standards are designed to provide information to a wide variety of stakeholders and consequently, include a very broad array of topics. SASB’s are designed to provide information to investors and consequently, focus on the subset of sustainability issues that are financially material.”

Hence the rationale for using SASB materiality as the starting point for this study is summarised by this alignment in purpose and the practically of the Materiality Map.
Appendix 4: SASB to Sustainalytics Mapping

The below table is an extract of the mapping undertaken by our research demonstrating how each of the 145 Sustainalytics subcategories have been mapped to the 30 issues identified by SASB framework as financially material.

<table>
<thead>
<tr>
<th>SASB Issue</th>
<th>Sustainalytics Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td></td>
</tr>
<tr>
<td>GHG emissions</td>
<td>E.1.9 Carbon Intensity Weighted Score</td>
</tr>
<tr>
<td>Waste and wastewater management</td>
<td>E.1.3.4 Oil Spill Disclosures &amp; Performance-Weighted Score</td>
</tr>
<tr>
<td>Human rights and community relations</td>
<td>E.4.2.2 Community Involvement Programmes-Weighted Score</td>
</tr>
<tr>
<td>Customer relations</td>
<td>S.3.3 Customer Incidents-Weighted Score</td>
</tr>
<tr>
<td>Data security and privacy</td>
<td>E.3.1.3 Data Privacy Policy-Weighted Score</td>
</tr>
<tr>
<td>Compensation and benefits</td>
<td>S.2.1.1 Compensation-Weighted Score</td>
</tr>
<tr>
<td>Human Capital</td>
<td></td>
</tr>
<tr>
<td>Labor relations</td>
<td>S.1.1.1 Working Conditions-Weighted Score</td>
</tr>
<tr>
<td>Employee health and wellbeing</td>
<td>S.1.6.4 Employee Health &amp; Safety Policy-Weighted Score</td>
</tr>
<tr>
<td>Diversity and inclusion</td>
<td>S.1.3 Diversity Programmes-Weighted Score</td>
</tr>
<tr>
<td>Product quality and safety</td>
<td>S.2.1.7 Product Quality-Weighted Score</td>
</tr>
<tr>
<td>Lifecycle impacts of products and services</td>
<td>S.3.3.1 Product Life Cycle-Weighted Score</td>
</tr>
<tr>
<td>Leadership and Governance</td>
<td></td>
</tr>
<tr>
<td>Systemic risk management</td>
<td>S.1.6.2.1 Health and Safety Management System-Weighted Score</td>
</tr>
<tr>
<td>Business ethics and transparency of payments</td>
<td>S.1.5 Business Ethics-Weighted Score</td>
</tr>
<tr>
<td>Competitive behavior</td>
<td></td>
</tr>
<tr>
<td>Regulatory capture and political influence</td>
<td>S.2.10 Audit Committee Independence-Weighted Score</td>
</tr>
<tr>
<td>Supply chain management</td>
<td>S.2.2.2.1 Supply Chain Management Weighted Score</td>
</tr>
</tbody>
</table>

Source: Russell Investments, SASB, Sustainalytics. As of July 30, 2017

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