CSA Guide - RobecoSAM’s Corporate Sustainability Assessment Methodology

Version 4.0
2nd September 2016
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As an investment boutique focused exclusively on sustainability investing, RobecoSAM has always believed that financial analysis is incomplete if it ignores material extra-financial factors. Sustainability trends such as resource scarcity, climate change or an aging population continuously reshape a company’s competitive environment. RobecoSAM is convinced that companies that can adapt to such challenges through innovation, quality and productivity enhance their ability to generate long-term shareholder value. For this reason, RobecoSAM developed the annual Corporate Sustainability Assessment (CSA) in 1999 in order to identify companies that are better equipped to recognize and respond to emerging sustainability opportunities and challenges presented by global and industry trends.

RobecoSAM pursues a truly integrated approach to analyzing sustainability performance. An interdisciplinary team of analysts designs, monitors and refines the CSA with the purpose of generating additional insights into the value creating and risk mitigating potential of companies, ensuring that the assessment focuses on sustainability criteria that are financially relevant to corporate performance and investment decisions. Not only does this make the results of the CSA assessment particularly relevant for investors, but it also helps companies to focus on sustainability issues that are more directly linked to their success as a business. RobecoSAM’s approach is also unique in that it is based on information provided by the companies directly through its proprietary online assessment tool. This allows RobecoSAM to analyze sustainability at a much deeper level than frameworks based on public disclosure alone. RobecoSAM is often asked how the CSA works and how a company’s Total Sustainability Score is calculated. This paper explains how the questionnaire is structured, how the score is calculated, and by using examples from three different industries, how specific questions can have an impact on a company’s Total Sustainability Score.
2. The Sustainability Indices

Since the launch of the DJSI World in 1999, several other Dow Jones Sustainability Indices and new index families that rely on the CSA results have been developed to meet a range of investor specific needs. As a result of the various objectives of these index families, index component selection rules as well as scoring methodology have had to be adapted. This document aims to address some of the key differences between the sustainability index families in terms of assessment methodology. The document also aims to provide further insight into how the Media & Stakeholder Analysis (MSA) affects scores and clarify how RobecoSAM determines which companies will be assessed in any given year.

RobecoSAM and S&P Dow Jones Indices offer a range of sustainability indices that investors can choose from depending on their sustainability objectives versus their diversification requirements. Currently, the three main index families that rely on information collected through the CSA are the DJSI, the DJSI Diversified and the S&P ESG index family.

The DJSI are a family of benchmarks that uses a best-in-class approach to select sustainability leaders from each of the 60 RobecoSAM industries. RobecoSAM has observed that industry leaders are most likely to make the effort to fill out the questionnaire and make sustainability information available in the public domain. The DJSI is for investors who have a strong sustainability conviction and are willing to accept certain regional/size biases to gain exposure to sustainability leaders.

The DJSI Diversified family seeks to provide a benchmark consisting of a balanced allocation of sustainable companies derived from standard market benchmarks, closely tracking their respective benchmark in terms of risk-return profile while also ensuring high sustainability standards. The DJSI Diversified targets investors who want to gain exposure to sustainability leaders, but have certain risk control guidelines that they cannot breach.

The S&P ESG Index family is the first global family of smart beta indices based purely on ESG research. The index methodology uses the same components as the underlying benchmark index but weights the components purely according to their ESG profile instead of using free-float market-cap weights. The goal is to achieve better risk-adjusted returns than the underlying benchmark in the long run.

Due to the different objectives that they are trying to meet, each of the three sustainability index families uses a different version of a sustainability score, although still all derived from the CSA. The DJSI family uses the Total Sustainability Score resulting from the CSA without further adjustment as described in the DJSI Guidebooks. For the DJSI Diversified, the Total Sustainability Scores are adjusted for sector and size bias as described in the DJSI Diversified Guidebook. The S&P ESG Indices use the ESG factor score, as developed by RobecoSAM and described in more detail later in this paper.
3. The Corporate Sustainability Assessment

3.1 A Structured Approach

Each year, RobecoSAM invites the world’s largest 3,400 publicly traded companies, measured by float adjusted market capitalization based on the S&P Global BMI Index, to participate in the annual CSA. An industry specific questionnaire featuring approximately 80 – 120 questions (depending on the industry) on financially relevant economic, environmental and social factors is the starting point for RobecoSAM’s annual assessment.

Because this information is also integrated into financial analysis for asset management products, RobecoSAM focuses on sustainability factors that can have an impact on companies’ long-term value creation potential. Based on the sustainability data collected through the CSA, RobecoSAM identifies companies that are more likely to outperform as a result of their adoption of sustainability best practices.

- Since 1999, RobecoSAM has been conducting the annual Corporate Sustainability Assessment (CSA), which serves as the framework for measuring corporate sustainability performance and forms the research backbone for the construction of the Dow Jones Sustainability Indices (DJSI)
- The world’s largest 2,500 publicly traded companies are invited to participate in RobecoSAM’s CSA for possible inclusion in the Dow Jones Sustainability World Index (DJSI World)
- Additional companies are invited to participate for the growing family of regional and country-specific sustainability indices, such as the DJSI North America, Europe, Asia Pacific and Emerging Markets, totaling 3,400 invited companies.
- 60 RobecoSAM industries derived from the GICS® industry classification system are analyzed using industry-specific questionnaires
- No industries are excluded from the assessment
- Companies are evaluated based on a range of financially relevant sustainability criteria covering the economic, environmental and social dimensions
- Companies receive a Total Sustainability Score between 0 – 100 and are ranked against other companies in their industry
- The top 10% of companies within each industry are selected for inclusion in the DJSI World
- The DJSI identify sustainability leaders across all industries, enabling investors to track their performance and integrate sustainability considerations into their portfolios

The CSA is designed to capture both general and industry-specific criteria covering the economic, environmental and social dimensions. Each of the three dimensions consists of, on average 6 – 10 criteria, and each criterion can contain between 2 – 10 questions, totaling approximately 80 – 120 questions, depending on the industry. Each criterion is worth up to 100 points, and is assigned a weight (percentage) of the total questionnaire. The criteria within each dimension roll up to the dimension weight. For each company, a Total Sustainability Score of up to 100 points is calculated based on the predefined weights established for each question and criterion. Figure 1 offers an overview of the general structure of the CSA.

1 The threshold for inclusion in the regional, local, and DJSI Diversified Indices will vary.
3.2 A comprehensive analysis with an industry-specific focus

Based on major global sustainability challenges identified by RobecoSAM’s analysts, general criteria relating to standard management practices and performance measures such as Corporate Governance, Human Capital Development and Risk & Crisis Management are defined and applied to each of the 60 industries. The general criteria account for approximately 40 – 50% of the assessment, depending on the industry.

In most industries, up to 50% of the questionnaire covers industry specific risks and opportunities that focus on economic, environmental and social challenges and trends that are particularly relevant to companies within that industry. This focus on industry-specific criteria reflects RobecoSAM’s conviction that industry-specific sustainability opportunities and risks play a key role in a company’s long-term success and allows RobecoSAM to compare companies against their own peers in order to identify sustainability leaders. For instance, a manufacturing company’s management of its exposures to climate change risks cannot be compared to a bank’s response to climate change. Therefore, for industries with complex supply chains and logistics, the assessment focuses on evaluating their efforts to manage carbon emissions, whereas for financial services providers, the assessment focuses on whether companies address climate change through their financial products or by offering innovative funding schemes that encourage a transition towards a low-carbon economy.

The relative weights of the economic, environmental and social dimension of the questionnaire vary by industry. For example, as shown in Figure 2, the environmental dimension warrants a higher weighting in the Electric Utilities industry than in the Banking or Pharmaceutical industries.
Figure 2: General versus industry-specific weights by dimension

Criteria within the questionnaire will vary from industry to industry to reflect industry-specific drivers, as shown in Figure 3, which provides a comparison of the criteria applied to the Banks, Electric Utilities and Pharmaceutical industries.

Moreover, certain criteria – even when applied to more than one industry – can have different weights within the CSA. For example, the Banks, Electric Utilities and Pharmaceutical industries each contain the “Occupational Health & Safety” criterion within the social dimension of their respective questionnaires, but the relative weight assigned to Occupational Health & Safety is 3%, 4%, and 3%, respectively. These differences stem from RobecoSAM research analysts’ fundamental bottom-up analysis of each industry. Furthermore, the same criterion, when applied to different industries, may contain a slightly different set of questions to reflect industry-specific issues.
Figure 3: Comparison of criteria and relative dimension weights for the Banks, Electric Utilities and Pharmaceutical industries

Criteria and weights are based on the 2016 CSA for Banking, Electric Utilities and Pharmaceutical industries and are provided for illustrative purposes only. Criteria and weights will differ for other industries. Specific criteria and their corresponding weights for subsequent years may change.

Source: RobecoSAM

For a complete overview of the criteria weights for each of the 60 RobecoSAM industries, please refer to the Criteria Weights document in the CSA Resource Center at www.robecosam.com/csa/resources.
3.3 What is RobecoSAM looking for?

In line with RobecoSAM’s conviction that material nonfinancial factors contribute to better informed investment decisions, the methodology focuses on long-term sustainability factors that are relevant to each industry, material to the company’s financial performance and under-researched in conventional financial analysis.

Within each criterion, RobecoSAM looks for evidence of a company’s awareness of sustainability issues and for indications that it has implemented strategies to address them. RobecoSAM also evaluates the company’s progress in implementing such strategies as well as the quality of its reporting on these issues. Therefore, the questions within each criterion are structured to capture and evaluate the following elements:

1. Awareness of the importance of these factors to its financial success
2. Determination of the potential financial impact (i.e. materiality) of its exposure to sustainability factors
3. Implementation of strategies to manage these sustainability risks or to capitalize on related opportunities in a manner that is consistent with its business models
4. Measurement of results in relation to stated KPIs in order to evaluate the effectiveness of its sustainability strategy
5. Validation or external audit of stated results
6. Transparent communication of its corporate sustainability strategies and extent to which stated targets have been met.

This framework for evaluating corporate sustainability performance enables RobecoSAM to develop a more robust understanding of a company’s quality of management.

3.4 Questionnaire & response rates

The CSA is based on 60 unique online questionnaires which differ from industry to industry as sustainability drivers and indicators vary depending on a company’s area of business. The 60 RobecoSAM industries are derived from the industry and sub-industry levels of the GICS® classification. At the industry group level, RobecoSAM uses the standard GICS® classification.

The eligibility and index component selection rules are explained in detail in the respective index guidebook. A list of companies invited to participate in the assessment is published on www.sustainability-indices.com each February.

In addition to this, RobecoSAM also performs additional assessments based on publicly available information to ensure that all components of the underlying indices used for the S&P ESG Family of indices are covered.

To learn more about the methodology used in the Corporate Sustainability Assessment, please refer to the CSA Companion, which provides additional detail on the rationale and structure for the general and cross-industry criteria in the CSA. The CSA Companion can be accessed at the CSA Resource Center at www.robecosam.com/csa/resources.
### 3.5 Industry Group Classification

The 60 RobecoSAM industries roll up into the 24 GICS® Industry Groups as indicated in the following table:

**Figure 4: RobecoSAM Industries**

<table>
<thead>
<tr>
<th>GICS® Industry Group</th>
<th>RobecoSAM Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobiles &amp; Components</td>
<td>ATX Auto Components</td>
</tr>
<tr>
<td></td>
<td>AIT Automobiles</td>
</tr>
<tr>
<td>Banks</td>
<td>BNX Banks</td>
</tr>
<tr>
<td>Capital Goods</td>
<td>ARK Aerospace &amp; Defense</td>
</tr>
<tr>
<td></td>
<td>BLD Building Products</td>
</tr>
<tr>
<td></td>
<td>COL Construction &amp; Engineering</td>
</tr>
<tr>
<td></td>
<td>ELQ Electrical Components &amp; Equipment</td>
</tr>
<tr>
<td></td>
<td>IDD Industrial Conglomerates</td>
</tr>
<tr>
<td></td>
<td>IEQ Machinery and Electrical Equipment</td>
</tr>
<tr>
<td></td>
<td>TCD Trading Companies &amp; Distributors</td>
</tr>
<tr>
<td>Commercial &amp; Professional Services</td>
<td>ICS Commercial Services &amp; Supplies</td>
</tr>
<tr>
<td></td>
<td>PRO Professional Services</td>
</tr>
<tr>
<td>Consumer Durable &amp; Apparel</td>
<td>CHP Household Durables</td>
</tr>
<tr>
<td></td>
<td>HOM Homebuilding</td>
</tr>
<tr>
<td></td>
<td>LEG Leisure Equipment &amp; Products &amp; Consumer Electronics</td>
</tr>
<tr>
<td></td>
<td>TKX Textiles, Apparel &amp; Luxury Goods</td>
</tr>
<tr>
<td>Consumer Services</td>
<td>CNO Consumer Services &amp; Gaming</td>
</tr>
<tr>
<td></td>
<td>CSV Diversified Consumer Services</td>
</tr>
<tr>
<td></td>
<td>EXD Restaurants &amp; Leisure Facilities</td>
</tr>
<tr>
<td></td>
<td>TRT Hotels, Resorts &amp; Cruise Lines</td>
</tr>
<tr>
<td>Diversified Financials</td>
<td>FBN Diversified Financial Services &amp; Capital Markets</td>
</tr>
<tr>
<td>Energy</td>
<td>COL Coal &amp; Consumable Fuels</td>
</tr>
<tr>
<td></td>
<td>OGR Oil &amp; Gas Refining &amp; Marketing</td>
</tr>
<tr>
<td></td>
<td>OXG Oil &amp; Gas Upstream &amp; Integrated</td>
</tr>
<tr>
<td></td>
<td>OIE Energy Equipment &amp; Services</td>
</tr>
<tr>
<td></td>
<td>PIP Oil &amp; Gas Storage &amp; Transportation</td>
</tr>
<tr>
<td>Food &amp; Staples Retailing</td>
<td>FDR Food &amp; Staples Retailing</td>
</tr>
<tr>
<td>Food, Beverage &amp; Tobacco</td>
<td>ORV Beverages</td>
</tr>
<tr>
<td></td>
<td>FDO Food Products</td>
</tr>
<tr>
<td></td>
<td>TDB Tobacco</td>
</tr>
<tr>
<td>Health Care Equipment &amp; Services</td>
<td>HEA Health Care Providers &amp; Services</td>
</tr>
<tr>
<td></td>
<td>MTC Health Care Equipment</td>
</tr>
<tr>
<td>Household &amp; Personal Products</td>
<td>COS Personal Products</td>
</tr>
<tr>
<td></td>
<td>HOU Household Products</td>
</tr>
<tr>
<td>Insurance</td>
<td>INS Insurance</td>
</tr>
<tr>
<td>Materials</td>
<td>ALU Aluminum</td>
</tr>
<tr>
<td></td>
<td>CHM Chemicals</td>
</tr>
<tr>
<td></td>
<td>CCM Construction Materials</td>
</tr>
<tr>
<td></td>
<td>CTR Containers &amp; Packaging</td>
</tr>
<tr>
<td></td>
<td>FRP Paper &amp; Forest Products</td>
</tr>
<tr>
<td></td>
<td>MNX Metals &amp; Mining</td>
</tr>
<tr>
<td></td>
<td>STL Steel</td>
</tr>
<tr>
<td>Media</td>
<td>PUB Media</td>
</tr>
<tr>
<td>Pharmaceuticals, Biotechnology &amp; Life Sciences</td>
<td>BTC Biotechnology</td>
</tr>
<tr>
<td></td>
<td>ORG Pharmaceuticals</td>
</tr>
<tr>
<td></td>
<td>LP Life Sciences Tools &amp; Services</td>
</tr>
<tr>
<td>Real Estate</td>
<td>REA Real Estate</td>
</tr>
<tr>
<td>Retailing</td>
<td>RTS Retailing</td>
</tr>
<tr>
<td>Semiconductors &amp; Semiconductor Equipment</td>
<td>SEM Semiconductors &amp; Semiconductor Equipment</td>
</tr>
<tr>
<td>Software &amp; Services</td>
<td>SOF Software</td>
</tr>
<tr>
<td></td>
<td>TSO Software &amp; Internet Software &amp; Services</td>
</tr>
<tr>
<td>Technology Hardware &amp; Equipment</td>
<td>CMT Communications Equipment</td>
</tr>
<tr>
<td></td>
<td>JTC Electronic Equipment, Instruments &amp; Components</td>
</tr>
<tr>
<td></td>
<td>THQ Computers &amp; Peripherals &amp; Office Electronics</td>
</tr>
<tr>
<td>Telecommunication Services</td>
<td>TLS Telecommunication Services</td>
</tr>
<tr>
<td>Transportation</td>
<td>AW Airlines</td>
</tr>
<tr>
<td>Utilities</td>
<td>TRA Transportation &amp; Transportation Infrastructure</td>
</tr>
<tr>
<td></td>
<td>ELC Electric Utilities</td>
</tr>
<tr>
<td></td>
<td>GAS Gas Utilities</td>
</tr>
<tr>
<td></td>
<td>MUW Multi &amp; Water Utilities</td>
</tr>
</tbody>
</table>
4. The Scoring Methodology

4.1 Scoring the Questions

The questionnaire is designed to ensure objectivity by limiting qualitative answers through predefined multiple choice questions in which each potential answer is assigned a number of points between 0 – 100. For questions in which qualitative answers are allowed, RobecoSAM analysts evaluate the response using a predefined appraisal method, and convert the response into a quantitative score. In addition, companies must submit documentation to support the answers they have provided. For many questions, companies will only receive the maximum score for the question if they have provided adequate supporting material. In the following pages, we provide examples of specific questions from two different industries, and show how a company’s response to these questions has an impact on the Total Sustainability Score.

Example 1: Pharmaceuticals

<table>
<thead>
<tr>
<th>Question</th>
<th>Please indicate your company’s approaches to improve accessibility of drugs in both developing and developed countries. Please provide supporting documents.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question Points</td>
<td>0 – 100</td>
</tr>
<tr>
<td>Question weight within criterion</td>
<td>50%</td>
</tr>
<tr>
<td>Criterion</td>
<td>Strategy to improve access to drugs or products</td>
</tr>
<tr>
<td>Dimension</td>
<td>Social</td>
</tr>
<tr>
<td>RobecoSAM Rationale</td>
<td>Underprivileged patients are often unable to buy medicine to treat or cure their diseases due to financial constraints. This is often the case in developing countries, and is now becoming a growing concern in developed countries. As a serious social challenge that requires attention from healthcare providers, some pharmaceutical companies are tackling this issue by implementing programs to provide these patients with improved access to medicine. Such initiatives help to improve the company’s credibility, build corporate and product brands and increase market penetration of their products and services.</td>
</tr>
</tbody>
</table>

**Possible Answers**

<table>
<thead>
<tr>
<th>A) list of potential approaches (company can check all that apply)</th>
<th>Number of Points Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 100 (depending on which approaches have been selected)</td>
<td></td>
</tr>
</tbody>
</table>

**B) not applicable**

A question that has been marked “Not Applicable” will not be scored and the weight of the question will be equally redistributed across the other questions within the same criterion, only if the analyst agrees that the question does not apply to the company’s business model. This option is only granted in exceptional cases.

| C) not known | 0 |

Assuming the company receives 50 points for its response to this question, its score will be calculated as follows:

\[
\text{Number of Points Received (between 0 and 100)} \times \text{Question Weight (within the criterion)} \times \text{Criterion Weight (within questionnaire)} = \text{Question Score} = 0.75 \text{ of Total Sustainability Score}
\]

Number of Points Received

50

Question Weight

50/100 = 0.50

Criterion Weight

3/100 = 0.03

= Question Score = 0.75 of Total Sustainability Score
4.2 Calculating the Total Sustainability Score

Total Sustainability Score = \sum (Number of Question points received \times Question Weight \times Criterion Weight)

A company's Total Sustainability Score at the highest aggregated level is the sum of all Question Scores. Each company receives a Total Sustainability Score ranging from 0 – 100. Once the Total Scores have been calculated, companies within the same industry are ranked against their peers in order to determine which companies are eligible for inclusion in the Dow Jones Sustainability Indices (DJSI). In addition, the 60 industries roll up into 24 global industry groups, and the top scoring company from each is named the Industry Group Leader and is profiled on the DJSI website.

CSA scores are derived from questionnaires that the invited companies complete online, on a voluntary basis. RobecoSAM aims to (i) identify, on a global basis, those companies that have a strong commitment to sustainability; and (ii) quantify that commitment, across the key dimensions of sustainability.
sustainability (environmental, social, economic), so that such companies can be compared with each other over time. Therefore, it is reasonable to assume that the companies most inclined to respond to the CSA Questionnaire are also those that have the highest commitment to and awareness of sustainability.

In addition, the CSA also includes a large group of companies whose sustainability performance is evaluated by RobecoSAM based purely on publicly available information. This ensures that the coverage of the CSA is representative of the broader, global market for mid and large cap companies, both in terms of commitment to sustainability, and in terms of size, industry and country exposure.

RobecoSAM believes that self-reporting allows sustainability analysis at a much deeper level than frameworks based on public disclosure alone. For instance, the CSA Questionnaire asks about confidential matters that companies would typically not disclose publicly, such as internal risk management systems, human resource indicators/compensation systems or a company’s innovation management framework.

Furthermore, RobecoSAM has taken a number of measures to ensure the accuracy of self-reporting:

- Statements regarding sustainability policies must be supported by official documents that the company provides separately.
- Most statements regarding actual performance (as opposed to policies) for which publicly available sources exist are verified against these sources. For standardized data and reporting, RobecoSAM looks for third-party verification or assurance in addition to the performance figures. An example of this would be environmental performance indicators such as Scope 1 CO2 emissions.
- The Media and Stakeholder Analysis (MSA), which is based on data provided by specialized media monitoring company RepRisk, serves as a cross-check between a company’s stated policies and its actual involvement in and response to violations, law suits and controversies.
- Deloitte provides annual assurance on the application of the CSA and Corporate Sustainability Monitoring methodology as described in the DJSI Guidebooks.

4.3 Assessing Companies exclusively on Publicly Available Information

In order to ensure that the CSA covers a representative group of companies – by region, industry sector and market cap size – RobecoSAM calculates Total Sustainability Scores for certain invited companies who choose not to participate in the CSA.

Non-participating companies’ questionnaires are completed based exclusively on publicly available information. Public sustainability disclosures are often more limited than the information that can be obtained directly from participating companies. In this context, it is worth noting also that comparability of publicly available information varies due to differences in measurement and time periods, for example.

Nevertheless, a great deal of relevant and valid information regarding sustainability performance can be obtained from public disclosures. Representativeness and breadth of coverage are clearly important features of any sustainability scoring methodology. Therefore, while the questionnaires for non-participating companies may contain some information gaps, they still provide valuable information related to the sustainability efforts of those companies.
4.4 Scoring Questions where no Information is available

Under the unadjusted approach, RobecoSAM assigns a zero score to any question where no information is available, as it is unknown whether the company has the applicable measure in place. This approach errs on the side of caution in granting sustainability scores: in the absence of any hard data, it grants the lowest possible score. While in some cases this may be a legitimate assumption, it is also true that this approach penalizes companies for not publicly disclosing information such as business strategies and competitive intelligence, but that may quite legitimately be considered confidential.

This approach effectively treats the level of disclosure in the questionnaires of the participating companies as the “gold standard” and sets the bar very high for companies whose score is based exclusively on public disclosures. It is best used in cases where the index user is more concerned with the level of sustainability performance itself, and less with representation of the underlying benchmark.

4.5 Financial Materiality & Methodology

RobecoSAM pursues a truly integrated approach to analyzing sustainability performance. An interdisciplinary team of analysts designs, monitors and refines the CSA with the purpose of generating additional insights into the value creating and risk mitigating potential of companies, ensuring that the assessment focuses on sustainability criteria that are financially relevant to corporate performance, valuation and security selection. Not only does this make the results of the CSA assessment particularly relevant for investors, but it also helps companies to focus on sustainability issues that are more directly linked to their success as a business. RobecoSAM’s approach is also unique in that it is based on information provided by the companies directly through the online questionnaire. This allows RobecoSAM to analyze sustainability at a much deeper level than frameworks based on public disclosure alone.

In most industries, at least 50% of the questionnaire covers industry-specific risks and opportunities. This focus on industry-specific criteria reflects RobecoSAM’s conviction that industry-specific sustainability opportunities and risks play a key role in a company’s long-term success and allows RobecoSAM to compare companies against their own peers in order to identify sustainability leaders. RobecoSAM’s CSA identifies the leading sustainability companies within the eligible universe from each RobecoSAM industry.

The starting point for the CSA is RobecoSAM’s financial materiality framework, which draws upon more than 20 years of experience in integrating sustainability into the investment process. For each of the 60 industries evaluated through the CSA, RobecoSAM’s Sustainability Investing analysts (SI analysts) conduct a financial materiality analysis to identify those sustainability factors that drive business value and that have the greatest impact on the long-term valuation assumptions used in financial analysis. This analysis results in a materiality matrix for each industry, which serves as the basis for determining the applicability and weights of the various sustainability criteria in the CSA.

The financial materiality analysis focuses on industry specific business value drivers that contribute to company performance. It leverages RobecoSAM’s quantitative research, which identifies which intangible factors have demonstrated the clearest correlations to past financial performance. Most importantly however, the materiality analysis draws upon the experience of the SI industry analysts, who determine which long-term economic, social or environmental factors are likely have the most significant impact on a company’s business value drivers of growth, cost or risk, and ultimately, future financial performance. Each factor is analyzed and ranked according to the magnitude and likelihood of its impact on the company’s business value drivers and financial performance over time. Those factors that are considered
to have the greatest impact on the long-term financial assumptions are given the highest weighting in
the CSA, and those factors that rarely impact the financial cases either receive a much lower weight or
are not included in the CSA. An example of a financial materiality matrix for the pharmaceuticals
industry is provided in Figure 5.

Figure 5: Financial materiality matrix for the pharmaceuticals industry

The factors that appear in the upper right-hand corner of the matrix are the most financially material.

Source: RobecoSAM
5. Media and Stakeholder Analysis

5.1 Integration of the Media and Stakeholder Analysis into the CSA

An integral component of the Corporate Sustainability Assessment is the ongoing monitoring of media and stakeholder commentaries and other publicly available information from consumer organizations, NGOs, governments or international organizations to identify companies’ involvement and response to environmental, economic and social crisis situations that may have a damaging effect on their reputation and core business.

Throughout the year, RobecoSAM monitors news coverage of companies in the universe on a daily basis using media and stakeholder stories compiled and pre-screened by RepRisk, a leading business intelligence provider specializing in environmental, social and governance issues. News stories covered by the Media and Stakeholder Analysis (MSA), using data provided by RepRisk, include a range of issues such as economic crime or corruption, fraud, illegal commercial practices, human rights issues, labor disputes, workplace safety, catastrophic accidents or environmental disasters.

An MSA “case” is created if a company has been involved in a specific negative event for which the company is considered to be responsible, and if the incident reveals that the company’s actions are inconsistent with its stated policies and goals and/or exposes either a failure of management or of company systems and processes.

In order for an MSA case to be created, it must also be financially material: the potential impact on the company’s reputation and financial consequences in terms of loss of customers, liabilities, litigation or fines must be significant. Once an MSA case has been opened, we expect the company to address the issue by taking measures to minimize the negative impact of the crisis and avoid the future recurrence of such incidents. In order to evaluate the quality of the company’s response to the situation, RobecoSAM contacts companies for which an MSA case has been created and continues to monitor news flow related to the incident through RepRisk until it has been resolved, which in some cases may take over a year.

The MSA is built into the Corporate Sustainability Assessment. For selected criteria within the questionnaire, predefined weights are defined for potential MSA cases that may arise during the year. The specific weight assigned to the MSA component will vary by criterion and from industry to industry, depending on the materiality of the potential impact on the company.

5.2 Impact of the MSA on Index Inclusion or Weight

The MSA is integrated into the CSA questionnaires by treating each MSA case as if it were a question—with a pre-defined weight, within a given criterion—to which a score is applied. The specific weight assigned to the MSA question will vary by criterion, and from industry to industry, depending on the potential material impact on the company. Each company starts the year with a score of 100 for such MSA questions. However, as a result of an MSA case, a company will typically receive a lower score, leading to a reduction in its Total Sustainability Score. The results of the MSA analysis can reduce a company’s Total Sustainability Score and thus affect its inclusion or weight in any of the DJSI Indices.

If a company has been part of recent controversies, scandals, allegations or disputes that negatively affected its reputation and/or financial performance it can lead to index exclusion in two ways: (i) by reducing the Total Sustainability Score causing the company to underperform its peers at the time of the
review and (ii) through an index committee decision in exceptional cases at any time during the year when the issue is so severe that the company is removed from the index regardless of its score.

The chart in Figure 6 provides an overview of how a specific MSA case is identified, evaluated and integrated into the CSA.

Figure 6: Overview of MSA Process: From Identification to Resolution

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**Source:** RobecoSAM
5.3 Calculation of the MSA Score for a specific case

Based on the example outlined in Figure 5, Bank X receives an MSA Score of 10/100. This score is then applied to the weight that has been allotted to the MSA component of the “Codes of Conduct / Compliance / Corruption & Bribery” criterion, as shown in Figure 7.

The same scoring process is applied to all other criteria that have been linked to the MSA case in question. If no MSA cases have been identified during the course of the year, then the company will receive the full 100 points allotted to the MSA component for each criterion, and will have no negative impact on its total score.

The results of the MSA can reduce a company’s Total Sustainability Score and thus affect its inclusion in any of the DJSI Indices. In addition, severe incidents and breaches that cast strong doubts on a company’s procedures and ability to handle the situation can be escalated to the DJSI Index Committee by the analyst. During the course of the MSA evaluation, the analyst may contact companies to clarify any open points that may arise from the MSA case, thus allowing the analyst to include the company’s responses when making a recommendation to the DJSI Index Committee. The Committee consists of two RobecoSAM representatives and two S&P Dow Jones Indices representatives and meets on a quarterly basis. Following a thorough analysis, the DJSI Index Committee may decide to change a company’s eligibility immediately, regardless of the company’s Total Sustainability Score.

5.4 Updating the Questionnaire – Raising the Bar

Each year following the announcement of the DJSI components, the CSA is reviewed and adjustments are made to the questions and their relative weights in order to capture new sustainability issues that are expected to have an impact on companies’ competitive landscape. Overall responsibility for updating the questionnaire and ensuring the assessment process runs smoothly lies with the Methodology Committee, the Sustainability Investing Research (SI Research) team and the Sustainability Application & Operations team.

Analysts are assigned to specific industries and draw upon knowledge gained through their participation in industry conferences, roundtable discussions with industry organizations, as well as direct contact with companies throughout the course of the year in order to determine which industry-specific criteria warrant a review. As a general rule, analysts rely on their financial expertise to determine which sustainability opportunities and challenges are most likely to have an impact on a company’s financial performance.

In addition, specialized analysts are assigned general and cross-industry criteria such as Supply Chain Management, Occupational Health & Safety and Corporate Governance. These analysts are responsible for staying informed on sustainability developments related to their assigned criteria and ensuring that
the questions connected to the specific topic are also current. During the annual methodology review process, analysts can propose adjustments to weights, as well as additions or deletions of specific questions.

In parallel, the Sustainability Application & Operations team, which is responsible for the implementation of the CSA methodology changes, conducts a statistical analysis of companies’ scores to identify questions that merit further review. Questions in which all (or almost all) companies received 100 or 0 points, or questions that have a very low statistical distribution of scores are subject to further discussion. This analysis provides RobecoSAM with an indication of which questions may be outdated, which corporate sustainability practices have been widely adopted by companies, or which ones may need to be refined in order to more adequately distinguish the leaders from the laggards.

The Methodology Committee is responsible for ensuring consistency of the methodology and is the decision making body within the governance structure that has been put in place for the annual review of the CSA. RobecoSAM aims to limit changes to approximately 10-20% of the questionnaire.

An overview of the methodology review process is provided in Figure 8.

**Figure 8: Updating the CSA**

**Methodology Committee**
- Decision making body with responsibility for ensuring consistency of the methodology.
- Prioritizes questions which will be reviewed based on statistical analysis and proposed changes submitted by Sustainability Investing Research (SI Research).

**Sustainability Application & Operations (SAOT) Responsibilities:**
- Over-all responsibility for the CSA methodology.
- Implementation of the CSA methodology.

**Statistical analysis of questionnaire to identify questions for review:**
- Questions with low statistical distribution of scores.
- Questions in which most companies received scores of either 0 or 100.

**SI Research Responsibilities:**
- Industry-specific expertise.
- RobecoSAM experts assigned to general or cross-industry criteria.
- Coordination of CSA methodology development.

**Analysts propose modifications, deletions or additions to:**
- Their assigned industry-specific questionnaires.
- Their assigned general or cross-industry criteria.

**Analysts refine proposed changes for criteria that have been prioritized by the Methodology Committee:**
- Adjust relative weights, giving more weight to most material relevant for the industry.
- Major changes subject to external consultation round with companies and industry experts.

**Updated CSA**

Source: RobecoSAM

### 5.5 External Verification

Information provided in the questionnaire is verified for accuracy by crosschecking companies’ answers with the supporting documentation they have provided, checking publicly available information, and by verifying a company’s track record on crisis management with media and stakeholder reports. In addition, to ensure quality and objectivity of the CSA, independent third party Deloitte conducts an external audit of the assessment process each year.
5.6 Leveraging Sustainability Insights

In addition to determining the components of the full range of the DJSI and DJSI Diversified index families, CSA information is also used to construct innovative products such as the S&P ESG series of indices, which include iconic benchmarks such as the S&P 500® as well as products like the S&P Long-Term Value Creation Index. The insights derived from the CSA are fully integrated into our asset management offering and sustainability benchmarking activities. Data from the CSA also form the basis for the sustainability information that our sister company Robeco integrates in its mainstream fundamental and quantitative investment activities.

Furthermore, RobecoSAM uses the results of the CSA to determine the companies that are eligible for inclusion in The Sustainability Yearbook – a reference guide to the world’s sustainability leaders.

The Sustainability Yearbook provides extensive qualitative analysis highlighting current and future challenges shaping the competitive landscape for each of the 60 industries. In addition, The Sustainability Yearbook contains statistical information indicating the total number of companies assessed for each industry, as well as the average and top scores at the dimension level.

5.7 Annual timeline

Figure 9: Timeline of CSA Process

Source: RobecoSAM
6. **ESG Factor Score Methodology**

Using the information collected through RobecoSAM’s annual Corporate Sustainability Assessment (CSA) over the past 20 years, RobecoSAM has developed an advanced “Smart ESG” scoring methodology. In contrast to traditional factors such as value or momentum, traditional sustainability, or “ESG” scores are very broad, often aggregating hundreds of single indicators into one score, diluting financially material information. RobecoSAM’s new generation of ESG scores builds upon our existing sustainability data by eliminating known biases such as market cap, industry and regional biases. By removing these known biases, we are able to pinpoint which ESG indicators are the most financially relevant for different industries, sharpening our focus on financial materiality. The resulting ESG factor scores can therefore be used like traditional factors (value, growth, momentum, etc.) and at the same time are uncorrelated to traditional factors. The ESG factor scores are used in the S&P ESG index family.

ESG factor scores are based on the same underlying ESG question data as the Total Sustainability score used for the DJSI index family. However, the scorecard used to calculate ESG factor scores from the ESG question data is different from the scorecard used for the calculation of Total Sustainability scores. The two key differentiators of the scorecard of ESG factor scores are:

- ESG factor scores are unbiased, i.e. they show no exposure to existing factors
- ESG factor scores focus on ESG criteria that have proved to be financially material in long-term materiality testing.

The scoring process for calculating ESG factor scores is as follows:

**I. Un-biasing sustainability data**

1. Allocate all assessed companies into 60 buckets, i.e.
   a. 3 regions (Americas, Europe, APAC)
   b. 2 assessment types (company assessment or self-assessment by RobecoSAM)
   c. 11 GICS sectors
2. In each bucket, calculate z-scores at question level
3. Apply sigma-function for reducing impact of outliers to each set of z-scores per bucket. The resulting scores are in [-1,1]

**II. Enhancing materiality**

1. Run Least Absolute Shrinkage Selection Operator (LASSO) [cf Tibshirani, 1996] regression of standardized question scores against total market return of all assessed companies in each sector-region, simulating across different subsets of the sample data
2. Obtain a mean regression coefficient (i.e. the materiality estimate) with a 95% confidence interval from the simulations.

**III. Calculated ESG factor scores**

1. Start with absolute DJSI question scorecard weights per company
2. Exclude all special values\(^4\) and redistribute missing weights over remaining questions (with no theme or dimension cap)

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\(^4\) Special values are missing data points for a certain company – either because the company did not provide the data or the data could not be found in the public domain.
3. Tilt weights according to LASSO regression results, using the DJSI scorecard as a starting point. Questions with a positive regression coefficient get weight added (linearly via regression coefficient size, up to a maximum of +4% to the best question), and negatively material questions get weights scaled down (linearly via regression coefficient size, down to a minimum of 1/4 weight to the worst question).

IV. Run factor adjustment

1. Perform a regression analysis of the scores calculated in III with common factors such as size, value and dividend yield of companies as input variable.
2. The residuals of the regression analysis are the final factor adjusted ESG factor scores

6.1 Data set

To start the construction of an unbiased ESG performance factor we first need to define the underlying data universe. As a starting point we consider the universe of companies $i=1..M$ that are assessed within the yearly ESG research process of RobecoSAM, which comprises the largest $>3000$ companies in global developed and emerging markets. The assessment of ESG indicators for each company is performed on an annual basis with $t=1, 2, 3...$ indicating the year of assessment. In each year for each company $i$ a set of $N$ numerical ESG indicators $c_{ijt} \in R$ is researched with $j=1..N$ (in RobecoSAM’s proprietary ESG research database there are several hundred different ESG indicators).

Since the start of RobecoSAM’s research in 1999 the ESG indicators are aggregated into the Total Sustainability score $T_{it}$ for each company, which has been as basis for the launch of the Dow Jones Sustainability indices:

$$T_{it} = \sum_{j=1}^{N} w_{i(j)t} c_{ijt}$$  \hspace{1cm} (1)

With $w_{i(j)t}$ denoting the weight of the ESG indicator $j$ in the scoring process for company $i$ in year $t$. The indicator function $I(i)$ indicates the GICS industry company $i$ belongs to. The dependency of the weights $w_{i(j)t}$ on the GICS industry is necessary because RobecoSAM’s ESG research methodology uses an industry specific approach, meaning that the weights for each indicator $j$ vary across industries. Moreover, some ESG indicators are used across all industries, but some are industry specific (i.e. not researched in all industries). In the context of the scoring formula (1) this means that in some industries some indicators are not applicable and therefore the corresponding weight in that industry will be zero.

Naturally we have $\sum_{j=1}^{N} w_{i(j)t} = 1 \forall I(i), t.$

6.2 Unbiasing the input data

There is broad evidence in existing literature on ESG research that ESG research data typically shows strong biases to allocation factors such as region, sector or size, which can therefore dominate the financial performance of the resulting ESG investment index or portfolio (cf Nagy and Sinnreich (2012), cf Fulton, Kahn and Sharples (2012), Roy and Gitman (2012), Cox (2013)). Generally speaking, one has to distinguish between two types of factor biases inherent in ESG research data:

1. Biases with respect to discrete allocation factors such as regional biases or sector biases.
2. Biases in continuous factors such as the size of the company.

Regional biases exists because both reporting standards as well as implementation standards with respect to environmental, social and governance issues differ considerably across regions, which makes a direct comparison of the ESG profile of companies from different regions very difficult, unless these differences are neutralized by a normalization process. Analogously, environmental, social and governance risks differ considerably across sectors and therefore one has to apply a normalization process per sector before ESG scores can be compared across sectors.
For biases with respect to such discrete factors, the methodology applied in existing literature is typically a bucketing approach (cf Cox 2013), i.e. one can divide the universe of assessed companies into peer groups that share the same exposure to the discrete factor. For the following analysis, we use RobecoSAM proprietary ESG database and sub-divide the universe along the two dimensions that show particularly strong biases, i.e. regions and GICS industries:

30 Peer groups = 3 regions (Americas, Europe, Asia Pacific) x 11 GICS sectors

To remove biases with respect to regions and sectors we group all companies $i=1..M$ in the assessed universe into these 30 peer groups and normalize the ESG data in each peer group $k=1..30$ by using the methodology of z-scores. In principle, this normalization process can be applied at the aggregated total ESG score level (1) or at the level of each individual ESG indicator $c_{ijt}$. The advantage of performing the z-score normalization at the individual indicator level is that the final score calculated using the linear aggregation formula (1) is automatically also normalized, irrespective of the weights used. This is an important advantage since in the second step of our methodology we will modify the weights according to our materiality framework explained below.

Hence, to unbias the ESG data in each peer group we normalize the individual ESG indicators $j=1..N$ for every company $i=1..M$ using the sigmoid-function on standard z-scores $\tilde{c}_{ijt}$ that are unbiased in terms of regions, sector and across years $t$.

$6.2.1 \quad \text{Financial materiality testing and materiality enhancing}$

The objective of the second step of our methodology is to identify those ESG indicators that are financially material, i.e. indicators that can have predictive power with respect to future stock performance. To be precise, we would like to analyze the relationship between the set of ESG indicators $\tilde{c}_{ijt}$ of company $i$ at time $t$ and the performance $p_{it}$ of its stock in percent from time $t$ to $t+1$, i.e. over one year time horizon. The naïve approach would be to simply estimate a linear regression for the returns $p_{it}$ using the ESG indicators $\tilde{c}_{ijt}$ as input variables. The key problem in doing so is the large number of variables entering the regression and consequently the risk of over-fitting the model to noisy return data (i.e. the risk of “data-mining”). To mitigate the risk of over-fitting our model we will make use of the following two statistical concepts, which we explain in detail below:

1. We will reduce the dimensionality of the regression by applying the so-called LASSO estimator, which reduces the regression to the most material indicators.
2. We will apply a sub-sampling approach to test and increase the robustness of the parameter matching process.

$6.2.1.1 \quad \text{Reduce dimensionality}$

We will use the so-called least absolute shrinkage regression estimator (LASSO) developed by Tibshirani (1996), which is designed to reduce the number of coefficients estimated within a linear regression model to the statistically most relevant ones and thereby reducing the dimensionality of the regression model and consequently reducing the risk of over-fitting the model to the underlying data set. When we apply the LASSO estimator to estimate the relationship between normalized ESG indicators and stock performance we obtain the following objective function for each of the $k=1..30$ peer groups which we denote by $P_k$:

$L_k(\beta_k, \lambda_k) = \frac{1}{2} \sum_{s=0}^{s=9} \sum_{i \in P_k} (p_{it(t-s)} - \beta_{k0} - \sum_{j=1}^{j=N} \beta_{kj} \tilde{c}_{ij(t-s)})^2 + \lambda_k \sum_{j=1}^{j=N} |\beta_{kj}|$  \hspace{1cm} (3)

Which we have to minimize with respect to the vector of factor loadings $\beta_k = (\beta_{k0}, \ldots, \beta_{kN})$. Equation (3) sums the linear regression terms of a company’s stock performance versus its normalized ESG indicators in the previous year over all companies in the respective peer group and over the past ten
years of ESG and stock performance data. The penalty term proportional to $\lambda_k > 0$ penalizes any coefficient that the regression deems to be different from zero in the objective function and thereby reduces the risk of over-fitting the model to noise in the return data. In our model (3) we use a cross-validation technique to determine the value of $\lambda_k$ that minimizes the error in the linear regression. As mentioned before, not all ESG indicators are available in all industries and therefore in all peer groups. Therefore, those coefficients $\beta_{kj}$ that refer to an indicator $j$ that is not available in peer group $k$ is set to zero before the optimization process of model (3) starts.

The reason for using the past ten years of data in the regression (3) also deserves some explanation: On the one hand, it is important to use several years of data to ensure the model (3) is able to capture the relationship between ESG indicators and stock performance across a full business cycle. However, on the other hand, one should not use too long a period as the link between ESG indicators and stock performance can change over time. Bebchuk, Alma, and Wang (2013) observe that the set of ESG indicators that shows positive contribution to stock performance is changing over time and that the time period in which indicators remain useful to predict stock performance is in the range of a decade. Therefore, to capture a full business cycle of ESG data but at the same time minimize the risk of keeping “old” indicators that are no longer useful in the dataset we use a ten years horizon in our model (3).

6.2.1.2 Sub-sampling
Another key element of our methodology is to check and increase the robustness of the regression model (3) by performing a sub-sampling process to test in how far the coefficients $\beta_{kj}$ estimated in (3) depend on the universe of ESG indicators included in the model.

To be precise, in our sub-sampling approach we perform a large number of iterations $m=1..K$ and in each iteration we draw a random sub-set of the ESG criteria $S_m \subseteq \{1..N\}$ in the range $1 \leq |S_m| \leq N$ and calculate the vector $\beta_k$ according to the regression (3) while only allowing coefficients $\beta_{kj}$ in the regression model for which $j \in S_m$ — all other coefficients are set to zero in the regression (3). As a result, for each sub-sampling iteration $m$ we estimate regression coefficients $\beta_{m,kj}$ using the regression model (3).

After performing $K$ iterations, we can calculate the average $\bar{\beta}_{kj}$ for the coefficients (averaged over all iterations that allowed the coefficient to be part of the model (3)), i.e.

$$\bar{\beta}_{kj} = \frac{\sum_{m \in S_m} \beta_{m,kj}}{\sum_{m \in S_m}}$$

(4)

In addition to this, for each coefficient we calculate the indicator

$$\bar{I}_{kj} = \begin{cases} 1 \text{ if } \bar{\beta}_{kj} \text{ is different from zero at a 95% confidence level} \\ 0 \text{ otherwise} \end{cases}$$

(5)

This indicator is quite important because from the sub-sampling of each coefficient we need to understand which coefficients are statistically significant different from zero. In the following calculations we used $K=1'000'000$ iterations in the sub-sampling of the model (3).

6.2.2 Producing materiality enhanced ESG scores
The output of the materiality analysis based on the regression model (3) and the corresponding sub-sampling (4) delivers a vector $\bar{\beta}_k$ of factor loadings for each peer group $P_k$ based on the set of unbiased ESG indicators $\tilde{e}_{ij,k}$. The next steps is to incorporate these factor loadings $\bar{\beta}_k$ into the scorecard model (1) to obtain a total ESG score that is both unbiased to existing common factors and shows a positive performance contribution.

In principle, there are multiple ways of modeling the dependency of the scorecard weights used in the scoring process (1) on the vector of factor loadings $\bar{\beta}_k$. One way would be to simply sub-select those criteria that have a high positive factor loading and ignore all the other indicators in the scoring process (1). This type of sub-selection methodology is quite common in the construction of credit scorecards and credit ratings.

However, we argue that leaving all indicators in the scoring model (1) and instead tilting the weights $w_{it(i)j,k}$ towards those criteria $j$ that have a high positive factor loading is a more reasonable approach, because (as mentioned by Bebchuk, Alma, and Wang (2013)) the financial materiality of ESG indicators can change over time and therefore performing a narrow sub-selection of ESG indicators based on the materiality testing would lead to substantial turnover of the weights used in the scoring model (1) over
time. Therefore, it makes more sense to keep all available ESG indicators in the model (1) and allow their weights to change smoothly over time to reflect changes in financial materiality. Furthermore, some ESG criteria that have never showed any positive performance contribution in the past might do so in the future. For instance, the CO2 efficiency of companies might not have been a performance factor before regulators imposed emission limits or charges for emissions but impacts companies’ profitability right after the introduction of such measures. Hence, keeping all indicators in the scoring approach makes sense to incorporate more recent market trends in the scoring approach. Consequently, we will use the weights \( w_{(1),jt} \) of the existing ESG scoring methodology (1) presented in RobecoSAM (2014) that has been developed over the past sixteen years to capture all relevant ESG indicators in each industry in an appropriate way as a starting point. We will create a performance enhanced weighting scheme \( \bar{w}_{(1),jt} \) that incorporates the factor loadings as a multiplier for those factor loadings that are statistically significant based on the indicator (5), i.e. we use the following model to calculate materiality enhanced scorecard weights:

\[
\bar{w}_{k(i),jt} = \frac{M_{k(i)}(\hat{\beta}_{k(i),j}, I_{k(i)}) w_{(1),jt}}{\sum_{j=1}^{N} M_{k(i)}(\hat{\beta}_{k(i),j}, I_{k(i)}) w_{(1),jt}} \tag{6}
\]

With \( k(i) \in \{1, \ldots, 30\} \) indicating the peer group of company \( i \). The model (6) simply applies a scaling factor \( M_{k,i} \) to the weights of all ESG indicators whose factor loading is statistically significant, whereas all other weights remain unchanged. Please note that the original weights \( w_{(1),jt} \) in (6) depend on the GICS-industry \( I(i) \) of company \( i \) only, whereas the materiality enhanced weights \( \bar{w}_{k(i),jt} \) additionally depend on the peer group \( k(i) \). The dependency of the weights on the peer group is important because the materiality testing and enhancing is performed at peer group level, i.e. it is specific to the region and GICS sector of companies.

The scaling function per peer group \( k \) and factor loading \( j \) is crucial for incorporating the financial materiality testing into the scorecard model (1). To promote a simple and robust methodology we use a linear scaling function that is bound between \( \frac{1}{4} \) for the lowest factor loading and a shift of four for the highest factor loading in the respective peer group, i.e.

\[
M_{k(i)}(\hat{\beta}_{k(i),j}, I_{k(i)}) = \begin{cases} 
\frac{1}{4}, & \text{if } I_{k(i),j} = 1 \\
\frac{1}{4}, & \text{if } I_{k(i),j} = 0
\end{cases}
\]

Factor loadings that are not statistically significant (i.e. \( I_{k(i),j} = 0 \)) will not be used to induce any shift in the weighting scheme.

To conclude, each year we run the materiality testing (3) to create the unbiased and materiality-enhanced total ESG scores \( \bar{T}_{it} \) using the unbiased ESG indicators (2) and the materiality tilted weights (6) in the scoring formula:

\[
\bar{T}_{it} = \sum_{j=1}^{N} \bar{w}_{k(i),jt} \tilde{c}_{ijt} \tag{8}
\]

### 6.2.3 Remove factor biases

The final step of our methodology is to neutralize potential exposures of the materiality enhanced ESG scores calculated in (8) to other common factors. To deal with the bias to common factors, we calculate a regression of the scores \( \bar{T}_{it} \) calculated in (3) using the exposure of each company to the following \( n=1..11 \) common factor exposures \( C_{itin} \) of company \( i \) at time \( t \) as input variables: Beta, book-to-price, dividend yield, earnings yield, growth, leverage, liquidity, momentum, size, non-linear size and residual volatility. The regression formula reads:

\[
\bar{T}_{it} = b_{to} + \sum_{n=1}^{11} b_{tin} C_{itin} + F_{it} \tag{9}
\]

The residuals of this regression \( F_{it} \) denote the ESG factor scores.
**Literature**


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7. Contact

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