ESG in Factors

Joint with Andrew Ang, Ying Chan and Ked Hogan

Q Group Spring Seminar
#ESGinFactors
ESG in factors
(not ESG factors)
Rewarded risk | Structural impediment | Behavioral bias

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Source: BlackRock, May 2020. For illustrative purposes only. There can be no assurance that performance will be enhanced or risk will be reduced for strategies that seek to provide exposure to certain quantitative investment characteristics ("factors"). Exposure to such investment factors may detract from performance in some market environments, perhaps for extended periods. In such circumstances, a strategy may seek to maintain exposure to the targeted investment factors and not adjust to target different factors, which could result in losses.
Rewarded risk

Structural impediment

Behavioral bias

Factors

ESG

ESG

ESG

Source: BlackRock, May 2020. For illustrative purposes only. There can be no assurance that performance will be enhanced or risk will be reduced for strategies that seek to provide exposure to certain quantitative investment characteristics ("factors"). Exposure to such investment factors may detract from performance in some market environments, perhaps for extended periods. In such circumstances, a strategy may seek to maintain exposure to the targeted investment factors and not adjust to target different factors, which could result in losses.
Factors can be ESG friendly
Some factors are naturally ESG friendly

ESG Score and Carbon Emission Intensity of Benchmark Factor Portfolios

Source: BlackRock, January 2021. Data from Worldscope, IBES, MSCI ESG and Barra. Chan, Ying and Hogan, Ked and Schwaiger, Katharina and Ang, Andrew, ESG in Factors (January 19, 2020). Available at SSRN. The chart summarises the ESG and carbon scores of the benchmark factors relative to the MSCI World market portfolio over January 2015 to September 2019. The origin represents the market portfolio, so the ESG scores represent percentage improvements relative to the market on the x-axis and we plot percentage carbon emission reductions on the y-axis. Thus, those factors in the top right-hand quadrant represent factors that have improved ESG scores and lower carbon emissions than the market as represented by the MSCI World Index.
Combining factors with ESG
ESG Outcomes in an Equity portfolio

**ESG improvement and portfolio exposures**

Source: BlackRock, as at September 2019. For illustrative purposes only. Portfolio exposure based on up to 50% ESG improvement. The chart shows a multifactor portfolio’s active factor exposure resulting from an improved ESG score/carbon emission intensity relative to the market. On the y-axis, we plot the percentage difference in active factor exposure between the optimal portfolio with ESG/carbon constraints and the optimum without constraints. This gives us an indication of how much the additional constraint (x-axis) moves us away from the optimal factor exposure. There are no assurances that the hypothetical portfolio’s objectives will be met. Additionally, there are frequently sharp differences between a hypothetical performance record and the actual record subsequently achieved. Another inherent limitation of these results is that the allocation decisions reflected in the performance record were not made under actual market conditions and, therefore, cannot completely account for the impact of financial risk in actual portfolio management. The performance shown does not represent any existing portfolio, and as such, is not an investible product.
Carbon Outcomes in an Equity portfolio

Carbon improvement and portfolio exposures

Source: BlackRock, as at September 2019. For illustrative purposes only. Portfolio exposure based on up to 80% carbon improvement. The chart shows a multifactor portfolio’s active factor exposure resulting from an improved ESG score/carbon emission intensity relative to the market. On the y-axis, we plot the percentage difference in active factor exposure between the optimal portfolio with ESG/carbon constraints and the optimum without constraints. This gives us an indication of how much the additional constraint (x-axis) moves us away from the optimal factor exposure. There are no assurances that the hypothetical portfolio’s objectives will be met. Additionally, there are frequently sharp differences between a hypothetical performance record and the actual record subsequently achieved. Another inherent limitation of these results is that the allocation decisions reflected in the performance record were not made under actual market conditions and, therefore, cannot completely account for the impact of financial risk in actual portfolio management. The performance shown does not represent any existing portfolio, and as such, is not an investible product.
ESG and Carbon Outcomes: In-Sample Information Ratios

Comparison of Information Ratios of factor portfolios with and without a 20% ESG improvement and 40% carbon emission reduction versus benchmark:

Source: BlackRock, as at September 2019. Chart shows the impact upon the information ratio of a portfolio due to ESG optimization (20% ESG improvement) and carbon reduction target (40% carbon improvement). Optimization is performed on a multifactor portfolio’s active factor exposure compared to one with an improved ESG score/carbon emission intensity relative to the market. Information Ratio calculated as return over risk. Past performance is not indicative of future results. For illustrative purposes only. There are no assurances that the hypothetical portfolio’s objectives will be met. Additionally, there are frequently sharp differences between a hypothetical performance record and the actual record subsequently achieved. Another inherent limitation of these results is that the allocation decisions reflected in the performance record were not made under actual market conditions and, therefore, cannot completely account for the impact of financial risk in actual portfolio management. The performance shown does not represent any existing portfolio, and as such, is not an investible product.
Intangible green value
Intangible Green Value

- Patents are often the result of R&D spending and represent intangible human capital.

- R&D spending typically increases before the patent is granted, and then continues to increase after:

Source: BlackRock FBSG Research, as at September 2019. For illustrative purposes only.
Global coverage of patents with a long history, dating back to at least 1980s.

Key data items:

1. The patent identification number
2. Date it was published
3. Date it was filed
4. Assignee names – the company or person the patent is assigned
5. Citations
6. IPC/CPC code - a classification code of the patent
7. Patent text - in the localized language
8. Country it was filed

Source: BlackRock FBSG Research, as at September 2019. For illustrative purposes only.
Entity name matching

One of the challenges with this data set, and many alternative data sets, is mapping entities (in this case we have both companies and individuals that published patents!) to companies.

We have approached this by:

• Normalize names through capitalization
• Remove any company suffixes (e.g. “Corp”, “Co”, “Inc.”)
• Converts names to “trigrams”
• Measure the occurrence of these “trigrams” (tf-idf)
• Measure a form of similarity between these occurrences (cosine)
• Select the entity that has the best match with a threshold

Unigram:

\[ idf(d, t) = \log\left(\frac{n}{df(d, t)}\right) + 1 \]

\[ tfidf(d, t) = tf(t) \times idf(d, t) \]

\[ \cos(a, b) = \frac{ab}{||a|| ||b||} = \frac{\sum_{i=1}^{n} a_i b_i}{\sqrt{\sum_{i=1}^{n} (a_i)^2} \sqrt{\sum_{i=1}^{n} (b_i)^2}} \]

Source: BlackRock FBSG Research, as at September 2019. For illustrative purposes only.
Green patents not only represent important priorities for society, but highly profitable, albeit risky, opportunities:

Source: BlackRock FBSG Research, as at September 2019. For illustrative purposes only.
Corporate culture quality
Corporate Culture
Quality
Innovation
Integrity
Quality
Respect
Teamwork

For illustrative purposes only.
Measuring Corporate Culture using Machine Learning

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<th>Core Corporate Values</th>
<th>Seed Words</th>
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<tr>
<td>Innovation</td>
<td>Creativity, Excellence, Passion, Pride, Leadership, Growth, Performance, Efficiency, Results, Innovation</td>
</tr>
<tr>
<td>Integrity</td>
<td>Integrity, Ethics, Accountability, Honesty, Fairness, Responsibility, Transparency</td>
</tr>
<tr>
<td>Quality</td>
<td>Quality, Customer, Commitment, Dedication, Value, Expectations</td>
</tr>
<tr>
<td>Respect</td>
<td>Respect, Diversity, Inclusion, Development, Talent, Employees, Dignity, Empowerment</td>
</tr>
<tr>
<td>Teamwork</td>
<td>Teamwork, Collaboration, Cooperation</td>
</tr>
</tbody>
</table>

Source: Chan, Y., Hogan, K., Schwaiger, K., Ang, A. “ESG in Factors” 2020. Available at: [https://papers.ssrn.com/abstract_id=3522354](https://papers.ssrn.com/abstract_id=3522354)  For illustrative purposes only. This material is not intended to be relied upon as a forecast, research or investment advice, and is not a recommendation, offer or solicitation to buy or sell any securities or financial product or to adopt any investment.
Corporate Culture Quality

2007-2019

Source: BlackRock FBSG Research, as at September 2019. For illustrative purposes only. The Corporate Culture Quality signal leverages machine learning techniques to identify S and G aspects of ESG; specifically human capital, employee satisfaction, product quality, inclusion and diversity, corporate behavior and business ethics. There can be no assurance that performance will be enhanced or risk will be reduced for funds that seek to provide exposure to certain quantitative investment characteristics ("factors"). Exposure to such investment factors may detract from performance in some market environments, perhaps for extended periods. In such circumstances, a fund may seek to maintain exposure to the targeted investment factors and not adjust to target different factors, which could result in losses. Past performance is not indicative of future results.
#ESGinFactors
Important information

Risk warnings

Capital at risk. The value of investments and the income from them can fall as well as rise and are not guaranteed. The investor may not get back the amount originally invested.

Past performance is not a reliable indicator of current or future results and should not be the sole factor of consideration when selecting a product or strategy.

Changes in the rates of exchange between currencies may cause the value of investments to diminish or increase. Fluctuation may be particularly marked in the case of a higher volatility fund and the value of an investment may fall suddenly and substantially. Levels and basis of taxation may change from time to time.

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