The quant road to ESG integration

Applying a quantitative approach to ESG integration offers big benefits to clients. It allows for an in-depth understanding of secondary exposures that come with applying ESG tilts to portfolios and offers a holistic framework for aligning performance and sustainability goals in a client investment portfolio.

Environmental, social and governance-based investing has surged in popularity in the past decade. A common approach is to apply an ESG screen to existing holdings, or to integrate ESG criteria directly into the analysis and selection of stocks. The objective is usually to improve the ESG-rating of a portfolio overall.

While this is a worthy approach, often investors have little understanding of the impact of introducing ESG criteria on their investment opportunity set, or how the risk and return characteristics of their portfolio are affected. Style or factor tilts can emerge without them knowing. Quantitative techniques can be used to evaluate and manage these effects to enable investors to achieve their sustainability and financial goals.

In the first section of this paper we show that the introduction of ESG criteria to an equity portfolio gives rise to implicit secondary market factor exposures when compared with a broad market index – an often overlooked result of socially responsible investing. For example a portfolio may end up with a large cap bias, or be overly exposed to European countries.

It is important for asset owners and portfolio managers alike to be aware of these secondary exposures, since they can alter the risk and performance metrics of a portfolio if they are not actively managed or neutralised.

To investigate the effects of ESG integration further, the second part of this paper is a case study where we build a portfolio that tracks the MSCI World index while applying a best in class ESG screening tool, specifically the DWS ESG engine. One way to do this is to combine ESG tilts with an alpha generating active strategy. This allows stocks to be screened in a way which maximizes risk adjusted returns.

We do this by using our own in-house active quantitative strategy.

The results are significant. We show that increasing the ESG tilts to passive portfolios requires investors to bear a greater tolerance to tracking error. Combining ESG screens with an active approach however can add value by producing higher risk adjusted returns while fulfilling investors’ ESG requirements. For a given investor, the ‘right’ parameters may be established through the use of quantitative analysis and simulation.

One catch seems to be that as the ESG tilt is increased above a certain level, the information ratio of these active portfolios drops off more rapidly – in other words risk adjusted returns begin to decline when combining alpha maximising strategies with higher ESG tilts although the information ratio remains positive. The combination of alpha and ESG investment objectives requires a higher active risk tolerance from investors.

These simulations therefore provide a framework for investors to think about the relationship between their sustainability and risk return objectives. This raises the question of whether standard market indices are adequate benchmarks given the ESG impact on the investible universe.

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Impact of ESG on an investment universe

Our first goal is to raise awareness that there is more information in ESG data than just the single ESG rating for each stock in a portfolio. Using quantitative analysis we show that applying ESG screening affects the investment universe in subtle ways and may introduce implicit bets that a portfolio manager should be aware of in order to be able to manage them.

It is intuitive that exclusionary stock screening, which often completely eliminates certain industries from an investor’s eligible investment universe, introduces tilts at the industry level compared with a broad benchmark such as the MSCI World Index. Some screens express their ESG views relative to sector peers, maintaining industry neutrality, however this does not prevent them also introducing other tilts to an eligible investment universe. What about new geographic or risk factor exposures, for example?

Regional tilts
We start by looking at the ESG rating distribution of the MSCI world developed market index based on DWS SynRating data. Figure 1 shows the distribution to be approximately normal.

![Figure 1. ESG Rating Distribution – MSCI World](image1)

Source: DWS as End of April 2018

While the geographical distribution of ESG ratings in Figure 2 reveals a similar pattern for APAC and North America, it shows a significant tilt towards higher ESG ratings in Europe. This may partially be due to mandatory ESG disclosures in some European countries.

![Figure 2. ESG Rating Distribution – MSCI Regions](image2)

Source: DWS as End of April 2018

But an implication of this finding is that investors who aim to increase the overall ESG rating of a global portfolio will find their holdings naturally tilt towards European companies. This exposure either has to be taken into account when defining the strategic asset allocation for a global equity portfolio or has to be explicitly controlled for in the portfolio construction process.

Further insights into the hidden tilts within ESG data can be drawn from an in-depth analysis of drivers behind the returns of ESG rating classes. For example, Figure 3 shows the performance of portfolios of equally weighted MSCI World stocks based on their DWS ESG SynRating.

![Figure 3. Performance of ESG Rating Classes](image3)


Although E and F rated stocks underperform over this cumulative period, over some shorter periods such as from 2011 to mid-2014, the opposite would be concluded. This simple equal-weighted basket approach suggests there is not always a performance advantage associated with any of the individual ESG rating classes. So other performance drivers may sometimes better explain relative returns.

ESG data and performance drivers
To further investigate these implicit tilts within ESG data, we looked at a more detailed analysis of the performance drivers that generated the outperformance of A versus F-rated stocks since 2011. Figure 4 shows the cumulative active return (grey area) and its various contributors (coloured lines).

![Figure 4. Performance of ESG Rating Classes](image4)


1 For further information on DWS Engine SynRating methodology, refer to THE ESG ENGINE bespoke solutions for responsible investors
2 The data presented in the charts above are taken from the DWS ESG stock rating engine however a similar analysis on ESG ratings provided by MSCI confirms this effect, source: MSCI FACTOR INVESTING AND ESG INTEGRATION available on https://www.msci.com/documents/10199/d130faa0e-600-e-4312-8d20-0a197a059c34
The first thing you notice is the variation in the magnitude of the factor attributions. Look at the reversal of the currency contribution in 2017, for example, due to the fact that the A-rated index has a lower exposure to the dollar compared with the F-index. This implicit currency exposure combined with the weak dollar in 2017 contributed strongly to the positive relative return that year. In contrast, the underperformance of the A index in 2014 was largely due to the strengthening dollar against the euro.

These findings raise another point worth remembering. That is when considering the relationship between high ESG scores and performance, outperformance could be the result of implicit tilts, rather than the inclusion of higher quality ESG stocks themselves. More work needs to be done to increase transparency in this area, but this is beyond the scope of this paper.

**ESG data and factor exposures**

Additional insights may be gained from analysing common factor exposure. Since a factor’s contribution is a product of its active exposure times the factor return, it is crucial to look at the relative exposures of the A-rated index compared with the F-rated index, which we do in Figure 5. Even if the active return contribution from risk indices as a total is slightly positive in this analysis, there might be offsetting effects that require further attention.

Looking at the chart above, what stands out is the significance and persistence of a high factor exposure to large caps and a low factor exposure to mid and small caps. At least part of this finding can be explained by the fact that large companies might be better positioned to earn a higher ESG rating, because they typically produce a more comprehensive sustainability reporting compared with smaller companies.

Figure 6 shows the relative return contribution resulting from risk indices (grey area) and contributions from the underlying risk factors.

The low exposure to mid and small caps has significantly detracted from relative benchmark performance in this analysis period.
Constructing an enhanced ESG portfolio

Next as a case study, we investigate the effects of incorporating DWS ESG data into our own relative return strategies, which are used by institutional investors and benchmarked to standard market indices.

Tilt strategies using ESG ratings
Taking our in-house quantitative alpha strategies we focus on the following data driven and quantitative methods to incorporate ESG data into portfolio construction:

1. Exclusions – Client driven hard exclusion of certain sectors, companies or practices from the eligible investment universe
2. ESG tilt strategies based on best-in-class screens

Both methods have their appropriate usage scenarios but have particular implications on the results. If ESG integration is defined via exclusions, it is possible that the overall portfolio ESG score (for example, as measured by DWS ESG SynScore) remains worse than the benchmark if the portfolio is dominated by eligible but low ESG-rated stocks.

An enhancement to this process are ESG tilt strategies, which utilise a best-in-class approach while controlling for the ESG rating of the overall portfolio. Tilt strategies aim to achieve an overall portfolio ESG score that is $x$ times higher compared with the benchmark ESG score, with $x$ being the tilt size.\(^3\)

Besides resulting in a higher ESG rating versus the benchmark, another advantage of using tilts is they work nicely with a quantitative approach to portfolio construction. Unlike excluding stocks, tilts allow both ESG and quant scores to be represented. For example if a client’s ESG goal requires the weighting to ‘B’-rated stocks in a portfolio to be increased, this can be achieved by overweighting ‘B’-rated stocks which have superior outlooks while reducing ‘B’-rated stocks with poor alpha scores.

Analysis settings
For our tests on the effects of ESG integration, we start by excluding companies involved in the production of controversial conventional weapons as most investors interested in ESG consider this a minimum requirement.\(^4\)

We then construct portfolios that aim to track the MSCI World developed market index with the lowest possible tracking errors given a range of ESG overlays.

Next we exclude names with the lowest ESG scores (SynRating E and F) from the eligible universe. Finally we gradually increase the tilt – lifting the required portfolio ESG SynScore level in the range of 1 to 1.5 times the ESG laggards-free universe.\(^5\)

**FIGURE 7. RELATIONSHIP BETWEEN ESG SYN RATING AND SYNSCORE**

<table>
<thead>
<tr>
<th>DWS ESG SynRating</th>
<th>SynScore</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>True leader in ESG</td>
</tr>
<tr>
<td>B</td>
<td>ESG leader</td>
</tr>
<tr>
<td>C</td>
<td>ESG upper midfield</td>
</tr>
<tr>
<td>D</td>
<td>ESG lower midfield</td>
</tr>
<tr>
<td>E</td>
<td>ESG laggard</td>
</tr>
<tr>
<td>F</td>
<td>True laggard in ESG</td>
</tr>
</tbody>
</table>

Source: DWS

**ESG tilt size and tracking error**
Figure 8 exhibits the cumulative performance of these ESG-tilted index tracking strategies relative to the MSCI World index from Dec 2013 to Jul 2018. The picture is rather mixed, showing underperformance for the base and milder tilts (10 and 20 per cent), while higher tilts generated slightly positive outperformance in the sample period.

However the chart above should not be read to mean that ESG tilts systematically produce superior returns. About 91 per cent of the relative performance of the Passive_1.5 portfolio is accounted for by the active contribution of only two stocks (Becton Dickinson and Neste Oyj). In order to

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\(^3\) For example, if the overall ESG score of the MSCI World Index, using the DWS ESG engine data is about 60 (as of 31.07.2018), a 20% tilt strategy requires the ESG score of the optimal portfolio to achieve at least 60 x 1.2 = 72.

\(^4\) The exclusion of controversial conventional weapons (cluster munitions and anti personnel mines) applies to all of our portfolios according to the official binding Controversial Conventional Weapon Policy at DWS.

\(^5\) The portfolio optimisation is implemented by using BARRA Portfolio Manager. We control for country, industry and maximum stock's active exposures and keep portfolio beta close to 1 in order to avoid unintended tilts.
conclude whether there is a sustainable systematic ESG premium associated with higher ESG-rated stocks, more comprehensive simulations and analysis are necessary.

More important for investors to note is the tracking error behaviour of these index tracking portfolios. As shown in Figure 9, there is a steady increase of the tracking error relative to the benchmark as the tilts become bigger.

**FIGURE 9. EX POST TRACKING ERROR PASSIVE**

More important for investors to note is the tracking error behaviour of these index tracking portfolios. As shown in Figure 9, there is a steady increase of the tracking error relative to the benchmark as the tilts become bigger.

**FIGURE 10 PORTFOLIO ESG RATING CLASS ALLOCATION**

Thus, investors wanting to increase the ESG quality of their portfolios must have a tolerance to bear active risk, since the ESG target function adds additional constraints on the potential size of the investment universe / opportunity set.

Next, we applied the identical optimisation settings and ESG criteria to our own global Qi relative return strategy.

**Combining ESG with Qi alpha capability**

In contrast to the index tracking example, this time the active strategy incorporates alpha signals. Thus the goal of portfolio optimisation changes from minimising tracking error to maximising risk adjusted active returns, while simultaneously achieving the ESG objectives. The simulated relative returns compared to the MSCI World Index for the different levels of ESG tilts are exhibited in Figure 11.

**FIGURE 11. QI ACTIVE ESG TILT PORTFOLIOS – RELATIVE RETURNS**

The return characteristics from both backtest cases are aggregated in Figure 12.

**FIGURE 12. ANNUALISED RELATIVE RETURN – ACTIVE VS. PASSIVE**
Investment solutions that integrate alpha screening from our multi-factor engine can add value in terms of excess return relative both to the benchmark and the passive index tracking case.

As Figure 13 shows, the tracking error in the active test is fairly constant and, remarkably, is approximately the same as the passive case with a 50% tilt size.

The crucial parameter in an active context is the information ratio, defined as the ratio of excess (active) return to active risk (tracking error). Figure 14 shows its distribution for different ESG tilt levels.

Figure 15 reveals, however, that in our simulation sample the information ratio begins to decline rapidly beyond a 40 per cent ESG tilt. Here it seems as if investors have to compromise some information ratio in our active strategies in favor of reaching higher overall portfolio ESG scores.

Despite a higher tracking error, an active quantitative strategy is able to consistently deliver higher risk-adjusted active returns for all ESG-integrated strategies.

Figure 14 shows its distribution for different ESG tilt levels.

Of course, the above analysis is simplified and dependent on time periods, starting portfolios, and investment universe and risk aversion parameter assumptions. However, it provides some important insights into the impact of ESG integration on investment strategy implementation. They can summarised as:

1. ESG implementation adds an additional investment objective and thus may require a higher active risk tolerance in terms of investor benchmarks.
2. At a certain level of ESG tilt, the trade-off between the ESG rating objective and information ratio becomes significant.
3. ESG integration raises the question of whether the standard market indices are adequate benchmarks given the ESG impact on the investible universe.
4. For a given set of investor requirements, the ‘right’ parameters can be found through the use of quantitative analysis and simulation.
Conclusion – Forewarned is forearmed

In this paper we have illustrated some of the capabilities and methods that we use in the Qi Dynamic Factors group to implement ESG techniques in our clients’ portfolios. We have looked at the various ways that ESG data can be integrated into portfolios and have shown that this process can cause unexpected and subtle changes to their internal dynamics, exposures and risk metrics.

Being aware of these tilts and understanding their origin gives us an advantage in dealing with them to ensure the investment objectives of our portfolios are met when implementing ESG criteria. Thus we can continue to focus on generating alpha for our clients in a controlled, robust and disciplined manner with a lower likelihood of being surprised by the behaviour of our strategies as a result of hidden portfolio risk.
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