Factor investing in investment grade & high yield corporate bonds: an overview

• Increasing evidence to support factor investing in corporate bonds

• Diversification across multiple factors reduces risk

• Multi-asset portfolios also benefit from allocating to bond factors

Size, Low-Risk, Quality, Value and Momentum factor portfolios have higher returns and Sharpe ratios than the corporate bond market index\(^1\). However, these factors may outperform or underperform the market for prolonged periods, resulting in drawdowns and high tracking errors. By combining factors in a multi-factor portfolio, the drawdowns and tracking errors become much smaller, while the higher returns and Sharpe ratios are conserved. Corporate bond factors can add about 1% return a year in a strategic multi-asset portfolio, regardless of whether the portfolio is already allocated to equity factors.\(^2\)

**Factor investing**

Investors are increasingly allocating their assets to factors. Factor investing differs from traditional portfolio management by following a systematic, rules-based approach to

\(^1\) The previous versions were titled “Smart credit investing: harvesting factor premiums”.

\(^2\) The value of your investments may fluctuate. Results obtained in the past are no guarantee for the future.
harvest one or more factor premiums, such as size, low risk, quality, value and momentum. The motivation for this shifting investment paradigm is two-fold. First, factors deliver higher Sharpe ratios than the market over the long term. Second, factors are responsible for a large part of the alpha that successful managers generate. Since many funds are often only tilted implicitly or weakly to factors, investors have started to strategiy and explicitly allocate to factors to generate alpha. Although most factor research focuses on the equity market, the concept and benefits of factor investing apply equally well to the corporate bond market.

Factor investing in the corporate bond market

In other notes, we discuss the individual size, low risk, quality, value, and momentum factors. In this article, based on our academic paper “Factor Investing in the Corporate Bond Market,” we show the risk-return profiles of both individual factors and a multi-factor portfolio. Such a multi-factor portfolio combines the factors in a single portfolio to allow diversification. This makes the alpha more stable over time. For instance, value may underperform over a certain period, while low risk outperforms. We show that the multi-factor portfolio retains the high Sharpe ratio generated by the individual factors, but with smaller drawdowns and a lower tracking error versus the market. Furthermore, in this note we analyze factor investing in a multi-asset context, demonstrating the added value of corporate bond factors compared to equity factors. We conclude by explaining how an investor can further enhance the generic factor strategies described in our academic work to successfully implement factor strategies in actual investment portfolios.

Evaluating and defining factors for corporate bonds

To evaluate the factors, we use 24 years of monthly data from January 1994 to December 2017 on all constituents of the Barclays US Investment Grade and US High Yield indices. Every month, we create equally weighted portfolios based on the factor definitions (see below). In addition to the single-factor portfolios, we also construct a multi-factor portfolio that invests equal proportions in each of the single-factor portfolios. We analyze the excess returns over duration-matched Treasuries to properly filter out the interest rate component, i.e. the term premium. We have two reasons for doing this, namely: (1) most institutional investors manage the interest rate exposure of their total portfolio separately, e.g. using interest rate

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swaps or bond futures and (2) investors buy corporate bonds primarily to harvest the default premium rather than the term premium, because the latter can be more efficiently harvested by investing in government bonds.

**Academic evidence is scarce, but emerging**

In contrast to the academic literature on equity markets, where factors have been documented since the 1970s, the evidence for corporate bond markets is more recent and more limited. Low risk and momentum are the best documented factors.\(^7\) Studies on quality, value and size are virtually non-existent. When defining factors in our academic study, we made sure that the definitions (1) are consistent with the existing literature, (2) only use bond characteristics that are readily available (e.g. spread, rating, maturity) and (3) are intuitive for a corporate bond investor. Specifically, we refrained from using accounting or equity data. This decision meant that we did not include the quality factor in our academic analyses, because quality can only be defined at company level using accounting data. At the end of this note we show the additional improvements that can be made by enhancing the generic factor definitions, e.g. by using accounting and equity data.

**Size**

Smaller companies tend to be under-researched, because investors typically aim to efficiently cover a large percentage of the market capitalization using a limited number of analysts. From that perspective, it is more efficient to cover companies with a larger weight in the index than those with a smaller index weight. Therefore, to define the size factor in the corporate bond market, we use the total size of a company’s public debt rather than the size of an individual bond. In addition to an “under-researched” premium, the size factor also partially captures an illiquidity premium, because smaller companies tend to issue smaller bonds and smaller bonds tend be less liquid than larger ones. Every month the size factor portfolio invests in 10% of the bonds belonging to the smallest companies in the index.

**Low Risk**

Previous studies show that bonds with lower risk generate higher risk-adjusted returns, where maturity and/or rating are typically used as risk measures. So, portfolios of shorter-dated and higher-rated bonds have historically had higher Sharpe ratios than the market. To construct our low-risk factor portfolio for investment grade, we first select all bonds rated AAA to A- and so exclude the most risky bonds rated BBB+, BBB or BBB-. Each month we then select those with the shortest maturity so the portfolio is made up of 10% of the total number

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\(^7\) See for example the articles “Which Risks Have Been Best Rewarded?” by Ilmanen, Byrne, Gunasekera and Minikin (2004) and “Betting Against Beta” by Frazzini and Pedersen (2014).

\(^8\) See for example the articles “Momentum and Reversal Effects in Corporate Bond Prices and Credit Cycles” by Pospisil and Zhang (2010), and “Momentum in Corporate Bond Returns.” by Jostova, Nikolova, Philipov and Stahel (2013).
of bonds. For high yield, we follow the same procedure, selecting bonds rated BB+ to B-and excluding the most risky ratings CCC, CC and C.

Quality

Quality is the phenomenon where stocks and bonds of profitable, cash-generating and well-managed companies tend to outperform the market. Although equity investors tend to view quality as a separate factor, we have found empirical and qualitative evidence to suggest that the low risk and quality factors tend to be closely related in corporate bond markets. For this reason, our enhanced low-risk factor definition includes quality variables. For the generic low-risk factor definition, we use the rating and maturity variables, as discussed in the previous paragraph.

Value

Correia et al. (2012) is the seminal paper on value investing in the corporate bond market. They show that bonds that are undervalued versus their ‘fair’ value subsequently outperform the market, and bonds that are overvalued, underperform. They estimate the fair credit spread using a variety of risk measures, including leverage and profitability. We choose rating, maturity and the 3-month change in the credit spread as risk measures. Otherwise, we follow the methodology of Correia et al. (2012). The value factor portfolio consists of the 10% most undervalued bonds, i.e. bonds whose market spread is high compared with other bonds with similar rating and maturity.

Momentum

The momentum effect is where past winners tend to be future winners and, similarly, past losers tending to be future losers. Previous research shows that this effect is present in the high yield market, but is not significant in the investment grade market. We follow Jostova et al. (2013) by defining momentum as the past 6-month return. The 10% bonds with the highest past returns are selected for the momentum factor portfolio.

Factor portfolios show high risk-adjusted returns

Investment grade

Figure 1 plots the risk and return of each factor portfolio in the investment grade market. We note that each factor has a distinctive risk-return profile. The low-risk portfolio has a somewhat higher return than the market, but much lower volatility. Value, on the contrary, has a higher volatility, but this is more than compensated for with a higher return. Momentum and size have a volatility similar to that of the market, but with higher returns. The volatility of the multifactor portfolio is the average of that of the four factor portfolios and is similar to the market. However, its annualized return is 0.67% higher. The Sharpe
ratios of 0.45 (size), 0.44 (low risk), 0.30 (value) and 0.37 (multi-factor) are significantly higher than the market Sharpe ratio of 0.17. However, the Sharpe ratio of momentum in investment grade is not significantly different from the market’s Sharpe ratio, which has also been documented in previous studies.

Figure 2 shows the same portfolios, evaluated relative to the market, so plotting tracking error versus outperformance. The results show that from this perspective the individual factors are less attractive. Low risk and value have particularly large tracking errors compared to the market volatility of 4.2% due to their large beta deviations. For value, a substantial outperformance of 1.2% a year compensates for this, but low risk only offers a modest outperformance of 0.2%, resulting in an information ratio of 0.06. However, it has among the highest Sharpe ratios. This highlights the importance of a long investment horizon, because the single factor-portfolio can be risky in the short term for benchmarked investors. The multi-factor portfolio, on the other hand, combines its high Sharpe ratio of 0.37 with an attractive information ratio of 0.58. The reason is that it diversifies across the individual factors, mitigating the possible underperformance of one or more factors for prolonged periods of time. This leads to a lower tracking error than that of the individual factors, while maintaining the outperformance.

**Figure 1: Risk-return plot per factor portfolio for US investment grade**

**Figure 2: Tracking error - outperformance plot per factor portfolio for US investment grade**


**High yield**

Figure 3 shows the risk and return of the high yield factor portfolios. The results are similar to those for investment grade. Low risk has a much lower volatility than the market and value a higher volatility. The Sharpe ratios of the four factors range from 0.45 (momentum) to 0.68 (size), significantly larger than the market Sharpe ratio of 0.27. The multi-factor portfolio’s volatility is similar to the market’s, but its Sharpe ratio is more than twice as high.
(0.59 versus 0.27) due to its higher return. Figure 4 shows the factor portfolios in a relative risk framework. As in investment grade, low risk has the lowest information ratio, only 0.26. The other factors have information ratios ranging from 0.51 (momentum) to 0.72 (size). Again, combining the four factors in a multi-factor portfolio leads to the highest information ratio, 0.83.

**Results also valid after transaction costs**

In our academic paper we conduct numerous robustness checks. The most important check is that these results also still hold after transaction costs have been deducted. Although the factors have higher turnover than the market and therefore incur higher transaction costs, we show that the break-even transaction costs, which are the cost levels that would make the after-cost alpha zero, are substantially higher than the actual transaction costs we observe in practice. Furthermore, in our academic paper we show that the results are robust to the exact definition of the factors.

**Corporate bond factor investing increases the return of a multi-asset portfolio**

In the previous section we showed the added value of factor investing within the corporate bond market. However, investors usually invest in other asset classes as well, such as equities and government bonds. An investor might already be allocating his equity portfolio to factors, and wondering about the added value of factor investing in his corporate bond portfolio. To answer this question, we analyze a hypothetical multi-asset portfolio containing 25% allocations to government bonds, equities, investment grade corporate bonds and high yield corporate bonds. First, we evaluate a traditional portfolio, in which all asset class
allocations are invested in market index portfolios. Next, we test three alternative allocations, where we (1) allocate only the equity portfolio to a multi-factor portfolio, (2) allocate only the corporate bond portfolios to the multi-factor portfolios and (3) allocate both the equity and corporate bond portfolios to multi-factor portfolios.

To evaluate the equity multi-factor portfolio, we use decile size, value and momentum portfolios from the website of Kenneth French. The equity market factor is also obtained from this source. Unfortunately, the website does not provide a low risk factor, so we took the return of the MSCI MinVol index from Bloomberg instead. The government bond return is the return on the Barclays 7-10yr US Treasury index. All these returns are in excess of the 1-month T-bill rate. Therefore, we add back the interest rate component to the corporate bond indices and factor portfolios to compare the asset classes on an equal footing.

**Figure 5:** Sharpe ratios market and factor portfolios over the risk-free rate for government bonds, investment grade (IG), high yield (HY) and equities

**Figure 6:** Sharpe ratios multi-asset portfolios over the risk-free rate


Corporate bond factor allocation pushes up the Sharpe ratio of a multi-asset portfolio

Figure 5 shows the Sharpe ratio of the market and the multi-factor portfolio per asset class. The improvements of the factor portfolios versus their respective market indices are substantial, with Sharpe ratios increasing by 0.14 (IG), 0.34 (HY) and 0.17 (equities). Figure 6 shows the Sharpe ratio of the traditional multi-asset portfolio and the three alternatives. Investing in the corporate bond multi-factor portfolios boosts the Sharpe ratio from 0.83 to 1.00. Investors that already allocate to the equity factors and decide to invest in the

10 http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. See our academic paper for details on the exact series used.
corporate bond multi-factor portfolio too, see their Sharpe ratio grow from 0.93 to 1.08. In both cases, the corporate bond factor allocation contributes almost 1% to the improved return, while the volatility is virtually unchanged.

Enhanced factor investing

So far in this note, we have analyzed the benefits of factor investing following academic methods. However, Robeco research has shown that it is possible to improve on these results in two ways: (1) enhanced factor definitions and (2) enhanced portfolio construction rules.

Using enhanced factor definitions

To enhance the factor definitions, it is important to understand the latent risks in each factor and to mitigate those that are not properly rewarded with higher returns. Moreover, since risk itself is unobservable and multi-dimensional, it is advisable to diversify across risk measures. We find that it is especially beneficial to expand the scope of the risk measures beyond bond market characteristics, and use accounting and equity data as well. For instance for low risk, we not only control for risk via rating and maturity, but also for the amount of leverage the company is taking on, how much risk its equity shows and the overall quality of the firm as measured by various quality variables. To enhance value, we not only look at rating and maturity to calculate the ‘fair’ credit spread, but also at company-level risk measures. Moreover, we account for the non-linear relationship between credit spreads and risks. Momentum has the tendency to prefer high-risk securities to low-risk securities after a bull market, and vice versa. In our models, we correct for this bias. Moreover, we use equity market information in our momentum definition.

Figure 7: Sharpe ratios generic and enhanced factor definitions investment grade

Figure 8: Sharpe ratios generic and enhanced factor definitions high yield

Figure 7 (investment grade) and Figure 8 (high yield) show the Sharpe ratios of the generic and enhanced factor definitions. In both universes and for all factors, the Sharpe ratios show improvements ranging from 0.11 to 0.22. The multifactor ('Multi') Sharpe ratio improves 0.13 in investment grade, and 0.15 in high yield. Clearly, by using enhanced definitions, the benefits of factor investing increase.

Enhancing portfolio construction rules

Besides enhanced factor definitions, the portfolio construction rules can also be improved to enhance performance. Below we list some examples:

• Turnover can be reduced substantially by not immediately selling a bond once it no longer belongs in the top decile. Postponing the sale, for example until the bond drops out of the top 50%, can reduce investors’ transaction costs. This requires a careful analysis, because the trade-off between giving up alpha and preventing transaction costs can be different for different factors.

• In a single-factor portfolio, there is often undesired negative exposure to other factors. For instance, a low-risk portfolio, can end up with safe but expensive bonds. To avoid this, other factors should be taken into account while constructing the portfolio. In Robeco QI Conservative Credits, our low-risk investment grade strategy, we also take size, value and momentum into account, albeit with a smaller weight in the overall model to maintain the low-risk profile.

• Large sector and region bets should be prevented. For instance, in the second half of 2007, a generic value strategy would have mainly bought financials as their credit spreads widened making them attractive from a value perspective, but in 2008 this would have led to a large drawdown. Limiting the portfolio weight in a single sector prevents concentrated positions, and improves the diversification.

Putting theory into practice

Our findings are put into practice in various factor strategies.\textsuperscript{11}

• Robeco QI Conservative Credits, launched in 2012, offers exposure to the low-risk factor, while avoiding undesired negative exposure to other factors. We run portfolios on euro-only and global investment grade universes.

• Robeco QI Global Multi-Factor Credits, launched in 2015, offers balanced exposure to all the factors in the global investment grade market.

• Robeco QI Global Multi-Factor High Yield, managed in an internal mandate since 2005, and available to external clients as of 2018, offers balanced exposure to all the factors in the global high yield market.

\textsuperscript{11} See our investment opportunities "Factor Investing in the credit market: Global Multi-Factor Credits" (2017) and "Factor Investing in the high yield market: Global Multi-Factor High Yield" (2017).
Conclusions

In this note we show strong empirical evidence for the existence of size, low risk, value and momentum factor premiums in the corporate bond market. All factors have substantially higher returns and Sharpe ratios than the market. The tracking errors, however, are relatively large, highlighting the risk of underperformance relative to the market over shorter investment horizons. By investing in a multi-factor portfolio instead, which diversifies across the four factors, the tracking error and drawdowns versus the market are reduced while the high returns and Sharpe ratios are preserved. For investment grade, the Sharpe ratio increases from 0.18 to 0.37 when investing in a multi-factor portfolio instead of in the market index. For high yield, the Sharpe ratio increases from 0.27 to 0.59.

In a multi-asset context, investors can improve the Sharpe ratio by 0.15 and their return by about 1% by allocating to corporate bond factors, regardless of whether they already allocate to factors in their equity portfolio. Although these results are already strong, there is still much to be gained by enhancing the investment process. This can be done by using enhancing factor definitions and by improving portfolio construction rules.