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Robust Investing in Corporate Bonds with Factor Investment Styles

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JYSKE BANK

1. Introduction

We will here discuss factor investment styles for corporate bonds in a non-technical way. We will show that a factor approach can create robust returns in a corporate bonds universe – even in different credit cycles without losing the upside. We will show evidence for excess performance of the single factor investment style, but also evidence for robust excess performance if the factors are combined[1]. The model was Implemented at Jyske Capital in May 2012. In-production results from the model will be used in the discussion.

Factor investment styles pioneered by Fama and French have become widespread tool for investing in equities and the academic research on the topic is extensive. Opposite to equity factor models the litterateur on factor models for corporate bonds is quite scares.

One of the reasons for the scarcity of litterateur is that corporate bonds are more complex instruments than equities. There is usually only one stock price and its maturity is infinite. However, a company can issue bonds with different maturities, call features, different covenants and different collateral structures. All factors that makes it more difficult to model the price of a bond. Even getting the correct price data of a corporate bond is not straight forward compared to the stock market due to the smaller liquidity of the corporate bond market.

However, the complexity of corporate bonds and the lack of attention from research side makes factor style investing in corporate bonds potentially more attractive then equity factor style investing. The risk that factor styles get arbitraged away is significantly smaller for corporate bonds.

The paper is organized the following way. Section 2 discusses the model and the three single factor investment styles value, momentum and quality. The factor investment styles are combined in the end of the section. Section 3 validates the model based upon in-production results. Section 4 concludes.

2. The Model

The factors in the model are selected in a two step procedure. First step is selecting factors based upon intuition without looking at data. The purpose of the step is to secure that only robust factors enters the model and avoid factors that look good in a back test solely due to randomness. The second step is the actual backtest. The factors are normalized and ranked.

The factor styles are constructed by ranking more than 200.000 observations of corporate bonds rated from BB+ to B- from 2002 to 2012. Bonds with duration smaller than 1 year and nominal size smaller than 200.000 USD are excluded. Only USD, EUR and GBP bonds are included and returns are evaluated in local currency to avoid any currency effect in the back test. Option adjusted spreads (OAS) are used in the model to adjust for bonds with call features.

[1] *No transaction cost and full liquidity is assumed.*

2.1 Value

Value is defined as the observed spread of a bond (OAS) compared to fair value spread estimated from a company's fundamentals. The fair value spread for a bond is estimated with a so-called structural credit risk model. The structural credit risk model estimates the default risk of a corporate bond from the relationship between the leverage and the volatility of a firms assets.

If a company is highly leveraged and the value of the assets are highly volatile then there is a large risk that the company ends up in financial difficulties. Hence, the risk of default must be high. On the other hand, if the company's leverage is low and the volatility of the assets is low the risk of financial disarray is low. Hence, the risk of default must be low.

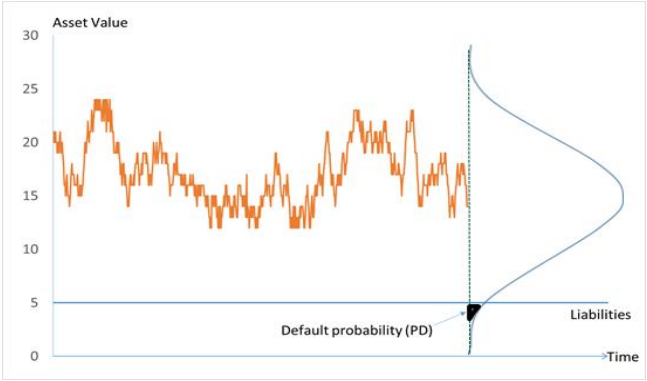

Figure 1: Low leverage and low asset volatility leads to a low default probability in a structural credit risk model. The company is a going concern as long as the market value of the asset is higher than the market value of the liabilities.

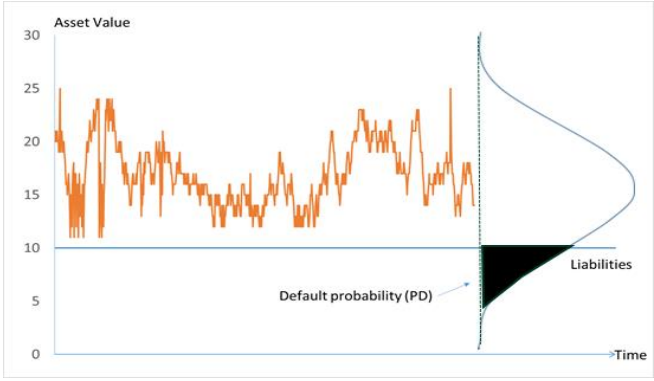

Figure 2: High leverage and high asset volatility leads to a high default probability in a structural credit risk model. The company is a going concern as long as the market value of the asset is higher than the market value of the liabilities.

f(PD, Duration, Loss Given Default)

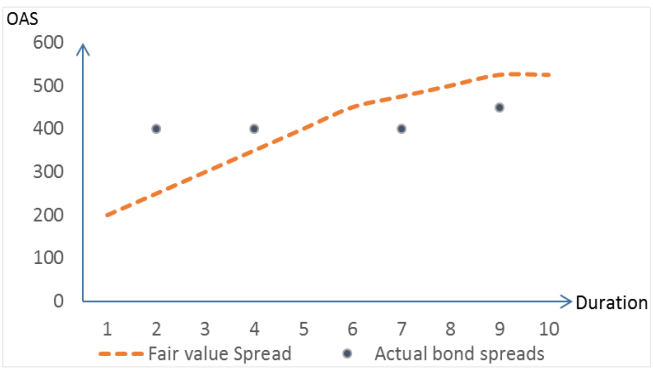

Figure 3: Adjusting for loss given default makes it possible to calculate a fair value spread for a company. Low leverage and low asset volatility leads to a slowly increasing spread curve. Bonds, with observed spreads above the fair value spread curve, are considered cheap. If the observed spread is below the curve, the bond is considered rich.

f(PD, Duration, Loss Given Default)

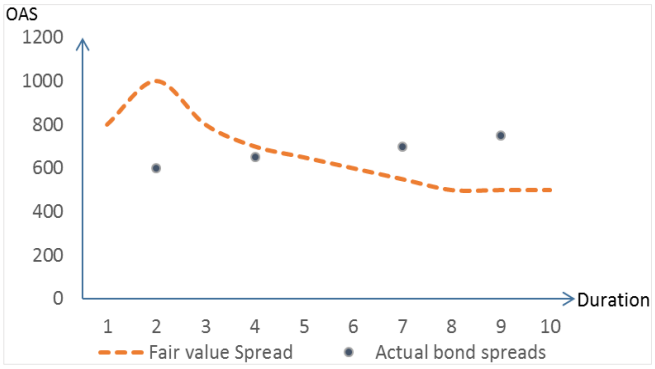

Figure 4: Adjusting for loss given default makes it possible to calculate a fair value spread for a company. High leverage and high asset volatility leads to a humped shaped fair value spread curve. The short duration bonds are considered rich because they are below the curve. The long duration bonds are above the curve and therefore considered cheap.

A high default risk leads to a demand for a higher spread to persuade the investors to buy the bond, whereas low default risk requires a lower spread from the investors to buy the bond. Adjusting for loss given default a complete credit spread term structure can be derived for a specific company. The effect of leverage level and asset volatility on the fair value spread is displayed in figure 1 to 4 below.

A bond with a low default risk is not necessarily cheaper than a bond with a high default risk. Nor is a bond with a high spread cheaper than a bond with a low spread. Instead, it depends on the spread compared to a fair value spread.

If the actual spread of a bond is above the curve, the bond is considered cheap – we get a higher expected return for the bond than indicated by its fundamental fair value. Over time we would expect the spread to decline to the fair value spread, resulting in a price increase of the bond. On the other hand, if the actual bond spread is below the fair value spread, we view the bond as rich. We would expect the spread of the bond to increase to the fair value spread over time leading to a drop in the bond price.

2.2 Momentum

Traditionally, momentum is based upon the rationality that past winners will also be future winners and past losers will be future losers. There is a fairly large amount of empirical research showing support for a momentum effect in the equity market. In the corporate bond market, however, there is little evidence of momentum in bond spreads. We have therefore used equity data to create our momentum factor. This means, that momentum plays a slightly different role in the corporate bonds factor model compared to an equity factor model. Liquidity of the corporate bond market is usually lower than the stock market. It is therefore likely that the stock price of a company reacts faster to news than the bond price. The equity market can therefore acts as an early warning indicator.

There is a tradeoff between the length of the momentum period and transaction cost. Short-term momentum works better than long term, but it also increases the number of transactions. It is essential to find a momentum length that minimizes transaction cost without diluting the information content.

2.3 Quality

During stressed market conditions, there is often a tendency for investors to buy the more conservative and low leveraged companies – also referred to as “flight to quality”. It is therefore interesting to introduce a factor that can capture “flight to quality”. This factor will do well during times of stress compared to the other factors, whereas it will underperform in a so-called bull market. The factor will therefore work as an insurance against large drawdowns.

The factor will not try to predict a crisis. It will merely indicate which bonds usually are attractive in time of crisis. Companies with strong balance sheets usually do well during a crisis. As a proxy for a strong balance sheet, we use a company’s ability to convert earnings into cash flow during a longer period. Growth companies often have large capex programs and might have large working capital issues. They will therefore often struggle to convert earnings into cash flow and are therefore not well equipped against an economic downturn.

2.4 Combining the factors

Each of the factors react differently to the changing economic cycles. The value factor is the best performing single factor from a total return perspective, but also the most volatile factor and the factor with the biggest drawdowns. At the other end of the spectrum, we have quality, where returns are lower but less volatile. Investing in the factors individually requires a view on where we are in the economic cycle. Put differently, the correlations between the different factors are low.

By combining the factors, we get a model that is more robust through the changing economic cycles due to the low correlations.

The accumulated return of the factors and the Merrill Lynch global corporate high yield benchmark are displayed in figure 5. The combination of factor displayed as the Multi Factor strategy, shows superior returns compared to the other factor and the benchmark. Furthermore, risk and drawdown for the Multi Factor strategy is similar to the risk and drawdowns of the benchmark.

The so-called carry factor is also displayed in figure 5. The carry factor is simply bonds ranked according to the size of the spread(OAS). It is, however, not included in the model due to its very large drawdowns.

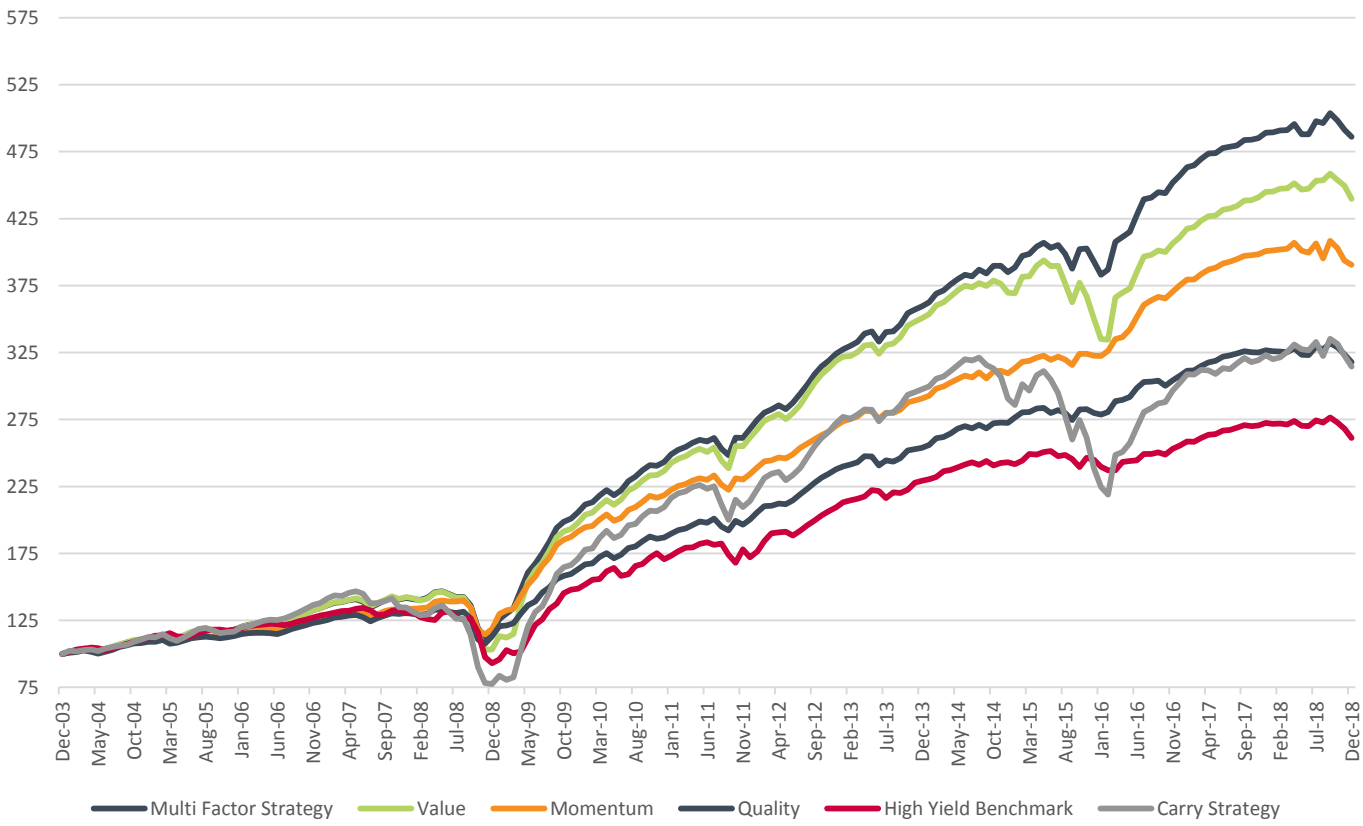

Figure 5: Accumulated Top Quintile Returns**. The accumulated return from the best quintile for the different factor styles are displays in the graph. The Merrill Lynch global corporate high yield benchmark and a so-called carry factor is also included. The carry factor is simply bonds ranked according to the size of the spread(OAS). Only Value, Momentum and Balance is included in the total model. Data from December 2002 to December 2018. The factors are not equally weighted. Past model returns are not a guarantee of future returns. Source: Jyske Capital and ICE Bond Indices.**

3. Validation of the model

The model was launched in May 2012. Hence, it makes sense to validate the robustness of the model in the in-production period. There is a risk that the returns generated from the factors used above are actually driven by omitted systemic factors. We have therefore attempted to validate the model by decomposing the model returns into the following sub segments: duration, sector and spread level. If we can observe increasing performance across the quintiles independent of the bucket of the different segments it is an indication of a valid and robust model.

The spread curve for corporate bonds are rarely flat – it typically increasing with duration and for distressed companies it is humped shaped for the short durations or even inverted. Hence, there is a risk of a duration effect in the model despite corporate bonds might have low correlation with government bonds[2]. We have therefore divided the quintiles into duration buckets. If there is no duration effect in the model, we expect the top quintile to outperform in all duration buckets. With the exception of duration bucket 1—3 years returns increase with bond ranking independent of duration as shown in figure 6.

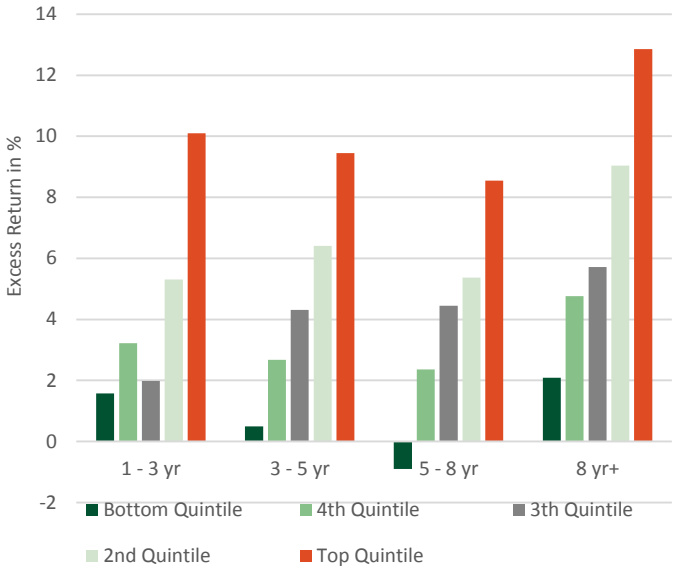

Figure 6: Duration Decomposition of Model**. The figure shows that model is able to generate solid returns independent of duration bucket. The best ranked bonds outperforms the worst ranked bonds in each duration bucket. Data from May 2012 to December 2018. Past model returns are not a guarantee of future returns. Source: Jyske Capital and ICE Bond Indices.**

Some sector are more sensitive to the economic cycle that others. We have therefore divided the sectors into 4 buckets based upon the average sector stock beta. Once again, we look for outperformance in the top quintile for each bucket. Figure 7 displays increasing returns from the worst quintile to the top for all sector buckets. This indicates that the model can deliver robust returns independent of sector.

[2] *The correlation between corporate bonds vary over time and quality of the bond*

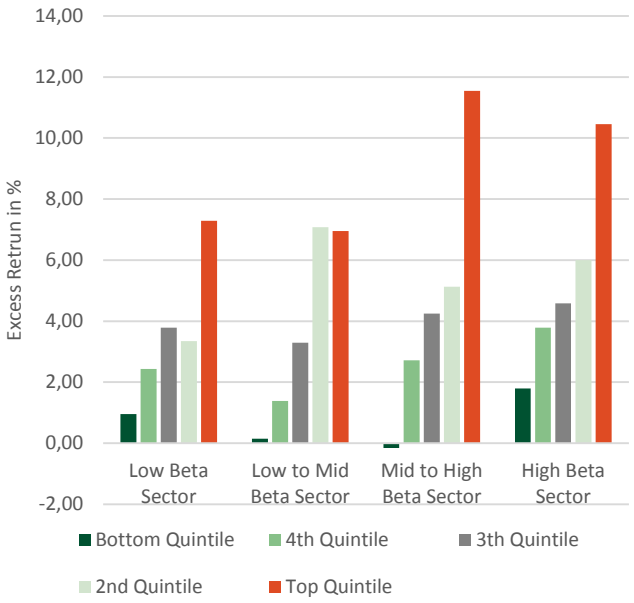

Figure 7: Sector Decomposition of Model**. The figure shows that the model generates robust returns independent of sector. The Sector buckets are based upon stock beta of the sectors. Data from May 2012 to December 2018. Past model returns are not a guarantee of future returns. Source: Jyske Capital and ICE Bond Indices.**

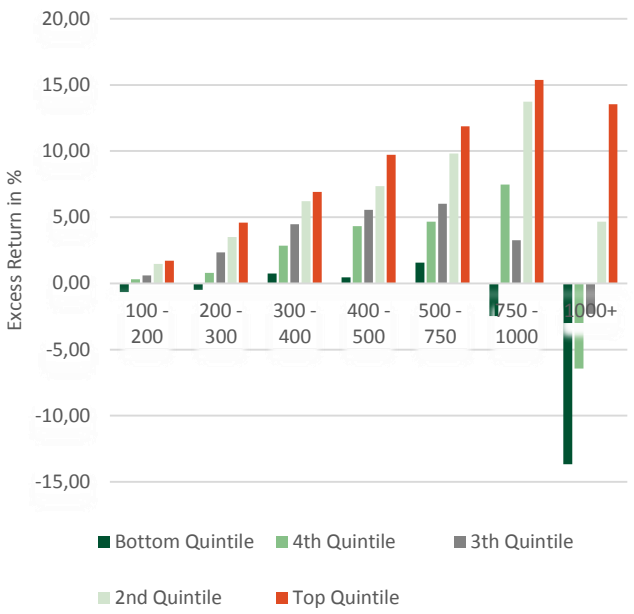

Figure 8: Spread decomposition of model. **The figure shows the model is able to generate robust returns independent of spread size of the bonds. Data from May 2012 to December 2018. Past model returns are not a guarantee of future returns. Source: Jyske Capital and ICE Bond Indices.**

If the model only works for bonds with high spreads, i.e. there is only value in bonds where the spreads are larger than 1000 and no value in bonds where spreads are below 300, it indicates that it is more important to buy bonds with high spreads than low fair value. There is, however, a clear indication of increasing returns from the worst quintile to the best for all spread buckets displayed in figure 8. This indicates that the factor model can generate superior returns independent of spread bucket. The 1000+ bucket, in particular, indicates that the traditional carry strategy does not deliver superior returns. The large discrepancy between the top and bottom quintile indicates that bonds from the 1000+ bucket must be selected carefully.

Table 1 illustrates the returns and risk from the different factors since May 2012. It is evident from the table that, not only, is the multifactor approach able to improve returns, but it also able to generate a better risk/return relationship compared to the single strategies. The multifactor model has a hit ratio of more than 70% on a monthly basis[3]. From a theoretically perspective a long/short strategy, where the top quintile is bought and the bottom quintile is sold, is the optimal strategy. Such a strategy is, however, extremely difficult to implement in corporate bonds due to difficulties of short selling.

[3] *See appendix figure 9 to 11*

Strategy	Bottom Quintile	4. Quintile	3. Quintile	2. Quintile	Top Quintile	Q1 – Q5
Quality Average Return	4,00	5,43	4,34	5,38	6,44	2,11
Quality Standard Deviation	7,06	5,72	4,40	3,69	4,66	4,32
Quality Information Ratio	-0,37	0,08	-0,67	0,00	0,72	0,49
Momentum Average Return	1,52	4,62	5,47	6,11	8,02	5,83
Momentum Standard Deviation	9,08	4,77	3,93	3,82	3,88	6,58
Momentum Information Ratio	-0,70	-0,48	0,07	0,39	1,21	0,89
Value Average Return	1,21	3,86	5,14	6,50	8,94	7,76
Value Standard Deviation	3,37	4,21	4,17	5,20	8,28	5,85
Value Information Ratio	-1,86	-1,13	-0,14	0,96	0,88	1,33
Multifactor Average Return	0,82	3,56	4,73	6,28	10,42	9,47
Multifactor Standard Deviation	5,47	5,09	4,56	4,94AA	5,04	2,70
Multifactor Information Ratio	-2,36	-1,30	-0,49	0,64	3,20	3,50

Table 1: ***Return and Risk data for the factor strategies*** *from May 2012 to December 2018. The Multifactor model is not equally weighted. Past model returns are not a guarantee of future returns. Source: Jyske Capital and ICE Bond Indices.*

Table 2 shows that the multi factor strategy is able to generate a superior risk/reward relationship with a beta close to 1 with a small drawdown.

	Index	Quality	Momentum	Value	Multifactor
Beta	1	0,88	0,71	1,45	0,95
Alpha (bps)	0	14	34	9	42
Tracking Error (bps)	0	148	209	392	153
Information Ratio	1	0,72	1,21	0,88	3,20
Drawdown (%)	13,4	3,27	2,21	9,57	0,89

Table 2: ***Portfolio ratios for the factor strategies*** *from May 2012 to December 2018. The Multifactor model is not equally weighted. Past model returns are not a guarantee of future returns. Source: Jyske Capital and ICE Bond Indices.*

Despite both back test and in-production show very encouraging results from the multifactor model, it is not straightforward to implement. It does not take transaction cost and illiquidity into account. Compared to the stock market Liquidity is typically significantly smaller and transaction cost is significantly higher in the corporate bond market. Correcting the model for transaction cost and illiquidity might reduce the positive result significantly. It is therefore important to combine the multifactor model with a more traditional qualitative approach.

4. Conclusion

There is clear indication that style factors can deliver superior returns in the corporate bond space. Value, as defined by a structural credit risk model, can boost the return in a portfolio. Momentum acts as an early warning indicator and quality can deliver robustness on the portfolio. Combining the factors hedges the portfolio against the changing economic cycle without destroying the upside. The model is robust to duration, sector and spread level effects.

5. Appendix

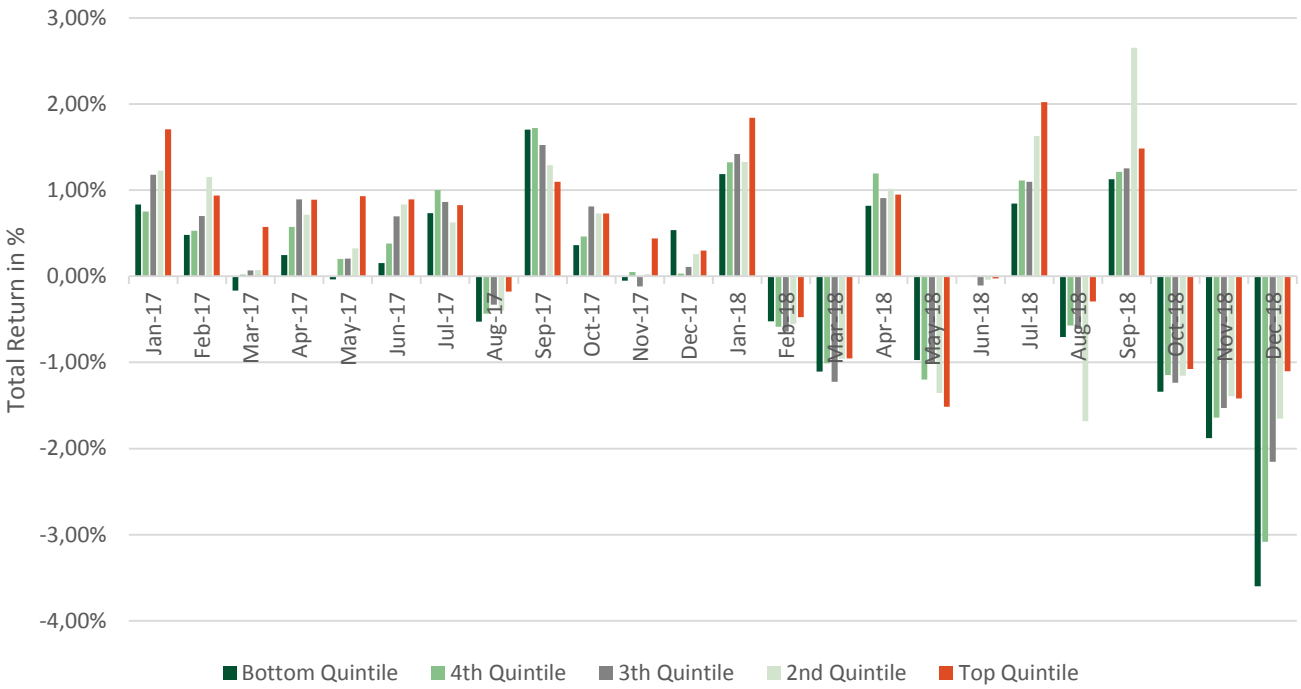

Figure 9: Returns for each quintile on a monthly basis. For the majority of the month the top quintile outperform the other quintiles. Past model returns are not a guarantee of future returns. *Source: Jyske Capital and ICE Bond Indices.*

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Figure 10: Returns for each quintile on a monthly basis. For the majority of the month the top quintile outperform the other quintiles. Past model returns are not a guarantee of future returns. *Source: Jyske Capital and ICE Bond Indices.*

Figure 11: Returns for each quintile on a monthly basis. For the majority of the month the top quintile outperform the other quintiles. Past model returns are not a guarantee of future returns. *Source: Jyske Capital and ICE Bond Indices.*

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