

Bond sentiment as a factor in timing swap spreads



- We designed a multi-factor model incorporating big data sentiment analysis to predict short-term sovereign swap spreads
- The model generates consistently positive gross returns across a range of markets and tenors, underscoring its efficacy as a timing model
- Applying turnover reduction features and increasing signal conviction can enhance net performance, making the model viable for a quantitative investment strategy

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Various models have been developed to predict long-term sovereign swap spreads, but as yet there is no short-term timing model. In this paper we describe a factor model we have designed that incorporates quantitative factors to analyse the short-term attractiveness of a government swap spread. In addition to well-known factors such as momentum and carry, we introduce a “non-traditional” factor: bond sentiment. Our approach gives consistent results, and after applying some turnover reduction features, it can be used both as a timing model and as a systematic quantitative strategy.

We have already developed and implemented bond factor models that have performed consistently over the years. In this new model, in addition to applying traditional signals based on momentum, carry-to-risk and the relative strength index, we introduce a non-traditional signal constructed from sentiment analysis based on big data. The addition of a swap spread factor model extends the scope of our existing quantitative models to increase the breadth and overall performance. For the purposes of this document, we define the swap spread as the difference between a government bond yield and the fixed leg of an interest rate swap rate that corresponds to the same tenor.

The aim of the swap spread timing model (SSTM) is to be valuable both as a timing model and as a quantitative trading strategy in its own right. In the first case, the model indicates the appropriate timing once a strategic investment decision to buy or sell has been made. If the model is implemented as a quantitative strategy, it is used to identify investment opportunities, so trades will be triggered based on the outcome of the model.

Traditional factors used in the model

The SSTM consists of four factors that systematically exploit factor premiums in swap spreads. Factors such as momentum, carry and value have been extensively documented in academic literature over the last couple of decades so we refer to these as traditional factors.

Momentum (MOM)

In general, information comes in successive strings of good or bad news. Investors tend to underreact to these persistent information flows by failing to adjust their return expectations quickly enough. In other words, they tend to not price in all the information at once but instead absorb it gradually. This creates

trends in bond prices. In the literature on momentum, the most recent month's bond prices exhibit mean reverting behaviour so we exclude these. These reversals could be related to liquidity issues and/or overreaction on the short horizon (Asness, C. S., Moskowitz, T. J., & Pedersen, L. H., 2013). It is therefore hypothesized that trends in the swap spread return of the past 12 months, excluding the most recent month, are positively correlated to the swap spread return in the near future.

Carry-to-risk (CTR)

Carry strategies are often applied in foreign currency markets. When investors participate in currency carry trades, they borrow in a currency with a relatively low yield and invest the proceeds in a currency with a higher yield (Bhansali, V., 2007). We implement a carry strategy by taking a long/short position in a bond with a certain maturity and taking a short/long position in a swap with the same maturity, both in the same currency. The carry per unit of volatility is taken to account for the risk involved. It is hypothesized that a relatively high carry-to-risk ratio signals a positive swap spread performance in the near future.

Relative strength index (RSI)

The relative strength index indicator was developed by J. Welles Wilder and explained in his book *New Concepts in Technical Trading Systems*. It is a short-term reversal indicator that measures whether a security is overbought or oversold. According to Wilder, a security becomes overbought (oversold) when its price moves up (down) rapidly in a short period of time. Once a security is either overbought or oversold, this trend is likely to reverse. It is hypothesized that the RSI of the swap spread performance of the recent past is negatively correlated to the swap spread return in the near future.

The new bond sentiment factor (SEN)

The usage of sentiment data to predict financial markets has taken a huge leap forward in the past decade – both because of the significant increase in computation power, and because of the widespread growth of the usage and influence of social media and news sources. Data from social media have been used to predict events such as the popularity of brands (De Vries, L., Gensler, S., & Leeﬂang, P. S., 2012) and election outcomes (O'Connor, B., Balassubramanyan, R., Routledge, B. R., & Smith, N. A., 2010). Shen, J., Najand, M., Dong, F., & He, W. (2017) found that commodity-specific psychological sentiments such as optimism, fear and joy have significant influence on individual commodities. These papers show the potential added value of the use of sentiment data in financial markets.

We use the Thomson Reuters MarketPsych Index (TRMI) as our source for sentiment data for our swap spread timing model. Hundreds of news and social media websites are analysed in real-time and converted to quantified variables using natural language processing. Based on this data, we have constructed a bond sentiment factor consisting of information extracted from both social media and news sources. This factor is a weighted average of the set of “bond emotions” outlined in Table 1.

Table 1. TRMI bond-related sentiment data

Variable	Description
bond view	overall positive references, net of negative references
bond optimism	optimism, net of references to pessimism
bond trust	trustworthiness, net of references connoting mistrust
bond fear	fear and anxiety
bond stress	arousal and intensity, weighted towards distress
bond surprise	unexpected events and surprise
bond uncertainty	uncertainty and confusion
bond default	debt defaults, late payments, bankruptcy
bond price direction	bond price increase, net of references to price decrease
bond price forecast	forecasts of bond price rises, net of references to forecasts of asset price drops
bond volatility	volatility in bond and debt values

Source: Thomson Reuters

Each variable shown in the table is constructed with a specific set of words. We assume that positive news for a specific country is expected to result in a decline in the sovereign bond risk premium (swap spread) and therefore a positive performance in the swap spread.

Data and methodology

We take the data for 2-, 5-, 10-, 20- and 30-year sovereign bond tenors for Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Portugal, Spain, UK and US from Bloomberg. The bond and swap returns are calculated using the carry including rolldown and the impact of both the spot movement and convexity.

All backtested results are from March 2012 to May 2020. As each timeseries has diverse characteristics in terms of returns and volatility, for comparison purposes, we opted to apply an equal risk budget strategy of 1%. This risk budget and the volatility of the swap spread return determine the weights assigned to each country/maturity tenor. We developed a selection criteria model based on two pillars to determine if a variable contains sufficient information to be included in the model. This system consists of a stringent quantitative pillar based on quantitative parameters (e.g. information ratio, drawdown) and a qualitative pillar (e.g. economic rationale) which can be used to determine whether a signal should be included in the model. A strong economic rationale for a factor is necessary to avoid the risk of data-mining. The final model is constructed by taking the weighted average of the outcomes of the individual signals.



Variables should not be overly sensitive to exact definitions or a certain set of optimized parameters; a small change in the construction of a variable should not materially alter performance. If this is the case it is much harder to determine whether the variable truly captures a causal relationship with swap spreads, or if the historical performance is merely the result of a data-mined artefact. In this paper, all variables have been tested with different parameters. For instance, the momentum factor is tested using different lookback windows and different hurdle rates on the Z-scores before a position is taken.

Results

The results shown in this section are obtained via backtesting the different strategies. We calculated information ratios for the different strategies by dividing the annual performance by the annual volatility. Table 2 shows the historical information ratios of the different variables that are included in the model per tenor and Figure 1 displays the correlation between the performances of the individual strategies.

Table 2. Gross information ratios per factor
Settings: daily trading, 15 countries aggregated

	2Y	5Y	10Y	20Y	30Y
MOM	1.26	1.07	0.68	0.42	0.22
CTR	1.41	1.21	0.79	0.80	0.58
RSI	-0.12	0.33	0.78	0.65	0.75
SEN	0.43	0.16	0.42	0.57	0.58
SSM	1.14	1.30	1.17	1.11	1.02

Source: NN Investment Partners

Figure 1. Correlations between the individual factor strategies

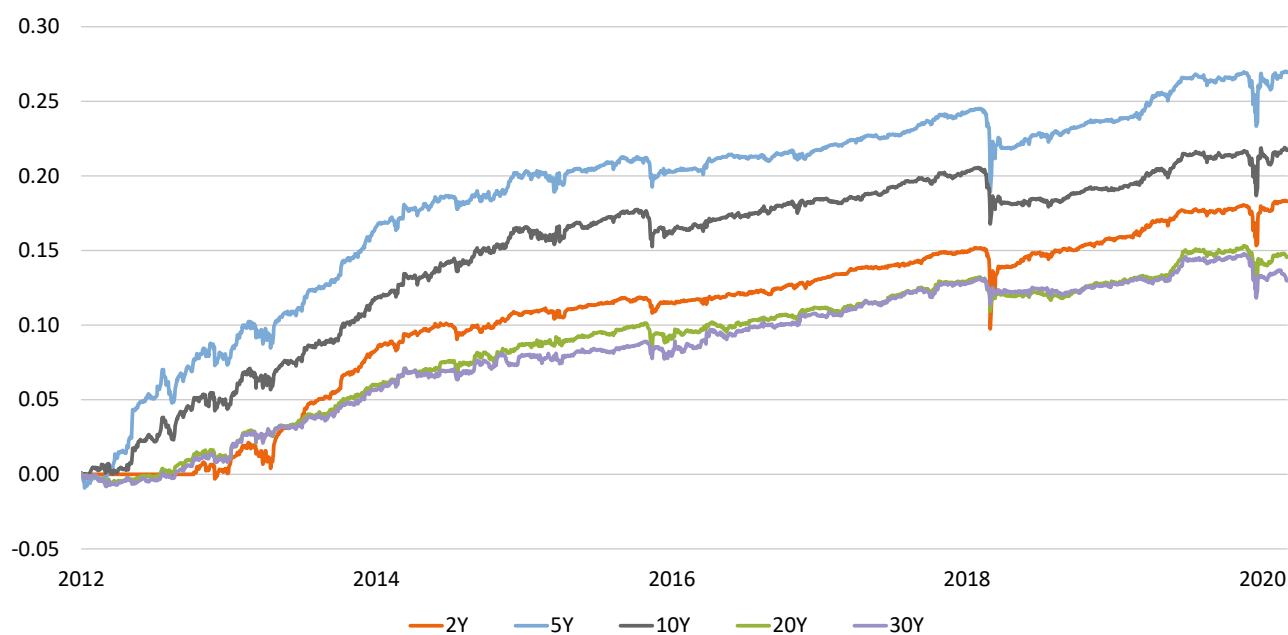


Source: NN Investment Partners

Table 2 shows that the different factor strategies can clearly help investors find an appropriate time to move funds from swaps to sovereign bonds. However, every variable can have periods of underperformance, so it is wise to combine signals together to take advantage of the benefits of diversification. Diversification causes the overall information ratio for all the strategies combined to exceed the sum of all the information ratios of the individual strategies. The low correlations between the individual variables further strengthens the argument for diversification, as Figure 1 highlights.

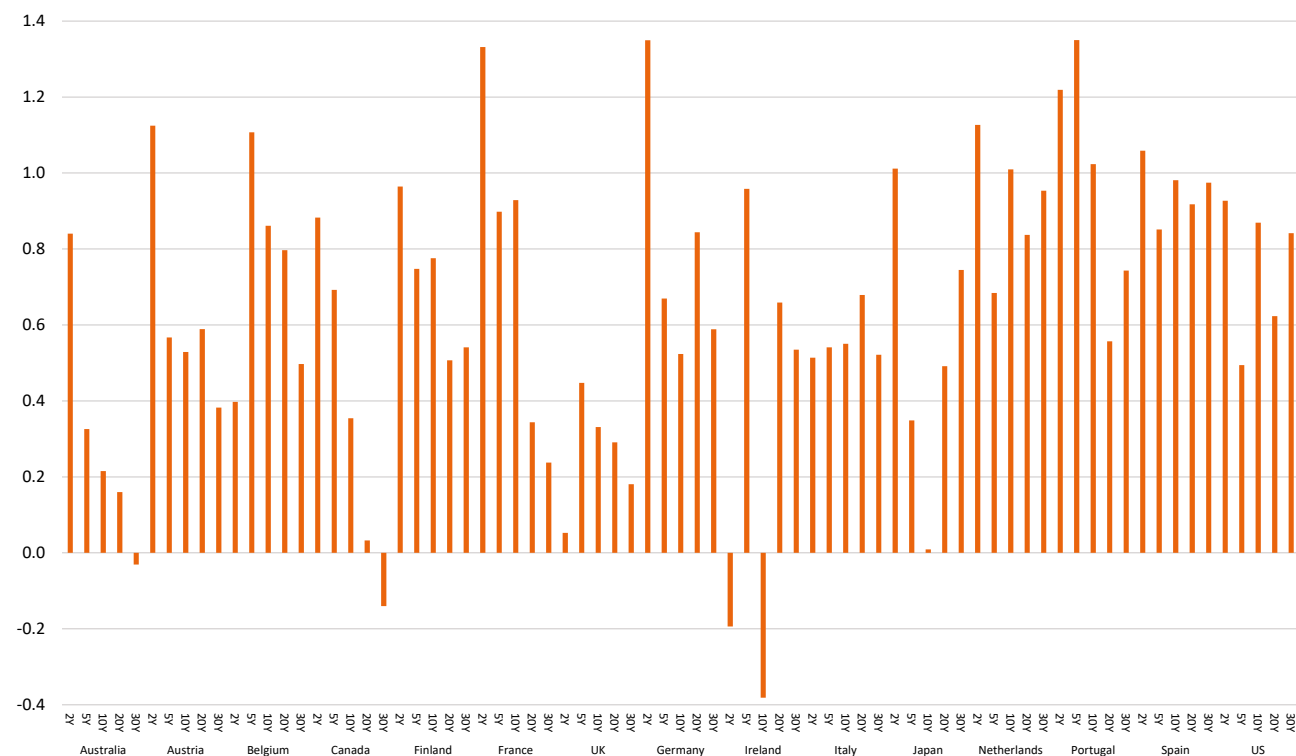
Figure 2 displays the historical cumulative returns of the swap spread timing model, applied to the five different tenors (2Y, 5Y, 10Y, 20Y, 30Y). We see a positive trend for every tenor indicating that the model has predictive power on the short- and long-term swap spreads.

Figure 2. Gross cumulative returns per tenor for the swap spread timing model



Source: NN Investment Partners

Figure 3. Information ratios per country per tenor for the swap spread timing model



Source: NN Investment Partners

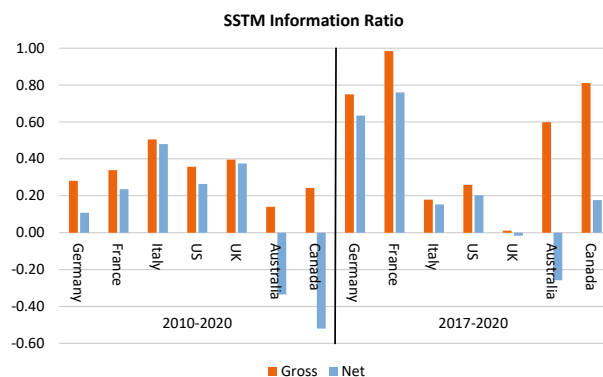
Figure 3 shows that the swap spread timing model performs consistently across the majority of the markets and tenors. The mostly positive gross information ratios underpin the model's effectiveness as a timing strategy.

Applying this model in practice in a quantitative trading strategy is more challenging as transaction costs play a significant role. If the model's outcomes are implemented naively, this can lead to significant turnover, incurring excessive costs and negatively impacting performance. To reduce turnover, it is necessary to take measures such as lowering the trading frequency and introducing thresholds and buffers on the aggregated signal level on the positions taken and/or at individual strategy level.

Implementation

As we use bond futures to implement this model as a systematic quant strategy, the applicable universe has been narrowed down to the 10-year swap spreads of the US, Germany, UK, Italy, France, Australia and Canada due to liquidity. The SSTM is updated on a weekly basis to reduce turnover. Furthermore, when there is no significant conviction in the signal, thresholds and buffers are applied to the individual signals to introduce a neutral zone where no positions are taken. The performance of the SSTM is shown in Figure 4. The results over the last ten years are shown on the left-hand side and those over the last three years on the right. We see mostly positive gross and net information ratios across the board, with the exception of Australia and Canada. These two countries have negative net information ratios due to their high transaction costs so we exclude them.

Figure 4: Gross and net information ratios of the swap spread timing model



Source: NN Investment Partners

Conclusion

Our study shows that adding a non-traditional sentiment factor based on big data to a multi-factor swap spread model enhances its performance. The SSTM performs consistently in terms of gross returns, which underlines its effectiveness as a timing model. With some adjustments to reduce turnover and increase signal conviction, it also delivers consistent net returns, making the model viable as a quantitative investment strategy. These positive results open up possibilities for further research into how we might effectively implement non-traditional factors in other models in the fixed income space.

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