



Bonding Over Inflation

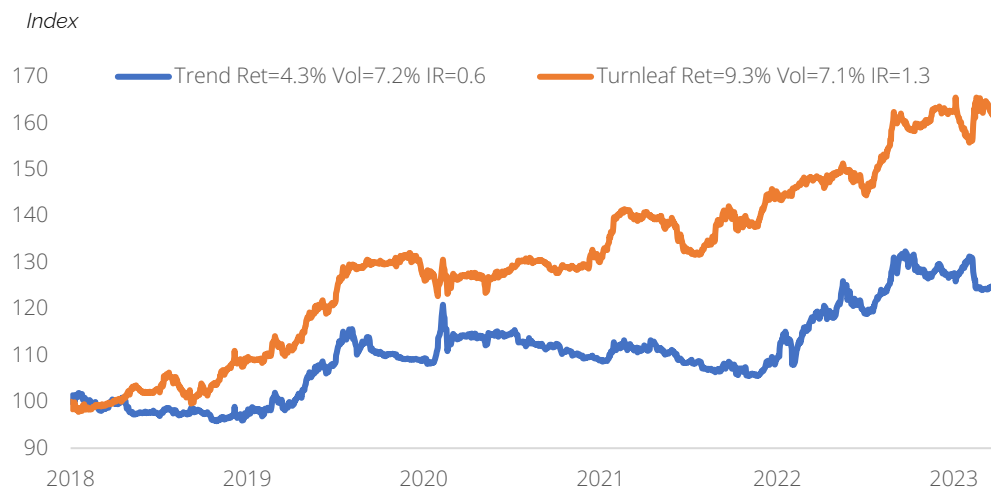
Trading bond futures with Turnleaf Analytics inflation forecasts

In this note, we discuss how Turnleaf Analytics inflation forecasts can be used to trade liquid bond futures using a systematic trading rule. The rationale is that inflation expectations impact monetary policy expectations, which then impact yields. Our basket of liquid developed bond futures traded using our inflation forecasts has risk adjusted returns of 1.3 and returns of 9.3% since 2018. This outperforms a trend following strategy on bond futures, which has risk adjusted returns of 0.6 and returns of 4.3%.

Introduction

Inflation impacts monetary policy expectations, given that central banks have inflation targets. If inflation is likely to remain high and sticky, a central bank would be expected to hike rates. Conversely, low levels of inflation expectations would see more dovish policy from a central bank. Hence, we can conjecture that rising inflation expectations are likely to be accompanied by rising yields, whilst lower inflation expectations tend to be accompanied by falling yields, to reflect the repricing of monetary policy expectations. By using this intuitive idea, we show that we can create systematic trading rules to trade bond futures, that outperform trend following rules on the same assets.

Figure 1: Historical returns of bond futures trend & Turnleaf forecasts trading rules



Source: Turnleaf Analytics

In Figure 1, we show the historical returns for trading liquid bond futures using:

- (In blue) the underlying trends in bond futures
- (In orange) Turnleaf Analytics inflation forecasts compared to recent realised inflation

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If you are interested in learning more about Turnleaf Analytics inflation forecasts and would be interested in a trial, please contact us



More about inflation and monetary policy

For there to be a relationship between inflation expectations and monetary policy expectations, a central bank needs to be perceived as credible when it comes to maintaining their inflation target.

If a central bank is not perceived credible, then there is likely to be a breakdown between inflation expectations and monetary policy expectations. In this scenario, a central bank may not hike rates, even with very high levels of inflation (and sometimes even cut them), such as happened in Turkey in the recent past.

Background on Turnleaf Analytics inflation forecasts

In this section, we give some background on how Turnleaf Analytics inflation forecasts are constructed. The data Turnleaf Analytics uses to forecast inflation consists of several types. This data is drawn from many sources, including central banks, official statistics organisations, data vendors etc. which we list below:

- Macroeconomic data
 - This includes what we would traditionally expect to be used for inflation, such as unemployment data and growth data
- Market data
 - This includes FX, rates and commodities data
- Benchmark data
 - Benchmark/consensus inflation forecasts are used as an input
- Alternative data
 - This includes, for example, time series on pollution, which can be used as a proxy for industrial activity, and is available on a high frequency basis

All of this data is collected and then pre-processed. This pre-processing includes checking for outliers, cleaning the data, and many other steps. As with other data science problems this step of collecting and preparing the data is the most time consuming.

The pre-processed data is then fed into a machine learning model. We have opted for a machine learning model, which:

- captures the non-linearities in the data (which for example an OLS cannot do effectively)
- is sufficiently simple, so it isn't very data greedy like deep neural net

Our inflation model generates forecasts from 1 month out to 12 months, and is updated for each country once a month, a short time after the inflation release for that country. For countries with liquid inflation markets, such as the US, we also update forecasts intramonth. In this paper, we shall be focusing on those forecasts updated once a month.

There are many potential use cases for inflation forecasts. In this paper, we shall explore a specific use case, notably, trading bond futures from both the long and short side using Turnleaf Analytics' monthly inflation forecasts as an input.



Our inflation trading rule for bond futures

We have already discussed the relationship between inflation expectations and yields. Notably, as inflation expectations rise, we would expect yields to rise reflecting expectations for more hawkish policy. Conversely, falling inflation expectations would likely see falling yields to reprice more dovish expectations. Hence, we can use Turnleaf Analytics' inflation forecasts as an input to a trading rule for bond futures.

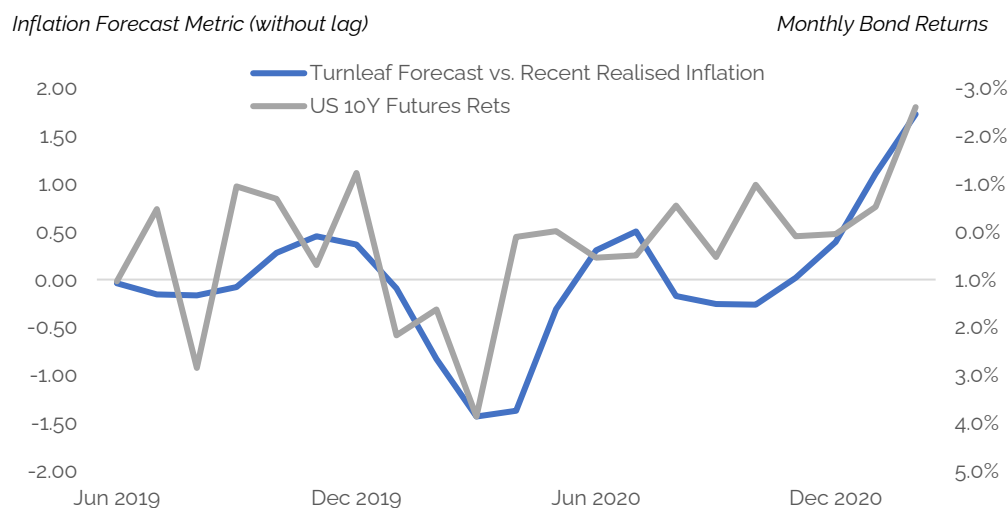
Let's say we are trading US 10Y futures using inflation forecasts. We create an inflation forecast metric for US 10Y futures:

- US 10Y futures inflation forecast metric = Average of 3M US CPI YoY NSA forecasts over the past quarter – Average of US CPI YoY NSA realised over the past quarter

If our inflation metric is positive, then we would expect yields to rise, and hence we expect bond prices to fall. In the scenario where the inflation metric is negative, we would expect inflation to fall, lower yields, and bond prices to rise.

In Figure 2, we show a stylized example of the Turnleaf inflation differential forecast metric for US 10Y futures against the US 10Y futures returns, both in monthly data. We see that the forecasts do seem to coincide to bond returns (inverted) to some extent, at least in this example.

Figure 2: Bond futures returns (inverted) vs. inflation forecast metric



Source: Turnleaf Analytics

Our Turnleaf Analytics inflation trading rule, would trigger:

- A short position in US 10Y futures if the inflation forecast metric is positive
- A long position in US 10Y futures if the inflation forecast metric is negative

If our reference date is February 2023, then our United States forecast will be updated after the inflation release date for the United States (usually in the middle of the next reference month March 2023).



Setting up our backtest of our trading rules

For trading purposes, we need to account for the delay in data releases. For simplicity, for example, we lag any forecasts with a reference date of February 2023 till the end of March 2023, and trigger the trades then. Hence, the lag is the same for each country for simplicity (although it would be possible to update the signal around the CPI release date).

In our historical analysis, we shall be trading the liquid bond futures:

- US 2Y, 5Y, 10Y and 30Y futures
- DE 2Y, 5Y and 10Y futures
- GB 10Y futures

We shall also compare our inflation based active trading rules for these same bond futures using a generic trend following rule, which we shall consider as our benchmark. Our trend following strategy looks at 3M, 6M and 12M returns to generate its signal on a daily basis.

In all cases, for both the trend following and Turnleaf inflation forecast strategy, for each asset, we apply a 10% volatility target and adjust the leverage of the strategy at the end of each month based on upon 1M realised volatility (up to a limit of 5x leverage). For example, if the volatility of the bond future is 5%, at the end of the month, then we would leverage the position by 2 to reach the 10% volatility target). In all cases, we shall be using 1st dated futures, which have been backadjusted by ratio when stitching them back together. We have also added transaction costs in all our trading simulations.

Note that we haven't converted the returns of instruments which are denominated in foreign currencies back into USD. In practice, this should be relatively close to assuming that we are hedging FX risk. Given that the strategies are not systematically long or short bond futures, carry from FX from hedging is unlikely to impact the results significantly.

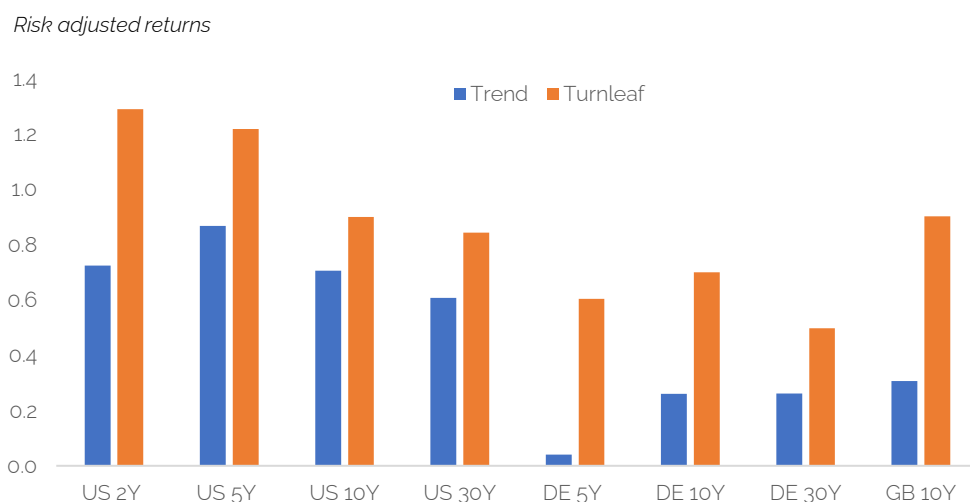
Our historical sample for our inflation forecasts is from 2018 onwards, and we use inflation forecasts for the United States (for US bond futures) for Germany (for DE bond futures) and the United Kingdom (for GB bond futures) as our inputs. Since August 2022, we have started to use United States, Germany and United Kingdom Turnleaf Analytics live inflation forecasts as they have been published. Prior to these points, we have used inflation forecasts from a backtest.

Historical results for our bond futures trading strategies

In Figure 3, we present the historical results for our trading rules for a historical sample from 2018 for each bond future in our universe. Whilst trend following is profitable for every bond future during our historical sample, the Turnleaf inflation forecast strategy outperforms it in every case.



Figure 3: Risk adjusted returns for our bond futures strategies

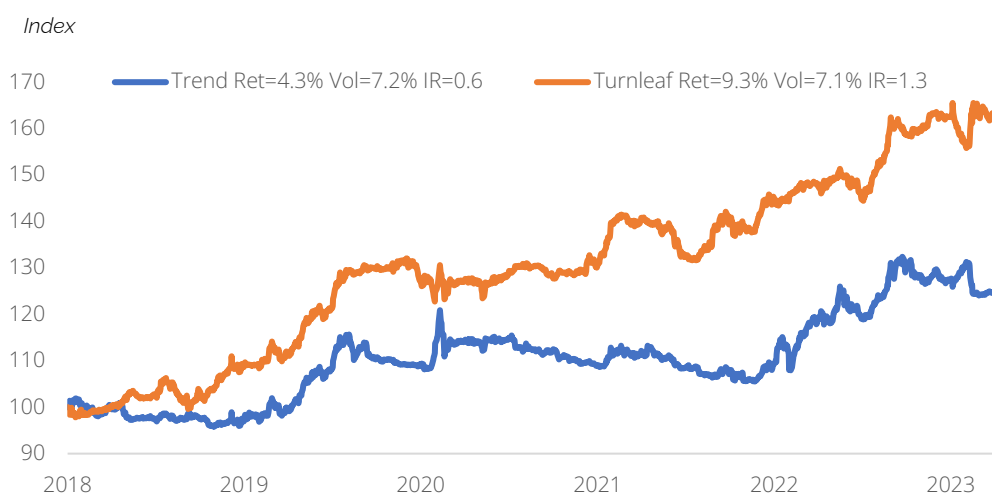


Source: Turnleaf Analytics

In Figure 4, we create a basket of all the bond futures in our universe both using our Turnleaf Analytics inflation based trading rule and trend following. In both cases, the strategies are profitable. However, there is a large difference in risk adjusted returns. The Turnleaf Analytics inflation trading strategy has risk adjusted returns of 1.3 over double the risk adjusted returns of the trend following strategy at 0.6.

Whilst there is some correlation between the basket returns (40%), we note that the significant outperformance of the Turnleaf Analytics strategy would warrant the use of the strategy alongside trend following.

Figure 4: Our Turnleaf Analytics inflation strategy outperforms trend following

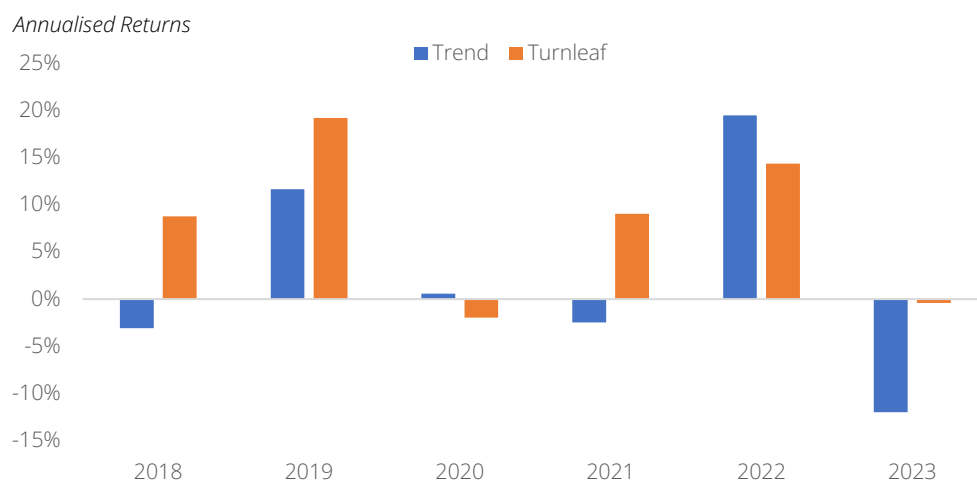


Source: Turnleaf Analytics



In Figure 5, we plot the annualised returns for each in our sample. In most years, our inflation trading rule outperforms trend. In particular, we note in 2023, inflation has been close to flat, but the trend following strategy loses over 10%.

Figure 5: Our Turnleaf Analytics inflation strategy outperforms trend following



Source: Turnleaf Analytics

Conclusion

In this note, we discussed how inflation expectations influence monetary policy expectations and hence, impact bond yields. When inflation is expected to rise, yields rise, pricing in an expectation of more hawkish monetary policy. By contrast, when inflation is expected to fall, markets push yields lower, on the expectation that of more dovish policy from the central bank. We can use this idea to create a metric comparing Turnleaf Analytics inflation forecasts to recent inflation prints, to rule to trade bond futures both from the long and short side.

We created a basket of liquid bond futures (US, DE and UK) using our Turnleaf Analytics based trading rule. We compared that to a trend following rule on the same assets, using historical data from 2018 to the present day. In this historical sample, our Turnleaf Analytics inflation basket trading bond futures had adjusted returns of 1.3 outperforming a basket which used trend following, which only had risk adjusted returns of 0.6.



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