



Surprise, it's inflation

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Trading macro assets over US CPI releases

In recent years, the US CPI release has impacted a wide array of macro assets. In this paper, we discuss how we can trade a portfolio of macro assets around US CPI. We create short term trading rules over the days of US CPI releases, using short term Turnleaf nowcasts for US CPI YoY NSA. Historically, our trading rule has risk adjusted returns of 0.87 and annualised returns of 1.0% since 2018.

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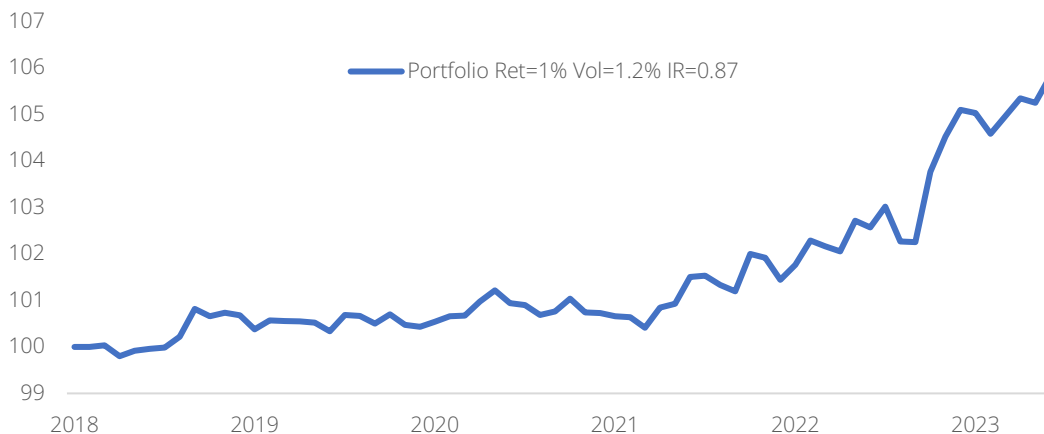
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Introduction

In recent years, one of the most widely followed economic releases has been US CPI. It has had a significant impact across a plethora of macro assets, as the market seeks to reprice assets in anticipation of the Fed's future monetary policy. In this paper, we seek to assess this relationship more quantitatively, and furthermore, we create systematic trading rules using Turnleaf Analytics forecasts to trade macro assets around US CPI release days. In Figure 1, we show the historic returns for our trading strategy which uses Turnleaf Analytics short term US CPI YoY NSA forecast. Historically, it has risk adjusted returns of 0.87 and returns of 1.0% since 2018. We'll discuss in more detail how we created this trading rule. Whilst returns seem comparatively low, we note the strategy only holds positions over the days of US CPI releases, ie. for 12 days a year.

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Figure 1: Historical returns of our short-term macro trading rule on US CPI days



Source: Turnleaf Analytics

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 the market does not perceive a central bank as credible, then there is likely to be a breakdown between inflation expectations and monetary policy expectations. If this happens, a central bank may not hike rates, even with very high levels of inflation.



Background on Turnleaf Analytics inflation forecasts

In this section, we give some background on how Turnleaf Analytics inflation forecasts are constructed. Turnleaf Analytics uses several types of data to forecast. This data is drawn from many sources, including central banks, official statistical 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

This data is collected and then pre-processed. This pre-processing includes steps like checking for outliers, cleaning the data etc. As with other data science problems, the steps involving the collection and preparation of 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 our forecasts closer to the CPI release, ie. we publish short term forecasts/nowcasts.

There are many potential use cases for inflation forecasts. In this paper, we shall explore a specific use case, looking at trading macro assets around US CPI, using Turnleaf Analytics' US CPI YoY NSA short term forecast/nowcast.



Understanding the relationship between US CPI and macro assets

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.

How do a range of macro assets behave in the short term around the US CPI release itself? To understand this, we calculate the correlation between a number of macro assets listed below, over the day of the US CPI release and a number of inflation metrics:

- iBoxx USD 10-Year Breakeven Inflation ETF
- UST 10Y futures
- EURUSD
- USDJPY
- US 10Y swaps
- US monthly fixing inflation swaps

We calculate the returns for all the macro instruments above (except US 10Y swaps and US monthly fixing inflation swaps, where we use changes). The inflation metrics we calculate are as the following:

- Prev inflation metric = Turnleaf Analytics US CPI YoY NSA nowcast – previous release US CPI YoY NSA
- Nowcast – Consensus = Turnleaf Analytics US CPI YoY NSA nowcast – current release short term consensus US CPI YoY NSA
- Actual – consensus/hindsight = Current release US CPI YoY NSA – current release short term consensus US CPI YoY NSA (hindsight)

In Figure 2, we present the correlations between the above macro assets and the inflation metrics, covering US CPI days since 2018. Our first observation is there is that there are reasonable correlations across the plethora of instruments in our sample, not purely, what we might perceive as the most inflation linked instruments.

We find that US breakevens and US inflation swaps are positively correlated with the various inflation release metrics above, which is intuitive since they benefit from inflation. Indeed, the payoffs of inflation swaps are directly tied to the CPI print. We find that the USD and US 10Y swaps are also positively correlated to these inflation metrics. This seems reasonable, given that the market will tend to reprice for more hawkish expectations on higher inflation (and more dovish expectations on lower inflation), and this will also have a knock on impact on the currency. By the same token bond futures, should be negatively correlated, given the inverse relationship between price and yield.

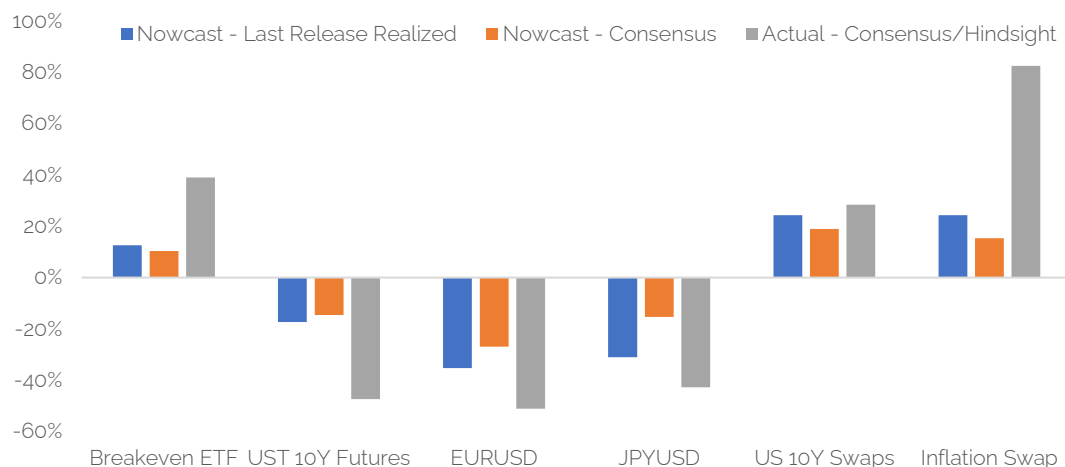
We note that the magnitude of the correlation is highest for the surprise of actual – consensus/hindsight. However, this “surprise” number is only available after US CPI is released. Hence, we cannot use it this as an input for a trading strategy, where we enter a trade before the release of US CPI. The next highest absolute correlation is for nowcast – last release realized.

Before the US CPI release, we know both Turnleaf Analytics’ nowcast and also the previous US CPI release. In other words, rather than computing the surprise, we can compute the



expected change since the previous month. Hence, we shall later use this quantity in our trading rule, given that it is tradable, unlike the "surprise".

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



Source: Turnleaf Analytics

Discussing our trading rule

We shall be using the prev inflation metric (ie. comparing Turnleaf Analytics US CPI YoY NSA nowcast versus the last published US CPI YoY NSA print) to trigger our trading rule for our macro assets. Below, we summarize our trading rule:

- if the prev inflation metric is greater than 0 => US CPI likely higher than previous release => buy USD & breakeven ETF and sell UST 10Y futures
- if the prev inflation metrics is smaller than 0 => US CPI likely lower than previous release => sell USD & breakeven ETF and buy UST 10Y futures

We shall enter the trade at the close before US CPI and exit the trade on the close after US CPI. Hence, we shall be holding each position over a single working day. Hence, the strategy will hold positions for 12 days in the year only. We do not include transaction costs in our analysis, but even if we account for transaction costs, it will not significantly impact the returns (eg. if we assume transaction costs of 1bp bid/ask for each asset, it would reduce returns by 12bp a year, given there are a relatively small number of trades per year).

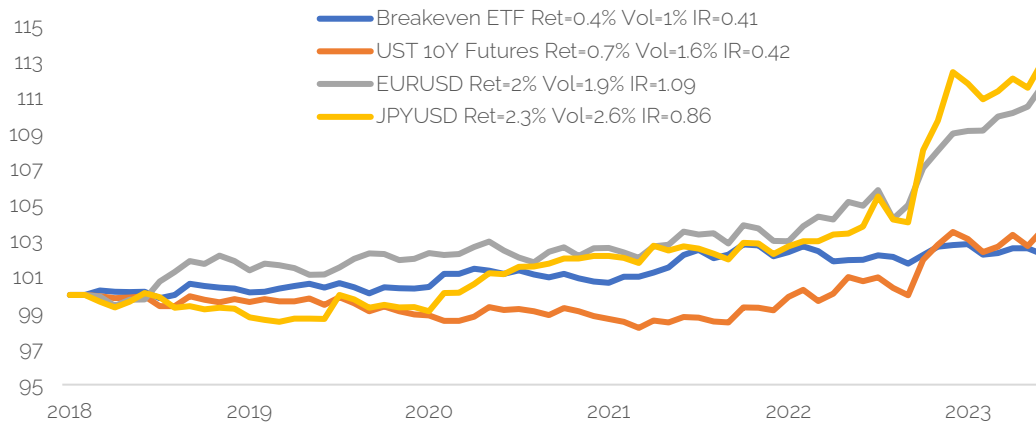
Our historical sample for our inflation forecasts is from 2018 onwards. Since February 2023, we have started to use Turnleaf Analytics US CPI YoY NSA live inflation nowcasts as they have been published. Prior to these points, we have used US CPI YoY NSA inflation nowcasts from a backtest of our latest model.



Historical results for our macro assets trading strategy over US CPI

In Figure 3, we present the historical results for our nowcast based trading rule for a historical sample from 2018 for each of the macro assets. The best performers by risk adjusted returns for this trading rule are the FX assets. The fixed income assets have very similar risk adjusted returns.

Figure 3: Historical returns for the nowcast trading rules over US CPI by asset



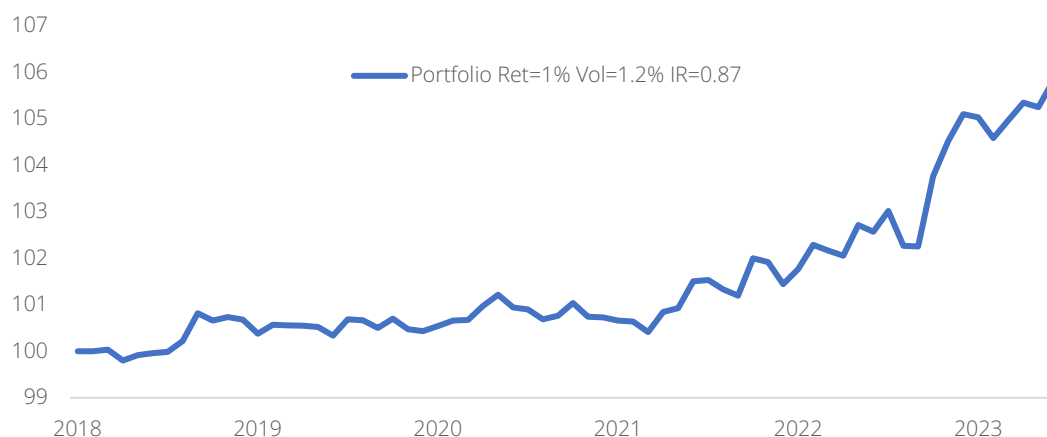
Source: Turnleaf Analytics

In Figure 4, we create a basket of all the macro assets above using the prev inflation metric trading rule. We equally weight each macro asset in the basket. In practice, we might consider other types of weighting for each asset, eg. volatility weighting, given the assets have varying levels of volatility. Historically, the risk adjusted returns for the basket are 0.87 since 2018. Perhaps unsurprisingly, the returns have been higher over the latter part of the sample, where inflation surprises have been more frequent, compared to the early years, when inflation surprises tended to be smaller in magnitude.

If we were to use the "hindsight" rule, unsurprisingly the risk adjusted returns are much higher (1.38), but this of course is not tradable. It does nevertheless illustrate why forecasting inflation is an important task, if we are trading macro assets around US CPI.



Figure 4: Turnleaf Analytics US CPI macro trading rule



Source: Turnleaf Analytics

Conclusion

In this paper, we discussed the relationship between macro assets and US CPI. We saw that over US CPI releases there was a reasonable correlation between the US CPI surprise and moves in major macro assets over the same day. However, this relationship is not tradable, given we only know the surprise after US CPI has been released.

As a result, we created a previous inflation metric, where we compared Turnleaf Analytics US CPI YoY NSA nowcast to the last available US CPI YoY NSA print. We used this as an input into a short term macro trading rule around the US CPI release, entering into positions at the close before US CPI and exiting at the close immediately after US CPI.

The historical risk adjusted returns of our US CPI based trading strategy using the previous inflation metric was 0.87 since 2018. The strategy performed particularly well over the latter part of the sample, where the magnitude of inflation surprises was larger.



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