



Index Insights | Macroeconomic Environment

# Factor performance under different inflation regimes

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## Overview

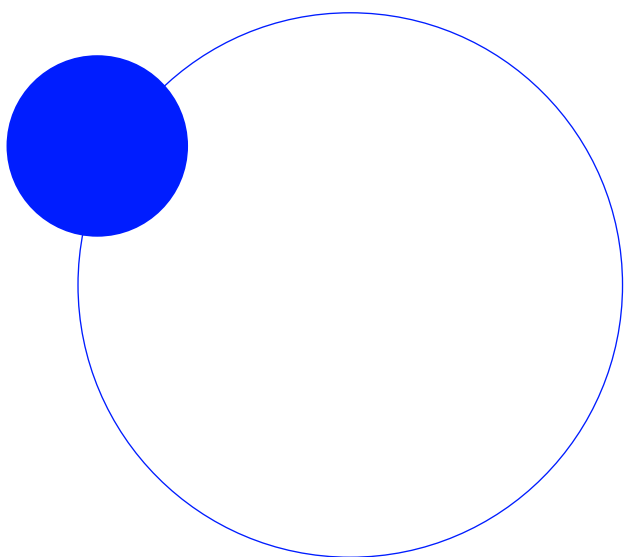
We examine the factor performance under alternating inflation regimes for different factor index series since January 2003.

The analysis, albeit over a relatively short time series, indicates that Size and Value factors perform better when inflation expectations are rising. Momentum, Quality and Low Volatility factors perform better in a falling inflation expectation environment.

The patterns are generally similar for different geographies.

Although it appears there is a link between inflation expectation changes and factor performance, the causation of this link and medium of transmission are beyond the scope of this paper.

However, some empirical regularities in factor performance under different inflation regimes do emerge, and we offer some provisional suggestions to explain this performance.



# Contents

Section 1: Introduction.....	4
Section 2: Inflation periods.....	6
Section 3: Correlations.....	9
Section 4: Changes in inflation expectations.....	10
Section 5: Conclusion.....	13
References.....	15

## Section 1: Introduction

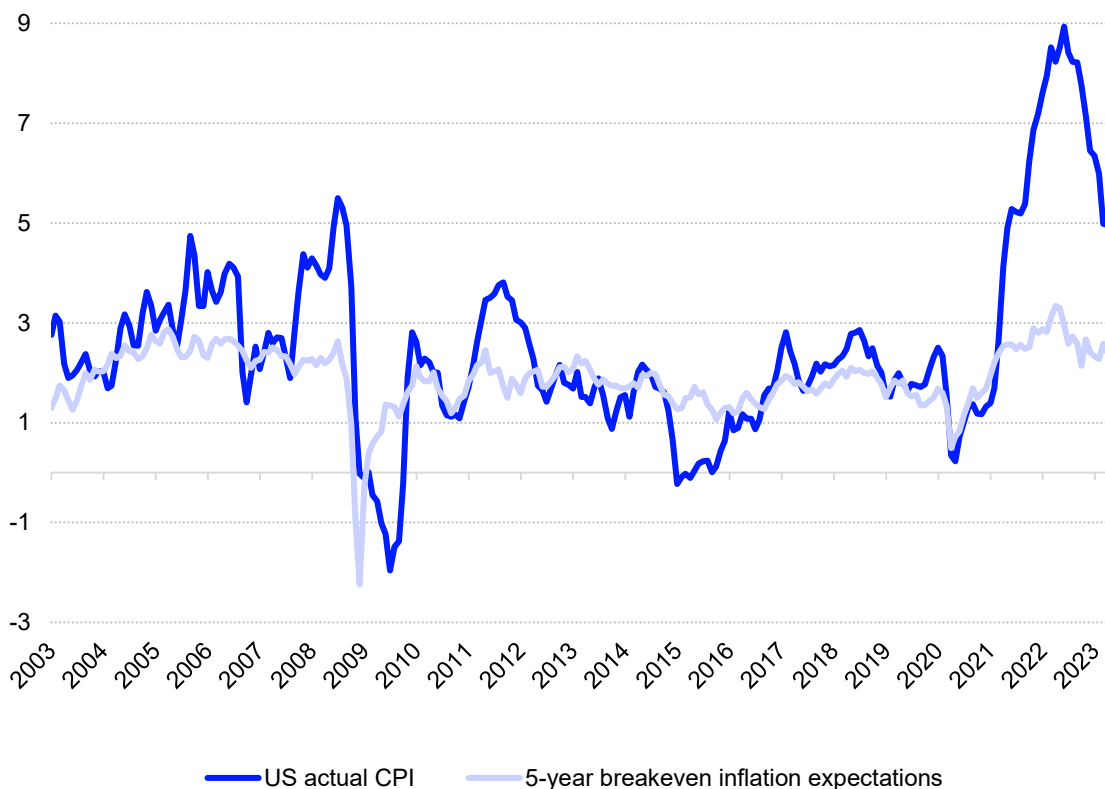
Inflation has been on top of the investors' agenda over the last couple of years. In this paper, we investigate the question of performance of factors in different inflation environments.

We appreciate factor performance is too complex to be fully explained by any single variable, moreover, we are not trying to assert or establish causation of the factor performance by inflation. Any conduit of impact, if any, of inflation on factor performance is also outside the scope of this paper.

For our inflation indicator, we selected the breakeven expected 5-year inflation. There are several reasons for that:

1. As opposed to the actual CPI, breakeven inflation expectations are contemporaneous, and can be backed out of market data. The actual CPI figures are only released with a time lag. Since stock market performance is driven by market expectations, it could also be more appropriate to use current inflation expectations for index performance analysis. Frequency of the data also varies; the CPI data is monthly, while the breakeven inflation data is daily.
2. Patterns of changes in actual CPI and breakeven expected inflation generally have similar turning points (see Chart 1). It suggests that most of the time, changes in the direction of market expectations of inflation are similar to actual inflation.
3. Volatility of inflation expectations is lower than the volatility of the actual CPI, which may be subject to one-off shocks that distort y/y increases for some time (e.g. the 2022 energy shock), as Chart 1 shows. Lower volatility helps in observing smoother inflation mode changes.
4. We chose 5-year inflation breakeven because longer term inflation breakevens may be distorted by investment flows related to regulation of pension funds and asset/liability matching.

**Figure 1: Actual US CPI and breakeven inflation expectations, in % p.a.**



Source: FTSE Russell & US FED St Louis. Please see the end for important legal disclosures.

For our analysis of factor performance, we selected three families of the factor indices: The FTSE Developed Factor Index Series, FTSE All World Pure Factor Index Series and FTSE USA Factor Index Series. Our standard factor definition and index construction are given in the Ground rules<sup>1</sup>.

We would like to highlight that we are considering both the regular factor index series (FTSE USA and FTSE Developed) as well as the pure factor index series (FTSE All World Pure Factor). The difference in methodology between the factor index series is that, in the Pure Factor index series, we have a constant target factor exposure maintained on the rebalance date. Furthermore, any off-target factor exposures are removed, whereas the regular factor indices have fixed factor tilt and factor exposures may fluctuate on rebalancing dates. Therefore, there may be small off target factor exposures. We will investigate whether these variations have a significant impact on the factor index performance in different inflation regimes.

The rest of the paper is structured as follows: in Section 2, we divided the last 20 years (since the history of the 5-year breakeven inflation is available<sup>2</sup>) into time series based on long-term inflation trends and analysed the factor performance during these periods.

In Section 3, we look at the correlation of changes in inflation expectations and factor performance. In Section 4, we analyse performance factors in the context of short-term fluctuations in inflation expectations. We make our conclusions in Section 5.

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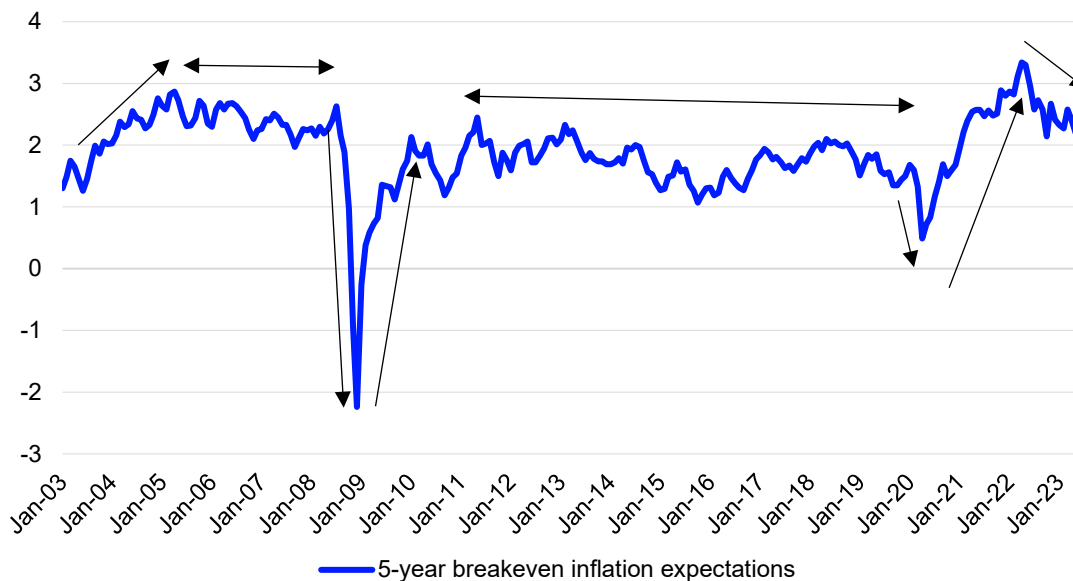
<sup>1</sup> [FTSE Global Factor Index Series Ground Rules.pdf \(ftserussell.com\)](#).

<sup>2</sup> The factor index series is marginally longer, going back to January 2001.

## Section 2: Inflation periods

We begin by splitting the period from January 2003 to May 2023 into multiple time segments, depending on the inflation expectations trends.

**Figure 2: Distinct periods in breakeven inflation expectations, in % p.a.**



Source: FTSE Russell & US FED St Louis. Please see the end for important legal disclosures.

In the last 20 years, we identified eight distinct periods:

Increasing inflation expectations	Jan 03 - Mar 05
Moderate, stable, inflation expectations	Apr 05 - Jul 08
Inflation expectations fall during the GFC	Aug 08 - Nov 08
Rising inflation expectations on QE and rebound from GFC	Dec 08 - Dec 09
A period of low and stable inflation expectations	Jan 10 - Feb 20
Covid-19 related falling inflation expectations	Feb 20 - Mar 20
Covid-19 counter measures increase inflation expectations	Apr 20 - Mar 22
Declining inflation expectations on rising interest rates	Apr 22 - May 23

These are quite broad definitions of the segments and there are certainly fluctuations of inflation expectations within those periods, which we will consider in the following sections of this paper.

Tables 1-3 show performance of different factor index series during the different inflation expectations sub-periods defined above.

**Table 1: Performance of the FTSE Developed factor indices, annualised in %**

Period	Timeframe	Quality	Momentum	Size	Low vol	Value
Increasing inflation expectations	Jan 03 - Mar 05	-1.8%	-2.1%	14.9%	-1.3%	8.4%
Moderate, stable, inflation expectations	Apr 05 - Jul 08	2.1%	2.4%	0.0%	-0.5%	0.4%
Inflation expectations fall during the GFC	Aug 08 - Nov 08	14.2%	5.5%	-10.9%	24.2%	-4.5%
Rising inflation expectation on bounce back from the GFC	Dec 08 - Dec 09	-1.8%	-7.2%	13.1%	-6.3%	2.7%
A period of low and stable inflation expectations	Jan 10 - Feb 20	2.8%	1.5%	-1.7%	2.6%	-5.0%
Covid-19 related falling inflation expectations	Feb 20 - Mar 20	239.1%	86.2%	-89.0%	109.3%	-91.4%
Covid-19 counter measures rising inflation expectations	Apr 20 - Mar 22	1.7%	0.9%	1.8%	-4.1%	-1.1%
Declining inflation expectations on rising interest rates	Apr 22 - May 23	0.4%	-0.6%	-1.6%	1.2%	1.7%

Source: FTSE Russell & US FED St Louis. Please see the end for important legal disclosures.

**Table 2: Performance of FTSE All-World Pure Target Exposure factor indices, annualised in %**

Period	Timeframe	Quality	Momentum	Size	Low vol	Value
Increasing inflation expectations	Jan 03 - Mar 05	-1.4%	2.9%	5.6%	-2.7%	2.6%
Moderate, stable, inflation expectations	Apr 05 - Jul 08	0.8%	6.0%	0.9%	2.0%	1.3%
Inflation expectations fall during the GFC	Aug 08 - Nov 08	8.6%	-2.1%	-1.9%	9.4%	-2.3%
Rising inflation expectation on bounce back from the GFC	Dec 08 - Dec 09	1.0%	-9.0%	4.8%	-0.4%	2.3%
A period of low and stable inflation expectations	Jan 10 - Feb 20	1.5%	4.6%	1.3%	2.2%	0.1%
Covid-19 related falling inflation expectations	Feb 20 - Mar 20	133.6%	56.1%	-38.8%	62.3%	-43.6%
Covid-19 counter measures rising inflation expectations	Apr 20 - Mar 22	-0.7%	-2.1%	-0.9%	-0.4%	4.1%
Declining inflation expectations on rising interest rates	Apr 22 - May 23	0.3%	-2.0%	-0.4%	2.2%	0.8%

Source: FTSE Russell & US FED St Louis. Please see the end for important legal disclosures.

**Table 3: Performance of FTSE USA factor indices, annualised, in %**

Period	Timeframe	Quality	Momentum	Size	Low vol	Value
Increasing inflation expectations	Jan 03 - Mar 05	-1.0%	-1.6%	10.6%	-3.1%	6.7%
Moderate, stable, inflation expectations	Apr 05 - Jul 08	2.1%	1.8%	0.4%	-0.9%	0.8%
Inflation expectations fall during the GFC	Aug 08 - Nov 08	18.8%	6.3%	-21.6%	32.3%	0.8%
Rising inflation expectation on bounce back from the GFC	Dec 08 - Dec 09	-1.5%	-5.5%	15.6%	-9.0%	-0.9%
A period of low and stable inflation expectations	Jan 10 - Feb 20	3.0%	0.6%	-1.3%	1.2%	-4.2%
Covid-19 related falling inflation expectations	Feb 20 - Mar 20	199.7%	66.5%	-89.1%	86.6%	-91.2%
Covid-19 counter measures rising inflation expectations	Apr 20 - Mar 22	0.9%	0.1%	5.1%	-6.6%	0.5%
Declining inflation expectations on rising interest rates	Apr 22 - May 23	1.6%	-1.1%	-2.8%	1.1%	1.3%

Source: FTSE Russell & US FED St Louis. Please see the end for important legal disclosures.

The statistical integrity of these results is compromised somewhat by the very small sample size. We can note, however, certain broad patterns albeit with some exceptions.

Generally, Size and Value factor indices perform better when inflation expectations are rising, and Momentum, Low Volatility and Quality mostly outperform in environments of stable, but falling inflation expectations.

One of the exceptions from the pattern above is the performance of the FTSE USA Value Index during the period of rising inflation expectations in the recovery from the GFC. It had a negative return (-0.9% p.a.), while the FTSE All-World Pure Target and FTSE Developed value indices produced positive returns at the same time. This may reflect the high weighting of financials in the FTSE USA Value Index, and underperformance by financials following the GFC.

Another notable exception is the period around the Covid-19 pandemic. During the inflation expectations rebound from April 2020 to May 2022, Value did not perform that well in the US and the FTSE Developed universes. At the same time, Size produced a negative excess return in the FTSE All-World.



## Section 3: Correlations

To make any meaningful statistical inferences, we increased the sample size by looking at higher frequency data. First, we consider the monthly correlations of normalised excess returns of factor indices and normalised monthly changes in inflation expectations.

As Table 4 shows, Quality, Momentum and Low Volatility factor indices' excess returns correlate negatively with changes in inflation expectations. In contrast, Size and Value factor indices' excess returns have positive correlation with inflation expectations.

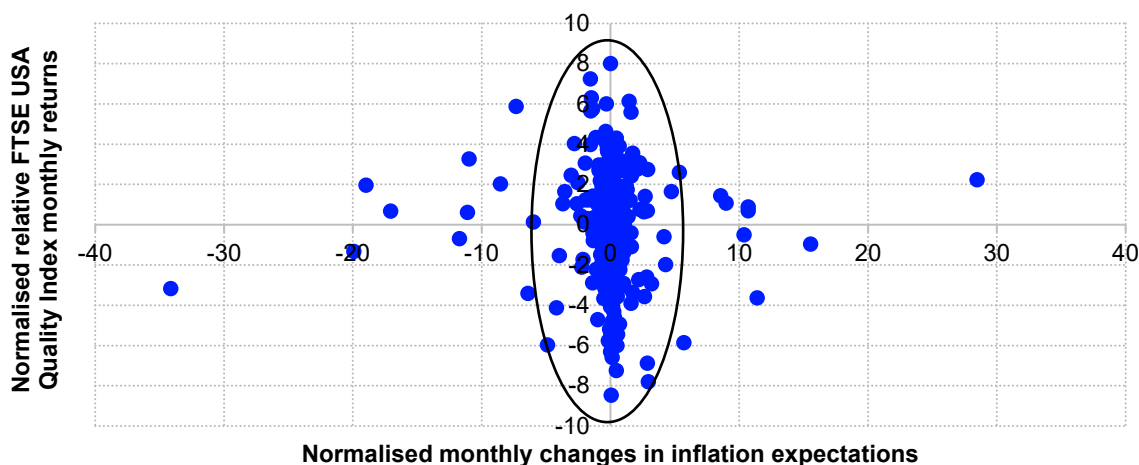
Remarkably, the correlations are similar across different index series. The confidence intervals suggest that the relationships are not that strong for Value in FTSE All-World and FTSE USA universes and Size in FTSE All-World. For the other factor indices, the correlations are statistically significantly different from 0.

**Table 4: Correlations between normalised monthly relative factor performance and normalised excess returns of factor indices, with 95% confidence intervals**

	Quality	Momentum	Size	Value	Low volatility
FTSE USA	-0.22	-0.13	0.17	0.10	-0.27
95% confidence interval	(-0.33, -0.09)	(-0.25, 0.00)	(0.04, 0.29)	(-0.02, 0.23)	(-0.39, -0.15)
FTSE All World	-0.22	-0.13	0.10	0.05	-0.18
95% confidence interval	(-0.34, -0.10)	(-0.25, 0.00)	(-0.02, 0.22)	(-0.07, 0.18)	(-0.30, -0.05)
FTSE Developed	-0.21	-0.15	0.18	0.21	-0.27
95% confidence interval	(-0.33, -0.09)	(-0.27, -0.03)	(0.06, 0.30)	(0.09, 0.33)	(-0.38, -0.15)

Source: FTSE Russell. Please see the end for important legal disclosures.

**Figure 3: Scatter plot of normalised excess returns of FTSE USA Quality Index vs normalised changes in inflation expectations**



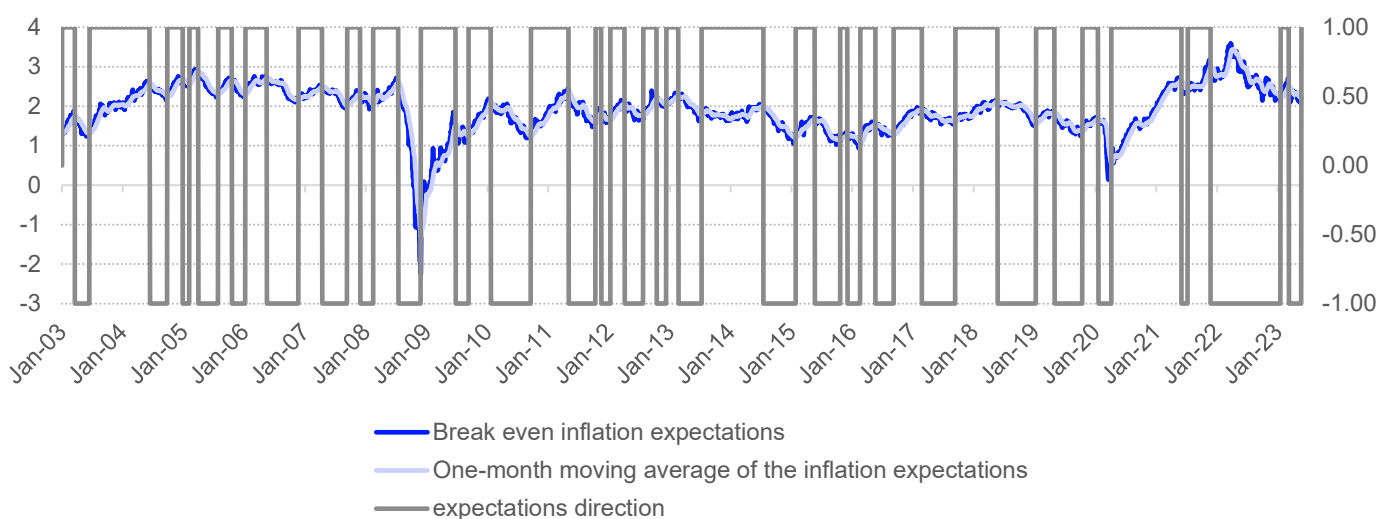
Source: FTSE Russell. Please see the end for important legal disclosures.

We plotted the normalised excess returns of the FTSE USA Quality index against normalised changes in inflation expectations in Figure 3. It shows that changes in inflation expectations fluctuate in a relatively narrow band, which leads us to investigate factor performance further over the wider variations of the expected inflation in the following chapters. It also suggests that other parameters are in play here, which we will consider in a separate paper.

## Section 4: Changes in inflation expectations

We also looked at the excess performance of the factor indices between the inflection/turning points of inflation expectations. First, we smoothed inflation expectations with one-month moving averages. Using local maxima and minima in a four-month rolling window, we have identified inflection points of the inflation expectations moving average.

**Figure 4: Breakeven inflation expectations with rolling averages and regime changes**



Source: FTSE Russell & US FED St Louis. Please see the end for important legal disclosures.

Since January 2003, there are 27 periods of declining, smoothed, inflation expectations and 28 periods of rising, smoothed, inflation expectations.

We calculated the annualised excess returns of the factor indices over each period and averaged them over periods of rising and falling, smoothed, inflation expectations. The results are presented in Table 5.

**Table 5: Average annualised excess returns of factor indices in different sub-periods (one month rolling average applied), in %**

Underlying benchmark	Inflation expectations	Quality	Momentum	Size	Value	Low volatility
FTSE All-World	rising	0.01%	0.29%	0.36%	0.33%	-0.36%
	falling	0.13%	0.00%	0.03%	0.15%	0.40%
	difference	-0.12%	0.29%	0.33%	0.18%	-0.76%
FTSE USA	rising	-0.04%	-0.02%	1.03%	0.33%	-0.93%
	falling	0.26%	-0.01%	-0.10%	0.41%	0.64%
	difference	-0.30%	-0.01%	1.13%	-0.08%	-1.57%
FTSE Developed	rising	-0.02%	-0.11%	1.05%	0.41%	-0.73%
	falling	0.26%	0.07%	-0.05%	0.11%	0.70%
	difference	-0.28%	-0.18%	1.10%	0.30%	-1.43%

Source: FTSE Russell. Please see the end for important legal disclosures.

In Table 5, we can observe the following patterns: in rising inflation expectations periods, Size factor indices perform better in all index series. In falling inflation expectations periods, Quality and Low Volatility factor indices, in all index series, perform better. Value and Momentum factors show more mixed performance. The Value factor does perform better in rising inflation expectations sub-periods in the FTSE All-World and FTSE Developed universes. But the FTSE USA Value Index performed better in falling inflation than in an increasing inflation expectations environment.

Instead of a one-month rolling window, as we did for calculations for Table 5, we used a two-month rolling window for Table 6, with everything else remaining the same.

**Table 6: Average annualised excess returns of factor indices in different sub-periods (two month rolling average applied), in %**

Underlying benchmark	Inflation expectations	Quality	Momentum	Size	Value	Low volatility
FTSE All-World	rising	-0.03%	0.18%	0.46%	0.36%	-0.25%
	falling	0.26%	0.35%	-0.01%	0.06%	0.22%
	difference	-0.29%	-0.17%	0.47%	0.30%	-0.47%
FTSE USA	rising	-0.15%	-0.14%	1.19%	0.55%	-0.73%
	falling	0.44%	0.10%	-0.27%	-0.08%	0.34%
	difference	-0.59%	-0.24%	1.46%	0.63%	-1.07%
FTSE Developed	rising	-0.08%	-0.15%	1.12%	0.51%	-0.46%
	falling	0.40%	0.14%	-0.20%	-0.16%	0.33%
	difference	-0.48%	-0.29%	1.32%	0.67%	-0.79%

Source: FTSE Russell. Please see the end for important legal disclosures

As we see from Table 6, the difference between average returns for periods of rising and falling inflation expectations is larger. It is also notable that, for all regions, Value performs better in the rising inflation expectation environment than in the falling.

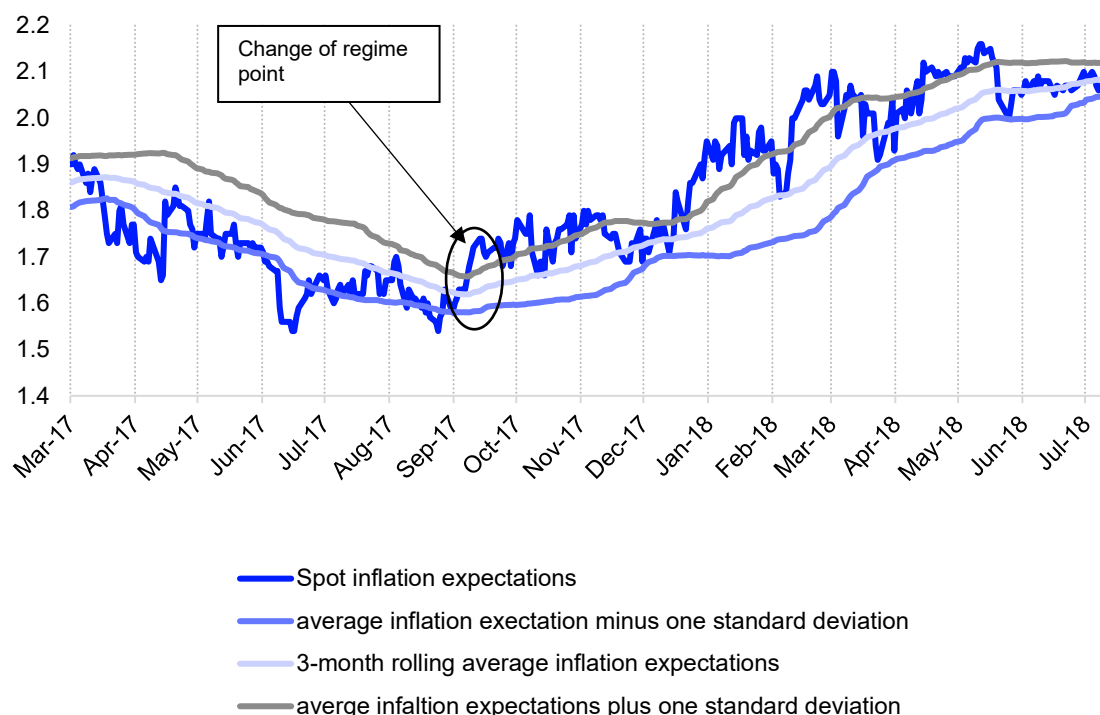
We note the analysis above has a look-ahead bias<sup>3</sup>, as we determined maxima and minima of smoothed inflation expectations, knowing its reading over the whole period.

We considered removing the look-ahead bias by defining the change of trend as the points when the inflation expectation reading is above (or below) one standard deviation band around the rolling average in direction opposite the trend (it is illustrated on Figure 5).

Having removed the look-ahead bias, we performed the analysis on the FTSE USA factor indices for one, two and three month rolling averaging periods. Table 7 shows similar patterns to those seen in Tables 5 and 6 earlier: in falling inflation expectations, Quality, Momentum and Low Volatility factors perform better than in rising inflation expectations. Size does better in a rising inflation expectation environment. The Value factor flips from performing better in a falling inflation expectation environment for a one-month rolling window to performing better in rising inflation expectations for two- and three-month rolling windows.

<sup>3</sup> Look-ahead bias occurs when using data in a simulation that was not known during the period being analysed.

**Figure 5: Illustration of the change of trend signal definition**



Source: FTSE Russell. Please see the end for important legal disclosures.

It is also notable that the difference between the average annualised return in falling and rising inflation expectations environments grows with increasing the length of the rolling averaging window. The increasing rolling window is reducing noise and the statistical significance is generally increasing with the exception of the low volatility factor.

**Table 7: Average annualised excess returns of FTSE USA factor indices in different periods and different inflation averaging time frames, in %**

Average period	Inflation expectations	Quality	Momentum	Size	Value	Low volatility
1 month	rising	0.02%	0.00%	0.06%	-0.01%	-0.08%
	falling	0.05%	0.01%	-0.02%	0.01%	0.05%
	difference	-0.03%	-0.01%	0.08%	-0.02%	-0.13%
	p-value	0.509	0.697	0.235	0.837	0.055
2 months	rising	0.00%	-0.04%	0.25%	0.03%	-0.14%
	falling	0.22%	0.05%	-0.12%	-0.05%	0.13%
	difference	-0.22%	-0.09%	0.37%	0.08%	-0.27%
	p-value	0.057	0.322	0.054	0.601	0.093
3 months	rising	-0.10%	-0.07%	0.38%	0.03%	-0.32%
	falling	0.43%	0.15%	-0.16%	-0.06%	0.11%
	difference	-0.53%	-0.22%	0.54%	0.09%	-0.43%
	p-value	0.025	0.186	0.056	0.658	0.211

Source: FTSE Russell. Please see the end for important legal disclosures.

## Section 5: Conclusion

In this paper we analysed the relative performance of single factor indices in different inflationary environments. We considered three different underlying universes: the FTSE USA, FTSE Developed and FTSE All-World. We also looked at differently constructed indices, where we used pure factor index series for the FTSE All-World and standard factor index series for the FTSE USA and FTSE Developed.

As the inflation indicator, we used inflation breakevens calculated from US Bond yields rather than actual reported inflation. We found that, although CPI and PPI are released with a lag, the contemporaneously calculated inflation breakevens have a similar inflection pattern as the actual CPI, which means market expectations of inflation trends are normally close to the actual reported inflation trends.

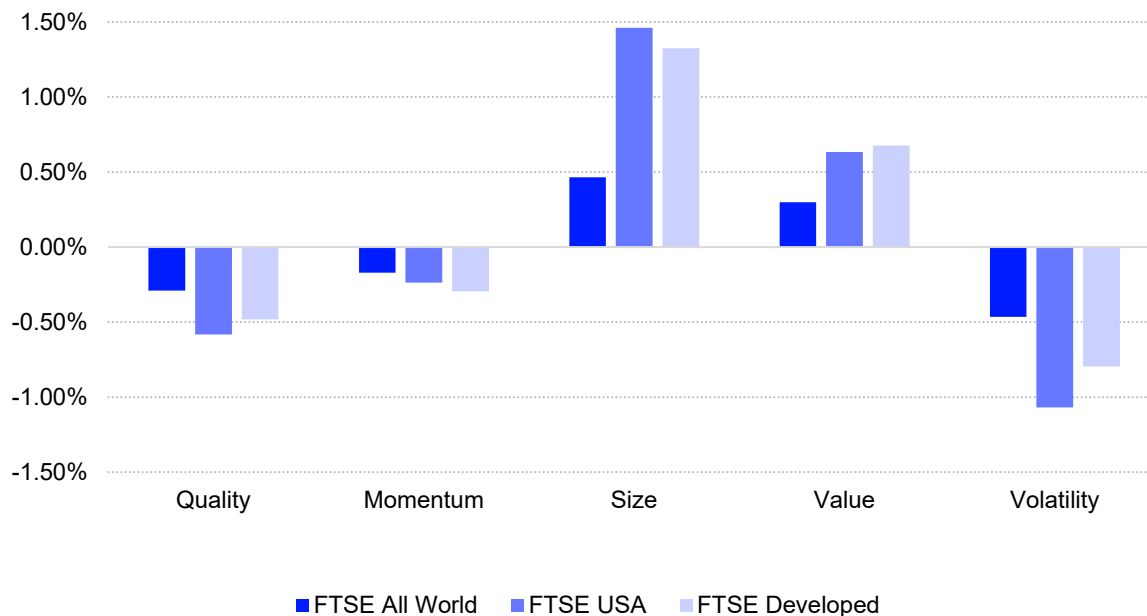
We segmented the last 20 years into eight sub-periods of different inflation expectations regimes. Although we can't infer statistical significance, there is a notable pattern for Size and Value generally performing better in a rising inflation expectations environment, and Low Volatility, Quality and Momentum doing better in falling inflation expectations environments.

We also looked at more granular changes in inflation expectations and compared the performance of factor indices in rising and falling inflation expectations periods.

With some exceptions, the analysis showed similar patterns at the more granular level: Size and Value generally performing better in the rising inflationary expectations and Low Volatility, Quality and Momentum doing better in the falling inflation expectations.

These results also align with correlations of monthly changes in inflation expectations and excess returns of factor indices.

**Figure 6: Difference in annualised excess returns of factor indices in rising and falling inflation expectation environment (two month rolling average applied)**



Source: FTSE Russell. Please see the end for important legal disclosures.

The results may also be rationalised by investor behaviour in different inflationary environments. It seems plausible that as inflation expectations rise, investors are more likely to switch to Value stocks with lower valuation metrics. These firms typically have more value attached to shorter term profits, in contrast to Growth stocks, where future earnings may be subject to higher discount rates.

Furthermore, better performance of smaller companies may be explained by the correlation between Size and Value. It could also be that higher inflation expectations are combined with expectations of faster economic growth, which produces a stronger positive impact on smaller firms. It could be that for the same reason, Quality and Low Volatility factors tend to do better in falling inflation expectations environments as investors could be associating it with slower growth and/or oversupply.

But these explanations need to be seen in context. Since different theories may fit the same set of data, we cannot infer inflation is the main cause or driver for relative factor performance. The statistical metrics also suggest that although there are patterns in factor performance in different inflation regimes, there are other parameters which may explain factor performance, which we will turn to in further research.

Although there were differences in the results in different regions they were not dramatically pronounced. We have not detected major difference in results for different single factor methodologies either.

## References

[1] FTSE Global Factor Index Series Ground Rules, FTSE Russell, April 2023.

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