QUANTICA CAPITAL

QUARTERLY INSIGHTS

TREND-FOLLOWING AND INFLATION PROTECTION

Can CTAs hedge inflation risk?

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Executive summary

Inflation is back on investors' minds, with most commodity prices, longer-term interest rates and expected inflation rates having risen sharply in the past six months. Increasing concerns about a rise in inflation and the damage it could cause raise the question of how to best hedge against such scenario. In this note, we perform an empirical and comparative analysis of the inflation hedging characteristics of traditional asset classes such as equities, bonds and commodities, a risk parity allocation and a generic trend-following program. To do so, we use more than 50 years of price data and a simple but rigorous framework. To assess a portfolio's inflation hedging characteristics, we consider three complementary factors: The portfolio's

- sensitivity (or 'beta') to quarterly changes in inflation,
- the realized conditional risk-adjusted returns in different inflation regimes, and
- long-term risk premia or cost effectiveness related to hedging inflation risks.

We show that the effectiveness and reliability of hedging inflation varies greatly amongst asset classes. Equities and bonds, for instance, have failed historically as individual asset classes to protect against the risk of an inflationary market environment.

Traditional equity/bond and risk parity portfolios are therefore likely at risk of significant losses in the event of an unexpected inflation shock. This is confirmed by the striking observation that, since 1962, high inflation environments have been systematically accompanied with a *positive* equity/bond correlation structure. Conversely, and maybe less surprisingly, we show that of all major asset classes, commodities have historically provided the strongest protection against inflation risk. At the same time, we highlight that such inflation protection also comes at a significant cost, i.e. with lower long-term risk-adjusted returns.

Unlike static single- or multi-asset class portfolios, a trend-follower's dynamic and diversified risk allocation process allows to opportunistically capture inflation-driven market price dynamics across a wide range of asset classes. These intrinsically adaptive characteristics lead to a highly robust inflation sensitivity profile and attractive risk- and inflation-adjusted returns irrespective of low or high, declining or rising inflation. We conclude that, among all options analyzed, diversified trend-following offers smart diversification and cost-effective protection against rising inflation, without sacrificing expected long-term returns.

Introduction

Inflation has largely been absent from the world's developed economies for more than a quarter of a century. Since 1994, US inflation as measured by the US Consumer Price Index, has hovered mostly below the typical 'healthy' rate of 2%, which is often used as an explicit long-term target by central banks around the world.

More recently, the combination of rising yields and multitrillion dollar fiscal and monetary stimulus packages on the back of an accelerating economic recovery has raised concerns that inflation could be finally making a comeback.

While high or unpredictable inflation is regarded as harmful to the overall economy, it also represents a significant challenge from an investment perspective, as it comes with increased uncertainty around individual asset price dynamics and cross-asset correlations. For instance, a substantial rise in inflation may simultaneously hurt traditional core institutional portfolio constituents such as equities and bonds, leading to reduced portfolio diversification and increased portfolio volatility. Evaluating potential hedging against the risk of an unexpected rise in price inflation should therefore be high on the priority list of institutional investors.

With this note we aim to add some empirical substance to the debate by analyzing the inflation hedging characteristics of main asset classes, typical long-only multi-asset strategies such as 60/40 and risk parity, and their ability to protect against a rise in inflation.

Based on long-term historical data since 1962, we estimate for individual asset classes and different investment strategies their so-called inflation betas, i.e., their sensitivity to contemporaneous changes in the year-on-year inflation rate. We will relate the inflation hedging characteristics to the long-term risk-adjusted returns of each asset and respective portfolios to assess the benefits and costs of each investment strategy in terms of inflation hedges.

We further quantify the impact of the level of inflation on the cross-asset correlation structure and analyze the potential consequences for balanced multi-asset portfolios.

Finally, following the same approach, we quantify the inflation hedging properties of diversified trend-following, providing empirical evidence that such an approach is well suited to deliver long-term risk-adjusted real returns irrespective of low or high, declining or rising inflation.

The challenge with quantifying inflation

Defining the inflation hedging properties of a portfolio starts with the challenge of measuring inflation, as there is not one unique generally accepted definition of it.

In the US, the most commonly used measure relies on the Consumer Price Index (CPI), which tracks the average price of a basket of goods and services that households typically purchase. The year-over-year change of the index then defines the inflation rate. The CPI has been released by the US Bureau of Statistics since 1913 and offers, amongst all available measures of inflation, the longest history.

An alternative indicator, based on a different construction methodology and used for instance by the Federal Reserve for inflation targeting, is the Personal Consumption Expenditures (PCE) price index, for which monthly data goes back to 1959. Both CPI and PCE price indices come in two versions: a "headline" and a "core" version. The latter strips out the more volatile energy and food price components of the headline figure.

While CPI and PCE metrics are backward looking measures of realized inflation, there are other metrics that focus on measuring people's expectations about future inflation, or that may be implied from breakeven inflation rates reflected in Treasury Inflation Protected

Securities (TIPS). Additional information about these alternative inflation metrics may be found in Appendix A.

A comparative chart of these measures of realized and expected inflation since 1959 or as they became available is provided in Figure 1. As a look at the long-term history of inflation shows, analyzing the impact of abnormally high and/or rising inflation rates on individual assets and investment portfolios comes with a challenge: The last significant inflationary episodes date back to the 1970s to 80s (when inflation rates were persistently above 5%), a period that hardly compares with today. Recent data on inflationary episodes is scarce, and the question arises whether inflation sensitivities measured back in the 1970s is still of relevance today. We leave it to the reader to judge.

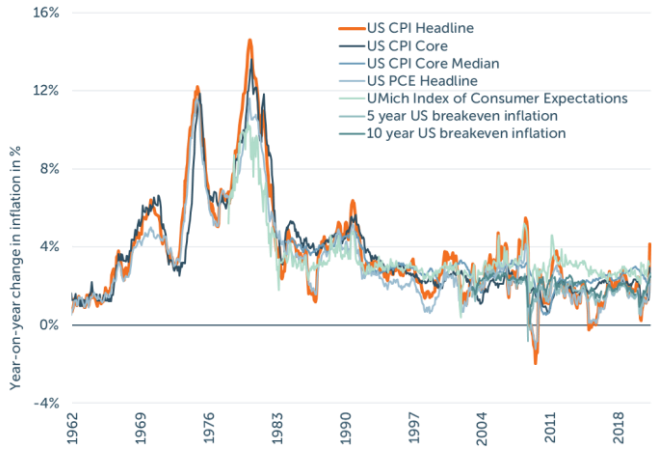

Figure 1: Historical evolution of different realized and expected inflation measures. Average US CPI headline year-on-year change: 1962-1999 = 4.7% vs 2000-2021 = 2.1%. *Source:* Federal Reserve Bank of St. Louis (FRED) / Quantica.

For the remainder of this note, we rely exclusively on the US headline CPI year-on-year inflation rate. It offers the longest history and, at the same time, seems to be the preferred choice in many research papers focusing on inflation.

The current annual inflation rate implied by the CPI stands at 4.2% as of end of March, a level that is close to the upper bound of the range within which it has evolved during the last 25 years. Its remarkable 1.7% increase in the first quarter of 2021 is the largest quarterly rise since 2009.

Introducing asset class and portfolio inflation betas

We introduce a simple measure, called inflation beta, which quantifies the sensitivity of a given asset or portfolio to a change in inflation. More specifically, we derive an assets' inflation beta from regressing its quarterly returns to contemporaneous quarterly changes in the year-on-year inflation rate. Hence, inflation beta quantifies the average impact of an increase in the inflation rate on the assets total return. The more positive an asset's inflation beta, the more likely it is to provide a hedge against the risk of a sudden rise in inflation.

We first focus on the four main asset classes: equities, bonds, currencies and commodities. Because of the heterogeneity of commodities, we further distinguish between the following four sub-categories: energy, precious metals, base metals and agriculturals. The aggregate commodity portfolio is formed by weighing the four commodity sub-groups portfolios equally.

Asset class / sub-category		Constituents	Bloomberg price start date	Backfilled long-term data start date
Equities		S&P 500	11-Sep-97	02-Jan-62
Bonds		2-year USD Note	27-Jun-90	01-Jan-62
		5-year USD Note	24-May-88	05-Jan-62
		10-year USD Treasury Note	05-May-82	05-Jan-62
		20-year USD Long Bond	24-Aug-77	05-Jan-62
Commodities	Energy	Brent Crude	27-Jun-88	27-Jun-88
		Crude	01-Apr-83	01-Apr-83
		Heating Oil	02-Jul-86	02-Jul-86
	Precious metals	Gold	06-Jan-75	06-Jan-75
		Silver	06-Jan-75	06-Jan-75
	Base metals	Copper	08-Dec-88	08-Dec-88
	Agriculturals	Coffee	18-Aug-72	18-Aug-72
		Corn	03-Jul-59	03-Jul-59
		Soybeans	03-Jul-59	03-Jul-59
		Sugar	05-Jan-61	05-Jan-61
		Wheat	03-Jul-59	03-Jul-59
Currencies		CAD	07-Apr-86	04-Jan-71
		CHF	08-Apr-86	04-Jan-71
		EUR	21-May-98	02-Jan-75
		GBP	29-May-86	04-Jan-71
		JPY	26-May-86	04-Jan-71

Table 1: List of instruments by asset class / sub-category including their exchange-traded and backfilled inception dates.

In addition to estimating inflation betas for individual asset classes, we compute such betas for the following three multi-asset portfolios:[1]

- A 60/40 portfolio, consisting of a 60% S&P 500 and 40% US 10-year Treasury bond futures allocation.
- A risk parity long-only portfolio that weighs every universe constituent and each of the four asset classes by an equal annualized volatility target. Individual portfolio constituents are scaled to meet a portfolio ex-ante volatility target of 12% p.a.
- A generic trend-following strategy, targeting an ex-ante annualized volatility of 12% and developed to closely track the SG Trend Index[2], an industry benchmark composed of the ten biggest trend-following programs.

Main asset class inflation betas before and after 2000

Figure 2 shows inflation betas for the four main asset classes and for two distinct time periods: prior to 2000 and after 2000, which can be interpreted as high and low inflation level regimes, respectively.

As Figure 2 highlights, US equities have been particularly vulnerable to rising inflation between 1962 and 1999. This means that over that time period, for any 1% rise in inflation, equities dropped by an average 3% in any such quarter.

The tamed inflation environment observed since the year 2000 appears to have led to an inversion of this historical relationship, with equities displaying a *positive* inflation beta of 2 over the last two decades. Equities may hence be considered a good inflation hedge in a tamed inflation environment, but a less reliable one when inflation is untamed like in the 1970s.

This result supports the economic wisdom that moderate inflation should have a positive impact on stock prices, whereas too high inflation may hurt companies and valuations.

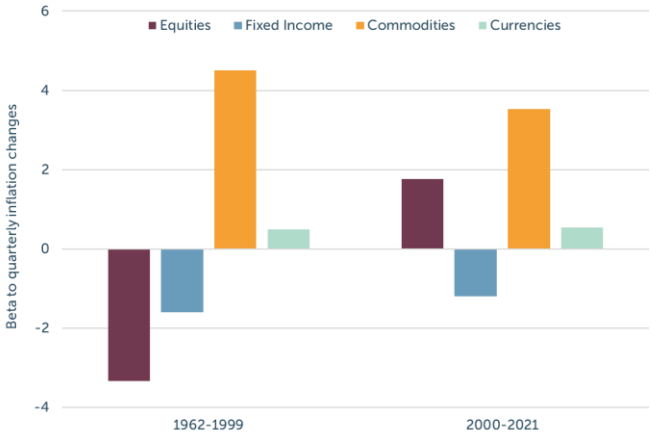

Figure 2: Beta of quarterly asset class nominal excess returns to quarterly changes in the year-on-year inflation rate over the same quarter for the four main asset classes, evaluated over two distinct time-periods: 1962-1999 and 2000-2021.

Unlike with equities, long-term average inflation sensitivities for all other main asset classes have remained consistent through time and independent of the level of inflation, with commodities strongly benefiting from an increase in inflation (returning on average four times as much as the inflation rate change), and treasury bonds dropping on average 1.2 times the rise in inflation for both periods. G7-currencies display a small positive beta to changes in the inflation rate.

To conclude, asset inflation betas are not necessarily static, and their sign may also change over time. Additionally, a portfolio manager is probably more interested in an assets' inflation beta in a high inflation regime, as the value-add of hedging inflation in a low inflation environment might be less relevant.

Asset class inflation betas conditional on the inflation level

To refine inflation sensitivities and better understand the relationship between inflation beta and the level of inflation, we further condition inflation betas on the year-on-year inflation rate recorded at the start of each quarter. For that purpose, we divide all non-overlapping quarters since 1962 into three equal-sized terciles corresponding to low, medium and high inflation regimes. Figure 3 shows that the relationship between quarterly equity returns and contemporaneous quarterly changes in the year-on-year inflation rate is indeed sensitive to the overall level of inflation.

Equities

Consistent with our initial results, equities display a positive beta of 2 to inflation changes if the inflation rate at the start of the period prints below 2.4%. Such a relationship confirms the economic intuition that low and declining inflation might raise the specter of deflation, which is often seen as a negative for corporations, thus leading to negative equity returns.

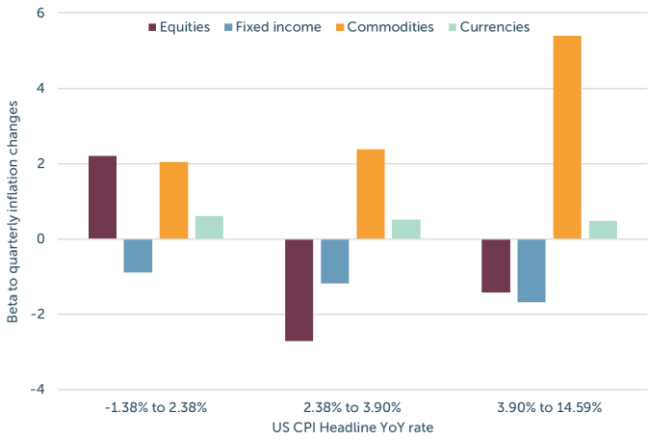

Figure 3: Beta of quarterly asset class nominal excess returns to quarterly changes in the year-on-year inflation rate over the same quarter, conditional on the inflation rate level at the start of each quarter. All non-overlapping quarters from 1962 to 2021 are split into three terciles corresponding to low, medium and high inflation regimes.

For that reason, equities are seen to benefit from rising inflation off low levels, which is in line with our empirical findings.

Inversely, if the level of inflation lies in the upper two terciles (i.e., year-on-year inflation rate above 2.4%), that same relationship turns negative. In such inflation regimes, which are typical of the decades prior to 2000, any rise in inflation has historically been associated with a corresponding drop in equity returns, by a factor of 1.2 to 2. Rising inflation rates leading to above-average inflation rates may be associated with increased uncertainty and fears about the impact of escalating inflation on the economy, negatively impacting equity prices.

Bonds

Government bonds display a consistent negative relationship to inflation changes, irrespective of the prevailing level of inflation. Rising inflation expectations are typically associated with rising yields and therefore declining bond prices, reflecting an expected future erosion of the purchasing power of a bond's future cash flows. Consequently, government bonds with the longest durations are also the most sensitive to inflation changes, as illustrated by Figure 4.

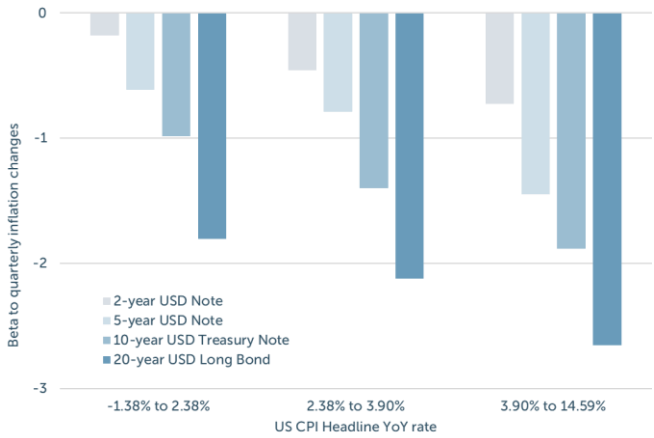

Figure 4: Betas for US Treasury bond futures of different maturities (2, 5, 10, and 20 years) to quarterly changes in the year-on-year inflation rate, conditional on the inflation rate level at the start of each quarter. All non-overlapping quarters from 1962 to 2021 are split into three terciles corresponding to low, medium and high inflation regimes.

The figure highlights how inflation betas are directly proportional to a future's underlying CTD bond duration characteristics (e.g., 10-year nominal bonds decline in value two times the increase in inflation, while 20-year bonds decline on average over three times the rise in inflation).

If only focusing on inflation betas, a short bond position may provide better hedge capabilities against the risk of rising inflation. However, good hedging properties would usually come at a cost, as we will see in the later part of this note.

Currencies

Similarly to bonds, the relationship between inflation and currencies is also a straightforward one. For the G7 currency futures considered in this note, a long position in each future corresponds to a short position in the US Dollar. The positive beta depicted in Figure 3 between nominal FX returns and inflation changes means that a long currency (short USD) position benefits from rising inflation. In other words, our results confirm that rising US inflation leads to a weaker US Dollar. The beta, however, remains low, and a short Dollar position would at best provide a very partial hedge against inflation. Still, that low beta hides some strong disparities between individual currencies, as shown in Figure 5.

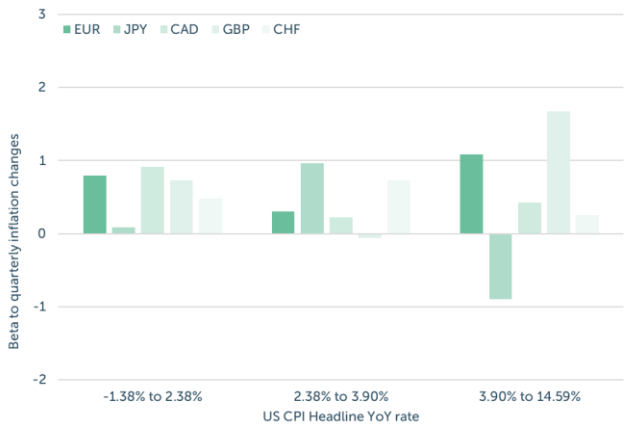

Figure 5: Betas for G7 currency futures to quarterly changes in the year-on-year inflation rate, conditional on the inflation rate level at the start of each quarter. All non-overlapping quarters from 1962 to 2021 are split into three terciles corresponding to low, medium and high inflation regimes..

In a high inflation environment, the British Pound's inflation beta is 1.7, while the Japanese Yen's sensitivity to inflation changes is a negative -0.7. This supports the hypothesis that within currencies the Japanese Yen is considered the only safe haven in a hyper inflationary environment.

Commodities

Commodities are generally believed to provide a good hedge against rising inflation, and such intuition is confirmed by the aggregate commodity portfolio's consistently positive beta across all three inflation regimes.

Commodities are often the source of and leading broad inflation trends. Many commodities are explicit components of the CPI basket and/or are directly impacting the prices of many goods and services tracked by the CPI.

Moreover, it is worth noting that the positive relationship between aggregate commodity returns and inflation changes increases monotonically with the prevailing inflation rate level. The beta of commodities in the highest inflation tercile (i.e., 5.3) is more than twice as high as in the lowest tercile (i.e., 2.2).

Given its heterogeneity as an asset class, a sensitivity analysis at a sub-group level provides further insights into the inflation hedging properties of individual commodity categories.

As shown in Figure 6, when inflation is high, inflation betas of all four commodity sub-group portfolios are significantly positive and higher when compared to the two lower regime terciles. Of all sub-groups, energy is by far the most sensitive to inflation changes with a beta of around 15. Precious metals, base metals and agricultural commodities all display positive inflation hedging characteristics, that are most pronounced in the highest inflation regime. The only notable outlier pertains to the inflation beta of precious metals in a low inflation environment

(lowest tercile). In such case, gold and silver appear to be completely insensitive to changes in inflation expectations.

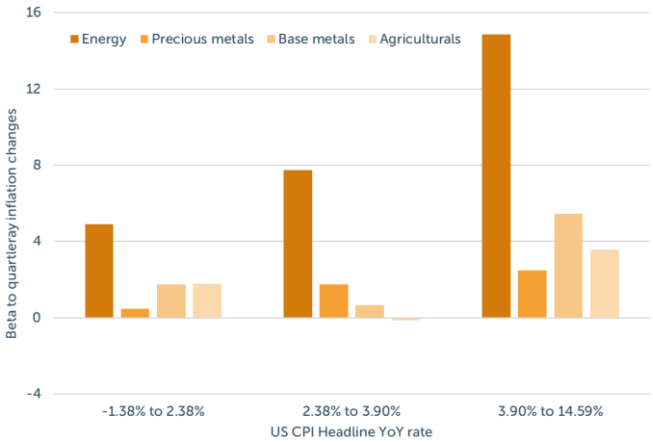

Figure 6: Beta between quarterly returns of four commodity sub-categories and contemporaneous quarterly changes in the year-on-year inflation rate, conditional on the inflation rate level at the start of each quarter. All non-overlapping quarters from 1962 to 2021 are split into three terciles corresponding to low, medium and high inflation regimes.

To summarize, a long exposure into a portfolio composed of a broadly diversified set of commodities may offer a strong inflation hedge by capturing generally consistent and high inflation betas and minimizing the dependency on idiosyncratic single-commodity patterns.

Please also refer to Appendix 2 for an analysis on the inflation hedging ability of individual commodities depending on their roll-yield characteristics.

60/40 portfolio, risk parity and trend-following

After having estimated the inflation hedging characteristics of the main asset classes, we now move on to estimate the inflation betas of the three dynamically rebalanced investment strategy portfolios – 60/40, risk parity and trend-following. Figure 7 provides an overview of their inflation betas, including their breakdown by asset class.

Starting with the 60/40 portfolio, its inflation betas are simply equal to the weighted average of its constituents' inflation betas. Not surprisingly, the 60/40 portfolio's inflation hedging characteristics are hence equivalent to those of a pure equity portfolio: a positive inflation beta in deflationary regimes, and a negative beta in inflationary regimes. Interestingly, a risk parity portfolio, despite running an additional risk-weighted long exposure to commodities and currencies (assets with positive inflation betas), displays the same inflation beta characteristics as its 60/40 counterpart. Most importantly, when inflation is high and above 3.8%, both the 60/40 and the risk parity portfolio appear to offer very poor inflation hedging properties. Historically, in such a regime, a 1% additional increase in the annualized inflation rate would have led to a 1.5% and 2.2% drop in the 60/40 and the risk parity portfolio returns, respectively.

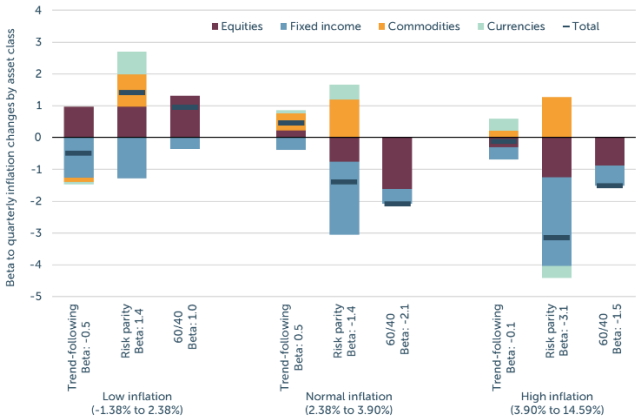

Figure 7: Betas of a generic trend-following, risk parity and 60/40 portfolio's quarterly nominal excess returns to quarterly changes in the year-on-year inflation rate, conditional on the inflation rate level at the start of each quarter, broken down by main asset classes. All non-overlapping quarters from 1962 to 2021 are split into three terciles corresponding to low, medium and high inflation regimes.

The static exposure or risk allocation approach restricts these portfolios from establishing higher allocations to commodities that would allow for a neutralization of the predominant negative beta contribution from equities and bonds. The adaptive nature of trend-following, however, allows to dynamically adjust the risk exposures to the market environment. As a result, the

sensitivity against a particular inflationary regime is much more balanced.

In addition, it appears that higher inflation considerably reduces the mutual diversification benefits between equities and bonds that have benefited typical 60/40 and risk parity portfolios for the past two decades. Figure 8a shows the historical relationship between inflation level and the equity/bond correlation, while highlighting the three regimes of low, medium and high inflation. Strikingly, since 1962, the equity/bond correlation in the US has always been positive when the inflation rate was above 5% at the beginning of a quarter.

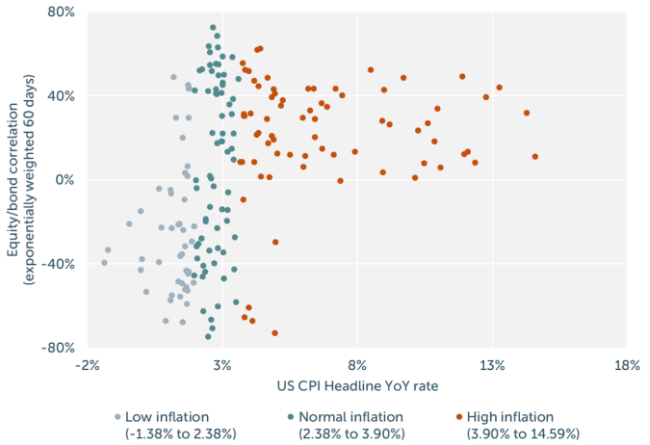

Figure 8a: Historical relationship between quarterly inflation level and contemporaneous S&P 500 Index / 10-year US Treasury Note correlation (exponentially weighted estimate over 60 days) as function of three regimes of low, normal and high inflation for the period 1962-2021.
Source: Bloomberg / FRED.

Figure 8b provides the historical evolution of the beta of the S&P 500 future to the 10-year US Treasury Note future since 1962. The relationship turned positive in the first quarter of 2021 with a 1:1 relationship between yield increases and equity losses that was last recorded towards the end of the 90s! If such pattern of equities and bonds moving in tandem were to persist, even during equity market corrections, traditional equity/bond portfolios will not adequately defend against the calamity of adverse inflation surprises.

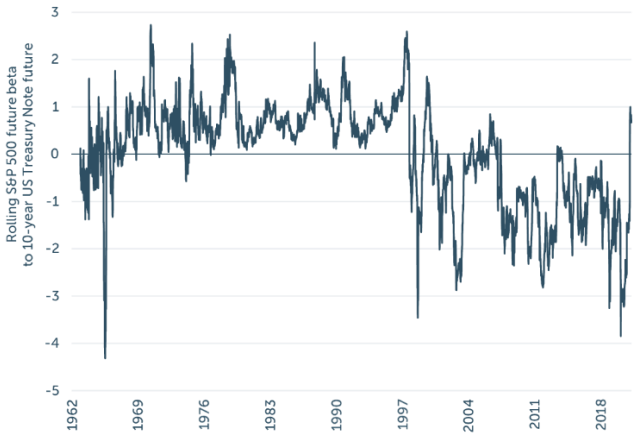

Figure 8b: S&P 500 future beta to 10-year US Treasury Note future (daily, 1962-2021)
Source: Bloomberg

Trend-following, which takes opportunistic long and short positions across a diversified universe of multiple asset classes, seems much less vulnerable to sudden changes in cross asset class correlations. That is likely one reason why it offers a very differentiated inflation sensitivity, as highlighted in Figure 7 above. Most importantly, and in striking contrast to the 60/40 and risk parity strategies, trend-following provides protection against rising inflation rates when it matters most, i.e. when inflation rates are in their highest tercile. As the beta attribution by asset classes further shows, in a medium to high inflation environment, a trend-follower's beta to inflation benefits heavily from an increased risk allocation to commodities and currencies, while the negative contribution from equities and bonds is strongly tamed. On the other hand, in the lowest inflation regime, a trend-followers exposure to inflation changes is explained in majority by the inflation betas of its equity and bond risk allocations. The differentiated risk attribution to inflation changes, depending on the overall level of inflation, is a powerful illustration of the value added of the highly adaptive nature of a trend-following approach, which can significantly shift its risk allocation in response to changing macro-economic conditions.

Translating inflation betas into risk-adjusted returns

Inflation betas are by construction – given the type of data used for their estimation – long-term average estimates and provide at best an indication about the direction and magnitude of an asset's historical sensitivity to inflation. They may be unstable, especially when evaluated over shorter time frames. They may vary significantly over time and their sign may change from positive to negative, leading to significantly altered inflation hedging properties of an asset or portfolio in the short term.

An analysis of the inflation hedging characteristics of individual asset classes and portfolios would therefore not be complete without investigating their actual risk-adjusted return characteristics during rising and falling inflation regimes and benchmarking their realized returns against the rate of inflation.

For that purpose, we split all calendar quarters since 1962 into three terciles (that is 79 quarters per tercile) of non-overlapping quarterly *changes in the year-on-year inflation rate*. These terciles correspond to three distinct regimes of quarterly falling (by at least 0.3%), unchanged (moving by less than +/-0.3%) and rising (by more than 0.3%) inflation rates, respectively.

We then perform a risk-adjusted return analysis conditional on these three regimes. As nominal returns do not take into account the increased loss of purchasing power that goes along with a high inflationary environment, we perform the analysis in both nominal and inflation-adjusted terms. Real returns, i.e. nominal returns adjusted for the rate of inflation, may provide a more accurate picture of a portfolio's hedging performance from the perspective of a US Dollar investor.

Figure 9a shows for each inflation regime the nominal and real (inflation-adjusted) annualized Sharpe ratios (based on quarterly returns in excess of a risk-free rate) of a buy and hold position in each of the four main asset classes and the three strategy portfolios. Figure 9b further breaks down the nominal returns of the three multi-asset strategies by the contributions of each asset class.

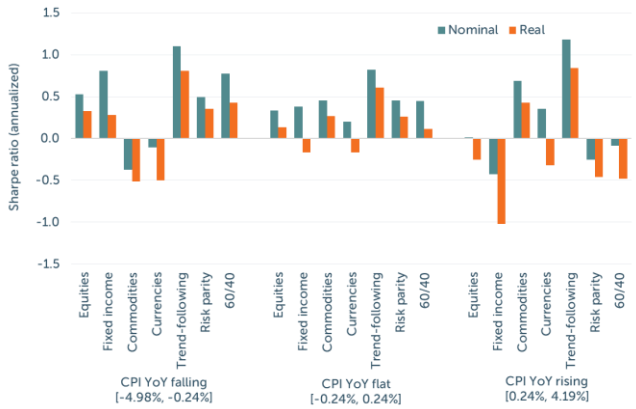

Figure 9a: Average *nominal* and *real* annualized Sharpe ratios of four major asset classes and three multi-asset strategies versus the contemporaneous change in the year-on-year inflation rate.

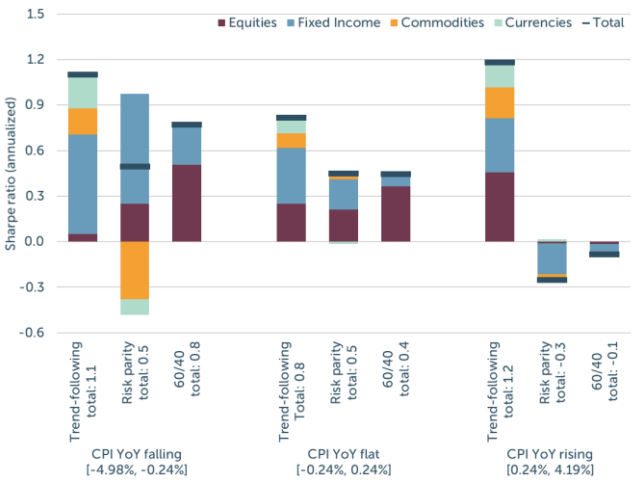

Figure 9b: Average *nominal* annualized Sharpe ratios of three multi-asset strategies versus the contemporaneous change in the year-on-year inflation rate, further attributed by individual asset classes.

In periods of rising inflation, commodities provide the best nominal and real risk-adjusted returns amongst all major asset classes, recording annualized positive nominal and real Sharpe ratios of 0.7 and 0.4, respectively. Conversely, bonds perform worst with a negative

nominal Sharpe ratio of -0.4, turning into a negative -1 after adjusting for inflation. Commodities seem in fact the only inflation-beating asset class in times of rising inflation.

In quarters of declining inflation, this pattern is reversed, with bonds offering the best risk-adjusted nominal and real returns (Sharpe ratios of 0.8 and 0.3 respectively), while commodities record negative nominal and real Sharpe ratios of -0.4 and -0.5, respectively.

The risk-adjusted return characteristics of equities deteriorate with rising inflation. Still, equity returns have proven to be resilient in such regimes with highly increasing inflation, with on average zero nominal returns and only a small negative realized Sharpe ratio of -0.3 in terms of real returns. Inversely, the risk-adjusted return characteristics of currencies improve with rising levels of inflation. While the asset class has produced positive nominal excess risk-adjusted returns in the upper two terciles, such returns are not enough to keep up pace with the rate of inflation. Particularly during quarters of falling inflation, currencies perform as poorly as their commodity counterparts, having recorded similarly negative Sharpe ratio characteristics (-0.5 in real terms).

As a result, both the 60/40 and the risk parity portfolio have historically recorded negative nominal and inflation-adjusted Sharpe ratios in quarters with rising inflation rates on average. This is consistent with the negative inflation hedging characteristics of equities and bonds outlined above.

Inversely, both portfolios have historically benefited from falling or muted inflation (lower two terciles), delivering strong nominal and inflation-beating risk-adjusted returns, supported by a generally negative equity/bond correlation, which has prevailed in such quarters. The long commodity risk allocation of a more broadly diversified risk parity approach, which represents one-fourth of the strategy's overall risk allocation, does not positively contribute towards compensating the negative contribution from equities and bonds in a rising inflation scenario.

Finally, if the last 50 years of data provide any guidance, nominal and real risk-adjusted returns offered by a generic trend-following strategy appear to be mostly insensitive to specific inflation regimes. Amongst all asset classes and strategies evaluated in this note, trend-following is the only portfolio that combines strong inflation hedging capabilities with the ability to generate strong and regime-independent inflation-beating long-term risk-adjusted returns. Hence, trend-following is the only strategy under consideration that offers *Smart Diversification* in different inflation regimes and has historically delivered positive expected returns in all different inflation scenarios. In addition, trend-following average risk-adjusted returns in rising inflation regimes are even higher than those offered by the aggregate commodity portfolio (the best-performing asset class portfolio when inflation is on the rise) in both nominal and real terms.

The cost of hedging inflation: Trade-off between hedging quality and long-term returns

Our regime conditional analysis shows that, like most hedges, static inflation protection does come with a cost. While, on average, asset classes with strong inflation betas such as commodities outperform during episodes of rising inflation, they typically underperform in periods with low or declining inflation. Especially in a deflationary environment, static inflation hedges may detract significantly from a portfolio's overall return.

We can corroborate this assessment by comparing long-term average risk-adjusted nominal returns and corresponding

unconditional (i.e. estimated across all quarters since 1962) inflation betas across our asset and strategy universe, such as shown in Figure 10.

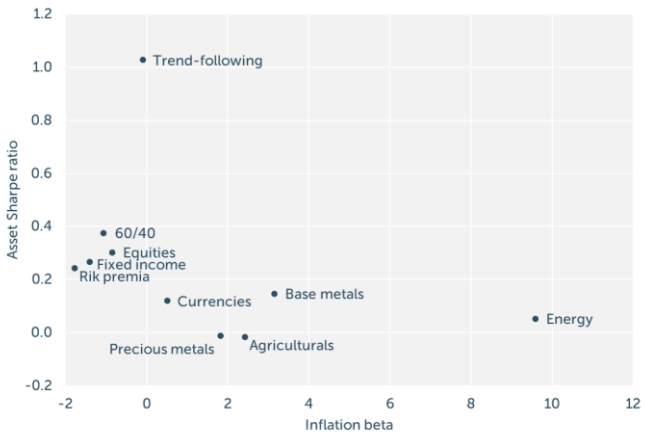

Figure 10: Average *nominal* annualized Sharpe ratios of different asset classes versus their inflation beta, estimated across all quarters between 1962 and 2021.

Assets with *highest* inflation betas (i.e. energy and metals) have also been those recording the *lowest* long-term realized Sharpe ratios since 1962. Equities, which provide poor inflation hedging characteristics, have delivered much stronger risk-adjusted returns than commodities in the long-run.

This is also why relying solely on a short bond position to hedge against the risk of rising inflation (as implied from the asset's strong negative inflation beta) may not necessarily lead to great overall risk-return characteristics. Historically, this is because bonds have delivered exceptional returns driven by a 30-year trend in declining yields. While such trend is unlikely to repeat in the near future, a bond's yield carry may still explain a large part of its total return. As a result, shorting bonds to hedge against inflation risk may come at the cost of paying a positive carry to hold onto such short positions.

The unconditional inflation beta of trend-following is insignificant, which implies that it is the only strategy under consideration that offers long-term uncorrelated returns. This means that there is no long-term inflation premium involved with trend-following strategies.

Like with any tail risk hedging strategy, inflation hedging requires to carefully balance between hedging efficacy and opportunity costs in the form of lower long-term risk-adjusted returns. The amount and type of inflation protection is driven by the investor's overall vulnerability/risk-tolerance to adverse inflation surprises.

Smart diversification: Trend-following protects against inflation risk while offering attractive long-term risk-adjusted real returns

The above observation is likely to be true for any static asset-based inflation hedge. Because trend-following can be highly dynamic and adaptive in its individual asset risk allocation across a widely diversified asset universe, the approach may offer a more cost-effective alternative to hedging against rising inflation. Contrary to a 60/40 or risk parity approach (having to follow a constant dollar and risk exposure, respectively), trend-following opportunistically scales in and out of individual long or short positions based on the instruments' current trend characteristics. The strategy allows to capture the upside of any persistent commodity trend that may originate from a period of rising inflation, while at the same time staying out of these markets in times of more reduced trend opportunities. As such, the intrinsic investment approach of trend-following makes it an ideal complement to any portfolio seeking to achieve real returns which are independent of an inflation regime.

Conclusion

Every crisis creates trends, and inflationary market episodes seem to be no different. Using almost 50 years of data, we have shown that a generic trend-following strategy provides attractive smart diversification against inflation risk, i.e. positive risk- and inflation-adjusted returns irrespective of low or high, declining or rising inflation. This is the result of the dynamic and adaptive nature of trend-following, which takes advantage of trends triggered by an inflationary environment across major asset classes. In contrast, "static" single or multi-asset class portfolios that provide strong inflation hedging characteristics come with the opportunity cost of weaker long-term adjusted returns, due to carry costs or adverse long-term trends.

As inflation betas for bonds and equities are negative, the widely adopted 60/40 and risk parity allocation schemes suffer from poor inflation protection. Historically, when inflation has risen meaningfully, correlations between equities and bonds have become positive, reducing portfolio diversification and risk-adjusted returns.

The intrinsic characteristics of the trend-following approach make it more likely to be successful in providing investors with regime-independent real returns. A trend-follower's asset class risk allocation is highly dynamic and diversified, which allows it to opportunistically capture inflation-driven market price dynamics across multiple asset classes, such as persistently rising commodity prices. At the same time, it may scale out of such dynamic inflation hedges if the underlying trends run out. This is why trend-following has the ability to generate sustainable long-term real returns and thus providing an effective hedge against inflation risk to any multi-asset portfolio.

References

[1] Both the risk parity and the generic trend-following strategy rely on an "expanding" universe, from 15 exchange-traded or equivalent synthetically reconstructed futures in 1962, up to 64 contracts since 1992 and onward. Further details about the underlying models, trading costs assumptions and universe construction methodology can be inferred from our December 2020 publication:

Quantica Capital, "A half-century of trend-following: How CTAs make money in different yield curve regimes", *Quantica Quarterly Insights, December 2020*.

[2] SG Trend Index; https://wholesale.banking.societegenerale.com/en/prime-services-indices/

[3] Federal Reserve Bank of Cleveland; https://www.clevelandfed.org/en/our-research/center-for-inflation-research/measures-of-expected-inflation.aspx

Appendix 1: Multiple measures of inflation

Measures of realized inflation, such as the CPI and PCE indicators, are complemented by measures of *expected* inflation. Two approaches have been developed to measure inflation expectations: model-based and survey-based measures.

The Federal Reserve Bank of Cleveland has been providing a model-based measure of expected CPI inflation for various time horizons since 1982. Estimates are updated on a monthly basis and coincide with the CPI release. Survey-based measures of expected inflation, such as the one released monthly since 1978 by the University of Michigan are derived by directly asking a sample of US households about the change in prices they expect during the next year, five and ten years.[3]

Finally, on any given day, current inflation expectations may also be implied from breakeven inflation rates reflected in Treasury Inflation Protected Securities (TIPS). The breakeven inflation rate, defined as the difference between the yield of a nominal bond and an inflation-linked bond of the same maturity, represent what market participants expect inflation to be in the next 5 or 10 years, on average. US inflation-linked government bonds were only introduced in 1997, which considerably shortens the analysis horizon, excluding any analysis of the inflationary periods of the 1970s and 80s when relying on breakeven inflation rates. Additionally, 5-year and 10-year breakeven inflation rates have hovered since their inception and with few exceptions in a narrow band between 1% and 2.5% reflecting the tamed inflation environment of the last two decades.

Figure A provides an overview of the long-term correlations between the quarterly changes of seven inflation measures.

	US CPI Headline	US CPI Core	US PCE Headline	US CPI Core Median	UMich Index of Consumer	5 year US breakeven inflation	10 year US breakeven inflation
US CPI Headline		0.56	0.89	0.32	0.48	0.50	0.53
US CPI Core	0.56		0.39	0.65	0.23	0.14	0.16
US PCE Headline	0.89	0.39		0.29	0.50	0.46	0.50
US CPI Core Median	0.32	0.65	0.29		0.19	-0.01	0.00
UMich Index of Consumer Expectations	0.48	0.23	0.50	0.19		0.57	0.57
5 year US breakeven inflation	0.50	0.14	0.46	-0.01	0.57		0.94
10 year US breakeven inflation	0.53	0.16	0.50	0.00	0.57	0.94	

Figure A: Correlations between quarterly changes in different inflation metrics

While quarterly changes in CPI and PCE based inflation on the one hand, and in 5-year and 10-year breakeven implied inflation on the other hand appear to be highly correlated, the average correlation between the other remaining pairs of inflation metrics can be qualified as rather low, varying between 0.2 and 0.6.

This simple analysis confirms that there is no single measure of inflation changes.

Appendix 2: The inflation hedging ability of individual commodities is closely related to their roll-yield characteristics

Unlike spot/physical commodity returns, commodity futures returns may be positively or negatively impacted by the shape of the contract's maturity term-structure. If the curve is in a state of backwardation (e.g. downward sloping), a so-called roll-yield may be earned by a long holder of the contract by "rolling up" the curve into the spot price. Inversely, when futures prices exceed spot prices (e.g. contango curve), the roll-yield becomes a cost to the long holder.

Figure B shows the long-term historical relationship between inflation betas and annualized roll-yields for our selection of commodity futures. The chart confirms that the level of inflation protection provided by a given commodity is explained in great part by the shape of its maturity term-structure and the implied return contribution from its roll-yield.

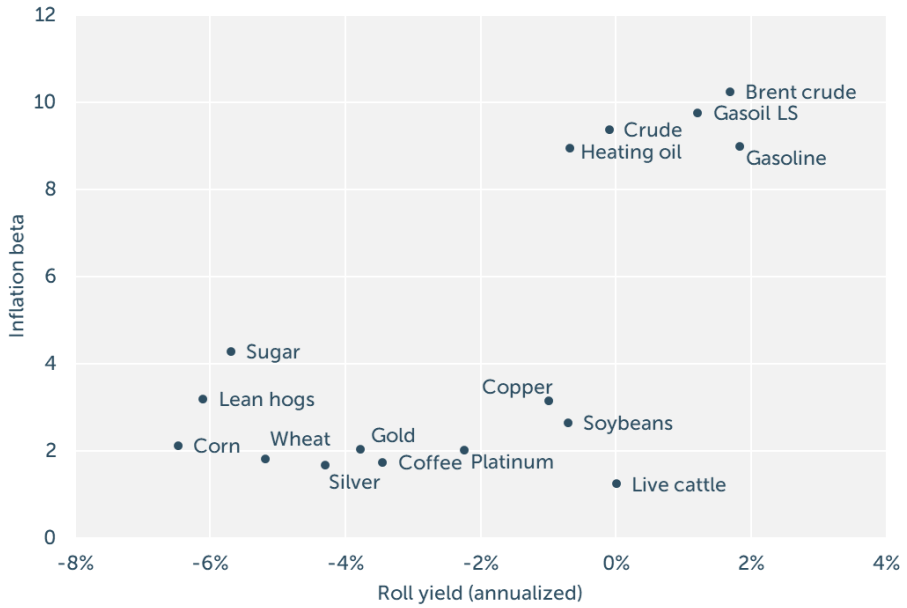

Figure B: Inflation betas versus annualized roll-yields for a representative set of individual futures contracts across major asset classes, estimated across all quarters between 1962 and 2021.

The roll yield may contribute significantly to the commodity future returns when the underlying physical commodity is in short supply, such as in a demand-driven inflationary environment. Similarly, high inventories, which may be associated with deflationary periods, may significantly reduce commodity futures returns.

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