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Quant Report

Multi-Assset Approach to Inflation Hedging

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Introduction

Abstract

The outbreak of the COVID-19 pandemic has caused turmoil in financial and monetary policies around the globe. Numerous governments have imposed quantitative easing policies in efforts to mitigate an economic catastrophe, reintroducing inflation to the discussion. Inflation is a critical factor for investors and market participants. Low-inflation environments in the past decade have allowed assets like core equities and conventional bonds to deliver stronger returns compared to inflation sensitive assets such as broad commodities, and treasury inflation-protec securities (TIPS). Under rising inflation environments, market participants may experience unexpected inflation shocks and a need to investigate inflation hedging strategies. With the current upward trend in inflation in 2022, it is worthwhile to seek out inflation-sensitive assets to gain protection from inflation shocks.

The last period of prolonged inflation occurred decades ago. Most investors and participants engaged in the financial market do not have sufficient experience to successfully adapt to the changing environment. The ultimate goal of this report is to construct a multi-asset inflation hedging portfolio that allows investors to gain protection from unpredictable inflation rates. The inflation sensitivity of various asset classes will be analyzed, identifying optimal strategies that perform better under different inflation regimes. A dynamic portfolio will be constructed that adjusts the allocation of weights for different asset classes in accordance with the inflation rate to hedge against inflation risk.

Theoretical Background

Asset Classes and Inflation Sensitivity

Since the overall objective is to explore different ways of constructing portfolios that can achieve standard risk-adjusted returns in low, mid, and high inflation regimes, different asset classes were chosen. Each asset class performs divergently in different inflation regimes. Below is the list of asset classes that have been used in the analysis. For simplicity purposes, S&P indices were selected over our own broad datasets.

S&P indices for each asset class	
Asset Class	Index Name
Bonds	S&P U.S. Aggregate Bond Index (TR)
Broad Commodities	S&P GSCI (TR)
Copper	S&P GSCI Copper (TR)
Crude Oil	S&P GSCI Crude Oil (TR)

Equity	S&P Composite 1500 (TR)
Gold	S&P GSCI Gold (TR)
Inflation-Protected Bonds	S&P U.S. TIPS Index (TR)
Real Estate	S&P United States REIT (USD) (TR)

Since U.S based indices were used, the U.S. CPI data was utilized to measure the inflation sensitivity of each asset class. Inflation beta measures the inflation sensitivity in this report. The inflation beta of an asset evaluates how much an asset's price drives on average corresponding to a rise or fall in inflation, and it is a practical indicator that shows each asset's hedging ability against expected and unexpected inflation. Equities and bonds are known to be suboptimal during relatively high inflation but sometimes tend to compensate more than inflation-protected assets in a predictable rise of inflation. However, they still suffer from a sudden increase in inflation. On the contrary, a mix of commodities like gold, copper, and crude oil, known as real assets equities, responds more favorably to high or rising inflation regimes. TIPS issued and guaranteed by the US government, get rid of inflation drawdowns, but only preserves the capital invested in TIPS, and does not perform strongly to unexpected inflation

Dynamic Portfolio

Different asset classes have differentiating inflation sensitivities, portfolio construction with a fixed allocation of major asset classes cannot provide satisfying risk-adjusted returns in every inflation regime. Hence, several model portfolios were constructed that hedged well in varying inflation regimes and switched between the combinations of the model portfolios which performed better in low, mid, and high inflation situations at regular intervals. Different combinations of growth-oriented and inflation-sensitive asset classes were considered and tactically adjusted the portfolio allocation periodically, returning the best potential reaction to the inflation-regime. Higher equity exposure to hedge against expected inflation and perform well in low inflation, would offer great growth potential, whereas the tactical allocation to inflation sensitive assets such as TIPS and real commodities, would protect the portfolio from unexpected inflation. Under the assumption that an investor should construct a portfolio with higher equity exposure during low inflation, a portfolio with low volatile assets during medium inflation, and a portfolio with inflation sensitive assets during high inflation.

Methodology

Strategy Selection

Due to the complex nature of the financial market and the overwhelming amount of financial data, this report presents a simplified multi-asset portfolio based on a look back period between October 2012 to October 2022. Within the defined time frame, the monthly change in CPI was used as an indicator for high, low, and medium inflation regimes. Any inflation value above the upper quartile within this time frame was labeled to be high inflation, any value below the lower quartile was labeled as low, and any value that was in between the interquartile range (IQR) was classified as medium inflation.

Under the two defined constraints, a variety of investment strategies and weight allocation methods were explored for the different inflation regimes. These are: Equally Weight Portfolio (EqWt), 60/40 (60/40), Proportional to Inflation Beta (ProIB), and Weights Inversely Proportional to Volatility (VolWt).

The EqWt portfolio is self-explanatory, it allocates weights equally across all 8 asset classes. The 60/40 portfolio places 60% of the weight on Equities and 40% on Bonds. The ProIB portfolio allocates higher weights to asset classes with higher inflation sensitivity. The inflation beta is calculated by running an ordinary least squares (OLS) regression of the rolling 12-month cumulative return R(12m) against the inflation rate(I) as below.

$$R_{12m} = \alpha + \beta I$$

Given the inflation beta $\boldsymbol{\beta}$ of each underlying index, the weights of the ProIB portfolio are calculated as:

$$W_k = \frac{B_k}{\sum_k B_k}$$

$where$:

$$B_k = 1 + B_k \qquad if\ B_k \geq 0\ , else\ \frac{1}{1 - B_k}$$

The VolWt portfolio allocates weights that are inversely proportional to the volatility of the asset. The volatility of each asset is given by the following formula:

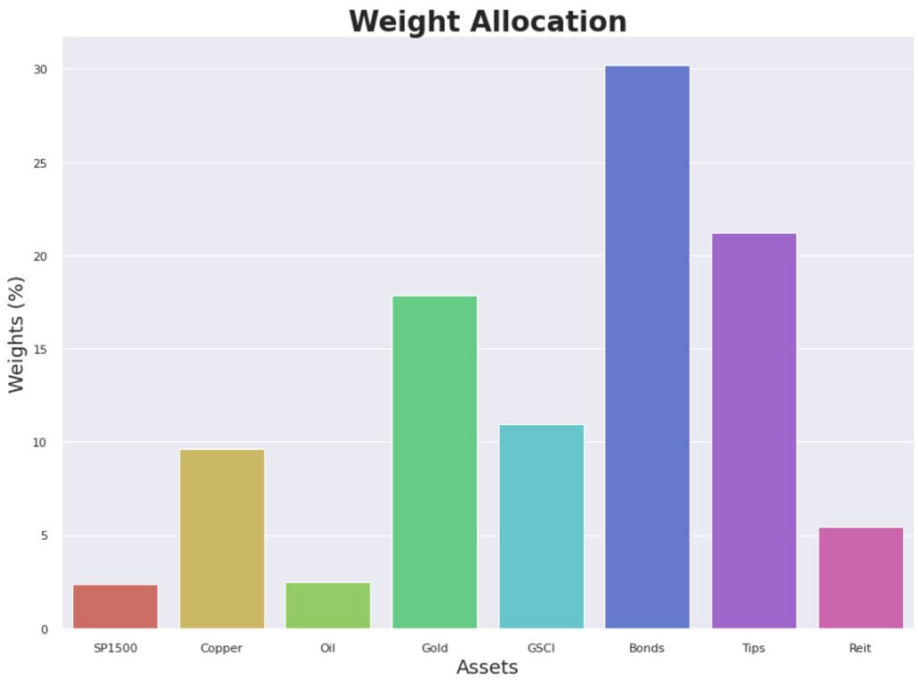
$$Vol_k = \sqrt{\frac{1}{N-1}(\sum_i R_{i,k} - R_k^-)^2}$$

The weights are then calculated inversely proportional to the volatility:

$$N = Look\ back\ window\ in\ Months, R = Monthly\ Total\ Return, R_k^- = Average\ Return\ over\ N$$

$$W_k = \frac{\frac{1}{Vol_k}}{\sum_k \frac{1}{Vol_k}}$$

The VolWt strategy overweights asset classes that have lower volatilities, resulting in a more balanced risk contribution. The weight allocation can be demonstrated in the chart below:



Portfolio Formulation

From the 4 proposed weight allocation strategies, 4 portfolios were constructed. Theoretically, the ProIB strategy was selected under higher inflation regimes. Allocating larger weights to asset classes with higher inflation beta results in greater returns. The EqWt strategy and 60/40 were used for lower regimes. These strategies had relatively higher allocations to equities and bonds, which are asset classes known to perform better in low inflation environments.

The 4 portfolios formulated for this report are the following:

60/40_VolWt_ProIB

Inflation Levels	Strategy
Low	60/40
Medium	VolWt
High	ProIB

60/40_ProIB_ProIB

Inflation Levels	Strategy
Low	60/40
Medium	ProIB
High	ProIB

EqWt_60/40_ProIB

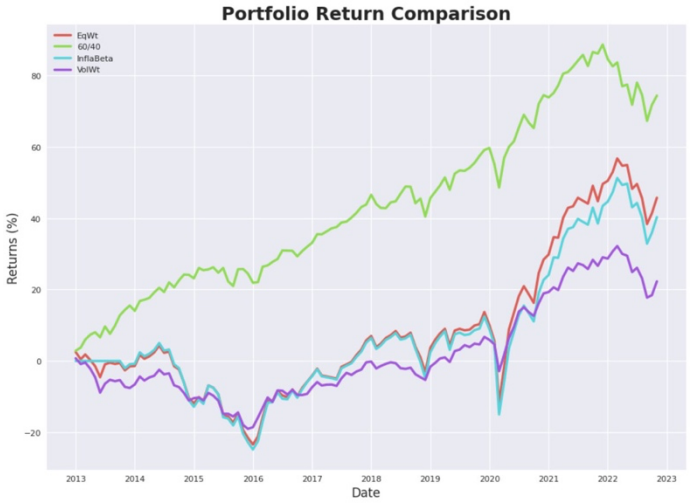
Inflation Levels	Strategy
Low	EqWt
Medium	60/40
High	ProIB

EqWt_ProIB_ProIB

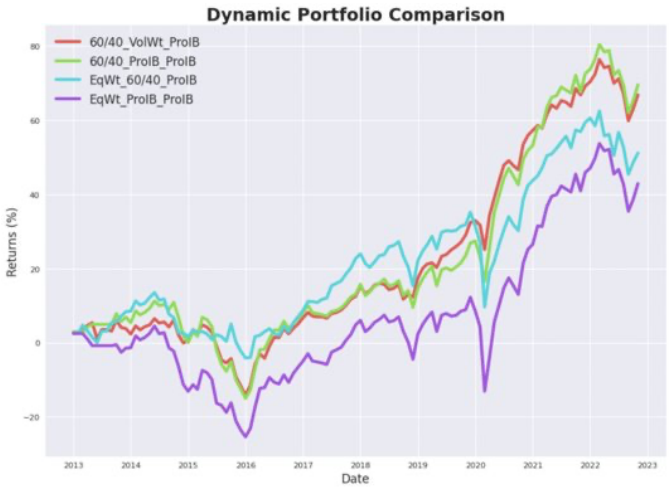
Inflation Levels	Strategy
Low	EqWt
Medium	ProIB
High	ProIB

Performance Results

Below is the result of the comparison of the different model portfolio strategies.



The 60/40 portfolio had the highest return overall but experienced a drastic fall in return since the end of 2021 when high inflation has taken place. VolWt portfolio had the lowest return overall but hedged better in the inflation drawdowns. We pursued long-term real purchasing power by a strategic adjustment of portfolio allocations by switching between the model portfolios in response to varying growth and inflation dynamics. Below is a comparison of the combination strategies of model portfolios at different inflation levels.



The 60/40_ProIB_ProIB and 60/40_VolWt_ProIB portfolios had a higher return than the other two strategies since 2020. However, the 60/40_VolWt_ProIB strategy hedges better in the several drawdowns because it includes the portfolio with low volatile asset classes.

Conclusion

The performance results of the constructed dynamic portfolio suggest using a multi-asset portfolio can bring optimal returns under different inflation regimes. Allocating weights to the different asset classes based on inflation sensitivity clearly has its benefits. However, the limitations of the report make it difficult to draw further conclusions.

Limitation

Two major drawbacks of this report are the lookback period and the formulation of the different inflation regimes. The look-back period for the dynamic portfolio was 10 years (N = 120). The past decade has had the lowest inflation rates in history, owing to a 'bull' market where equities and bonds outperformed all other assets. Hence, portfolios with higher weights allocations to these asset classes capitalized over other portfolios. If the look-back period was increased to 20 years (N = 240), or even 30 years (N = 360) – different weight allocations will have occurred. Inflation sensitivity has proved asset classes with higher inflation beta such as broad commodities generate higher returns under medium and high inflation regimes. Less weight will be allocated to equities and bonds. This directly impacts the second limitation of the investigation.

The formulation of the inflation regimes can be criticized. The concrete values of the high and low inflation regimes are respectively: 0.42, and -1.03. The regimes are defined for 'relatively' high and low changes in inflation values within the look-back period – where inflation rates were at a historical low. Both of these values in the real-world market can actually be considered as low inflation if we increase the lookback period as proposed above. Hence, it is difficult to draw conclusions on whether the constructed portfolio will actually perform well under high inflation environments. What can only be demonstrated is the correlation between the returns of inflation-sensitive assets to the relative inflation rates within the given lookback period. Under relatively high and low inflations, it seems the strategy proposed in this report is effective for hedging under a rising inflation environment.

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