Inflation Hedging Tools—
What Works and What Doesn't

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KEY FINDINGS

- Gold and TIPS bonds are remarkably poor mitigants against inflationary surprise.
- Oil, silver, diversified commodities, and agricultural foodstuffs are the most effective mitigants and strongly dominate all others.
- Successful mitigation relies critically on applying the mitigant with the correct level of frequency (not too often, and not too infrequent), and the correct dosage size.

ABSTRACT

Inflation hit 9.1% year-over-year, spurring significant concern on the part of both institutional and retail investors. Examining the behavior of a 60/40 stock/bond portfolio over the 108.4 years (ending 2/28/2023) one finds that it returned an inflation-adjusted return of 8.44% during the 75% of the months during which inflationary surprise was at its lowest. But it lost –5.18% per annum during the 25% of the months when inflationary surprise was at its highest. These data suggest that investor attention to this topic is well placed. Investors, investment managers, advisors, and strategists often discuss gold, TIPS bonds, and diversified commodities as effective, useful mitigants. But are they? This article considers twenty-nine different mitigants over the time period spanning 1914 through today and identifies those mitigants that are effective and those that are not. It presents results that strongly support the conclusion that both gold and TIPS are remarkably poor mitigants. This result is not surprising, given that gold is driven, in large measure, by its use as an event-risk mitigant, both domestic and international. Moreover, gold lacks any significant industrial use. In a similar fashion, TIPS bonds carry significant interest rate risk, which serves to disrupt their use as an inflationary surprise mitigant. The largest TIPS ETF ("TIP") carries an effective interest rate duration of seven years. This article shows that the most effective mitigant is a 50/50 blend of broadly diversified commodities and wheat. The inclusion of wheat may be an indirect way of reducing the overall weighting to fossil fuels. Perhaps fossil fuels are playing a reduced role and agricultural foodstuffs an expanded role, as the global economy becomes less energy-intensive and the middle class grows. Finally, it is shown that the benefits of inflationary surprise mitigation rely, in large measure, on the frequency with which the mitigant is applied (not too often, but still often enough) and the dosage size. Moreover, although correct timing is highly beneficial, the benefits of mitigation still accrue to those who arrive surprisingly late to the party.

Year-over-year CPI inflation spiked to 9.1% as of 6/30/2022. This was a forty-one-year high, i.e., the highest level since November 1981. Nor is inflation a U.S.-based problem; instead, it is present at similar or higher levels throughout the global economy. As a result, interest in portfolio protection against inflationary surprise has grown. Nevertheless, is this an important topic, one to which investors should assign serious attention? The answer is yes. Consider the 108.4 years spanning 9/30/1914 through 2/28/2023. During this time period, a simple 60/40 stock/bond portfolio returned an inflation-adjusted return of 8.44% during the 75% of the months when inflationary surprise was at its lowest. In contrast, this same portfolio returned an inflation-adjusted loss of –5.18% during the 25% of the months when inflationary surprise was at its highest. Clearly, successful mitigation offers out-sized benefits.

Many have suggested that both gold and TIPS bonds are effective mitigants against inflationary surprise. But are they? They are widely used, but is their popularity grounded in fact or in fantasy? This article has as its objective to review the full array of possible inflationary surprise mitigants and determine which work and which don't. A secondary objective is to determine how much of the portfolio needs to be allocated to the mitigant and for how long. Finally, results are presented that speak to the performance impact of being either early or late in the application (addition and subsequent removal) of the mitigant to the investor's portfolio.

To explore these issues, I assume a baseline 60/40 stock/bond portfolio devoid of commodities. Next, this article assumes an investment objective defined by a ten-year investment period and an absolute real return objective. A crisp/clear definition of inflationary surprise is provided. Finally, a series of twenty-nine different possible inflationary surprise mitigants are examined. These four structural assumptions are fleshed out in the following, each in turn.

THE BASELINE UNPROTECTED PORTFOLIO

A 60/40 stock/bond portfolio is selected because it is probably the single most popular asset mix in use today. Both stocks and bonds are 50% U.S. and 50% non-U.S. This balance between domestic and international was selected to avoid the ex-post cherry-picking problem resulting from the selection of the single best performing country over the last 100 years, i.e., the U.S. (Dimson et al. 2002, Global Financial Data, Inc. 2022, Ibbotson and Brinson 1987, Reid et al. 2020, Brown 2023a, b).

All nations rise and subsequently fall. No nation has been able to maintain unending dominance. Instead, nations cycle. So, unless the investor commands the unique ability to accurately know the future, then the average returns from across the full diversity of nations, becomes the more reasonable and representative basis for understanding how the future is likely to unfold. I adopt this approach throughout this article. Again, the use of a 50/50 U.S./non-U.S. portfolio is not intended as a recommended asset mix. It is used only to avoid ex-post cherry-picking of the best performing country from among the many, over the last 100 years. Keep in mind that the U.S. transitioned from an explosive embryonic nation, to a rapidly growing emerging country, to a young formative developed economy, and, finally today, to that of a mature slow-growing developed nation. As a result, growth of the U.S. economy, population, and prosperity-level slowed in a consistent and unrelenting fashion as the nation matured over the last 150 years (Brown 2023b).

To capture behaviors across the full range of investment market and macroeconomic environments, data is used that spans the period September 1914 through February 2023. This article's analysis takes the following approach:

- Stocks are 50% U.S.[1] and 50% non-U.S.[2] with monthly rebalancing (to avoid ex-post cherry-picking)
- Bonds are also 50% U.S.[3] and 50% non-U.S.[4] with monthly rebalancing (to avoid ex-post cherry-picking)
- Data is drawn from 1914 through the present[5] (reliable unbiased returns are available from this point forward)
- All results are adjusted for inflation[6] (inflation has varied to such an extent over the millennia, that analysis without inflation-adjustment would be misleading … and investors only care about their standard of living, i.e., what they're able to purchase with their investment savings, whether IRA, 401k, 529, or HSA)
- Monthly total returns are utilized

THE INVESTMENT OBJECTIVE

To determine whether the addition of a specific mitigant is beneficial during times of high inflationary surprise, I must first specify the portfolio's investment objective. If investment market returns were actually iid (independent and identically distributed), we might consider specifying the objective in terms of the expected return, standard deviation, and Sharpe ratio for monthly returns. However, investment markets are not iid; they do not follow a random walk, where one period's return is unrelated to its prior. Stocks, bonds, and commodities experience potent bull and bear markets. Episodic eras do exist, during which, for example, interest rates, inflation, and even currencies may rise or fall for multiple decades (not years). Trending and momentum are fundamental defining elements across stocks, bonds, commodities, currencies, domestic, and international … and, most important, for inflation.

The misguided approach that one model investment market returns using iid random variables defined with simple means, standard deviations, and correlation coefficients, provides the basis for seeking return- and risk-mitigation-opportunities defined at each individual moment in time. In other words, how do I beat my benchmark each individual period? Such an approach is in conflict with a more genuine and real-world approach, one driven by the presence of powerful trending behaviors across the full range of investment markets and consumer price inflation (Brown 2018; Brown 2022; Brown 2023b; Asness et al. 2014; Hurst et al. 2017; Ilmanen et al. 2019; Montier and Tarlie 2022).

[1] U.S. stocks are represented by a 50/50 blend of the S&P 500 and the Dow Jones Industrials with monthly rebalancing.

[2] Non-U.S. stocks are represented by an equal-weighted blend across twelve countries with monthly rebalancing (Australia, Canada, Denmark, France, Germany, India, Ireland, Japan, New Zealand, South Africa, Spain, and the United Kingdom).

[3] U.S. bonds are represented by a blend across five types of bonds with monthly rebalancing (12.5% GFD Indices USA 10-year Government Bond Total Return Index, 12.5% GFD Indices USA Total Return T-Bill Index, 12.5% BofA Merrill Lynch US Inflation-Linked Treasury Total Return Index, 12.5% USA 5-year Government Note Total Return Index, and 50% GFD Indices USA Total Return AAA Corporate Bond Index).

[4] Non-U.S. bonds are represented by the GFD Indices All-World x/USA Countries Government Bond GDP-weighted Return Index.

[5] All returns are total returns and provided by Global Financial Data, Inc. as of March 19, 2023.

[6] Inflation is defined by the All-Urban Consumer Price Index without Seasonal Adjustment.

For this reason, I define the portfolio's investment objective in a more practical and realistic fashion. "Success" is defined as earning at least 2.623% over and above the rate of inflation for a ten-year investment period. The portfolio's explicit investment objective is to maximize the probability of realizing "success." Where did the "2.623% number" come from? The 60/40 portfolio described previously earned at least 2.623% over ten-year investment periods 70.0% of the time. Essentially, the use of a mitigant during times of extreme inflationary surprise is to raise the likelihood of success as far above 70.0% as possible, for a randomly selected ten-year window drawn from data spanning September 1914 through February 2023. Exhibit 1 summarizes the explicit investment objective.

Could this article restrict its analysis to just those isolated months when inflationary surprise exceeded some predetermined level? No. Adopting such an approach runs the risk (and even high likelihood) that the results would be misleading if the benefits of mitigation were all concentrated within a single standalone time period (or a small number of periods), as opposed to being uniformly distributed across all possible periods. This observation provides one additional motivation for adopting the ten-year investment time interval described and the associated investment objective defined by a probability.

THE DEFINITION OF INFLATIONARY SURPRISE

Investment markets are far more affected by inflationary surprise than they are by high absolute levels of inflation. Moreover, the affects are more consistent across time for "surprise" versus absolute levels. But this leaves us with the need for a crisp/clear definition of "inflationary surprise." This article defines inflationary surprise as the percentage the current CPI[7] index lies above/below its average level over the last eleven months (which includes the current month). This is consistent with the approaches taken by Brown (2018, 2022, Brown 2023a, 2023b). It is also the definition that was used in the introduction, which identified a 1362bps annual performance gap for the 60/40 portfolio between periods of low and high inflationary surprise.

Exhibit 2 shows the incidence and severity of inflationary surprise since 1914. The height of the bar shows the severity, i.e., the definition described above. Only

EXHIBIT 1

Probability of Success

Stated Investment Objective

Maximize the probability of earning at least 2.623% real retum over a randomly selected 10-year period

Basis

Since 1914, the passive 60/40 stock/bond portfolio earned at least 2.623% real return during 70% of all possible 10-year investment periods

This computation gave equal-weight (equal-emphasis) to each of the monthly returns since 1914

Assumed Investment Portfolio

60% stocks, 40% bonds, rebalanced monthly

Stocks are 50% US and 50% international

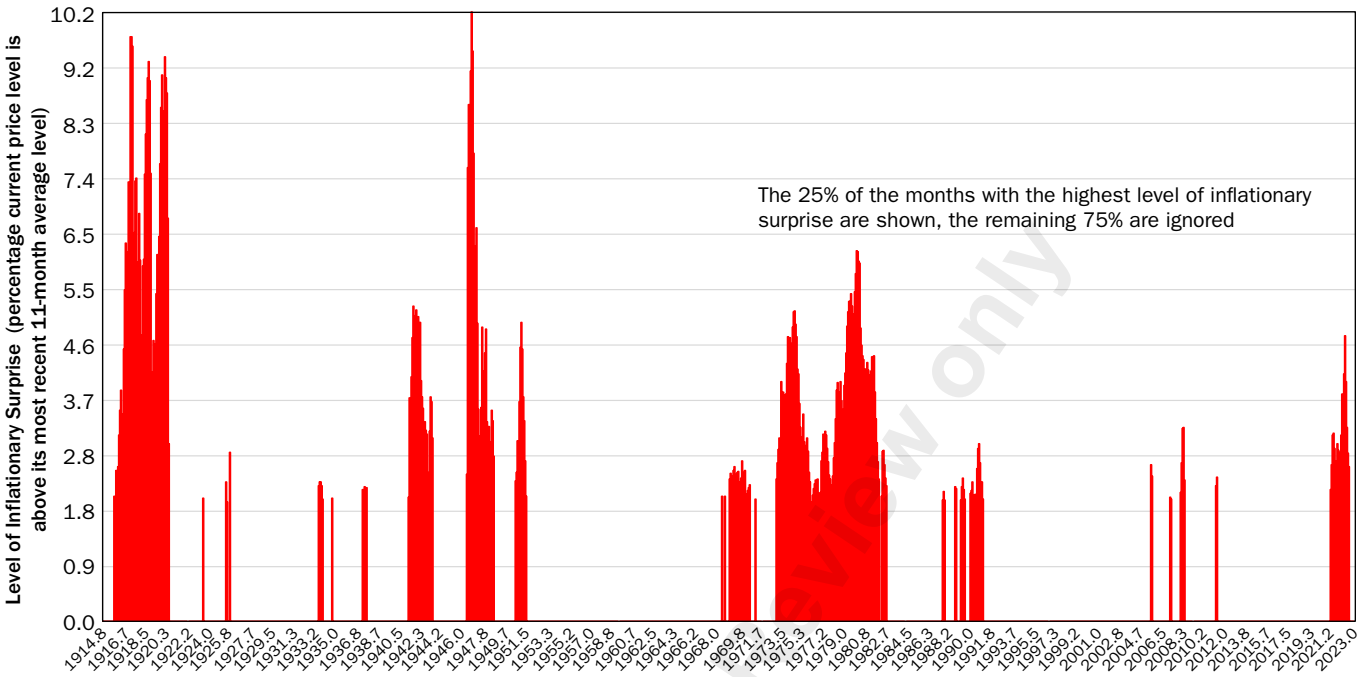
Bonds are 50% US and 50% international

International stocks are equally-weighted across 12 countries, rebalanced monthly

[7] CPI is defined as the All-Urban Consumer Price Index without Seasonal Adjustment, 1982–84 Base.

EXHIBIT 2

Inflationary Surprise, When and How Severe



values for the 75th-percentile and above are depicted. In other words, Exhibit 2 shows the 25% of the months when inflationary surprise was at its most extreme.

The definition of inflationary surprise and its profound impact on the performance of the 60/40 portfolio beg the question as to how does one identify or forecast such periods in advance, so that beneficial actions can be taken in a timely fashion. However, this question remains out of scope for this article. Nevertheless, I return to this question at the end of this article with several pertinent and useful observations.

THE 29 POSSIBLE INFLATIONARY SURPRISE MITIGANTS

While identifying the possible inflationary surprise mitigants, we assume that the investor lacks both the size and sophistication to be considered truly institutional in character. Effectively, this restricts their implementation to the use of ETFs. This is a pertinent distinction. Consider for a moment how, in the field of energy, the noninstitutional investor is restricted to oil and/or natural gas (at this moment). In contrast, the institutional investor could consider the market for electricity futures (an approach that proceeds one step beyond simple fossil fuels). This article further restricts its analysis to asset categories for which quality monthly returns exist back to September 1914. This requirement rules out assets such as natural gas or 1-year U.S. Treasury bonds.

Today, retail investors are able to use ETFs delivering exposure to diversified precious metals (Aberdeen Physical Precious Metals Basket Shares, GLTR) and diversified base metals (Invesco DB Base Metals Fund, DBB). For this reason, this article has developed commodity portfolios intended to mimic these two ETFs. I have also included three 50/50 blends based on the four most effective inflationary surprise mitigants.

Finally, I also consider domestic, international, and global stocks and bonds as possible mitigants … in addition to five different types of U.S. bonds. These are examined to explore the possibility that commodities are nothing more than a way of "getting out" or "moving away from" the traditional 60/40 portfolio, as opposed to providing any meaningful hedge against inflationary surprise. Exhibit 3 describes the twenty-nine possible mitigants examined herein.

Of the twenty-nine possible mitigants, one series did not go back to September 1914, i.e., TIPS bonds. TIPS are widely used by retail investors, investment

EXHIBIT 3

Asset Categories Examined for Mitigation of Inflationary Surprise

Diversified

- Reuters CRB Total Return Index (with GFD extension)
- Thompson Jefferies CRB Core Commodity Total Return Index (with GFD extension)
- Thomson Reuters Core Commodity CRB Index (with GFD extension)

Energy

- West Texas Intermediate Oil Price (US$/Barrel) (with GFD Extension)

Base Metals

- Aluminum Spot Price (USD/Ton) (with GFD Extension)
- Zinc Special High Grade ($/Ton) (with GFD Extension)
- High Grade Copper (US Cents/Pound) (with GFD Extension)
- Diversified Base Metals (mimics the Invesco DB Base Metals ETF)

Agricultural

- World Bank Agriculture Commodity Price Index
- Wheat cash price

Precious Metals

- Silver Cash Price (US$/Ounce) (with GFD Extension)
- Gold Bullion Price-New York (US$/Ounce) (with GFD Extension)
- Palladium (USD per Troy Ounce) (with GFD Extension)
- Platinum Cash Price (US$/Ounce) (with GFD Extension)
- Diversified Precious Metals (mimics the Aberdeen Physical Precious Metals Basket Shares ETF)

Bonds

- GFD Indices USA Total Return T-Bill Index
- USA 5-year Government Note Total Return Index
- GFD Indices USA 10-year Government Bond Total Return Index
- BofA Merrill Lynch US Inflation-Linked Treasury Total Return Index
- GFD Indices USA Total Return AAA Corporate Bond Index
- US Bond Composite
- GFD Indices All-World x/USA Countries Government Bond GDP-weighted Return Index
- Global Bond Composite

Stocks

- US Stock Composite
- International Stock Composite
- Global Stock Composite

Blends

- 50% Silver and 50% Reuters CRB Total Return Index (with GFD extension)
- 50% Wheat and 50% Reuters CRB Total Return Index (with GFD extension)
- 50% Silver and 50% West Texas Intermediate Oil Price (US$/Barrel) (with GFD Extension)

advisors, and financial planners. They are characterized as an effective and powerful mitigant against inflationary surprise. Retail investors have been led to believe that if they desire protection against inflation, then they should use TIPS bonds. It would be a disservice to discuss inflation mitigation and ignore the single most commonly used tool within the retail community. Therefore, this article must estimate TIPS past behavioral attributes. This is not an unusual approach, and is frequently found throughout the institutional investment industry. For example, it is commonly seen in the area of options pricing, where index option characteristics are modeled back in time to cover past historic periods. It is also found throughout commercial real estate and bond pricing, where standalone property and individual bond prices are estimated.

For the period 1997 through the present, live TIPS data were employed. Prior to 1997, an estimation of monthly TIPS returns was developed using stepwise regression. Live TIPS data was sequentially regressed on a host of return series, selecting the top six that contributed most strongly to the adjusted R-square statistic. Exhibit 4 provides the structure of the stepwise regression.

I want to be careful here. The objective is not to state exactly what TIPS would have earned month-by-month since 1914. Instead, the objective is to provide a sufficiently accurate/relevant set of risk-factor loadings to allow this article to evaluate the inflation mitigation properties of TIPS bonds. Certainly, the factor loadings identified in Exhibit 4 are logical and as expected and the resulting return, risk, and autocorrelation are consistent with near non-TIPS Treasuries.

GOLD AS AN INFLATIONARY SURPRISE MITIGANT

I start the analysis with gold, since it is one of the most popular or at least most commonly referenced mechanisms for protection against inflation. The fundamental question being, does gold help, hurt, or have no impact? Two additional variables are present in the analysis. First, one must decide what portion of the portfolio to allocate to the mitigant. Second, one must decide how frequently to apply the mitigant,

EXHIBIT 4

TIPS (Treasury Inflation-Protected Securities) Estimation Prior to 1997

Stepwise Regression Statistics				
R Square	0.55			
Adjusted R Square	0.54			
F Statistic	75.4			
Observations	312			
Factor Loadings		**Long/Short**	**t Statistic**	**P-Value**
10-year US Treasury Bond		long	17.4	0.0000
International Stock Composite (not currency hedged)		long	5.1	0.0000
Spot Platinum		long	4.1	0.0000
World Bank Agricultural Price Index		long	3.4	0.0008
Consumer Price Index (all Urban Consumers, NSA)		long	3.1	0.0025
Comparison - TIPS versus 10-year Treasuries		**Return**	**Standard Deviation**	**Autocorrelation**
10-year US Treasury Bond		4.7	6.3	0.12
TIPS Bonds		5.0	4.8	0.12

i.e., above what percentile level for the measure of inflationary surprise does one add the mitigant. Exhibit 5 provides the results.

The vertical axis measures the probability of success. Recall that the unprotected 60/40 portfolio has a 70% likelihood of success. The horizontal axis identifies the percentile level for the measure of inflationary surprise above (below) which gold is added (subtracted) to the portfolio.

Five lines appear in this exhibit, each corresponds to a different allocation of gold, ranging from a low of 5% to a high of 40%. The probability of success is maximized if 40% of the portfolio is allocated to gold when the measure of inflationary surprise rises above its 47th percentile level. In other words, gold would be present in the portfolio during 53% of the months, resulting in an average long-run allocation to gold of 21.2%. This application resulted in the probability of success rising from 70.0% to 80.6%. A final takeaway from this exhibit is the observation that allocating 5% of a portfolio to gold has a negigible impact, i.e., it is nothing more than an irritant.

This is an interesting result and identifies gold as a possible mitigant, but it leaves unanswered gold's relative benefits versus other mitigants. It also leaves unanswered what the risks or downsides might be associated with the use of gold. These two issues will be fleshed out in the following. But first, we turn to an initial assessment of TIPS bonds as a mitigant against inflationary surprise.

TIPS BONDS AS A MITIGANT

TIPS bonds are incredibly popular among retail investors, investment advisors, and financial planners. Conventional wisdom is that if you need/desire protection against inflation, then you should use TIPS bonds. But do they work? Exhibit 6 provides the analysis and is presented in a fashion identical to that previously used for gold.

EXHIBIT 5

Gold Bullion as Mitigant Against Inflationary Suprise

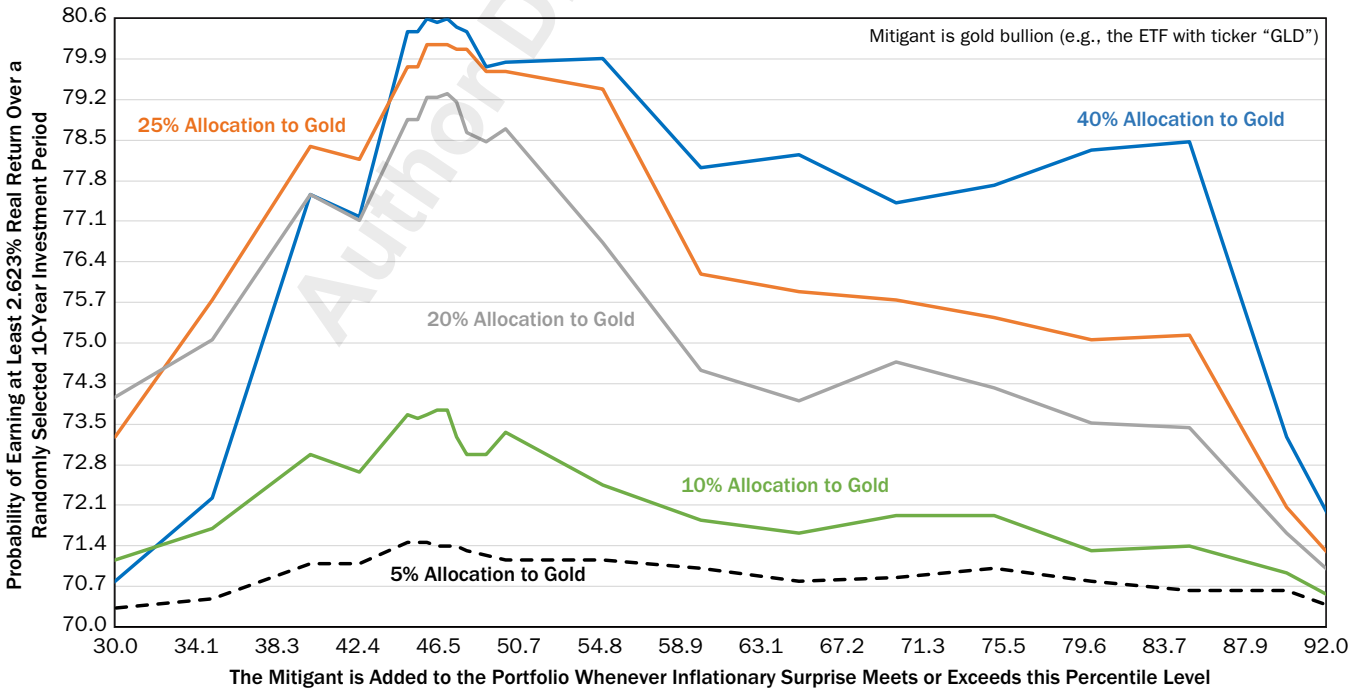
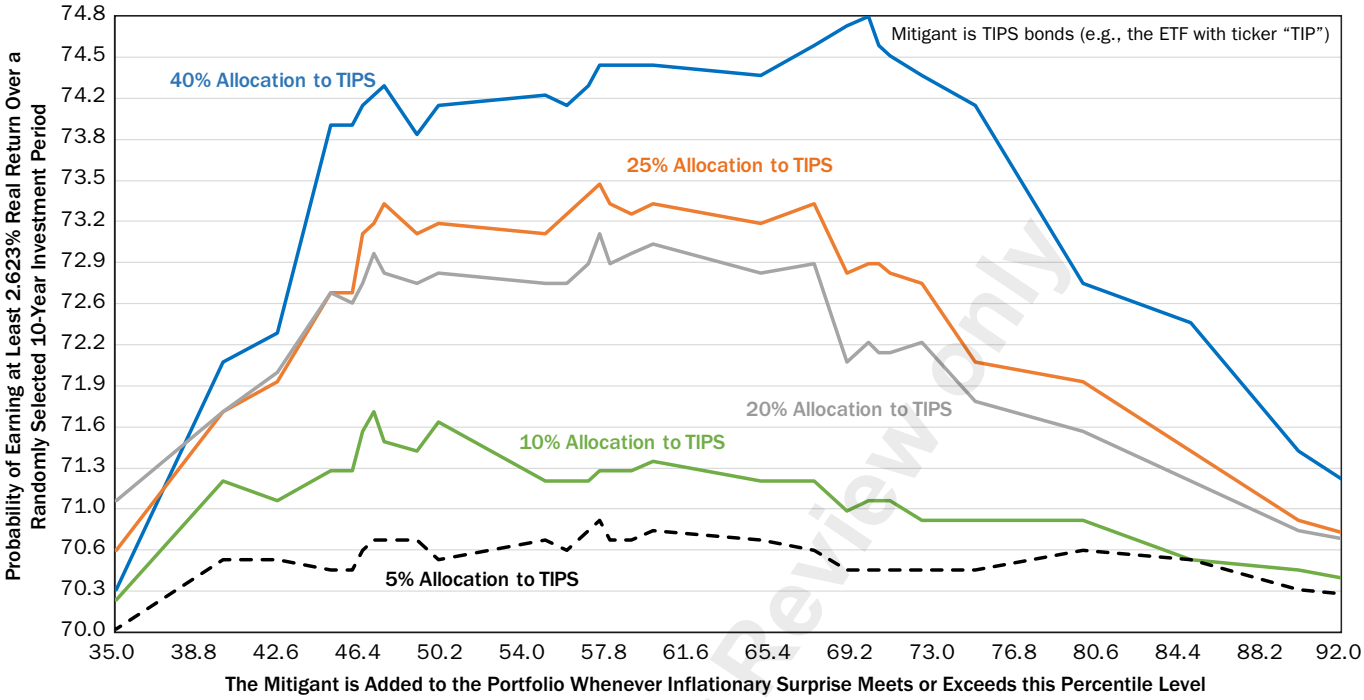


EXHIBIT 6

TIPS Bonds as Mitigant Against Inflationary Surprise



The vertical axis shows the probability of success, the horizontal, how often TIPS are added to the 60/40 base-portfolio. Each of the five lines corresponds to a different TIPS dosage. In a word, the results are disappointing, and not unexpected.

The probability of success is maximized if 40% of the portfolio is allocated to TIPS when the measure of inflationary surprise rises above its 70th percentile level. In other words, TIPS would be present in the portfolio during 30% of the months, resulting in an average long-run allocation to TIPS of 12%. This application resulted in the probability of success rising from 70.0% to 74.8%. Such a modest improvement, although statistically significant, remains uninteresting. And benefits from a better understanding of why TIPS are such a poor method for protecting against inflationary surprise.

Consider the recent period, when one desperately needed TIPS to work. Consider March 9, 2020 through the present (March 19, 2023). During this 36.3-month period, YOY CPI inflation rose from a low of 0.1% to a high of 9.1%. Surely, if TIPS are an effective inflation protection tool, then their return should be attractive during this time period. Unfortunately, as measured by the single largest TIPS ETF (TIP), TIPS delivered a loss of –12.7% (unannualized total return, inflation-adjusted). If they didn't work during such a period, then they never will. But why?

Refer back to Exhibit 4; TIPS single largest risk-factor loading is to intermediate-term U.S. Treasury bonds. In other words, TIPS carry significant interest rate risk. More specifically, consider four of the largest and most popular TIPS ETFs. The iShares TIPS Bond (TIP), SPDR Portfolio TIPS (SPIP), PIMCO 15+ Year US TIPS (LTPZ), and the SPDR FTSE International Government Inflation-Protected Bond (WIP) have interest rate durations[8] of 6.9–, 7.2–, 19.7–, and 10.0–years, respectively. Consider for a moment the conversation between the retail client and their investment advisor. Client says,

[8] Interest rate durations provided by YCharts as of March 19, 2023.

"You told me that you were putting TIPS into my portfolio to protect against inflation. Inflation rose from 0.1% to 9.1%. During this period, my TIPS bonds lost –12.7%. You're fired." Let's next turn to diversified commodities.

DIVERSIFIED COMMODITIES AS A MITIGANT

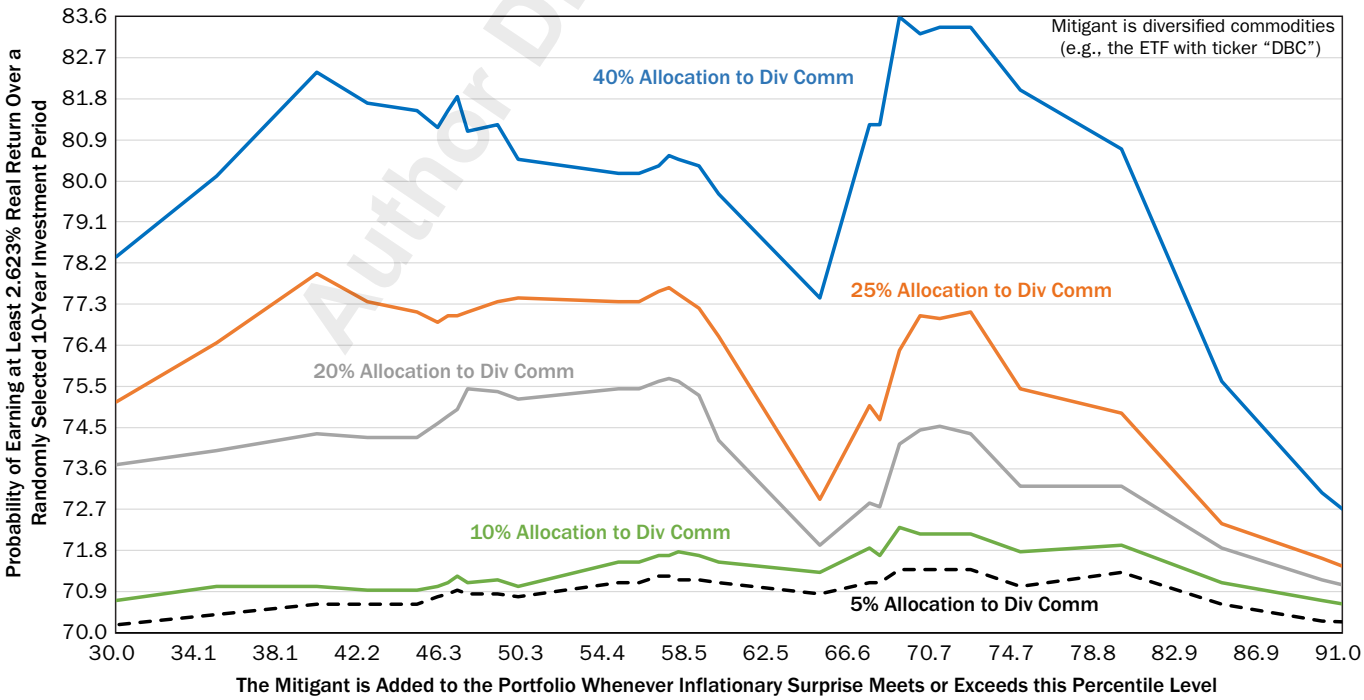
A package of widely diversified commodities is the third most frequently referenced inflation mitigant by non-institutional investors and advisors. Exhibit 7 provides the results where the mitigant is defined by Reuters CRB Total Return Index (with GFD extension). As before, five lines appear, each corresponding to a different mitigant allocation.

The probability of success is maximized if 40% of the portfolio is allocated to diversified commodities when the measure of inflationary surprise rises above its 69th percentile level. In other words, commodities would be present in the portfolio during 31% of the months, resulting in an average long-run allocation of 12.4%. This application resulted in the probability of success rising from 70.0% to 83.6%. As with gold, and TIPS bonds, allocating 5% of the portfolio to commodities is pointless, it hardly moves the needle.

It is perhaps interesting that gold and TIPS are more popular than commodities as an inflation mitigant. The reason for this behavior is outside the scope of this article. But let me offer a few thoughts on this question. Perhaps TIPS have been successful for no better reason than the fact that "inflation protection" is part of their literal name. I wish there was a better reason, but I suspect not. Gold's popularity may result from its long-term use (i.e., over the last several hundred years) and its application as a mitigant against event risk … and this aspect is being conflated with inflation protection. Finally, commodities are perhaps felt to be far less understandable and

EXHIBIT 7

Diviersified Commodities as Mitigant Against Inflationary Surprise



may be feared to be overly correlated with declines in industrial production. But let's set aside gold, TIPS, and commodities and return to a more comprehensive analysis of the 29 possible mitigants.

ANALYZING ALL 29 POSSIBLE MITIGANTS

As an initial placeholder, let us make two assumptions. First, we will allocate 20% of the portfolio to the mitigant when indicated. Second, the long-run average allocation must average 10%. These two assumptions imply that the mitigant will be applied whenever our measure of inflationary surprise exceeds its 50th percentile level. We will revisit these assumptions shortly. Exhibit 8 provides the results of applying these assumptions to all twenty-nine possible mitigants. With the objective of brevity, only the twenty most effective mitigants (as measured by the probability of success) are reported.

This exhibit rank orders the top twenty mitigants and shows the results for the unprotected 60/40 portfolio at the bottom. With the objective of providing a robust understanding of the risk attributes associated with each of the mitigants, six additional columns are providing. These six show the percentile outcomes (50th, 40th,

EXHIBIT 8

Allocating 20% to the Mitigant when Inflationary Surprise is at or above its 50th Percentile Level

		Statistics for 10-Year Geometric Mean REAL Returns (all in %)					
Mitigant	Probability of Success	50th Percentile	40th Percentile	30th Percentile	20th Percentile	10th Percentile	5th Percentile
West Texas Intermediate Oil - Spot Price	78.9	4.95	3.90	3.28	2.53	0.62	–0.32
Gold Bullion Price, New York - Spot Price	78.7	5.47	4.17	3.14	2.40	0.05	–1.05
50/50 blend of Silver and Oil	76.5	4.81	3.84	3.05	2.36	0.80	–0.23
50/50 blend of Reuters CRB Total Return Index and Wheat	75.8	4.75	3.85	3.09	2.28	1.31	0.52
Wheat #2 - Spot Price	75.5	4.99	4.01	3.18	2.30	1.33	0.28
Reuters CRB Total Return Index	75.2	4.57	3.64	3.03	2.18	1.07	0.44
Thompson Jefferies CRB Core Commodity Total Return Index	75.2	4.57	3.64	3.03	2.18	1.07	0.44
50/50 blend of Reuters CRB Total Return Index and Silver	74.2	4.77	3.65	2.95	2.07	1.12	0.22
Diversified Precious Metals (e.g., the ETF with ticker "GLTR")	73.1	4.93	3.80	2.82	2.07	0.60	–0.54
TIPS Bonds	72.8	5.07	3.92	2.91	1.40	0.52	–0.61
Silver Bullion - Spot Price	72.2	4.75	3.69	2.80	1.95	0.92	–0.16
World Bank Agriculture Commodity Price Index	71.3	4.59	3.57	2.74	1.75	0.79	–0.53
90-day US Treasury Bills	70.8	4.86	3.63	2.67	1.02	–0.09	–1.10
US Bond Composite	70.7	5.02	3.78	2.69	1.01	–0.08	–1.28
Long-Term AAA-Rated US Corporate Bonds	70.3	5.04	3.78	2.64	0.98	–0.17	–1.45
Platinum Bullion - Spot Price	70.3	4.66	3.37	2.64	1.89	1.06	0.30
5-year US Treasury Bonds	70.2	5.00	3.77	2.64	0.99	–0.26	–1.36
US Stock Composite	70.1	4.90	3.60	2.66	1.04	–0.01	–1.14
10-year US Treasury Bonds	69.9	5.08	3.85	2.60	0.88	–0.34	–1.67
Global Stock Composite	69.6	4.90	3.55	2.57	1.17	0.00	–1.19
60/40 Portfolio without the use of a mitigant	70.0	4.88	3.62	2.62	1.13	–0.13	–1.39

NOTES: 20% of the portfolio is allocated to the mitigant, but only when the measure of inflationary surprise exceeds its 50th percentile level Statistics based on total return data spanning Sep 1914 through Feb 2023.

30th, 20th, 10th, and 5th) for the distribution of all possible ten-year inflation-adjusted returns. For example, the single most effective mitigant was oil. Adding 40% of the portfolio to oil whenever inflationary surprise rose above its 50th percentile level resulted in the probability of success rising from 70.0% to 78.9%. Moreover, left-hand tail risk decreased monotonically, as seen by a comparison of the percentile levels between the protected and unprotected portfolios, which increased by between 7bps and 140bps. Recall that standard deviation of monthly returns would not be a valid measure of risk because the underlying return distributions are not iid, i.e., they exhibit strong trending and momentum.

The possible takeaways from this exhibit are several. First, when measured within the context of a ten-year investment time period, the use of stocks (and bonds) as a mitigant against inflation remains unattractive (or even useless). Second, TIPS provide an unhelpful level of protection. Third, oil, gold, silver, broadly diversified commodities, and wheat all provide meaningful enhancement when faced with inflationary surprise. Wheat may at first feel like an unlikely candidate, but it proxies well for a broader basket of agricultural commodities and is well represented by the ETF with ticker symbol WEAT.

To continue this analysis, let's next turn to a slightly different set of assumptions. First, the long-run average allocation to the mitigant must remain at 10%, as before. But now, we will allocate 40% of the 60/40 portfolio to the mitigant when indicated. Together, these two assumptions imply that the mitigant will be added whenever our measure of inflationary surprise exceeds its 75th percentile level. These assumptions will be relaxed in a subsequent section. Exhibit 9 provides the results and as before we show only the twenty most effective mitigants drawn from the twenty-nine candidates.

Using a 40% allocation applied during the 25% of the months exhibiting the highest level of inflationary surprise, diversified commodities as measured by the Reuters CRB Total Return Commodity Index jumped to the top of the list. Use of this mitigant improved the probability of success from 70% (unmitigated) to a far more attractive 82.0%. Some might be concerned that a 40% allocation to commodities imposes undue or unbalanced risk. But such a conclusion is without basis, as is demonstrated by the left-hand tail risk statistics. Consider the comparative 50th, 40th, 30th, 20th, 10th, and 5th comparative percentile levels, i.e., those for the CRB-mitigated portfolio versus the unprotected portfolio. Returns we improved by between 15bps and 278bps. Clearly, the application of commodities is not increasing risk, it is reducing it when measured during a 10-year investment time period.

As before, there are several takeaways. First, stocks and bonds remain inherently ineffective at protecting against inflation. Second, TIPS bonds are helpful, but relatively unattractive versus practical cost affective alternatives. Third, gold is more helpful than TIPS, but is clearly dominated by at least four other mitigants. Fourth, the most effective mitigants are broadly diversified commodities, oil, wheat, silver, and combinations of these four.

The results presented by Exhibits 8 and 9 identify several fundamental conclusions in terms of which mitigants are effective and which are not. But this analysis fails to adequately answer the question of how much should be allocated and how frequently. We next turn to this more meaningful question, by optimizing these two parameters for each individual mitigant.

INDIVIDUAL OPTIMIZATION BY MITIGANT

In this section, I customize the application of the twenty-nine mitigants separately, one at a time. Considering for each … every possible allocation, ranging from a low of 1% to a high of 40%. Moreover, for each of these allocations, this article identifies

EXHIBIT 9

Allocating 40%to the Mitigant when Inflationary Surprise is at or above its 75th Percentile Level

Mitigant	Probability of Success	Statistics for 10-Year Geometric Mean REAL Returns (all in %)					
		50th Percentile	40th Percentile	30th Percentile	20th Percentile	10th Percentile	5th Percentile
Reuters CRB Total Return Index	82.0	5.03	4.25	3.47	2.79	1.90	1.40
Thompson Jefferies CRB Core Commodity Total Return Index	82.0	5.03	4.25	3.47	2.79	1.90	1.40
50/50 blend of Reuters CRB Total Return Index and Wheat	81.6	4.91	4.18	3.67	2.75	1.92	1.10
50/50 blend of Reuters CRB Total Return Index and Silver	81.3	5.09	4.08	3.49	2.79	1.71	0.97
50/50 blend of Silver and Oil	81.2	5.63	4.68	3.51	2.77	1.05	0.14
West Texas Intermediate Oil - Spot Price	81.0	6.21	4.87	3.76	2.74	1.12	–0.17
Wheat #2 - Spot Price	80.7	4.92	4.20	3.62	2.70	1.73	0.35
Silver Bullion - Spot Price	78.2	5.19	4.07	3.16	2.42	1.16	0.24
Gold Bullion Price, New York - Spot Price	77.7	5.42	4.34	3.25	2.42	–0.07	–1.02
Zinc Special High Grade - Spot Price	77.2	5.38	4.28	3.34	2.36	0.05	–3.07
Diversified Precious Metals (e.g., the ETF with ticker “GLTR”)	75.3	5.06	3.97	3.02	2.25	0.87	–0.35
World Bank Agriculture Commodity Price Index	75.2	4.89	4.06	3.25	2.14	1.34	–0.32
Aluminum - Spot Price	75.1	5.01	3.74	3.03	1.96	–1.12	–3.35
TIPS Bonds	74.1	5.19	4.06	2.91	1.99	1.05	–0.30
Diversified Base Metals (e.g., the ETF with ticker “DBB”)	73.3	5.23	4.01	2.87	2.02	0.29	–2.58
Thomson Reuters Core Commodity CRB Index	72.2	4.85	4.00	2.89	2.10	1.28	0.14
90-day US Treasury Bills	71.5	5.22	3.86	2.78	1.53	–0.18	–1.17
US Bond Composite	71.1	5.22	3.82	2.70	1.41	–0.16	–1.26
Platinum - Spot Price	70.9	5.22	3.62	2.68	1.78	0.85	–0.07
5-year US Treasury Bonds	70.6	5.20	3.82	2.68	1.42	–0.41	–1.40
60/40 Portfolio without the use of a mitigant	70.0	4.88	3.62	2.62	1.13	–0.13	–1.39

NOTES: 40% of the portfolio is allocated to the mitigant, but only when the measure of inflationary surprise exceeds its 75th percentile level Statistics based on total return data spanning Sep 1914 through Feb 2023.

at what level of inflationary surprise (expressed as a percentile level) the probability of success is maximized. The results are presented in Exhibit 10. As before, only the twenty most effective mitigants are listed. Three additional columns are added on the far right-hand side. These identify the (i) long-run average portfolio allocation for the mitigant, (ii) percentage allocation to the mitigant when applied, and (iii) at what level of inflationary surprise (expressed as a percentile level) the mitigant is added to the underlying 60/40 portfolio.

The probability of success increased to 85.3% through the use of a 50/50 blend of diversified commodities (the Reuters CRB Index) and wheat. This attractive result was achieved through a 40% allocation of the mitigant whenever inflationary surprise exceeded its 78th percentile level. As a result, the mitigant would have been employed during 22% of the months, resulting in a long-run average portfolio allocation of just 8.8%.

Some would fear that a 40% allocation to such a commodity blend would create sharp-edged risk properties for the “protected portfolio.” But such a fear remains baseless, as is demonstrated by the six percentile levels for the distribution of ten-year inflation-adjusted returns shown in columns three through eight. Observe how

EXHIBIT 10

Top 20 Mitigants—Each Individually Optimized by Frequency of Use and Dosage

Mitigant	Probability of Success	Statistics for 10-Year Geometric Mean REAL Returns (all in %)						Average Portfolio Allocation Over the Long-Run	Allocation When Inflationary Surprise Exceeds its Threshold level	Threshold Level for Inflationary Surprise (expressed as a percentile)
		50th Percentile	40th Percentile	30th Percentile	20th Percentile	10th Percentile	5th Percentile			
50/50 blend of Reuters CRB Total Return Index and Wheat	85.3	5.37	4.58	4.11	3.11	2.19	1.55	8.8	40	78
Wheat #2 - Spot Price	85.2	5.57	4.77	4.23	3.28	2.11	1.30	8.8	40	78
West Texas Intermediate Oil - Spot Price	84.9	6.29	5.44	4.43	3.26	1.56	–0.16	12.2	40	69.5
Reuters CRB Total Return Index	84.1	5.28	4.39	3.79	2.97	2.07	1.43	8.8	40	78
Thompson Jefferies CRB Core Commodity Total Return Index	84.1	5.28	4.39	3.79	2.97	2.07	1.43	8.8	40	78
50/50 blend of Silver and Oil	83.3	5.76	4.69	3.91	3.01	1.37	0.31	12.2	40	69.5
50/50 blend of Reuters CRB Total Return Index and Silver	82.6	5.43	4.43	3.88	2.99	1.81	1.03	8.8	40	78
Zinc Special High Grade - Spot Price	80.3	5.53	4.52	3.45	2.66	0.43	–3.17	9.2	40	77
Gold Bullion Price, New York - Spot Price	80.1	5.56	4.44	3.43	2.64	–0.07	–1.05	13.6	40	66
Palladium - Spot Price	79.6	5.33	4.27	3.32	2.59	1.08	0.04	5.0	40	87.5
Silver Bullion - Spot Price	78.6	5.60	4.77	3.88	2.50	1.35	0.24	8.6	40	78.5
Diversified Precious Metals (e.g., the ETF with ticker "GLTR")	78.2	5.21	4.09	3.19	2.43	0.46	–0.76	5.4	40	86.5
World Bank Agriculture Commodity Price Index	76.8	4.86	4.04	3.22	2.32	1.51	0.17	12.4	40	69
Aluminum - Spot Price	76.3	5.22	3.89	3.20	2.01	–1.09	–3.34	8.6	40	78.5
Thomson Reuters Core Commodity CRB Index	76.2	5.06	4.21	3.21	2.32	1.51	0.21	8.8	40	78
Diversified Base Metals (e.g., the ETF with ticker "DBB")	76.0	5.36	4.24	3.21	2.16	0.34	–2.58	9.2	40	77
Platinum Bullion - Spot Price	75.9	5.26	3.98	3.14	2.11	0.83	–0.28	6.0	40	85
TIPS Bonds	74.9	5.31	4.19	3.05	2.02	1.08	–0.14	12.8	40	68
High Grade Copper - Spot Price	73.5	5.02	3.95	2.87	2.13	0.75	-2.41	5.8	40	85.5
90-day US Treasury Bills	71.9	5.20	3.77	2.86	1.35	–0.01	–1.06	7.5	23	67.5
60/40 Portfolio without the use of a mitigant	70.0	4.88	3.62	2.62	1.13	–0.13	–1.39	na	na	na

NOTE: Statistics based on total return data spanning Sep 1914 through Feb 2023.

the use of this mitigant increased the 50th, 40th, 30th, 20th, 10th, and 5th percentile outcomes by between 50bps and 294bps over the unprotected 60/40 portfolio.

Several takeaways can be drawn from this exhibit. First, even after optimization, stocks and bonds prove to be useless in protecting against inflationary surprise. Second, the most useful stock or bond is TIPS. But even TIPS are relatively unattractive when compared to the alternatives, and where strongly dominated by seventeen other mitigants. Third, gold maintains its position as a credible mitigant, but still falls short when compared to eight more effective inflation mitigation tools (Goldman Sachs 2020). Fourth, the most effective mitigants included broadly diversified commodities, wheat, oil, silver, and various combinations of these four. Each of these could be implemented through the use of ETFs such as DBC, WEAT, DBO, SLV, and combinations of these four.

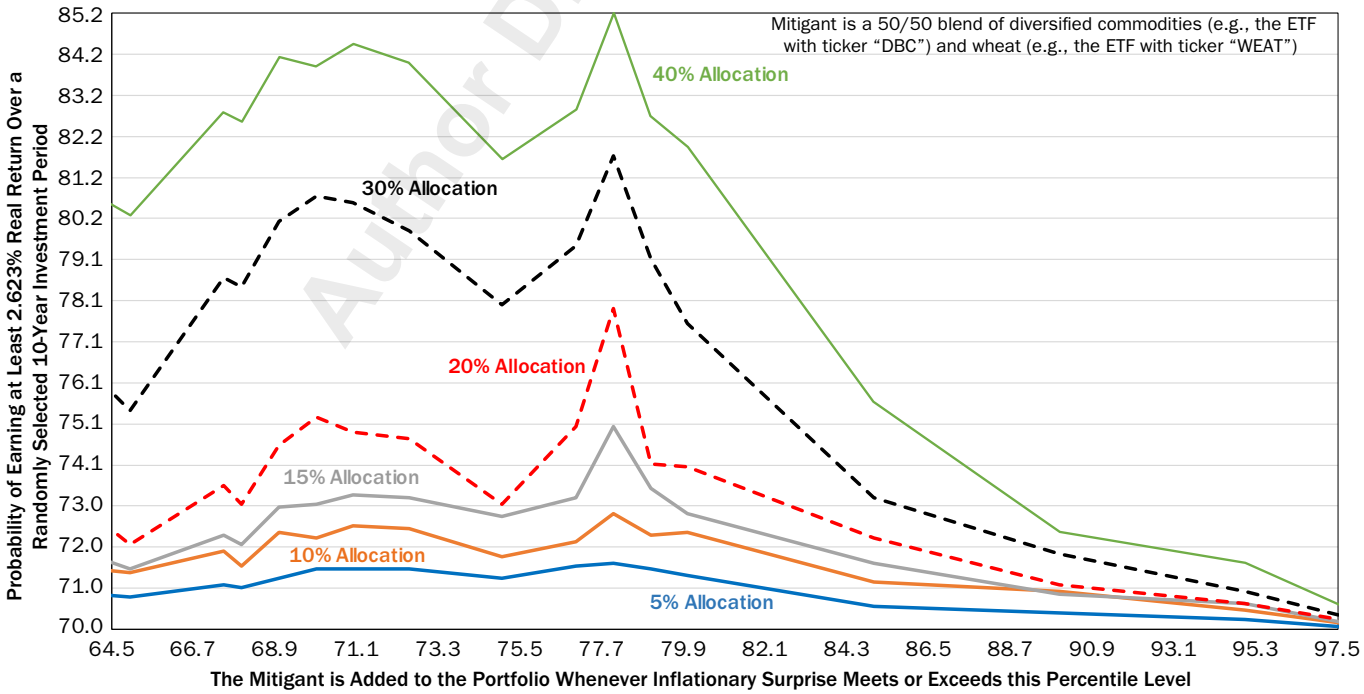
How would this have worked out over the last ten years, i.e., ending February 28, 2023? If we employ the optimized results (specifications) appearing in Exhibit 10, the unprotected 60/40 portfolio would have earned an inflation-adjusted 2.85% per annum. This is in contrast to that same portfolio using TIPS bonds, gold, or the 50/50 blend of Reuters CRB Index and wheat as mitigants … which delivered superior annualized real returns of 2.92%, 3.43%, and 4.71%, respectively.

Let us next return to the question of dosage and frequency of application through the use of the most successful mitigant over the last 109 years, i.e., the 50/50 blend of broadly diversified commodities and wheat. Exhibit 11 provides the results and in the same fashion as this article used earlier in Exhibits 5, 6, and 7.

Although this particular 50/50 blend performed best, that should not, then, be interpreted as a recommendation or conclusion for the future. Why a 50/50 mixture of diversified commodities and wheat delivered a higher probability of success than the other twenty-eight competing mitigants remains outside the scope of this article. However, let me offer a few tentative speculations. The Reuters CRB Total Return

EXHIBIT 11

Dosage Size and Frequency of Application have Major Impacts on the Resulting Benefit



Index is a portfolio providing exposure to all commodities. It is heavily weighted to hydrocarbons (fossil fuels). It might be that fossil fuels are less relevant to today's macroeconomy and inflationary surprise than in the past. And that by weighting the blended portfolio 50% to wheat, we have done nothing more than reducing the aggregate portfolio exposure to fossil fuels … and it is this weight-reduction that has delivered the higher probability of success. If this speculation is correct, then a more effective mitigant might be nothing more than a broad basket consisting of all commodities, but one that underweights fossil fuels.

Exhibit 11 provides several important takeaways that are relevant, no matter the mitigant selected. First, applying just 5% or 10% of the underlying portfolio to a mitigant against inflationary surprise is of little benefit, and is most likely not worth the effort. Second, applying the mitigant too infrequently is similarly unhelpful. For example, if one is adding the mitigant during just 10% of the months, then they should probably not bother making the effort. Obviously if they have perfect (or near) foresight, this conclusion does not apply.

Third, the probability of success is maximized when the mitigant is applied at the 40% level. Such "large" application does not increase profolio risk, as is well demonstrated by the six percentile outcomes reported for each mitigant in Exhibit 10. Fourth, benefits of mitigation fall off quickly as one reduces the frequency of application from say 35% of the months down to 5% of the months. Fifth, applying the mitigant too frequently similarly errods benefits, i.e., a sweet spot does exist, although that sweet spot is likely somewhat different for each mitigant.

HOW IMPORTANT IS TIMING?

This article assumed that the investor had no advance knowledge of when to add the desired mitigant. Instead, investors must wait until after the measure of inflationary surprise had already passed some pre-established trigger point (e.g., the 78th percentile level) before the mitigant was applied. By using this approach, all of the results presented in Exhibits 5 through 11 could have been realized. No forecasting or foreknowledge was required.

However, we need to show how the results would change if the investor acted early and if they acted late. Why? Because this early/late analysis will serve to provide strong additional confirmatory evidence to the relationships described in Exhibits 5 through 11 … or it will serve to cast significant doubt on the prior findings. Acting early should provide added benefit. Acting late should diminish the results. Exhibit 12 provides the analysis for the 50/50 blend of the Reuters CRB Index and wheat.

Being just one month early provides significant benefit. The probability of success climbs from 70.0% for the unprotected portfolio to 87.4% for the mitigated. And risk falls even further as demonstrated by the 50th, 40th, 30th, 20th, 10th, and 5th percentiles, which increased over the unprotected portfolio by between 58bps and 321bps. This result is confirmative of earlier findings.

Applying the mitigant one or two months late served to diminish the results with the probability of success falling from 85.3% (for the 0-month delay case) to 81.2% (1-month late) and 79.6% (2-months late). Pleasantly, the results are monotonically increasing across the five cases shown in Exhibit 12. This relationship is strongly confirmative of earlier findings.

The benefits of acting early, even as little as a single month, are significant. Doing so requires that one has a sufficiently accurate estimate of the coming month's CPI Index value. The operative word here is "sufficiently." It actually doesn't have to be all that accurate to be of significant benefit. Recall how our measure of inflationary surprise is calculated, i.e., the percentage that the current CPI Index value is above/below

EXHIBIT 12

Impact of Applying the Inflationary Surprise Mitigant Either Early or Late

Number of Months that the Mitigant is Applied Either EARLY or LATE	Probability of Success	Statistics for 10-Year Geometric Mean REAL Returns (all in %)					
		50th Percentile	40th Percentile	30th Percentile	20th Percentile	10th Percentile	5th Percentile
1 early	87.4	5.45	4.74	3.92	3.35	2.38	1.82
0	85.3	5.37	4.58	4.11	3.11	2.19	1.55
1 late	81.2	5.24	4.36	3.59	2.82	1.68	1.17
2 late	79.6	5.26	4.24	3.45	2.60	1.37	0.79
No mitigant used	70.0	4.88	3.62	2.62	1.13	–0.13	–1.39

NOTES: Mitigant is 50% Reuters CRB Total Return (not "core") and 50% wheat (e.g., use the ETFs with tickers "DBC" and "WEAT"), The Allocation to the mitigant is 40% of the portfolio (for those months to which it is utilized), The mitigant is applied only when the level of Inflationary Surprise is at or above its 78th percentile level, EXAMPLE: If the mitigant is applied "1 month early", then it is added to the portfolio 1 month earlier than it should have been AND is also removed from the portfolio 1 month earlier then it otherwise would have.

its average over the last eleven months … this is a relatively stable metric. Numerous forecasting services are available that provide month-ahead estimates as to the coming value for the CPI Index. Some of these include: Financial Forecast Center, LLC; Goldman Sachs; Cleveland Fed's Center for Inflation Research; Capital Group; and Trading Economics, or one can simply turn to the markets for Treasuries and TIPS bonds and their associated derivatives. Using past one-month ahead estimates from Financial Forecast Center, one finds that their past estimates have been more than sufficiently accurate to pursue the approach of applying the mitigant based on next month's CPI Index value. If this continues, then a reasonable goal for pursuing such a strategy would be the 87.4% probability of success, a handsome improvement over the unprotected base case.

CONCLUSIONS

Consumer price inflation recently peaked at 9.1% on a year-over-year basis. The factors that drove this inflation included: (1) millions leaving the labor force as a result of COVID; (2) the global supply chain broke, again as a result of the pandemic; (3) consumers got bored and just started buying a whole lot of stuff (goods), once again driven by COVID-19; (4) heroic monetary stimulus; (5) record fiscal stimulus; (6) the war in Europe; (7) some unusually disruptive weather; and (8) deglobalization. Eventually, these eight factors will settle out and inflation will return to a more normal and sustainable level. But the discussion today is asking: will that "normal level" be the old 2% or a new 4%, 5%, or even 6%.

Retail investors and most institutional investors have needs or liabilities defined in inflation-adjusted or real terms. As a result, the question of inflation is unusually pertinent. But even for those less common investors whose needs or liabilities are satisfied in nominal, non-inflation-adjusted terms, inflation remains a critical factor. How so? Consider history: from 1914 through 2023, a 60/40 portfolio returned a +8.44% real return during the 75% of the months when inflationary surprise was it its lowest, and –5.18% real return during the 25% of the months when it was the highest. That gap, 1362bps per annum, is of significant interest to all investors.

Among non-institutional investors and their advisors, gold, TIPS bonds, and diversified commodities are the most commonly discussed mitigants against inflationary surprise. This article examined twenty-nine different potential mitigants over the time

period spanning 1914 through the present (108.4 years). It was shown that both gold and TIPS are remarkably poor mitigants, and easily dominated by others such as oil, silver, diversified commodities, wheat, and even diversified precious metals. In a sense, this observation should not be surprising. Gold is driven, in part, by three other aspects (unrelated to inflationary surprise). First, gold has almost no industrial applications. Second, gold is frequently driven by extreme event-risk (whether national or international). Third, gold's price movements are often driven by central bank and/or national treasury policy decisions unrelated to inflationary developments. In contrast, TIPS bonds carry a high level of interest rate risk. For example, the highly popular TIPS bond ETF (symbol TIP) carries an interest rate duration of seven years.

At times, it has been suggested that equities, whether U.S., international, or global, serve as a more effective mitigant than gold or other types of commodities. But the analysis presented herein, which focuses on ten-year investment time horizons, strongly suggests otherwise. In all cases, as poor and weak a mitigant as both gold and TIPS were shown to be, they still trounce stocks (of any ilk).

The best performing mitigant, drawn from among the twenty-nine, was a 50/50 blend of diversified commodities and wheat. The overweighting to wheat may be nothing more than an indirect way of underweighting the fossil fuel component inherent in diversified commodities. However, it may be a reflection of a changing global economy, wherein fossil fuels are falling in relative importance and agricultural foodstuffs are increasing in relative importance. This speculation feels in alignment with how a growing portion of the global population are becoming middle class, serving to consume increased foodstuffs.

For retail investors and their investment advisors, ETFs provide ready mitigation tools. Diversified commodities, oil, silver, wheat, and diversified agricultural products can all be accessed via securities such as DBC, DBO, SLV, WEAT, and DBA. However, successful mitigation requires adequate dosage and sufficient frequency … but not too frequent. The data presented herein suggests that 40% allocations are plausible with a frequency somewhere around 20% of the months.

Finally, timing is everything. Foreknowledge of inflationary surprises proves to be remarkably beneficial. Nevertheless, arriving too late to the party, whether a month or two late, still adds significant value. Such a result strongly supports the use of a mitigation approach, provided the correct mitigant is selected, it is applied with appropriate frequency, and in sufficient dosage.

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