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Expect the Unexpected: The Role of Commodities During Periods of Unexpected Inflation

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For most investors, maintaining the purchasing power of their assets over the long term is a primary concern, especially when future liabilities or spending needs aren't fixed in today's dollars. Maintaining purchasing power means that the nominal return they receive on their portfolio must outpace inflation, such that their real return—the return after adjusting for the impact of inflation—is positive. For most risky assets, this isn't a problem because part of their expected return is directly tied to being compensated for expected inflation. And when inflation expectations become reality, most investors do pretty well given their exposure to traditional assets, such as stocks and bonds.

But what happens when the inflation that materializes is different—even drastically different—from what was priced in or expected by market participants? The result can have a profound effect on returns because asset prices have historically been much more sensitive to inflation surprises than to inflation itself. In addition, no single asset class does best in each inflationary environment, so being broadly diversified is the only way to hedge against an inflation surprise.

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Figure 1: Asset classes expected to perform well in inflationary environments

	Inflation	Deflation
Expected	Equities, bonds, inflation-linked securities, real estate	Cash
Unexpected	Commodities	Long bonds, cash

Sources: Bloomberg, Parametric. For illustrative purposes only. Not a recommendation to buy or sell any asset class.

Figure 1 lays out in broad strokes which asset classes should be expected to do well in various inflationary environments. The most common outcome, shown in the upper left corner, is that inflation comes in close to market expectations. This is typically a sign of positive economic growth as well as an indication that this growth is proceeding close to market expectations. Accordingly, traditional asset classes are expected to do well. In times of deflation, fixed cash flows become increasingly important as economic growth becomes more challenged. This tends to benefit fixed income holdings and cash, though bonds with a longer duration are expected to do particularly well when deflation is unexpected.

The remaining case of unexpected inflation is the subject of this paper. This environment tends to be harmful to traditional asset classes as discount rates implicit in the valuation of equities and bonds are reset to a higher level, leading to a decline in prices. Commodities, on the other hand, tend to reprice to the benefit of the investor as recast inflation expectations are reflected in higher forward prices.

Most portfolios already carry allocations to more traditional assets, such as stocks, bonds, and cash, but may lack exposure to assets that do well during periods of unexpectedly high inflation. It's in this environment, however, that an investor's portfolio may be most vulnerable. Not only can its purchasing power be eroded by higher-than-expected inflation, but its market value may also be eroded by falling stock and bond prices. Investors looking to hedge this risk can be best served by increasing their exposure to asset classes that have a positive expected return when unexpectedly high inflation hits. Historically, commodities have served this purpose well, outperforming other asset classes when inflation has been unexpectedly high.

Below we discuss what inflation expectations are and how we've chosen to measure them. In addition, we present historical evidence to support our claim that commodities outperform other asset classes during periods of unexpectedly high inflation.

What are inflation expectations?

Measuring expected inflation is challenging for many reasons. Surveys tend to have spotty accuracy, both the household and professional level, and the results seem to be only getting worse with time. Likewise, many economic models, including regime-switching or term-structure models, have also proven inaccurate. As the US Treasury Inflation-Protected Securities (TIPS) market has developed breadth and liquidity within the past decade, market-based metrics have become available. Unfortunately, these breakeven rates can be driven by technical pressures within the TIPS market, so they can reflect factors other than changes to inflation expectations. In the absence of a better measurement, we use the quarterly three-month US Treasury bill (T-bill) rate as the expected inflation rate for the prior quarter.¹

According to economist Irving Fisher's theory of interest, first developed in 1930, the local risk-free nominal interest rate should equal the expected inflation rate plus a small real return. Since the 1970s, T-bills have, in fact, outperformed inflation by about 100 basis points per year. However, this has varied substantially, including both positive and negative real returns. Given this inconsistency and the fact that we're using quarterly data, we assume a zero real rate of return. For realized inflation, we use the Consumer Price Index for All Urban Consumers (CPI-U).² The CPI-U is the most widely used of the CPI baskets. It measures a basket of goods and services purchased by the average consumer in a highly populated area (approximately 90% of the US population). It's also the index used to determine the principal adjustment for TIPS.

A (relatively) short history of commodities and inflation

For our analysis, we constructed a diversified commodity basket, using end-of-day pricing for Bloomberg and S&P GSCI total-return subindexes, to represent a broad-based exposure to the commodity asset class. This diversified basket reflects the impact of price changes of a commodity futures portfolio along with an assumed T-bill return on collateral.³ One important note is that commodity futures indexes have a much shorter history than equities and fixed income indexes, which limits the time periods we can examine.

Commodities included in the diversified basket are listed in the Appendix, with each commodity added as the published index data became available. Static sector weights were applied and proportionally adjusted based on underlying commodity availability, then commodities were equally weighted within a sector.⁴ The basket was rebalanced monthly.

Performance during unexpected inflationary periods over the last 50 years

We classified each quarterly period as a positive or negative surprise by looking at the realized inflation at the end of the period, based on the percentage change in the CPI-U, and comparing it to the T-bill yield at the start of the period. Using this methodology, we calculate 81 positive surprises and 123 negative surprises over the January 1970 to December 2020 period.⁵ Of the positive surprises, the average was 0.52%. Next we defined each period as having unexpectedly high inflation if the positive surprise fell within the top 50% of quarterly observations. In total there were 40 quarters of unexpectedly high inflation, with an average of 0.83%. Figure 2 displays these historical inflation surprises along with the periods of unexpectedly high inflation.

¹ As represented by the generic US on-the-run government bill.

² As calculated by the US Bureau of Labor Statistics and published monthly.

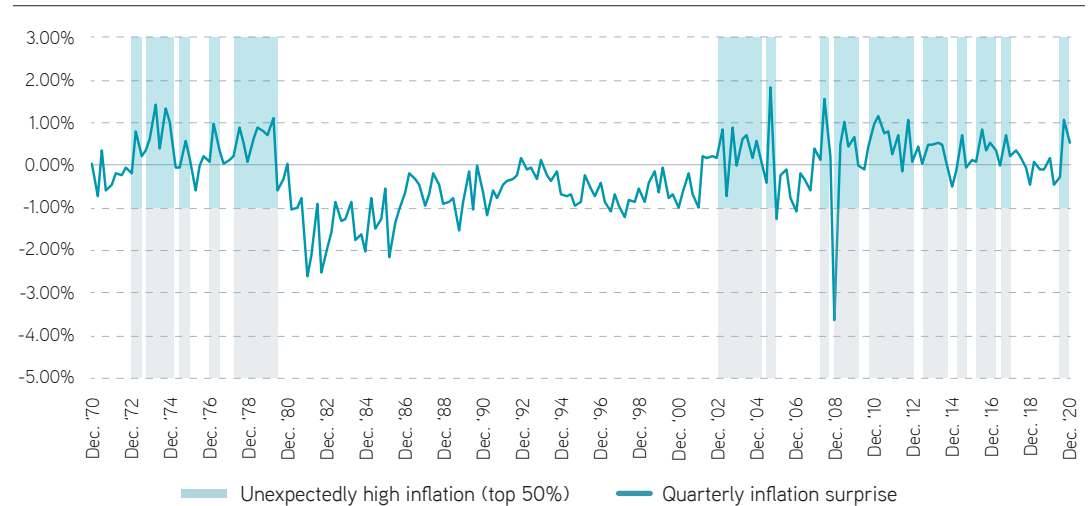
³ Unlike other investments, commodity futures require only a portion of the total contract value to be posted as initial margin, while the remaining portion can be left unfunded. For this reason, commodity futures indexes are published as either total return or excess return. Excess return indexes reflect only the movement of the underlying commodity futures contracts themselves. Total return indexes assume there's cash supporting the commodity futures positions, and they assume a cash-based return (three-month T-bills) for the collateral in addition to the return generated from the commodity futures contracts.

⁴ In other words, on 1/29/1960, the basket would have consisted of a 100% weight to agriculture made up of equal parts wheat, corn, soybeans, soybean oil, cotton, and cocoa. Weights would then be proportionally adjusted as each new commodity and sector was added through time.

⁵ Time frame selected for our analysis represents data availability for all indexes presented in figures 3 and 5.

We chose to look at the top 50% of observations for two reasons. First, it allows for a modest amount of uncertainty around our calculation of surprise inflation. As an example, if in a particular quarter inflation came in at 0.95% when it was predicted at 0.82%, is that actually a surprise in the eyes of the market? As such, we conservatively limited our sample to larger surprises to better test how various assets have performed when inflation really is unexpected. Second, the top 50% is roughly one standard deviation from the average surprise, so it more accurately captures the observations that are truly unexpected.

Figure 2: Inflation surprises, January 1970–December 2020



Sources: Parametric, Bloomberg, 12/31/2020. For illustrative purposes only.

Figure 3 presents the results of our historical analysis regarding how various asset classes performed during times of unexpectedly high inflation. We find a diversified basket of commodities performed well, with an average quarterly return of 7.53%. This vastly outperforms the next closest asset class, which was international equities. In addition, when we account for the volatility of the asset class in those quarters, we find that commodities again come out ahead. Per unit of risk, commodities delivered a return of 0.75% above cash.

Figure 3: Performance in quarters of unexpectedly high inflation, January 1970–December 2020

	CPI-U	US T-bills	US equities	International equities	US corporate bonds	REITs	Diversified commodity*
Average quarterly return	1.59%	0.83%	1.89%	2.15%	0.46%	1.94%	7.53%
Standard deviation of quarterly return			8.44%	9.50%	3.62%	10.53%	8.98%
Sharpe ratio			0.13	0.14	-0.10	0.11	0.75

*Diversified commodity represented by the Diversified Commodity Basket as previously described. Results are based on index results. It is not possible to invest directly in an index. Indexes are unmanaged and do not reflect the deduction of fees and other expenses. Please refer to the Disclosures for additional information.

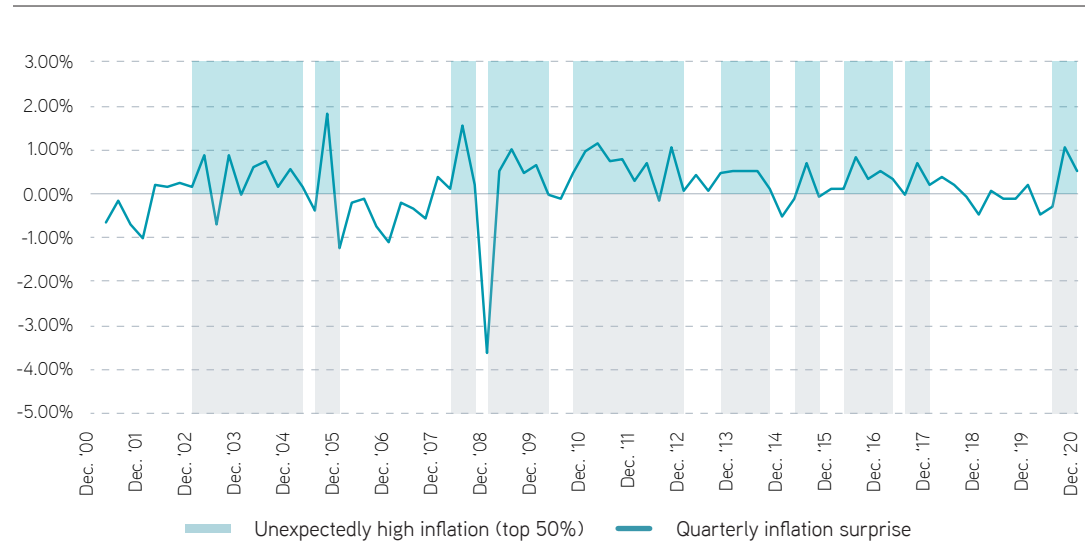
Sources: Parametric, Bloomberg, 12/31/2020. US equities represented by MSCI USA Gross Total Return USD Index, international equities represented by MSCI EAFE Net Total Return USD Index, US corporate bonds represented by Bloomberg Barclays US Corporates Total Return Index, REITs represented by FTSE NAREIT All Equity REITs Total Return Index. For illustrative purposes only. Past performance is not indicative of future results. All investments are subject to loss. It is not possible to invest directly in an index.

Arguably, the time frame analyzed above includes two separate periods of inflation dynamics, corresponding to two distinct levels of central bank intervention. The 1970s are well known as a decade of high inflation, and when Paul Volcker became chairman of the Federal Reserve in 1979, year-over-year inflation was in double digits. When he left in 1987, inflation had dropped to nearly 4%. Prior to his arrival there was much skepticism over the ability of a central bank to control inflation. However, Volcker’s decision to reduce inflation by focusing on monetary policy paved the way for a dynamic shift in perspective. Although a formal inflation target wasn’t adopted until 2012, it’s widely thought that after Volcker’s reign informal inflation targeting has widely been a Fed goal. To this end we feel it’s also worth examining a more recent time frame to see if central bank intervention has had any influence on how asset classes have responded to unexpected inflation.

Performance during unexpected inflationary periods over the last 20 years

Following the same methodology as previously outlined, we now turn our attention to the 20-year period ending December 2020. One benefit of this review is that we can now include TIPS in our analysis. From January 2001 to December 2020, we calculate 51 positive and 29 negative quarterly surprises, with an average positive inflation surprise of 0.52%. Looking at the top 50% of positive surprises, we find 25 quarters with unexpectedly high inflation, with an average of 0.82%. Figure 4 displays these historical inflation surprises along with the periods of unexpectedly high inflation.

Figure 4: Inflation surprises, January 2001–December 2020



Sources: Parametric, Bloomberg, 12/31/2020. For illustrative purposes only.

Given this shorter time frame, we find that a diversified basket of commodities again provided the best average quarterly return. Figure 5 below presents summary results for various asset classes over this more recent period. However, unlike in the much longer period examined before, the second-place finisher—US equities—was much closer when focusing on average performance. Looking at excess return per unit of risk, though, commodities still provided the best bang for their buck during these periods of unexpectedly high inflation, demonstrating a Sharpe ratio of 0.78.

Perhaps most surprising was the lack of performance from TIPS, given that their main purpose is to protect against inflation. This is best understood by recalling that the nominal yield on TIPS is made up of two components—actual inflation, as measured by CPI-U, and the real yield in the marketplace. Although TIPS prices have benefited from a slight decline in real yields during periods of unexpectedly high inflation, the average decline hasn't been statistically different from zero—meaning that TIPS returns haven't seen strong rallies, on average, during periods of unexpectedly high inflation.

Figure 5: Performance in quarters of unexpectedly high inflation, January 2001–December 2020

	CPI-U	US T-bills	US equities	International equities	US corporate bonds	US TIPS	REITs	Diversified commodity*
Average quarterly return	0.95%	0.15%	3.94%	3.48%	1.29%	1.42%	2.89%	5.68%
Standard deviation of quarterly return	-	-	6.89%	9.10%	2.90%	2.26%	11.30%	7.10%
Sharpe ratio	-	-	0.55	0.37	0.39	0.56	0.24	0.78

*Diversified commodity represented by the Diversified Commodity Basket as previously described. Results are based on index results. It is not possible to invest directly in an index. Indexes are unmanaged and do not reflect the deduction of fees and other expenses. Please refer to the Disclosures for additional information.

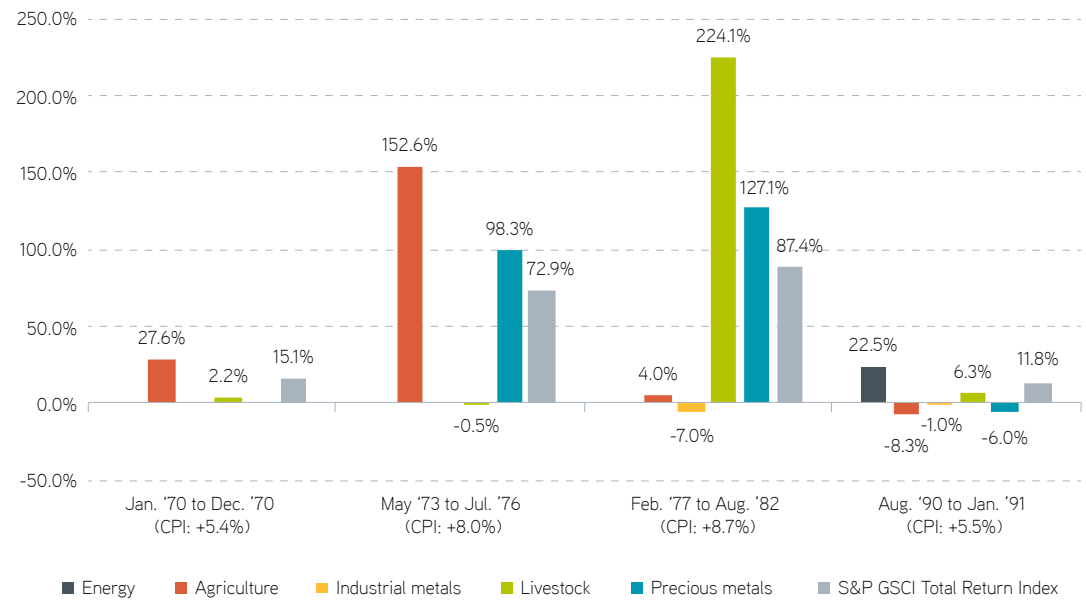
Sources: Parametric, Bloomberg, 12/31/2020. US equities represented by MSCI USA Gross Total Return USD Index, international equities represented by MSCI EAFE Net Total Return USD Index, US corporate bonds represented by Bloomberg Barclays US Corporates Total Return Index, REITs represented by FTSE NAREIT All Equity REITs Total Return Index. For illustrative purposes only. Past performance is not indicative of future results. All investments are subject to loss. It is not possible to invest directly in an index.

⁶ For example, we've encountered many individuals who believe energy is the most inflation-sensitive commodity sector given the US economy's reliance on its subcomponents as inputs to production. However, this isn't supported by either historical data or academic research. Instead most studies find the impact of energy prices has become muted in terms of inflationary pressures, due to a more energy-efficient US economy and increased domestic production.

Why a basket of commodities?

While it's clear that a diversified basket of commodities may do well during periods of unexpected inflation, there's a common belief that one commodity, or commodity sector, provides "better" inflation protection than a diversified basket.⁶ This belief isn't supported by historical evidence, however. Instead we see varying patterns of inflation sensitivity, depending on which time period we examine. Figure 6 details commodity sector performance during four notable outbreaks of high inflation.

Figure 6: Commodity sector performance in periods of high inflation



Sources: Parametric, Bloomberg, 12/31/2020. Disclosure: Commodity sector performance represented by their respective S&P GSCI® total return sub-index. This information is for illustrative purposes only and should not be considered investment advice. The purpose of this information is to provide historical examples of commodity futures performance during periods of high inflation (5%+). The S&P GSCI® Total Return Index has historical data dating back to 1970. For illustrative purposes only. Past performance is not indicative of future results. It is not possible to invest directly in an index.

The lack of consistency in performance leadership is notable: Grains led in the first two time periods, only to lag in the last two, while precious metals did quite well in the second and third time periods, only to trail in the last time period. All of this emphasizes our thesis that which individual commodity or sector will outperform is impossible to say in advance. Inflation may present itself from rising energy prices, higher food costs, or greater input prices for manufacturers. Factors such as technological innovation, weather patterns, labor strife, broader economic patterns, and even the political climate in a few select countries all impact inflation sensitivity. For this reason we recommend a broadly diversified basket of commodity futures when seeking inflation protection.

Conclusion

Commodities have historically been included in the asset-allocation process for their diversification benefits and sensitivity to inflation. For most assets, when inflation either matches or comes in below expectations, investors are either unharmed (as inflation expectations are already priced into forecasted asset returns) or benefit from higher real returns. However, as we’ve shown, very few assets perform well during periods when inflation exceeds expectations.

When looking to protect purchasing power of their assets, investors may want to focus on the specific environments in which inflation exceeds expectations. Commodities relative to either stocks or bonds have historically offered the greatest opportunity for positive performance in these environments. As such we advise that including commodities in a portfolio not only offers the opportunity for increased diversification but can also help protect from the worst inflationary storms.

Appendix

Diversified commodities basket

Commodity	Date available	Weight
Bloomberg Natural Gas Total Return Index	1/31/91	
Bloomberg WTI Crude Oil Total Return Index	1/31/84	
Bloomberg Brent Crude Total Return Index	1/31/91	30%
Bloomberg Unleaded Gasoline Total Return Index	1/30/87	
Bloomberg Gas Oil Total Return Index	1/31/91	
S&P GSCI Heating Oil Total Return Index	1/31/83	
Bloomberg Wheat Total Return Index	1/29/60	
Bloomberg Kansas Wheat Total Return Index	1/31/91	
Bloomberg Corn Total Return Index	1/29/60	
Bloomberg Soybeans Total Return Index	1/29/60	
Bloomberg Soybean Oil Total Return Index	1/29/60	
Bloomberg Soybean Meal Total Return Index	1/31/91	25%
Bloomberg Sugar Total Return Index	1/31/61	
Bloomberg Cotton Total Return Index	1/29/60	
Bloomberg Coffee Total Return Index	1/31/73	
Bloomberg Cocoa Total Return Index	1/29/60	
Bloomberg Orange Juice Total Return Index	1/31/91	
Bloomberg Aluminum Total Return Index	1/31/91	
S&P GSCI Copper (LME) Total Return Index	1/31/77	
Bloomberg Copper (NY) Total Return Index	1/31/89	
Bloomberg Zinc Total Return Index	1/31/91	25%
Bloomberg Nickel Total Return Index	1/31/91	
Bloomberg Lead Total Return Index	1/31/91	
Bloomberg Tin Total Return Index	1/31/91	
Bloomberg Gold Total Return Index	1/31/75	
S&P GSCI Silver Total Return Index	1/31/73	15%
S&P GSCI Platinum Total Return Index	11/29/85	
Bloomberg Palladium Total Return Index	12/31/97	
Bloomberg Live Cattle Total Return Index	1/29/65	
S&P GSCI Lean Hogs Total Return Index	1/30/76	5%
Bloomberg Feeder Cattle Total Return Index	1/31/91	

Sources: Bloomberg, Parametric

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