T.RowePrice®
INVEST WITH CONFIDENCE

PRICE PERSPECTIVE®

June 2017

In-depth analysis and insights to inform your decision-making.

Steve Bartolini
Portfolio manager, Inflation Protected Bond and Limited Duration Inflation Focused Bond Funds

Wyatt Lee
Co-portfolio manager, Retirement Funds

Fixed Income

THE CASE FOR INFLATION PROTECTION IN A BROAD ASSET ALLOCATION

EXECUTIVE SUMMARY

Even at relatively low levels, inflation can substantially reduce real portfolio returns over time. And while it is important to consider the current inflation outlook, investors should note that unexpected inflation can inflict the greatest damage on a portfolio. The challenge in addressing inflation risk is that traditional stock and bond allocations have typically done a poor job of hedging against unexpected inflation and have historically demonstrated relatively weak real returns in periods of high inflation. However, research suggests that allocations to real assets equities and inflation-indexed bonds can improve overall portfolio performance by dampening the volatility of both nominal and real returns during inflationary periods. Treasury inflation protected securities (TIPS) have had a high correlation to unexpected inflation and thus provide protection against the damage it can do to longer-term investment returns.

Rising prices—particularly unexpected bouts of consumer price inflation—can have a negative impact on a number of asset classes, but many investors have little protection against higher inflation in their portfolios. A recent uptick in U.S. inflation expectations highlights the value of investment strategies that include portfolio components designed to protect purchasing power. Real assets, such as natural resource stocks, and inflation-linked bonds historically have performed well in inflationary environments and can potentially reduce volatility in a diversified portfolio.

CURRENT ENVIRONMENT

After a prolonged period of very low inflation, inflation expectations accelerated in the wake of the U.S. presidential election, reflecting a rebound in global growth, a recovery in commodity prices, and the potential for growth-oriented fiscal policies. Along with the higher inflation expectations, measures of current inflation also increased, with the U.S. consumer price index (CPI) rising 2.7% in the 12-month period ended in February—its largest gain in five years—before deaccelerating somewhat to 2.4% in the March report.

That is likely to be the peak for consumer inflation for the near term, though, as commodity prices have stabilized and the Federal Reserve seems poised to continue raising interest rates. However, over the longer term, rising wages could contribute to price pressures and more significant inflation may build if President Trump is successful at enacting the policies he campaigned on. These include tax cuts and higher infrastructure spending at a time when the economy is already near full employment, more protectionist trade measures, and efforts to weaken the U.S. dollar.

While the current inflation outlook is important, investors should note that unexpected inflation can inflict the greatest damage on a portfolio. And unexpected inflation, by definition, cannot be forecast and thus is more disruptive.

Our research also found that TIPS have had a high correlation to unexpected inflation and thus provide solid protection against the damage it can do to longer-term investment returns.

THE CHALLENGE OF INFLATION

It is worth keeping in mind that even moderate rates of inflation can substantially reduce a portfolio's purchasing power over longer periods. Over the three decades ended December 31, 2016, for example, a $10,000 portfolio invested 60% in U.S. large-cap stocks (as measured by the S&P 500 Index) and 40% in U.S. bonds (as measured by the Bloomberg Barclays U.S. Aggregate Bond Index) would have grown to $129,940—for an annualized return of 8.92%. Inflation would have reduced that amount to just $59,292 in 1986 dollars—a real return of 6.11%. This was a period when headline inflation was relatively low, averaging 2.7%. A period of high inflation—such as the double-digit rates of the 1970s—during an investor's time frame would reduce real returns even more.

The challenge in addressing inflation risk is that traditional stock and bond allocations have typically done a poor job of hedging against unexpected inflation and have historically demonstrated relatively weak real returns in periods of high inflation—although equities have performed well amid moderately rising prices.

T. Rowe Price research suggests that allocations to real assets—including natural resource equities and real estate investment trusts (REITs)—and inflation-indexed bonds such as Treasury inflation protected securities can improve overall portfolio performance by dampening the volatility of both nominal (before inflation) and real (after inflation) returns during inflationary periods. However, returns and the correlations between the returns on different asset classes both can vary widely over different time horizons and in different economic environments. This supports the case for exposure to a diversified basket of real assets.

TYPES OF INFLATION AND HOW DIFFERENT ASSETS REACT

To analyze the degree of inflation protection that various asset classes have provided historically, we looked at how closely returns on those asset classes have correlated with inflation over rolling one-month and three-year periods. (The three-year period was chosen because it is roughly the length of time from peak to trough or from trough to peak in a typical inflation cycle.) We found that shorter-term TIPS have had the highest positive correlation to inflation over both one-month and three-year time frames, indicating that their returns typically have moved in the same direction as inflation at the same time—in other words, nominal returns on TIPS have tended to be higher when inflation is higher. (Because TIPS did not exist prior to 1997 (and shorter-term TIPS data are not available prior to 2002), T. Rowe Price analysts created a proxy return series for earlier years based on the after-inflation yields on conventional Treasuries of comparable maturity during the pre-1997 time periods. This return series then served as the basis for measuring TIPS characteristics such as nominal and real volatility and correlations.)

Our research also found that TIPS have had a high correlation to unexpected inflation and thus provide solid protection against the damage it can do to longer-term investment returns. This is in contrast to returns on conventional bonds, which have been negatively correlated with inflation over one-month and three-year time periods and thus have generally failed to protect purchasing power in inflationary periods.

The historical relationships between inflation and nominal returns on various asset classes are illustrated in Figure 1, page 3. Correlation is measured on a scale that runs from -1 to +1, with positive results indicating that returns and the inflation rate have tended to move in the same direction at the same time, while negative correlation indicates that returns have tended to move in the opposite direction from the inflation rate.

Longer-term TIPS provided less inflation protection than their shorter-term counterparts—and also less protection than real asset equities—over the periods studied. Although, like shorter-term TIPS, principal amounts on longer-term TIPS are adjusted to reflect the monthly change in the CPI, their longer durations make their returns more sensitive to the increases in real interest rates that often accompany periods of inflation.

Real assets had relatively weak correlations with inflation over monthly periods but showed greater value as protection against inflation over three-year periods. It is also worth noting that real assets tended to have lower correlations with the broader equity market returns over longer time periods, indicating their potential to reduce volatility in a diversified portfolio (Figure 2). This effect was most notable in the metals sector, which had a negative correlation with the broader equity market over three-year periods. Over one-month periods, by contrast, returns on real equities have tended to show relatively high positive correlations with the broader equity market—a reflection of their short-term sensitivity to general market risk, or beta. (See Figure 4, page 5, for descriptions of the benchmarks and asset classes used in the study.)

FIGURE 1: Correlation to Inflation

September 30, 1976, through December 31, 2016

Asset Class/Sector	1 Month	3 Years
Metals and Mining	0.05	0.44
Energy and Materials	0.07	0.33
U.S. REITs	0.00	0.39
Global REITs	-0.01	0.24
U.S. Stocks (S&P 500)	-0.03	0.06
Shorter-Term TIPS	0.27	0.60
Longer-Term TIPS	0.11	0.23
Aggregate Bonds	-0.11	-0.05
T-bills	0.44	0.76

Source: Morningstar, Inc.; analysis by T. Rowe Price.

FIGURE 2: Correlation to the S&P 500 Index

September 30, 1976, through December 31, 2016

Asset Class/Sector	1 Month	3 Years
Metals and Mining	0.54	-0.09
Energy and Materials	0.75	0.45
U.S. REITs	0.61	0.34
Global REITs	0.63	0.42

Source: Morningstar, Inc.; analysis by T. Rowe Price.

INFLATION DRIVERS CAN VARY

Besides looking at how various asset sectors have held up over different time periods, we also looked at how investments have performed in different inflation environments. The 1970s, for example, saw higher commodity prices and rapid increases in wages and consumer prices. The 1980s, by contrast, saw decelerating consumer inflation, slow wage growth, and minimal gains or even deflation in commodity prices.

In our study, all four real equity sectors outperformed both the S&P 500 Index and the CPI during the high-inflation periods. But these sectors also demonstrated varying relative strength in different inflation environments. Global REITs, for example, posted their highest returns in periods of high broad-based inflation, while energy and materials equities performed somewhat better during periods of high commodity inflation. TIPS are designed to offset one particular type of inflation—U.S. consumer inflation—and may be less effective in environments where rapid commodity inflation is the primary concern.

Finally, we looked at the effect that investments in real assets and TIPS would have had on reducing volatility in a portfolio that included a mixture of traditional stock and bond investments. As shown in Figure 3, page 4, we modified a traditional 60% U.S. large-cap equity/40% U.S. fixed income portfolio to include allocations to real assets and TIPS. We then calculated the annualized volatility on these portfolios over rolling one-month, three-month, one-year, and three-year periods. Our research showed that adding either TIPS or real assets equities to the equity/fixed income portfolio lowered volatility for all holding periods, although the effect was more pronounced over longer periods. Adding both real assets and TIPS reduced portfolio volatility even further.

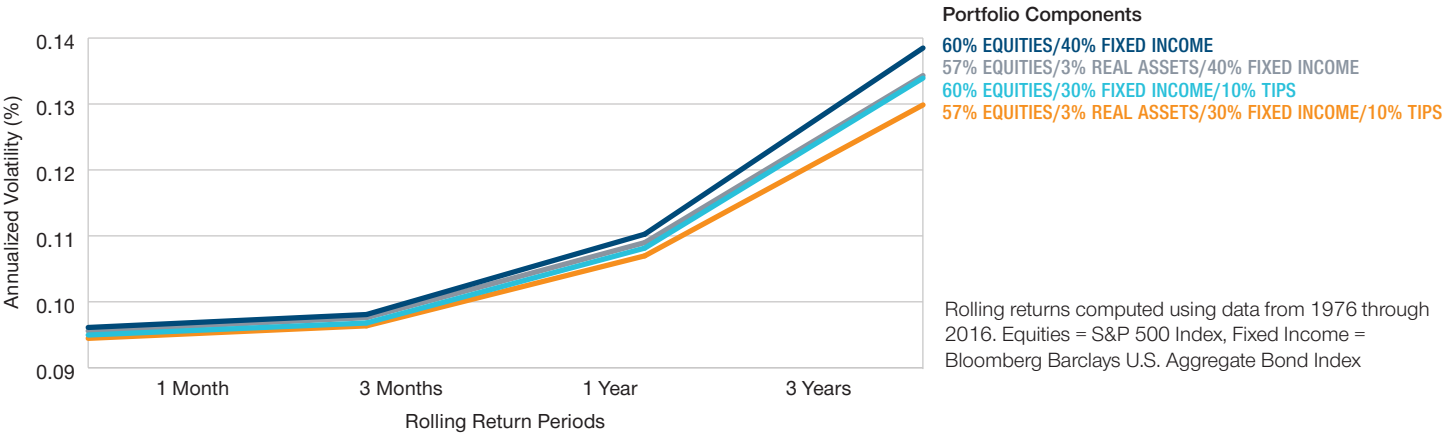
Investors should be aware, though, that there are trade-offs involved with investing in assets that protect against inflation. For example, real assets have underperformed traditional equities in recent years as a result of an oversupply of energy and other commodities along with tepid global economic growth. Trade-offs also apply to short- versus longer-term TIPS. The potential benefit of a higher correlation with inflation that short-term TIPS have provided usually has come at the price of accepting lower yields than for longer-term TIPS. Because TIPS and real assets have different properties, we believe they generally should be used as part of a long-term strategy that also includes assets that will outperform in a low inflation environment and that have higher long-term return potential. Diversification cannot assure a profit or protect against loss in a declining market.

THE T. ROWE PRICE APPROACH

T. Rowe Price has a long history of addressing the risks that inflation can pose to investment portfolios. The firm's founder,

FIGURE 3: Adding Inflation Protection Has Reduced Volatility

As of December 31, 2016



Source: T. Rowe Price.

Thomas Rowe Price, Jr., was a pioneer in the field. He designed a model inflation portfolio in 1966—featuring gold, other commodities such as forest products and oil, and real estate—to prepare for the era of higher inflation that he saw approaching. In addition, Mr. Price launched the New Era Fund, a mutual fund that was also focused on providing inflation protection, in 1969.

This forward-looking approach has continued to the present day. The firm offers investment strategies that invest specifically in real assets and in short-term TIPS, and our asset allocation team incorporates those strategies in diversified portfolios designed to help investors save for retirement as well as pay for college expenses. By including these assets, we seek to provide a buffer against unexpected inflation risk, thus potentially reducing volatility without sacrificing overall expected return.

The fixed income portion of our asset allocation inflation protection strategy is invested in the Limited Duration Inflation Focused Bond Fund. As noted earlier, short-term TIPS are more positively correlated with changes in inflation than long-term TIPS, primarily because of their shorter duration. Higher interest rates often accompany higher inflation, and a shorter-duration profile—relative to strategies benchmarked to the full TIPS index—should provide more protection against a rising rate environment.

Within this inflation hedging component, we also have the flexibility to invest in inflation-linked securities outside the U.S. and in non-inflation-linked bonds such as high-quality asset-backed securities when U.S. TIPS offer less relative value or to produce income when inflation is declining. These out-of-benchmark positions also show positive correlation to unexpected inflation.

Our asset allocation team invests in the Real Assets Fund for the real assets portion of their portfolios. When approaching real assets such as natural resources and real estate, we invest in a diversified portfolio of equity securities rather than directly in physical commodities or property. This approach provides improved liquidity as positions can typically be bought or sold quickly without adverse price reactions. Our research has also shown that real assets securities provide inflation sensitivity that is equal to or better than comparable physical assets. In addition, natural resources equities have the potential to benefit from factors other than rising commodity prices, such as increased earnings from productivity gains, while REITs may benefit from rising rents. We use our quantitative research capabilities to determine the appropriate exposures to various sectors such as natural resources, energy, metals and mining, and real estate.

In addition to their roles in T. Rowe Price's asset allocation portfolios, both the Real Assets Fund and Limited Duration Inflation Focused Bond Fund are also available as investment options for investors seeking to add inflation protection to their own portfolios. Unlike the Treasury securities in which it invests, an investment in the Limited Duration Inflation Focused Bond Fund is not insured or guaranteed by the U.S. government.

CONCLUSION

Even at relatively low levels, inflation can substantially reduce real portfolio returns over time. Unexpected inflation has the potential to do the most damage, suggesting that inflation protection should be an integral component of a long-term investment strategy and not just a tactical position in response to current events. Different real assets have shown varying return and correlation patterns across different inflation environments. This underlines the value of constructing diversified real asset allocations, instead of focusing on a single asset class or sector. It also highlights the potential for skilled managers to add value through active allocation, both between real and conventional assets (such as the broad equity market and non-inflation-linked bonds) and among real asset sectors.

FIGURE 4: Description of Benchmarks Used in Inflation Studies

Asset	Time Period	Indexes Used	
Metals and Mining[1,2]	Sep. 1976 to Sep. 1989	41%	S&P Metals & Mining Index
		5%	S&P Aluminum Index
		21%	S&P Iron & Steel Index
		33%	S&P Gold & Precious Metals Index
	Oct. 1989 to Dec. 1994	83.33%	S&P Metals & Mining Index
		16.67%	S&P Gold & Precious Metals Index
	Jan. 1995 to Feb. 2001	83.33%	MSCI World Metals & Mining Index
		16.67%	MSCI World gold and precious metals subindustry group[3]
	Mar. 2001 to Dec. 2016	83.33%	MSCI All Country World (ACW) Metals & Mining Index
		16.67%	MSCI ACW gold and precious metals subindustry group[3]
Energy and Materials	Sep. 1976 to Sep. 1989	65%	S&P Oil Composite Index
		17.5%	S&P Chemicals Index
		12.25%	S&P Paper & Forest Products Index
		2.6%	S&P Metals & Mining Index
		0.29%	S&P Aluminum Index
		1.31%	S&P Iron & Steel Index
		1.05%	S&P Gold & Precious Metals Index
	Oct. 1989 to Dec. 1994	65%	S&P Energy Sector Index
		35%	S&P Materials Sector Index
	Jan. 1995 to Feb. 2001	65%	MSCI World Energy Sector Index
		35%	MSCI World Materials Sector Index
	Mar. 2001 to Dec. 2016	65%	MSCI ACW Energy Sector Index
		35%	MSCI ACW Materials Sector Index
U.S. REITs	Sep. 1976 to Dec. 1977		NAREIT U.S. Real Estate—Equity REIT Index
	Jan. 1978 to Dec. 2016		Wilshire U.S. Real Estate Securities Index
U.S. Stocks	Sep. 1976 to Dec. 2016		S&P 500 Index
U.S. Bonds	Sep. 1976 to Dec. 2016		Bloombeg Barclays U.S. Aggregate Bond Index
Consumer Inflation	Sep. 1976 to Dec. 2016		Consumer Price Index for All Urban Consumers (CPI-U)
Core Inflation	Sep. 1976 to Dec. 2016		CPI-U All Items Less Food and Energy
Commodity Inflation	Sep. 1976 to Dec. 2016		Producer Price Index (PPI), Crude Materials for Further Processing
Wages	Sep. 1976 to Dec. 2016		Average Hourly Earnings, U.S. Bureau of Labor Statistics

[1]Metals and mining contains a structural 1/6 (16.67%) overweight to precious metals over the entire study period.
[2]Some overlap exists between the energy and materials sector and the metals and mining sector during certain periods.
[3]The gold and precious metals subindustry groups are subsets of the metals and mining indexes provided by MSCI. Return series for these subindustry groups were created by T. Rowe Price based on the MSCI data.

INVEST WITH CONFIDENCE®

T. Rowe Price focuses on delivering investment management excellence that investors can rely on—now and over the long term.

To learn more, please visit troweprice.com.

201706-167762

6/17