

IS INFLATION ABOUT TO REVIVE? REAL ASSETS CAN HELP INSULATE YOUR PORTFOLIO

June 2021

AUTHORS

Yesim Tokat-Acikel, PhD

Managing Director, Director of
Multi-Asset Research and Portfolio Manager

Edward L. Campbell, CFA

Managing Director, Director of Dynamic
Asset Allocation and Portfolio Manager

Stephen Brundage, CFA

Managing Director, Head of Product
and Affiliate Relations

Rory Cummings, CFA

Principal and Portfolio Manager

Sameer Ahmed

Portfolio Manager

Manoj Rengarajan, CFA

Principal and Portfolio Manager

ABOUT QMA

QMA began managing multi-asset portfolios for institutional investors in 1975. Today, we manage systematic quantitative equity and global multi-asset strategies as part of PGIM, the global investment management businesses of Prudential Financial, Inc. (PFI). Our investment processes, based on academic, economic and behavioral foundations, serve a global client base with \$118.8 billion in assets under management as of 3/31/2021.

FOR MORE INFORMATION

To learn more about our capabilities, please contact QMA by email at contactus@qma.com or by phone in the US at +1 (866) 748-0643 or in the UK at +44 (0) 20-7663-3400.

INTRODUCTION

Advanced economies, including the United States, have experienced a powerful disinflationary trend for the past several decades, driven by a confluence of reinforcing global trends. We believe that the four-decade trend of falling inflation in the US has ended, and inflation will likely rise at a higher rate over the next decade. We see upside risks to the current 10-year inflation forecast of 2.3% embedded in our capital market assumptions, however, an extreme scenario of 1970s-style, double-digit inflation appears unlikely.

Inflation affects asset prices in varied ways and can have a material impact on portfolio outcomes. Investors should build their strategic portfolios using forward-looking growth and inflation expectations rather than extrapolating forward the recent experience of low inflation. Our goal is to set reasonable expectations for inflation over the next decade, considering multiple factors, and to explore if “real assets” can enhance portfolio outcomes in a rising inflation environment.

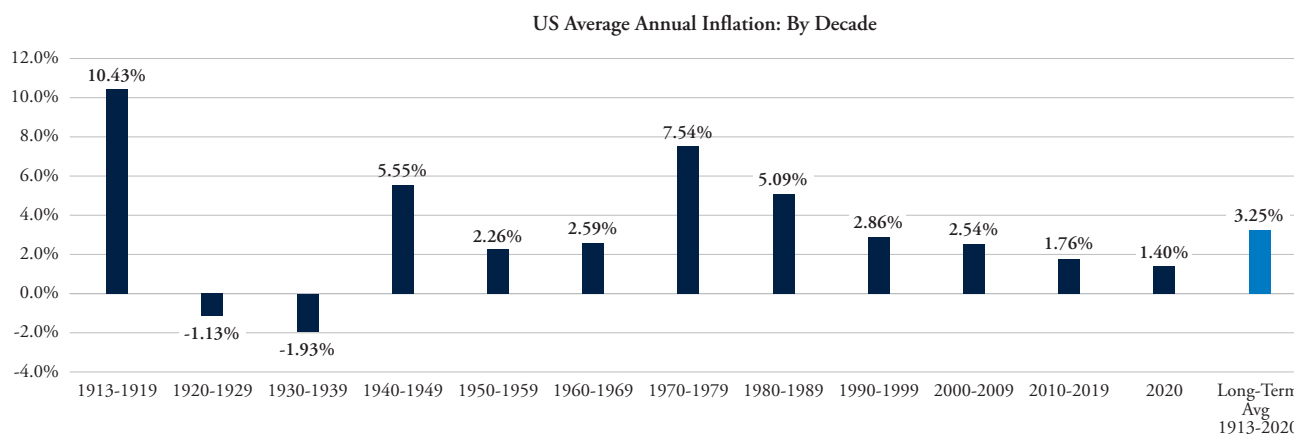
We examine the performance of a wide range of publicly traded assets in inflationary environments. We find that real assets have much better inflation-hedging properties than nominal bonds and stocks. Additionally, real assets are diversifying to nominal assets. Our analysis shows a hypothetical portfolio that allocates to real assets would have outperformed a traditional balanced stock/bond portfolio meaningfully in inflationary periods. We suggest investors diversify their portfolios by allocating a portion to liquid real assets for more robust portfolio outcomes in the next decade.

Note: We would like to thank Bruce Phelps, Harsh Parikh, and Wenbo Zhang of PGIM Institutional Advisory Services for their collaboration in some of the analysis presented in this paper.

Inflationary Environment: That 70s Show? Is Inflation About to Revive?

The US and major advanced economies have experienced a powerful disinflationary trend for the past several decades (Figure 1), driven by a confluence of reinforcing global trends. After the “Great Inflation” of the 1970s, central banks were granted greater independence by governments and began pursuing policies more credibly aimed at achieving disinflation/price stability. Governments also implemented supply-side structural reforms beginning in the 1980s, including deregulation, privatization, tax cuts and increased international trade, that improved productivity and strengthened the disinflation trend. Increased economic liberalization began in the US and the United Kingdom, and these market-based reforms eventually spread globally.

Figure 1 – Four Decade Trend in Declining Inflation



Source: Datastream. As of 12/31/2020.

Deepening globalization and a revolution in information technology reinforced these trends. China joined the World Trade Organization (WTO) in 2001 and soon established itself as the world’s manufacturing platform. The combination of China’s full economic integration, which occurred over multiple decades, and the return of Eastern Europe to global capitalism (after the fall of the Berlin Wall in 1989) led to a massive increase in the global supply of labor. This labor supply shock amplified the aforementioned trends, resulting in a decline in the bargaining power of labor in advanced economies and further fueling a decline in the power of unions, a reduction in real wage growth and an increase in inequality.

The key trends of the past several decades have produced winners and losers. The winners have been emerging-market labor, owners of capital and the professional classes in the developed world (i.e., knowledge workers). The main loser, on a relative basis, has been developed-market labor. Worsening trends in inequality and stagnant real median income in advanced economies have produced a political response, leading to a backlash against globalization and establishment economic policies. The pandemic and its aftermath have seen an uneven “K-shaped” recovery, reinforcing the same trends in terms of relative winners and losers.

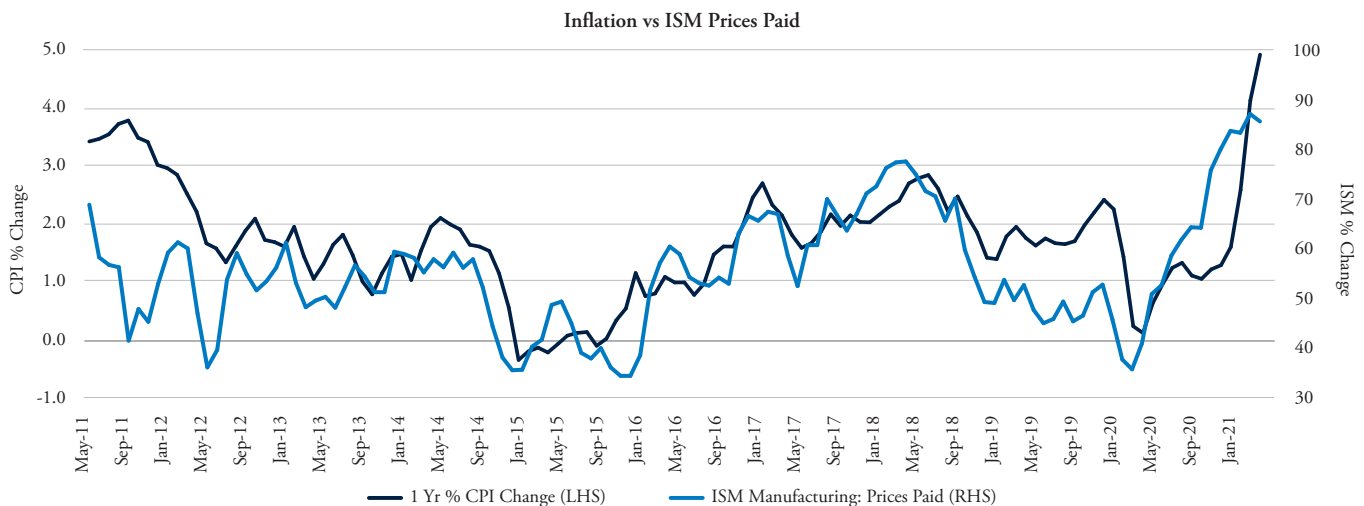
However, an inflation regime change could be underway once the deflationary shock of the pandemic fades. Some of the supply-side trends that we’ve discussed, which have supported low inflation, have either exhausted themselves or are in the process of reversing. Demographic trends, which we will discuss further, were supportive of disinflation over the past several decades. But, looking forward, the demographic “sweet spot” may have also turned. On the demand side, changes in politics have led governments away from the austerity policies implemented after the Global Financial Crisis (GFC) and toward fiscal and monetary profligacy. If sustained, these trends could also lead to a revival in inflation.

I. Short-/Medium-Term Dynamics

The US is likely to experience a notable pick-up in inflation this year due to “base effects,” the effect of comparisons with the abnormally low readings that followed the initial COVID lockdown last year. In particular, March through May of 2020 saw falling rates of inflation. Rising energy and commodity prices from last year’s depressed prices will play a pronounced role here.

Base effects could be amplified by demand-pull inflation. Here a boom in demand could outpace the economy’s ability to supply those goods and services, putting upward pressure on prices. Currently, there are signs of supply bottlenecks, surging transport costs and inventory shortfalls. Global flash Purchasing Managers Indexes (PMI) have highlighted extended delivery times for raw material and other inputs, rising production backlogs and a sharp increase in input prices (Figure 2). On the demand side, the pandemic initially shifted spending away from services towards goods. This strong demand for goods resulted in lean inventories, creating upward price pressure.

Figure 2 – Rising Input Prices/Rising Inflation



Source: Datastream. As of 5/31/2021.

Given the cumulative impact of government relief over the past year and limited opportunity to spend due to the restrictions on mobility and economic activity, the US now has massive excess savings, which are getting another boost from payments to households via the 2021 American Rescue Plan. With vaccine inoculation reaching critical mass in the US, we could see a torrent of spending on services this spring and summer. Excluding shelter and medical care, consumer services make up about 22% of the Consumer Price Index (CPI) basket, while consumer goods comprise 14.5%.

Many observers believe that, while a temporary rise in inflation may linger due to the factors described above, the pace will likely revert to its pre-crisis norm after the “sugar rush” of the stimulus-fueled growth surge fades. That would likely be the case if longer-term inflation expectations stay anchored at current levels. Indeed, the primary achievement of central banks over the past four decades has been anchoring inflation expectations at low and stable levels. It’s hard to imagine that cyclical factors alone associated with supply/demand imbalances would change that. However, it could take time for a supply response to materialize in certain industries, extending a period of rising prices. Further, persistent loose fiscal and monetary policy could pull inflation expectations away from current low levels.

The real test for whether inflation will be higher on a sustained basis will depend on how policymakers respond once the economy has returned to full employment. Those who are less sanguine on inflation trends note that policymakers (particularly in the US) are seeking to create a “high-pressure economy” that boosts wages to counter the long-term trend of increasing inequality (Figure 3). Sustained periods of higher inflation have historically been traced to government policies. We discuss this further in the next section.

Figure 3 – US Policymakers Aim to Boost Wage Share of GDP



Source: Datastream. As of 3/31/2021.

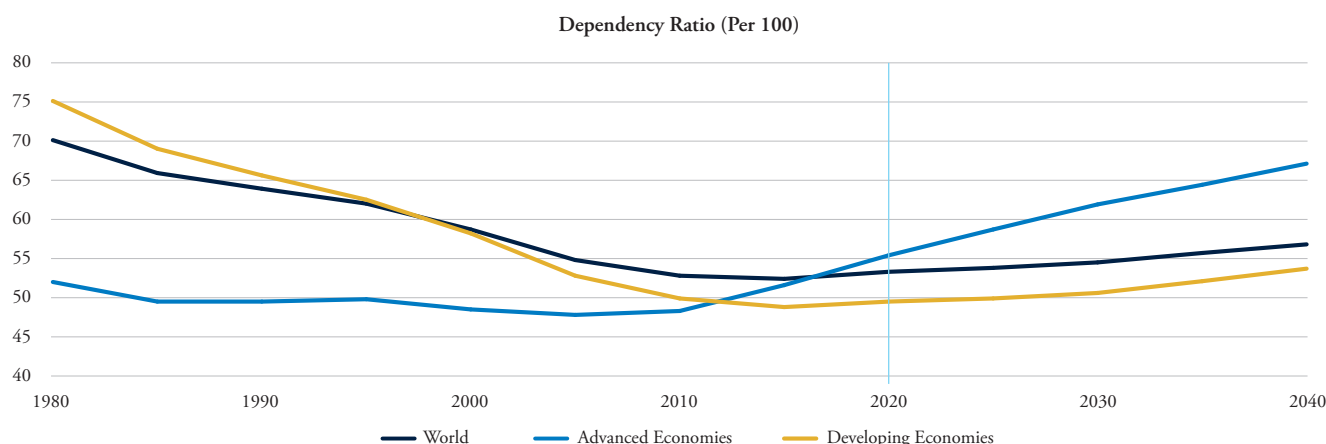
Some pessimists believe that higher inflation stemming from base effects and demand-pull factors, if sustained for a while, could unmoor inflation expectations and add a cost-push dynamic to inflation trends. In this scenario, structural changes such as “increased corporate concentration, deglobalization, disrupted movement of people, and skill mismatches play a role in fueling a self-feeding dynamic that would keep inflation high and rising.”¹

2. Longer-Term Issues & Risks

Some longer-term factors also seem tilted in the direction of higher inflation, however, there are potential offsetting factors as well, which could fuel cost savings and increased productivity.

- **Demographics:** Goodhart and Pradhan focus on shifting demographics in arguing for a higher inflation world.² Over the past three decades, the global economy has been swimming in excess labor, as the rise of China and the return of Eastern Europe to capitalism led to a doubling of the global supply of labor. This was the largest positive supply shock ever for the global economy. It also happened at a time when the working age population was rapidly expanding for these countries. Advanced economy demographics were also in a sweet spot for disinflation during this time period, as dependency ratios—the ratio of dependents (either the very old or the young) to workers—were falling. More workers relative to dependents means more production relative to consumption, which is deflationary (while the inverse is inflationary). The result of the labor supply shock and falling dependency ratios were very deflationary. Looking forward, the picture is very different. China’s integration from autarky/isolation won’t replay itself (and continued integration is, at minimum, on pause) and dependency ratios are now generally rising (Figure 4).

Figure 4 – Demographic Sweet Spot Turning Sour



Source: United Nations, Department of Economic & Social Affairs. As of 3/31/2021.

- **Politics:** Worsening inequality has shifted voter preferences to the left on economic matters.³ Opinion surveys in the US consistently show that voters increasingly doubt the benefits of free trade and favor greater involvement of the public sector in the economy, compared to 10 or 20 years ago. Additionally, support for “socialism” has become more widespread in some quarters. The swift fiscal easing accompanying the COVID recession was focused on addressing social need and has been much more popular than the fiscal easing that followed the GFC, which addressed financial stability (i.e., “bailing out the bankers”).⁴

As we described earlier, US policymakers are keen on creating a “high pressure economy” as a way to boost wages to at least partially counter trends in inequality. Greater government spending and larger fiscal deficits are being used to achieve faster GDP growth and a return to full employment as quickly as possible. Should this profligacy continue after the economy has reached full employment, it will become inflationary, as it will create aggregate demand in excess of aggregate supply. Regulatory policy may also be used to diminish competition and boost wages for workers, and efforts to limit global trade flows are already underway. Tax policy will also likely be used to force a redistribution of income and wealth toward the middle class. According to BCA Research: “The shift by median voters to the left on economic matters will force greater fiscal profligacy and regulatory rigidity. It will also contribute to a more dovish bias by central banks. This policy mix will add a secular drift to inflation.”

¹ Bloomberg Opinion: Faster Inflation Is Coming. How Bad Will It Be? Mohamed El-Erian, March 29, 2021.

² The Great Demographic Reversal: Aging Societies, Waning Inequality, and An Inflation Revival, Goodhart and Pradhan, 2020.

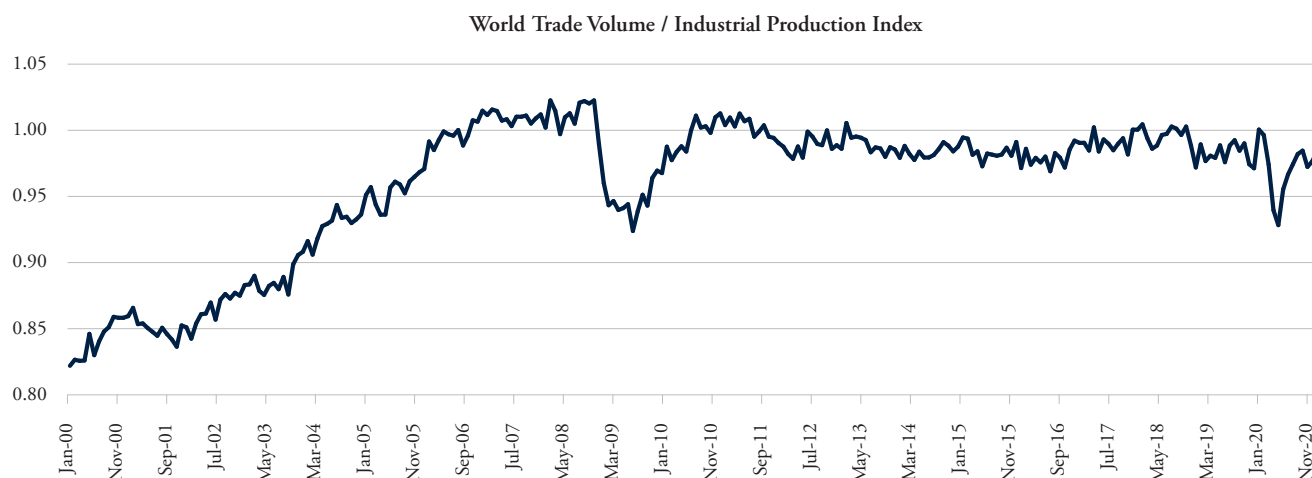
³ Financial Times, Opinion Economy: The Left is Winning the Battle of Economic Ideas, Chris Giles, April 29, 2021.

⁴ The Bank Credit Analyst, BCA Research, November 2020.

There are potential mitigating or offsetting factors as well. Increased political will on pursuing antitrust action (and/or the threat of such actions) could result in increased competition in industries currently dominated by oligopolies. Further, 1970s-style inflation was the result of enormous and persistent policy mistakes (exacerbated by two oil shocks) that we think are unlikely to be repeated over the next decade.

- **Globalization:** As noted, the political support in advanced economies in favor of globalization, especially as it relates to China, has significantly diminished, and thus globalization is no longer advancing (Figure 5). Deglobalization remains a risk rather than a current reality, but at a minimum increased globalization is no longer a force for disinflation. A move toward deglobalization or regional trade blocks would have significantly worse implications for inflation.

Figure 5 – Globalization: A Spent Force?



Source: CFB Netherlands Bureau Economic Analysis. As of 3/31/2021.

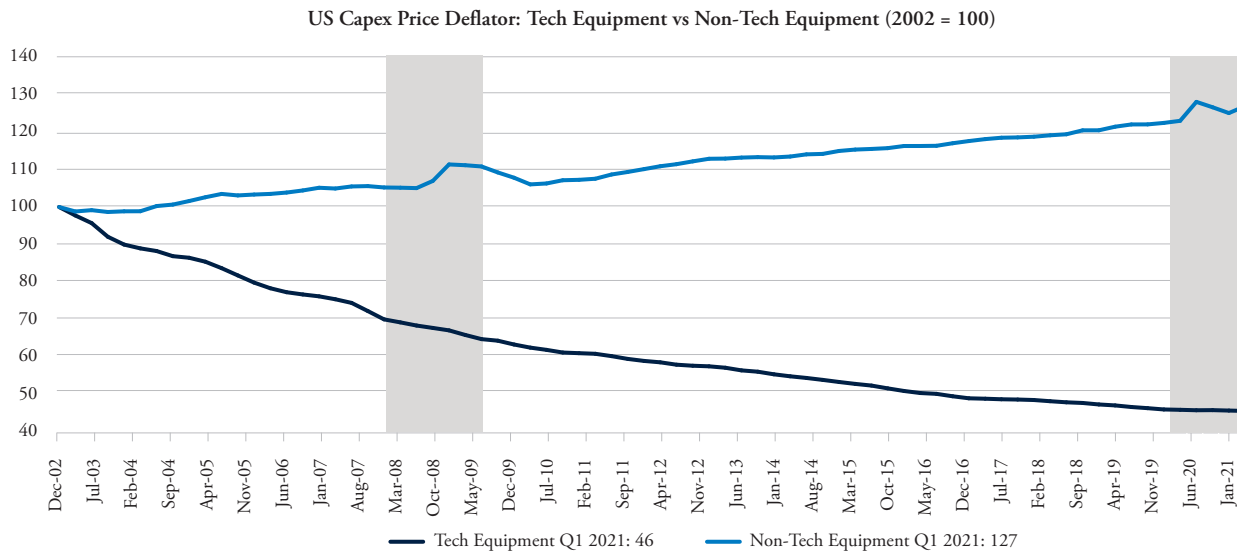
- **Climate Spending:** In the short run, the massive amounts of “green” investment required to substantially lower carbon emissions could boost inflation. Where being green raises productivity, businesses will do it voluntarily. However, voluntary green investment will likely be insufficient to combat climate change, and government policies may require firms to adopt costlier technologies, reducing productivity. In his latest book,⁵ Bill Gates describes this as the “green premium,” which he defines as the “difference in the cost between a product that involves emitting carbon and an alternative that does not.” The costs of these green premiums are likely to be borne by governments (in addition to firms and individuals), which would boost demand, especially if financed by deficits, as is currently expected. In the longer run, however, climate spending should make the economy more sustainable and less prone to future downside risks to productivity as well as supply/demand shocks associated with climate change.⁶ Further, investment in green technology is likely to become more efficient over time (i.e., green premiums will shrink).
- **Technology and Productivity:** Signs that companies are massively accelerating automation and digitalization in response to the pandemic may exert downward pressure on inflation that could mitigate and/or potentially offset some of the forces described above. Real private fixed investment in information processing equipment has risen by more than 30% since early 2020, an unprecedented increase in recent history.⁷ Tech disruption 2.0 lies ahead for sectors such as health care, finance and education, with huge potential efficiency gains. New Economy capital expenditures (i.e., software, tech hardware and R&D) make up a rapidly growing share of overall capital spending (now over 50%), according to Cornerstone Macro. “The growing adoption of New Economy Capex is a huge productivity-boosting disinflationary headwind, with its deflator less than core inflation for most of the past 40 years,” notes Nancy Lazar (Figure 6).

⁵ Bill Gates, *How to Avoid A Climate Disaster: The Solutions We Have and the Breakthroughs We Need*, 2021.

⁶ Long-term impact of climate change on inflation is complex. It may create supply and demand shocks that pull inflation and output in opposite directions, generating a trade-off for central banks between stabilizing inflation and stabilizing output fluctuations. Supply-side shocks can include pressures on the supply of energy and agricultural products that are particularly prone to sharp price adjustments and increased volatility. The frequency and severity of such events may well increase, impacting supply through more or less complex channels. Demand-side shocks could be related to mortality or growth impacts of climate change, particularly over the longer term. Shocks to long-term demand are not always easy for central banks to disentangle from the business cycle, which can make them more difficult to respond to. See Tokat-Acikel et al (2021) for further discussion.

⁷ Through the end of the first quarter 2020.

Figure 6 – Tech Disruption Fuels Productivity and Disinflation



Source: BEA, Factset. As of 3/31/2021.

3. Our Take: Shifting Toward a Higher Inflation World, But No Replay of the 1970s

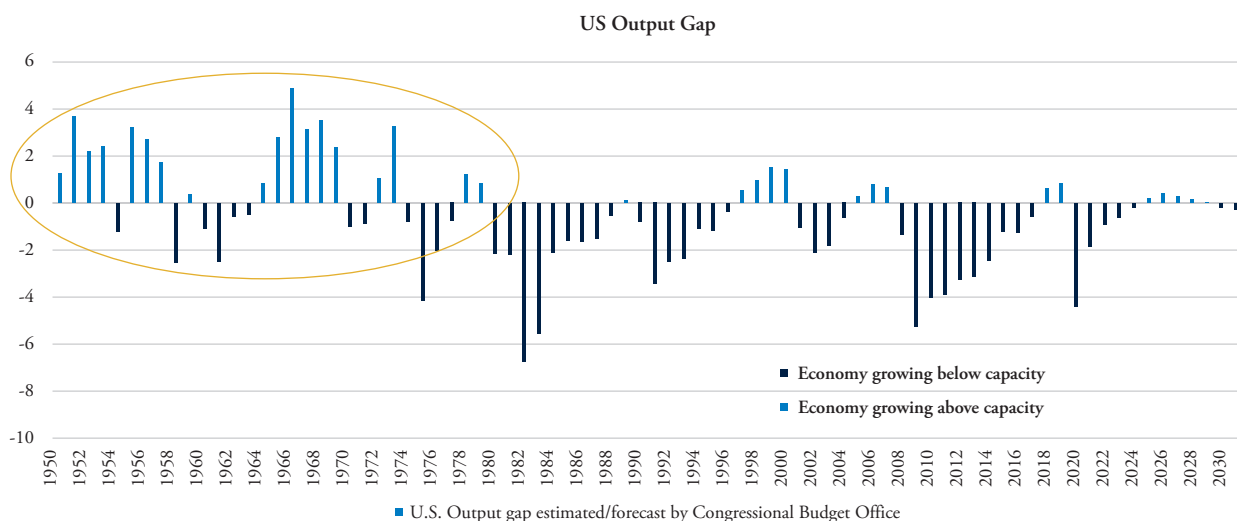
“The times, they are a-changing.” — Bob Dylan

We believe an inflation regime change could be underway once the deflationary shock of the pandemic fades into memory. The four-decade trend in falling US inflation has likely ended, and inflation will probably increase at a higher rate over the next decade. An inflation forecast of 2.3% over the next 10 years is embedded in our capital markets assumptions (CMAs). While there are risks on both sides of this forecast, we believe they are skewed to the upside. We view the potential for a sustained period of 3-4% average inflation as a non-trivial risk for investors.

The impact of slow-moving structural forces on inflation needs to be analyzed in the context of aggregate supply and demand. Thus, super-aggressive monetary and fiscal policy in the US could overwhelm structural impediments to rising inflation (i.e., slow trend growth, high debt, etc.). Therefore, the real test for whether inflation will be sustainably higher or not will depend on how policymakers respond once the economy has returned to full employment, which could come sooner than expected, especially in the US.

Structural trends in politics, globalization and demographics highlight the risk of higher inflation on a trend basis, however, we think an extreme outcome will likely be avoided. Continued technology innovation, automation and digitalization are deflationary and could mitigate and/or potentially offset some of the inflation drivers we’ve discussed. Inflation in the 1970s was the product of many years of running the economy above its potential growth rate (Figure 7). Policymakers have presumably internalized the lessons of that episode. We think they will have opportunities to adjust policy and proverbially step back from the brink to avoid such an extreme outcome.

Figure 7 – 1970s Style Inflation Required Enormous and Persistent Policy Mistakes



Source: Congressional Budget Office. As of 3/31/2021.

Post-GFC “Money Printing” Did Not Lead to Inflation. So Why Is This Time Different?

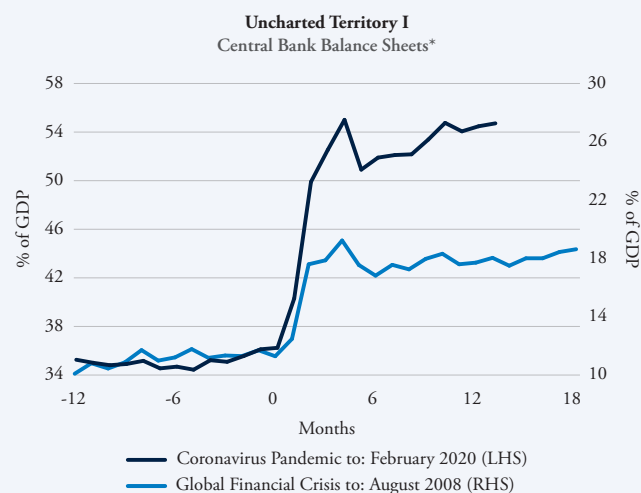
Inflation skeptics point to last decade’s fears about rampant inflation, which stemmed from the unconventional monetary policy and fiscal stimulus undertaken post-GFC, but which never materialized. However, we see many differences between now and then:

- Fiscal and monetary stimulus are much larger than after last crisis. Please see figures below: Uncharted Territory I and Uncharted Territory II.
- In August 2020, the Federal Reserve (the “Fed”) adopted an Average Inflation Target (AIT). This new operating framework enables the Fed to tolerate inflation overshoot to make up for past inflation undershoot. The central bank’s pledge to react only to inflation that is above its target and not transitory raises the risk of it falling behind the curve.
- Both Fed Chair Jerome Powell and Treasury Secretary Janet Yellen have endorsed the concept of a “high pressure economy” (i.e., running the economy hot in a bid to raise wages).
- Broad money (M2) is now growing at a much faster rate than during the post-GFC period, which saw rapid growth only in narrow money (i.e., bank reserves).
- Banks are well-capitalized and consumers are not overleveraged this time. Banks are more likely to lend and consumers are more likely to borrow than after the GFC (less economic “scarring”).
- Post-GFC fiscal stimulus was aimed at financial stability, while current stimulus is aimed at meeting social need (putting money in the hands of those most likely to spend it). Lower-income earners have higher marginal propensity to consume. Redistribution policies are reflationary and boost demand.
- After the GFC, fiscal stimulus was pulled back due in part to the rise of the Tea Party, growing concerns about moral hazard and an emphasis on fiscal austerity.
- Fiscal and monetary policy stimulus could continue longer this time because of political concerns on inequality and the rise of populism on both right and left. Moral hazard is not considered a concern because the pandemic is a global health crisis.

“There was a fundamental difference between what happened during the financial crisis and what is happening now. The money created during the GFC found its way into excess reserves in the banking sector. Little of it was lent out to the private sector.”

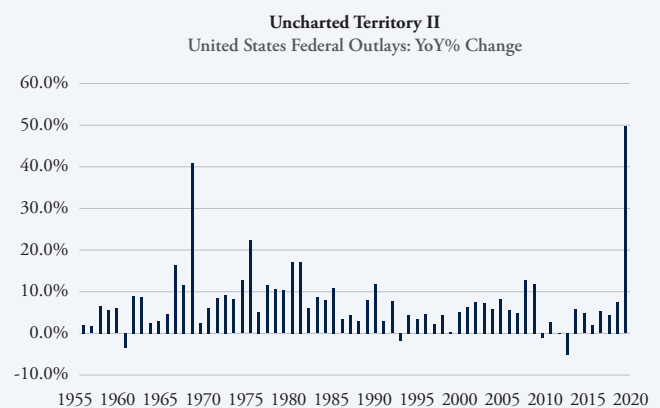
“...[T]he actions of the Fed and Treasury in response to the COVID 19 crisis are producing a very different outcome. The money created by the Fed is not only going into excess reserves in the banking system. It is going directly into the bank accounts of individuals and firms through the paycheck protection program stimulus checks, and grants to state and local governments.”

—Jeremy Siegal, *Higher Inflation Is Coming and It Will Hit Bondholders*, *Financial Times*, January 19, 2021



Source: Haver Analytics. As of 3/31/2021.

*Federal Reserve, ECB, Bank of Japan, and Bank of England; GDP is sum across the four economies.



Source: Haver Analytics. As of 12/31/2020.

Asset Performance and Portfolio Implications

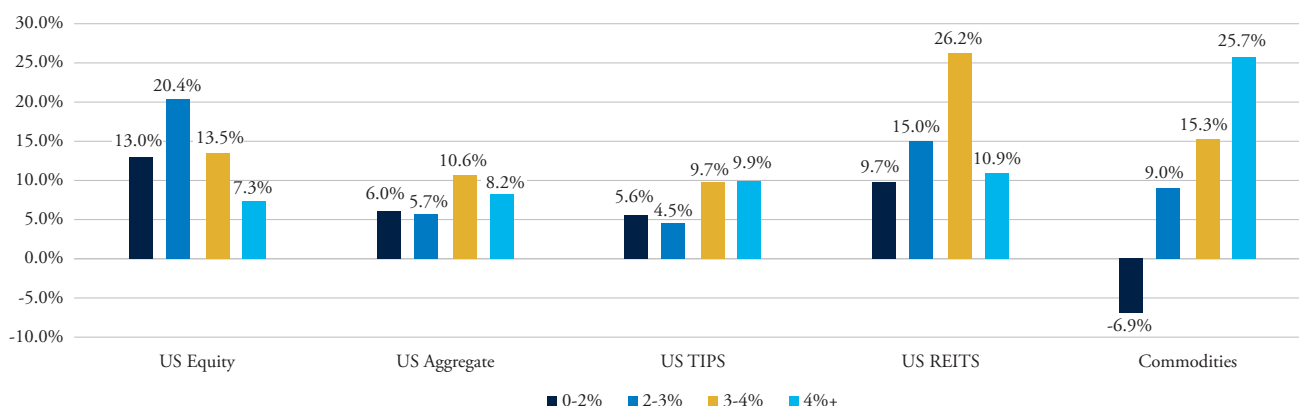
Since we expect nontrivial upside risks to inflation in the future, we seek to now understand how various nominal and real asset classes have performed in periods of inflation and in periods of strong economic growth in the past. While the US economy has evolved over the last 50 years, and some historical relationships should be extrapolated carefully, we believe core relationships should be good guidelines for what the future holds.⁸

We start with a high-level analysis of nominal and real asset returns in various inflationary intervals from 1973 to 2020 (Figure 8). Equities and nominal bonds have done well for investors in the 0-2% inflation environment that characterized the last decade. Among the widely recognized real asset classes of Treasury Inflation Protected Securities (TIPS), REITS and commodities, TIPS kept pace with nominal bonds, while REITS and commodities lagged behind equities.

That relationship flips, however, in periods of inflation above 4%. Equities and nominal bonds have historically struggled, while commodities, REITS and TIPS have done well in those periods. An allocation to real assets had a significant payoff in those higher inflation environments.

While a sustained period of 4% inflation or greater may be a low risk for the US economy, arguments presented in the first section of our paper suggest that the risk of 2-4% inflation is non-trivial. Even with such moderate inflation, real assets have performed at par or better than stocks and nominal bonds. These results suggest that owning real assets essentially provides insurance against high inflation environments without material performance drag in moderate inflationary environments.

Figure 8 - Asset Class Performance at Various Inflation Levels



Notes: See Appendix for details. Average annualized returns for real and nominal assets within different inflation buckets. Quarterly returns data and YoY inflation at quarterly frequency. Sources: Datastream, Bloomberg, Factset, QMA. As of 5/31/2021.

Quantifying Inflation and Growth Beta

After exploring select real assets in various inflation periods, we now look to formally measure the “beta” of a broad range of liquid real assets against inflation and economic growth. Our goal is to characterize the trade-off between the growth exposures and inflation exposures of asset classes.

Our beta analysis⁹ measures the coincident performance of various assets with realized inflation and economic growth levels as well as with inflation and economic growth surprises. We regress quarterly real asset returns on the following independent variables (in a multivariate model):

- Realized inflation¹⁰ and economic growth¹¹
- Inflation surprise¹² and growth surprise¹³

As a robust way of capturing coincident behavior regardless of the data release date, we regress returns on growth and inflation in leading, coincident and lagging quarters.

⁸ While we acknowledge that energy accounts for only about 4% of the total weight in the inflation basket today, energy commodities have explained about half of the monthly price variation in the CPI index since the 1970s, and they remain critical to determining the direction of overall inflation. Kolet et al, “Considerations for Inflation and Inflation Protection,” Fidelity White Paper, 2021.

⁹ We would like to thank Bruce Phelps, Harsh Parikh and Wenbo Zhang of PGIM Institutional Advisory Services for this analysis. This methodology follows the Harsh and Zhang (2019). Asset return (t) = $\alpha + \beta_{ai1} * \text{inflation}(t-1) + \beta_{ai2} * \text{inflation}(t) + \beta_{ai3} * \text{inflation}(t+1) + \beta_{ag1} * \text{growth}(t-1) + \beta_{ag2} * \text{growth}(t) + \beta_{ag3} * \text{growth}(t+1) + \text{residual}$ Dimson [1979] used a combination of leading and lagging market returns as independent variables when estimating a stock’s sensitivity to the market. The sum of the estimated coefficients, popularly known as the “Dimson beta,” is the stock’s estimated beta. Similarly, Nelson [1976], recognizing the reporting lags in inflation, used leading and lagging actual and inflation surprises to study inflation’s impact on stock market returns. Nelson found that the equity returns were negatively related to inflation as the sum of the estimated coefficients was both negative and significant.

¹⁰ Quarter-over-quarter US CPI Headline Inflation Seasonally Adjusted (Source: BLS, as of 3/1/2020).

¹¹ Quarter-over-quarter US GDP Constant Prices Seasonally Adjusted (Source: BEA, as of 3/1/2020).

¹² First reported US CPI headline inflation – mean economist forecast by Survey of Professional Forecasters.

¹³ First report US GDP – mean growth forecast by Survey of Professional Forecasters.

Traditional Assets

Overall, nominal bonds show no significant beta to inflation or growth in our full period of analysis. However, this hides their significant *negative* beta to inflationary *surprises*. As yields are set with certain inflationary expectations, any surprise to those expectations causes bonds to be re-priced. When inflation surprises were positive — that is, realized inflation came in higher than expected in the 1973-1993 period — we see a very strong negative beta from nominal bonds (Figure 10).

While equities provided positive exposure to growth, they suffered in inflationary environments, with a negative inflation beta. Although equities can be a real asset over the very long term, inflation pass-through is not perfect over short and intermediate time horizons (Neville et al, 2021). In an inflationary environment, some companies may be unable to fully pass on increased input costs to customers, leading to shrinking margins. Inflation surprises also drive risk premiums higher, reducing equity prices, and high duration stocks (i.e., growth stocks) are especially sensitive to increased discount rates. Higher inflation also has tax implications for companies, especially those with high capital expenditures. Since depreciation is calculated based on historical cost (not inflation-adjusted), the recognized expense will be artificially low in a rising inflation environment. Equities have provided negative exposure to inflation surprises, especially during periods of high inflation.

Real Assets

TIPS are the most explicit real asset, with inflation protection built into their coupons via principal adjustments. TIPS had a significant positive beta to realized inflation as well as to inflation surprises in the 1993-2020 period. (TIPS were first issued in the US in 1997. Our extension of their history using an approximation methodology suggests the market re-pricing may still overwhelm the yield adjustment. As with all simulated data, it should be interpreted cautiously.)

While TIPS offer the most direct inflation hedge, they provide no growth exposure to investors seeking capital appreciation in line with the growth of the economy. Alternative ways of inflation hedging are offered by REITS and other equity-like assets, such as natural resource stocks, infrastructure and master limited partnerships (MLPs) in the energy sector. These assets have provided positive exposure to realized growth and growth surprises and hold up better than the broader equity market in inflationary environments. With REITS, it is important to note that sensitivity to inflation surprises has varied over time. As REITS have matured as a market segment, their economic sensitivities have been driven more by their real estate fundamentals. This is evident in their betas to inflation surprises turning positive in the period from 1993 to 2020.

Finally, commodities are another natural inflation hedge, as they are inputs to components of the consumer basket, such as food and energy. While goods are currently a smaller component of the CPI basket than historically, they are still the most volatile component, and they drive marginal changes. While individual commodities vary in their growth exposure, varying from positive to negative, they have provided positive inflation beta, given their relatively inelastic supply-and-demand traits, especially over shorter periods. Energy, agriculture and livestock have provided a better inflation hedge than metals. The behavior can be time-sensitive for individual commodities but has been robust for a broadly diversified index. Energy and industrial metals have provided a good hedge against inflation surprises and have a positive beta to growth surprises.

While our analysis covers 1973-2020, similar results hold up in other papers. For example, Neville et al, (2021) explores 95 years for US, UK and Japan and show that neither equities nor bonds perform well in real terms during high inflation regimes. They find that TIPS are robust to rises in inflation, with positive real returns in inflationary regimes, and that traded commodities have historically performed best during high and rising inflation.

Figure 9 – Exposures to Inflation and Real GDP, Level; Estimated Dimson Betas (1973–2020; and subperiods)

Asset	Inflation Level			GDP Level		
	1973-2020	1973-1993	1993-2020	1973-2020	1973-1993	1993-2020
Fixed Income						
US Aggregate	-0.41	-2.01	0.15	-0.12	-0.63	-0.56
US Cash	0.81	0.19	0.79	0.17	-0.26	0.37
US TIPS	0.38	-0.59	2.41	-0.40	-0.89	-0.60
Equity-Like						
US Equity	-0.42	-1.38	-1.16	3.02	1.55	5.07
Global Infrastructure	-0.24	-2.86	5.34	3.01	0.83	4.81
Global Natural Resources	1.04	-0.14	10.47	2.95	2.42	3.36
MLPs	0.02	-0.87	5.93	0.88	-0.04	1.81
Real Estate						
US REITS	0.38	-0.73	1.85	3.78	2.44	5.60
Developed REITS	0.57	0.31	2.67	3.89	3.19	5.51
Commodities						
Gold	1.99	4.06	3.30	-2.15	-0.95	-2.13
Precious Metals	2.19	4.38	3.76	-1.44	-0.34	-1.70
Industrial Metals	1.19	0.21	10.99	2.69	1.77	3.08
Energy	5.58	2.67	28.78	4.43	-2.02	5.25
Agriculture	3.03	2.82	7.32	-0.13	-1.74	1.17
Livestock	2.18	-1.06	4.72	2.87	-0.05	3.66
Commodities	4.34	2.25	21.32	2.52	-1.07	3.48

Note: Betas in bold suggests significance at a 90% confidence level. Sources: Datastream, Bloomberg, Factset, QMA. See Appendix for details. As of May 31, 2021.

Figure 10 – Exposures to Inflation and Real GDP, Surprise; Estimated Dimson Betas (1973–2020; and subperiods)

Asset	Inflation Surprise			GDP Surprise		
	1973-2020	1973-1993	1993-2020	1973-2020	1973-1993	1993-2020
Fixed Income						
US Aggregate	-2.00	-3.54	-1.02	-0.85	-1.44	0.09
US Cash	0.85	0.11	0.07	0.40	0.02	1.13
US TIPS	0.84	-0.52	3.12	-1.09	-1.60	0.45
Equity-Like						
US Equity	-2.62	-4.52	-1.67	4.36	1.36	10.87
Global Infrastructure	-2.74	-6.98	7.71	1.23	-1.52	6.40
Global Natural Resources	2.07	-1.56	15.42	4.46	2.88	8.67
MLPs	0.17	-0.91	1.79	3.24	1.68	6.94
Real Estate						
US REITS	-1.42	-4.26	3.27	3.74	0.46	8.70
Developed REITS	-1.18	-3.00	1.41	3.17	1.35	6.66
Commodities						
Gold	8.55	10.95	6.70	-1.91	-0.25	-3.08
Precious Metals	9.85	12.96	7.24	0.52	3.03	-2.46
Industrial Metals	4.21	1.42	17.61	2.81	0.47	7.91
Energy	16.40	11.50	48.18	8.31	0.92	15.37
Agriculture	9.54	10.83	5.31	-0.51	-2.07	1.54
Livestock	1.44	-2.65	6.18	3.33	1.85	4.08
Commodities	12.96	8.49	34.69	4.74	0.64	10.39

Note: Betas in bold suggests significance at a 90% confidence level. Sources: Datastream, Bloomberg, Factset, QMA. See Appendix for details. As of May 31, 2021.

Real Assets are Diversifying to Traditional Assets

In addition to their inflation protection benefits, real assets offer a general diversification of returns to equities and bonds (Figure 11). Another point to note is that while the correlation between stocks and bonds was low for the full period, it has changed from positive to negative between the first and the second period, as identified in Figure 11. In an inflationary period, bonds are not as effective a diversifier to equities.¹⁴ On the other hand, the correlation of commodities to equities follows the reverse pattern — negative during inflationary periods and positive during periods of lower inflation. While precious metals are reliably non-correlated to equities, other commodities had positive correlation in low inflation periods due to shared growth exposure.

Figure II – Correlation with US Stocks and Bonds (1973–2020; and subperiods)

Asset	Correlation with US Equity			Correlation with US Aggregate		
	1973-2020	1973-1993	1993-2020	1973-2020	1973-1993	1993-2020
Fixed Income						
US Aggregate	0.17	0.39	-0.20	1.00	1.00	1.00
US Cash	0.02	0.01	-0.02	0.36	0.38	0.23
US TIPS	0.08	0.24	-0.13	0.83	0.87	0.70
Equity-Like						
US Equity	1.00	1.00	1.00	0.17	0.39	-0.20
Global Infrastructure	0.65	0.58	0.71	0.40	0.60	0.07
Global Natural Resources	0.72	0.79	0.69	0.07	0.27	-0.22
MLPs	0.54	0.62	0.49	0.21	0.36	0.08
Real Estate						
US REITS	0.65	0.74	0.60	0.22	0.39	0.05
Developed REITS	0.71	0.72	0.70	0.21	0.41	0.00
Commodities						
Gold	-0.05	-0.04	-0.09	0.11	0.06	0.26
Precious Metals	0.00	0.00	-0.01	0.03	-0.04	0.24
Industrial Metals	0.21	-0.08	0.42	-0.15	-0.11	-0.26
Energy	0.03	-0.06	0.28	-0.12	-0.13	-0.16
Agriculture	-0.03	-0.24	0.20	-0.04	-0.09	-0.02
Livestock	0.10	0.00	0.18	-0.01	-0.02	-0.17
Commodities	0.07	-0.19	0.33	-0.12	-0.15	-0.17

Sources: Datastream, Bloomberg, Factset, QMA. See Appendix for details. As of May 31, 2021.

Portfolio Outcomes: Real Asset Portfolio versus Traditional Balanced Portfolio

Comparing a traditional stock/bond balanced portfolio and a broadly diversified real asset portfolio makes the trade-offs very clear (Figure 12). A broadly diversified real asset portfolio provided an inflation hedge without sacrificing return in the long term. The diversified real asset portfolio is comprised of TIPS, REITS, a broadly diversified commodity index, gold and commodity stocks (natural resources, infrastructure and MLPs). As can be seen from Figure 12, REITs and commodity stocks sacrifice less return relative to US equities while providing a higher inflation beta, whereas commodities, gold and TIPS provide higher inflation betas that help a real asset portfolio outperform stocks and nominal bonds during periods of higher inflation.

The long-term performance of the real asset portfolio is quite similar to the performance of the 60/40 portfolio, but with modestly higher volatility. This results in a Sharpe ratio of 0.5 for the real asset portfolio, which is close to the 0.53 Sharpe ratio for the 60/40 portfolio. More importantly, both portfolios have a comparable positive beta to growth and growth surprises, while only the real assets portfolio has a positive beta to inflation and inflation surprises, which provides inflation protection during periods of rising inflation. A combined portfolio that allocates 20% to real asset portfolio and 80% to balanced 60/40 portfolio achieved the same return with lower risk from 1973 to 2020.

¹⁴ See Shen and Weisberger (2021) for a fuller treatment of this topic. Shen and Weisberger, “US Stock-Bond Correlation: What are the Macroeconomic Drivers?” PGIM IAS paper, 2021.

We categorized inflation into four sub-periods, 0-2%, 2-3%, 3-4% and 4%+, and measured the performance of the real asset and 60/40 portfolios over those periods.¹⁵ During the 0-2% inflation period the traditional 60/40 portfolio outperforms the real asset portfolio significantly, driven by the strong performance for US equities. On the other hand, the real asset portfolio outperforms the 60/40 portfolio significantly during periods of inflation higher than 4%. In the 2-4% inflation periods, performance of real asset and 60/40 portfolio are comparable. Adding real assets to the 60/40 portfolio has no performance drag in 2-3% inflation bucket and benefits in higher inflation buckets. Based on the performance of the real asset portfolio in the different sub-periods, it can be seen that we don't need to be in a hyperinflationary period for an investor to benefit from allocating to a real asset portfolio. The higher beta to inflation and inflation surprises helps the real asset portfolio outperform the 60/40 portfolio by a wide margin during periods of higher inflation. Even in periods during which inflation is between 2% to 4%, investors should benefit from adding exposure to real assets that have a positive beta to inflation level and surprises.

Figure 12 – Putting it All Together: Real and Nominal Asset and Portfolio Characteristics (1973-2020)

	US TIPS	US REITS	Dev. REITS	Commodities	Global Natural Resources	Gold	Global Infra	MLPs	US Equity	US Agg	US Cash	Real Asset Portfolio	60/40 Portfolio	Combined Portfolio
Performance														
Average Return	7.4%	13.3%	11.4%	10.3%	8.1%	11.7%	11.4%	13.0%	12.4%	7.4%	4.7%	10.5%	10.4%	10.4%
Volatility	6.6%	18.0%	18.2%	28.6%	20.1%	19.0%	16.1%	22.0%	16.7%	6.1%	1.9%	11.5%	10.7%	10.2%
Sharpe	0.41	0.47	0.37	0.20	0.17	0.37	0.41	0.38	0.46	0.45	0.00	0.50	0.53	0.56
Performance by Inflation Bucket														
0-2%	5.6%	9.7%	8.4%	-6.9%	5.7%	2.9%	11.7%	5.6%	13.0%	6.0%	1.7%	4.4%	10.1%	9.0%
2-3%	4.5%	15.0%	15.0%	9.0%	7.4%	23.7%	13.5%	24.6%	20.4%	5.7%	3.6%	12.5%	14.4%	14.0%
3-4%	9.7%	26.2%	20.3%	15.3%	3.3%	14.0%	15.8%	21.6%	13.5%	10.6%	4.8%	16.0%	12.3%	13.0%
4%+	9.9%	10.9%	7.8%	25.7%	11.5%	9.2%	9.3%	4.0%	7.3%	8.2%	8.2%	11.8%	7.7%	8.5%
Dimson Beta's														
CPI Level	0.38	0.38	0.57	4.34	1.99	1.04	-0.24	0.02	-0.42	-0.41	0.81	1.13	-0.42	-0.11
CPI Surprise	0.84	-1.42	-1.18	12.96	8.55	2.07	-2.74	0.17	-2.62	-2.00	0.85	2.40	-2.37	-1.42
GDP Level	-0.40	3.78	3.89	2.52	-2.15	2.95	3.01	0.88	3.02	-0.12	0.17	1.90	1.77	1.79
GDP Surprise	-1.09	3.74	3.17	4.74	-1.91	4.46	1.23	3.24	4.36	-0.85	0.40	2.24	2.28	2.27

Notes: **Past performance is not a guarantee or reliable indicator of future results.** The number of quarterly observations in each bucket are: 44, 49, 32, and 58 for 0-2, 2-3, 3-4, 4+ inflation buckets, respectively. Inflation buckets are created using YoY inflation, measured at quarterly frequency.

Real asset portfolio consists of 25% TIPS, 12.5% US REITS, 12.5% Non US Developed REITS, 18% Commodities, 3% Gold, 10% Global Infrastructure, 9% Natural Resources and 10% MLPs.

60/40 portfolio is 60% US equity and 40% US Aggregate Bonds. **Combined Portfolio allocates 20% to real asset portfolio and 80% to balanced portfolio.**

Sources: Datastream, Bloomberg, Factset, QMA. See Appendix for details. As of May 31, 2021.

Conclusions

Traditional stocks and nominal bonds have thrived in the low and well-anchored inflation period of the last two decades. With inflation likely to rise at a higher rate over the next decade and with inflation risks building on a shorter horizon, investors should consider insulating their portfolios with an allocation to real assets.

An allocation to real assets is prudent for many investors for two reasons. First, real assets are an effective inflation hedge; they are likely to outperform nominal assets, such as stocks and bonds, in a period of rising inflation levels and upside inflation surprises, without sacrificing exposure to economic growth. Second, real assets are diversifying to traditional stocks and bonds.

¹⁵ We formed inflation buckets using both YoY inflation as well as quarterly annualized inflation. The results in the highest and lowest inflation buckets are robust to either measurement. In the middle, real asset portfolio does better than 60/40 portfolio when quarterly annualized inflation is used. We show weaker YoY inflation results here to be more conservative. The other results are available upon request.

Asset	Index	Source
US Aggregate	71% US Treasury + 29% US Corporate Baa up to 12/31/1975; Bloomberg Barclays US Aggregate later	Datastream
US Cash	T-Bills 3-month total returns index	Datastream
US TIPS	Bloomberg-Barclays US TIPS All Maturity total returns index spliced with Pond and Mirani [2009] TIPS performance prior to April 1997; Bloomberg Barclays US Treasury US TIPS later	Bloomberg, Datastream
US Equity	S&P 500 Total Returns Index	Datastream
Global Infrastructure	85% World Utility + 15% World Pipeline up to 10/31/2000; S&P 500 Global Infrastructure later	Datastream
Global Natural Resources	28% World Basic Materials + 72% World Oil & Gas up to 3/31/1997; S&P North American/Global Natural Resources later	Datastream
MLPs	US Pipeline up to 3/31/1997; Alerian MLP Index	Datastream
US REITs	FTSE Nareit Equity REIT Total Return Index	
Developed REITs	Spliced with US REITs up to 1989; FTSE EPRA Nareit Developed Total Return Index	Datastream
Gold	Gold Bullion LBM U\$/Troy Ounce price returns index	Datastream
Precious Metals	S&P GSCI Precious Metals – Commodity Index	Factset
Industrial Metals	49% Copper + 51% Aluminum up to 1/31/1991	Datastream
Energy	Crude Oil BFO M1 Europe FOB \$/BBL up to 12/31/1982; S&P GSCI Energy Total Return later	Datastream, Factset
Agriculture	S&P GSCI Agriculture – Commodity Index	Factset
Livestock	S&P GSCI Livestock – Commodity Index	Factset
Commodities	GSCI Total Returns Index. Energy futures backfilled prior to 1983	Datastream

References

- BCA Research. “Beware the Bond-Bearish Blue Sweep” The Bank Credit Analyst, Vol. 72, No.5, November 2020.
- Chris Giles. “The left is winning the battle of economic ideas.” Financial Times, 29 April 2021, <https://www.ft.com/content/d3c1c5c5-e601-4c46-8d3a-187e1d9a6b87>.
- Dimson, Elroy. “Risk measurement when shares are subject to infrequent trading” Journal of Financial Economics, Vol. 7, Issue 2, June 1979, pp.197-226.
- El-Erian, Mohamed. “Faster Inflation Is Coming. How Bad Will It Be?” Bloomberg, 29 March 2021, <https://www.bloomberg.com/opinion/articles/2021-03-29/faster-inflation-is-coming-how-bad-will-it-be>.
- Gates, Bill. “How to Avoid A Climate Disaster: The Solutions We Have and the Breakthroughs We Need”, February 2021.
- Goodhart and Pradhan. “The Great Demographic Reversal: Aging Societies, Waning Inequality, and An Inflation Revival.” August 2020.
- Harsh & Zhang. “The Diversity of Real Assets: Portfolio Construction for institutional Investors.” PGIM IAS Whitepaper, April 2019.
- Kolet et al. “Considerations for Inflation and Inflation Protection,” Fidelity White Paper, January 2021.
- Nelson, Charles R. “Inflation and Rates of Return on Common Stocks” Journal of Finance, Vol. 31, No. 2, May 1976, pp.471-483.
- Neville et al. “The best Strategies for Inflationary Times.” SSRN, 29 March 2021, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3813202.
- Shen and Weisberger. “US Stock-Bond Correlation: What are the Macroeconomic Drivers?” PGIM IAS paper, 6 May 2021.
- Tokat-Acikel et al. “Top-down Portfolio Implications of Climate Change” QMA White Paper. 23 March 2021, <https://cdn.pfcdn.com/cms/qma/sites/default/files/2021-03/QMA-Top-Down-Implications-Climate-Change-Research-Paper.pdf>.



Notes to Disclosure

For Professional Investors only. All investments involve risk, including the possible loss of capital. In the United Kingdom, information is issued by PGIM Limited with registered office: Grand Buildings, 1-3 Strand, Trafalgar Square, London, WC2N 5HR. PGIM Limited is authorised and regulated by the Financial Conduct Authority ("FCA") of the United Kingdom (Firm Reference Number 193418). In the European Economic Area ("EEA"), information is issued by PGIM Netherlands B.V. with registered office: Gustav Mahlerlaan 1212, 1081 LA Amsterdam, The Netherlands. PGIM Netherlands B.V. is authorised by the Autoriteit Financiële Markten ("AFM") in the Netherlands (Registration number 15003620) and operating on the basis of a European passport. In certain EEA countries, information is, where permitted, presented by PGIM Limited in reliance of provisions, exemptions or licenses available to PGIM Limited under temporary permission arrangements following the exit of the United Kingdom from the European Union. QMA LLC, which is an affiliate to PGIM Limited, is an SEC-registered investment adviser, and a limited liability company. Registration with the SEC does not imply a certain level or skill or training. These materials are issued by PGIM Limited and/or PGIM Netherlands B.V. to persons who are professional clients as defined under the rules of the FCA and/or to persons who are professional clients as defined in the relevant local implementation of Directive 2014/65/EU (MiFID II).

QMA, PGIM Limited and/or PGIM Netherlands B.V. are indirect, wholly-owned subsidiaries of PGIM, Inc. ("PGIM"), the principal asset management business of Prudential Financial, Inc. ("PFI"), a company incorporated and with its principal place of business in the United States. PFI of the United States is not affiliated in any manner with Prudential plc, incorporated in the United Kingdom or with Prudential Assurance Company, a subsidiary of M&G plc, incorporated in the United Kingdom.

In Japan, investment management services are made available by PGIM Japan, Co. Ltd., ("PGIM Japan"), a registered Financial Instruments Business Operator with the Financial Services Agency of Japan. In Singapore, information is issued by PGIM (Singapore) Pte. Ltd. ("PGIM Singapore"), a Singapore investment manager that is licensed as a capital markets service license holder by the Monetary Authority of Singapore and an exempt financial adviser. These materials are issued by PGIM Singapore for the general information of "institutional investors" pursuant to Section 304 of the Securities and Futures Act, Chapter 289 of Singapore (the "SFA") and "accredited investors" and other relevant persons in accordance with the conditions specified in Sections 305 of the SFA. In South Korea, information is issued by QMA, which is licensed to provide discretionary investment management services directly to South Korean qualified institutional investors.

The opinions expressed in this research paper are those of the authors, and not necessarily of PGIM. The investments and returns discussed in this paper do not represent any PGIM product. This research paper makes no implied or express recommendations concerning how a client's account should be managed. This research paper is not intended to be used as a general guide to investing or as a source of any specific investment recommendations.

Distribution of this information to any person other than the person to whom it was originally delivered is unauthorized, and any reproduction of these materials, in whole or in part, or the divulgence of any of the contents hereof, without prior consent of QMA LLC (QMA) is prohibited. Certain information contained herein has been obtained from sources that QMA believes to be reliable as of the date presented; however, QMA cannot guarantee the accuracy of such information, assure its completeness, or warrant that such information will not be changed. These materials are not intended as an offer or solicitation with respect to the purchase or sale of any security or other financial instrument or any investment management services and should not be used as the basis for any investment decision. No liability whatsoever is accepted for any loss (whether direct, indirect, or consequential) that may arise from any use of the information contained in or derived from this report. QMA and its affiliates may make investment decisions that are inconsistent with the views expressed herein, including for proprietary accounts of QMA or its affiliates. These materials are for informational and educational purposes only.

PGIM, QMA, the QMA logo and the Rock design are service marks of PFI and its related entities, registered in many jurisdictions worldwide.

QMA-20210601-156