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US Inflation and Global Asset Returns[†]

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Abstract

We study the relation between US inflation and the performance of global asset classes (including bonds, stocks, industry portfolios, factor premiums, commodities, and REITs), both over a long sample period (1927–2020) and over the most recent 30 years (1991–2020). We find that most assets had positive average real returns in both low- and high-inflation years. While average real returns were lower in years with higher inflation for most assets, many of the differences are not statistically reliable, especially among non-bond assets and in more recent times. We also find mostly weak correlations over time between nominal returns and inflation, including contemporaneous, lagged, expected, and unexpected inflation. The notable exceptions are energy stocks and commodities, where there are reliably positive correlations with both expected and unexpected inflation, but our results also suggest both assets are too volatile to be an effective inflation hedge. Our results confirm the potential of most asset classes to outpace inflation over the long term and suggest that, for investors prioritizing the preservation of purchasing power, inflation-indexed securities may be a more appropriate inflation hedge than commonly suggested alternatives.

Introduction

Investors are naturally concerned about inflation and its negative impact on the purchasing power of their invested wealth. Indeed, even over the past 30 years, a period of relatively moderate inflation in the US, the purchasing power of $1 would have shrunk to 51.4 cents.[1] Conceptually, one can mitigate the impact of inflation by outpacing it or by hedging against it (or a combination). To outpace inflation over the long term, one can build an asset allocation that emphasizes assets with high expected real returns (i.e., net of inflation), such as equities. This may not be appropriate for all investors, however, if outpacing inflation means taking on more market risk than an investor is comfortable with. For investors with greater sensitivity to inflation and lower risk tolerance, it might make sense to hedge against inflation by investing in assets that move closely with it. Inflation-indexed securities—such as Treasury Inflation-Protected Securities (TIPS) and inflation swaps—are natural candidates, but some have argued that commodities, real estate investment trusts (REITs), stocks in "inflation-sensitive" industries, and value stocks may also be a good hedge against inflation.

In this paper, we study the empirical relation between inflation and the performance of different asset classes. We take the viewpoint of a US investor with a global investment-opportunity set and analyze how the returns to government securities, corporate bonds, stocks, industry portfolios, size/value/profitability factors, REITs, and commodities have varied with inflation, including expected and unexpected inflation.

[1] This uses the US Consumer Price Index for All Urban Consumers (CPI-U, not seasonally adjusted). Rebasing the CPI-U to 100 in January 1991, its value in December 2020 was 194.7. Hence, the purchasing power of $1 in December 2020 is 100/194.7 = 0.514 of the purchasing power that $1 had in January 1991.

Our results are reassuring with regard to which assets have been able to outpace inflation over the long term. We find that most assets we study had positive average real returns in both low- and high-inflation years. This is true over the longest sample period we consider, from 1927 to 2020, as well as the most recent 30-year period (1991–2020), where US inflation has been relatively benign and stable.

With regard to which assets have been an effective hedge against inflation, our results suggest that investors considering alternatives to inflation-indexed securities should do so while exercising caution. We find mostly weak correlations over time between nominal returns and inflation, including contemporaneous, lagged, expected, and unexpected inflation. In the few cases where the correlations were reliably positive, such as for energy stocks and commodities over 1991–2020, the assets' returns were around 20 times as volatile as inflation and more than half of their nominal-return variance was unexplained by inflation. Hence, if an investor is seeking inflation protection to reduce the uncertainty around the real value of future wealth, these assets may not accomplish this objective, because their relatively high volatility can lead to large dispersion in future consumption outcomes.[2]

Data

We study the relation between inflation and asset returns over two sample periods: a long sample period from 1927 to 2020 (94 years) and a more recent sample period from 1991 to 2020 (30 years). For brevity, we only describe the results for inflation and returns at the annual frequency, but the conclusions are similar at the monthly frequency.

For the long sample, we have data for the following 23 US assets: government securities (T-bills, five-year notes, and long-term bonds); long-term corporate bonds; the Fama/French market portfolio; the 12 Fama/French industry portfolios; the Fama/French value and growth portfolios among small and large caps; and the Fama/French size and value factors. For the post-1991 sample, we augment the assets in the long sample with the following seven assets: non-USD government bonds (USD hedged); non-USD government/corporate bonds (USD hedged); the Fama/French developed ex US markets and emerging markets portfolios; the Fama/French US profitability factor; US REITs; and commodities. While the return series to some of the latter assets are available pre-1991, we use them in the common sample period starting from 1991.[3] All returns are in US dollars.

[2] Our conclusion that most asset classes have limited inflation-hedging abilities is broadly consistent with the literature. Bodie (1976), Fama and Schwert (1977), and Fama (1981), among others, find that nominal stock returns are negatively related to measures of expected and unexpected inflation in the US. Gultekin (1983) and Beckers (1991), among others, find similar evidence outside the US. Fama and Schwert (1977) also find (i) that nominal returns to government bonds and bills are only positively related to expected inflation and (ii) that while nominal private residential real-estate returns are positively related to both expected and unexpected inflation, more than 40% of their variance is left unexplained by the two components of inflation. Bekaert and Wang (2010) find limited inflation-hedging abilities for bonds, stocks, real estate, and gold across 45 countries.

[3] The returns to US government securities and long-term corporate bonds are from Morningstar (previously from Ibbotson Associates). The returns to the Fama/French portfolios and factors are from Ken French's data library: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. We use the size factor from the Fama/French three-factor model for the 1927–2020 sample period and the size factor from the Fama/French five-factor model for the 1991–2020 sample period. Non-USD government bonds are proxied by the FTSE Non-USD World Government Bond Index (USD hedged). Non-USD government/corporate bonds are proxied by the Bloomberg Barclays Global Aggregate ex-USD Bond Index (USD hedged). US REITs are proxied by the Dow Jones US Select REIT Index. Commodities are proxied by the Bloomberg Commodity Total Return Index. The latter is available starting from February 1991, so its annual return for 1991 is based on the available 11 months.

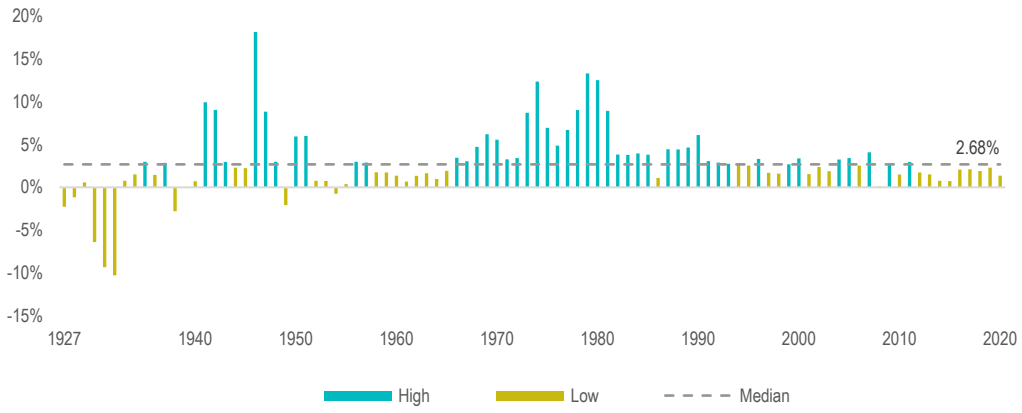
We compute US inflation as the annual rate of change in the Consumer Price Index for All Urban Consumers (CPI-U, not seasonally adjusted) from the Bureau of Labor Statistics.[4, 5] **Exhibit 1** shows the evolution of US inflation over time, with an indication of the years with low and high inflation during each of the two sample periods. We use a given sample period's median inflation as the breakpoint for classifying low- and high-inflation years. US inflation has been relatively benign and stable over 1991–2020 compared to 1927–1990, which featured periods of considerable deflation (most notably during the Great Depression, 1929–1933) as well as historically high, double-digit inflation (during the 1940s and 1970s).

EXHIBIT 1

Low- and High-Inflation Years.

This figure shows the annual US inflation rate over time. Low- and high-inflation years are defined according to the full-sample median. Panel A is for the long sample period from 1927 to 2020 (94 years). Panel B is for the more recent sample period from 1991 to 2020 (30 years). Data are annual.

PANEL A: 1927–2020



PANEL B: 1991–2020

[4] The CPI-U represents all goods and services purchased for consumption by about 93% of the total US population and covers expenditures in the following eight major groups: food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services.

[5] Another popular measure of inflation is the rate of change in the Personal Consumption Expenditures Price Index (PCE-PI, seasonally adjusted) from the Bureau of Economic Analysis, which is available starting from 1959. Over 1959–2020, the inflation measures based on the annual rates of change in the CPI-U and PCE-PI had mean values of 3.65% and 3.22% per year, standard deviations of 2.86% and 2.46% per year, and a correlation of 0.98. For brevity, we only describe the results for the measure based on CPI-U, but the conclusions are similar using the one based on PCE-PI.

Asset Returns in Low- and High-Inflation Years

Exhibit 2 shows summary statistics in low- and high-inflation years for inflation and the returns to the 23 assets we study over 1927–2020. Average inflation was just 0.47% per year in low-inflation years but 5.49% per year in high-inflation years. As shown in Panel A, all assets had positive average nominal returns in both low- and high-inflation years. The only reliable difference in average nominal returns between high- and low-inflation years is for T-bills: 2.80% per year with a *t*-statistic of 4.89.

Panel B shows the statistics for real returns. All but one asset had positive average real returns in both low- and high-inflation years; the exception is T-bills with an average real return of −0.64% per year in high-inflation years. Hence, while we previously saw that T-bills had reliably higher average nominal returns in high-inflation years, this was not enough to keep up with the average inflation in such years. Looking at the differences, most assets had lower average real returns in high-inflation years. For US bonds, all the differences are reliably negative and, in general, more negative for longer-term bonds, although this pattern was mainly driven by the higher average real returns of longer-term bonds in low-inflation years. For US equities, the differences are reliably negative for the market portfolio, four of the 12 industry portfolios (durable goods, chemicals, shops, and health care), and the large cap growth portfolio. Across all assets, the only positive differences are for energy stocks and the value factor, although neither is statistically reliable.

EXHIBIT 2

Nominal and Real Returns in Low- and High-Inflation Years, 1927–2020

This table shows average annual inflation and returns in %. Low- and high-inflation years are defined according to the full-sample median. For long-only portfolios, real returns are computed as $(1+r)/(1+\pi)-1$, where r is nominal annual return and π is annual inflation. For the Fama/French size and value factors, real returns are $(r_L - r_S)/(1+\pi)$, where r_L and r_S are the nominal annual returns to the long and short sides. Test-statistics are for two-sample t-tests assuming unequal variances. Data are annual, from 1927 to 2020.

	PANEL A Inflation and Nominal Returns				PANEL B Real Returns			
	Low Inflation ($N=47$)	High Inflation ($N=47$)	Difference (High minus Low)	t-Statistic	Low Inflation ($N=47$)	High Inflation ($N=47$)	Difference (High minus Low)	t-Statistic
US Inflation	0.47	5.49	5.02	7.88				
US Bonds								
One-Month Treasury Bills	1.94	4.74	2.80	4.89	1.54	-0.64	-2.18	-2.94
Five-Year Government Notes	4.38	6.16	1.78	1.55	3.97	0.77	-3.21	-2.41
Long-Term Government Bonds	6.67	5.71	-0.95	-0.46	6.25	0.39	-5.86	-2.68
Long-Term Corporate Bonds	6.81	6.24	-0.58	-0.32	6.38	0.90	-5.48	-2.86
US Stocks								
Fama/French Total US Market Research Index	13.66	10.45	-3.21	-0.78	12.98	4.91	-8.07	-2.00
Industry Portfolios								
Nondurable Goods	13.53	11.26	-2.27	-0.59	12.90	5.71	-7.19	-1.90
Durable Goods	22.66	9.83	-12.83	-1.68	21.93	4.41	-17.52	-2.33
Manufacturing	15.40	11.08	-4.33	-0.84	14.65	5.54	-9.11	-1.79
Energy	8.00	15.88	7.89	1.72	7.41	9.92	2.51	0.57
Chemicals	15.49	9.99	-5.50	-1.25	14.85	4.46	-10.39	-2.38
Business Equipment	16.85	12.75	-4.10	-0.71	16.09	7.23	-8.86	-1.55
Telecommunications	12.48	9.88	-2.60	-0.65	11.85	4.40	-7.45	-1.91
Utilities	10.55	11.65	1.10	0.25	9.97	6.11	-3.86	-0.88
Shops	16.33	10.85	-5.48	-1.12	15.66	5.34	-10.32	-2.16
Health Care	15.63	11.79	-3.84	-0.88	15.00	6.11	-8.89	-2.10
Financial Services	13.69	12.10	-1.59	-0.31	13.04	6.52	-6.52	-1.29
Other	12.80	8.56	-4.23	-0.87	12.04	3.09	-8.95	-1.91
Style Portfolios								
Small Cap Growth	16.62	10.65	-5.96	-0.91	15.89	5.09	-10.80	-1.70
Small Cap Value	19.16	17.84	-1.32	-0.20	18.39	11.95	-6.44	-1.01
Large Cap Growth	14.33	9.56	-4.76	-1.16	13.69	4.10	-9.59	-2.36
Large Cap Value	16.19	13.86	-2.34	-0.42	15.44	8.13	-7.31	-1.35
Premiums								
Size	3.18	3.01	-0.17	-0.06	3.15	2.88	-0.26	-0.10
Value	2.21	5.74	3.53	1.12	2.13	5.45	3.32	1.08

Past performance is no guarantee of future results. Indices are not available for direct investment.

Exhibit 3 repeats the analysis for the most recent 30-year period (1991–2020), which expands the assets we study to a total of 30. Post-1991, average inflation was 1.52% per year in low-inflation years and 2.98% per year in high-inflation years, both of which are more moderate than for the long sample. Most assets had positive average real returns in both low- and high-inflation years. Notable exceptions are energy stocks and commodities, which had negative average real returns in low-inflation years that were reliably lower than in high-inflation years. In fact, they produced the only reliable differences in average real returns between high- and low-inflation years post-1991: 14.89% per year for energy stocks (t-statistic of 2.44) and the 17.11% for commodities (t-statistic of 3.26). As such, none of the reliably negative differences observed over the long sample in Exhibit 2 remain reliable over the most recent 30 years.[6]

[6] Not surprisingly, the Great Depression (1929–1933) appears to have some influence over the results in Exhibit 2, particularly the number of reliable differences in average real returns between high- and low-inflation years. As an example, starting the sample in 1935 implies that none of these differences are reliable for US bonds.

EXHIBIT 3

Nominal and Real Returns in Low- and High-Inflation Years, 1991–2020

This table shows average annual inflation and returns in %. Low- and high-inflation years are defined according to the full-sample median. For long-only portfolios, real returns are computed as $(1+r)/(1+\pi)-1$, where r is nominal annual return and π is annual inflation. For the Fama/French size, value, and profitability factors, real returns are $(r_L - r_S)/(1+\pi)$, where r_L and r_S are the nominal annual returns to the long and short sides. Test-statistics are for two-sample *t*-tests assuming unequal variances. Data are annual, from 1991 to 2020.

	PANEL A Inflation and Nominal Returns				PANEL B Real Returns			
	Low Inflation ($N=15$)	High Inflation ($N=15$)	Difference (High minus Low)	*t*-Statistic	Low Inflation ($N=15$)	High Inflation ($N=15$)	Difference (High minus Low)	*t*-Statistic
US Inflation	1.52	2.98	1.46	7.61				
US Bonds								
One-Month Treasury Bills	1.48	3.51	2.04	2.94	-0.04	0.52	0.56	0.84
Five-Year Government Notes	4.88	6.31	1.43	0.67	3.32	3.23	-0.09	-0.04
Long-Term Government Bonds	8.86	9.23	0.37	0.08	7.25	6.07	-1.18	-0.26
Long-Term Corporate Bonds	8.96	8.56	-0.39	-0.12	7.32	5.43	-1.89	-0.59
International Bonds								
FTSE Non-USD World Government Bond Index (USD Hedged)	5.51	6.86	1.35	0.82	3.94	3.77	-0.17	-0.10
Bloomberg Barclays Global Aggregate ex-USD Bond Index (USD Hedged)	5.37	6.70	1.33	0.81	3.79	3.61	-0.18	-0.11
US Stocks								
Fama/French Total US Market Research Index	13.68	11.58	-2.10	-0.32	11.91	8.36	-3.55	-0.55
Industry Portfolios								
Nondurable Goods	10.47	13.36	2.89	0.52	8.78	10.07	1.29	0.24
Durable Goods	25.12	9.28	-15.84	-1.09	23.18	6.15	-17.03	-1.20
Manufacturing	12.05	16.34	4.29	0.62	10.29	12.97	2.68	0.40
Energy	0.26	16.99	16.73	2.65	-1.31	13.58	14.89	2.44
Chemicals	10.25	13.80	3.54	0.67	8.55	10.51	1.96	0.38
Business Equipment	19.34	16.50	-2.84	-0.26	17.48	13.15	-4.32	-0.41
Telecommunications	13.91	8.18	-5.73	-0.68	12.14	5.09	-7.05	-0.86
Utilities	7.84	13.73	5.89	0.91	6.17	10.41	4.24	0.68
Shops	18.13	9.86	-8.27	-1.30	16.32	6.69	-9.63	-1.56
Health Care	14.94	12.22	-2.72	-0.35	13.19	8.97	-4.22	-0.56
Financial Services	13.66	14.52	0.86	0.10	11.88	11.22	-0.65	-0.08
Other	11.23	8.03	-3.21	-0.48	9.50	4.91	-4.60	-0.71
Style Portfolios								
Small Cap Growth	14.74	10.10	-4.64	-0.51	12.95	6.93	-6.03	-0.68
Small Cap Value	14.87	16.50	1.63	0.21	13.07	13.14	0.07	0.01
Large Cap Growth	15.91	11.54	-4.37	-0.62	14.12	8.32	-5.80	-0.84
Large Cap Value	11.88	12.92	1.04	0.14	10.13	9.65	-0.48	-0.07
Premiums								
Size	1.19	2.47	1.28	0.33	1.17	2.40	1.23	0.32
Value	-1.95	3.89	5.84	0.89	-1.93	3.77	5.70	0.89
Profitability	1.49	5.96	4.46	1.14	1.49	5.78	4.29	1.12
Non-US Stocks								
Fama/French International Market Index	6.14	10.38	4.24	0.59	4.48	7.20	2.72	0.39
Fama/French Emerging Markets Index	4.11	23.49	19.38	1.67	2.47	19.92	17.45	1.55
REITs and Commodities								
Dow Jones US Select REIT Index	7.53	16.09	8.56	1.30	5.88	12.74	6.86	1.07
Bloomberg Commodity Total Return Index	-6.02	12.90	18.91	3.48	-7.49	9.63	17.11	3.26

Past performance is no guarantee of future results. Indices are not available for direct investment.
Profitability is defined as operating income before depreciation and amortization minus interest expense divided by book equity.

Taken together, the results in Exhibits 2 and 3 show that most of the assets we study have been able to outpace inflation over the long term. The return premiums associated with the size, value, and profitability factors have also been mostly positive, with no reliable differences depending on the level of inflation. While average real returns were lower in high-inflation years for most assets,

many of the differences are not statistically reliable, especially among non-bond assets and in more recent times. Nonetheless, the fact that energy stocks and commodities had reliably higher average real returns in high-inflation years post-1991 may seem promising for investors looking to hedge against inflation using alternatives to inflation-indexed securities. We caution, however, that energy stocks and commodities have been much more volatile than inflation in our sample, which casts doubts about their ability to serve as an effective hedge against inflation. For example, over 1991–2020, the standard deviation of inflation was 0.90% per year while the standard deviations of the nominal returns to energy stocks and commodities were 19.02% and 17.52% per year, respectively, or around 20 times as large for either asset. In the following, we shed further light on the ability of different assets to hedge against inflation, with a particular focus on energy stocks and commodities.

The Correlation between Inflation and Asset Returns over Time

We analyze the inflation-hedging capabilities of different assets by examining how their returns have comoved with inflation over time. Since expected inflation is embedded in nominal asset prices, it is unexpected inflation that erodes real asset values. Hence, an asset is most useful as a hedge against inflation if its nominal returns comove closely with contemporaneous inflation, not just past inflation, and particularly with the unexpected component of contemporaneous inflation. We therefore consider two time-series regressions for each asset: (i) nominal returns on contemporaneous and one-year lagged inflation, and (ii) nominal returns on the expected and unexpected components of contemporaneous inflation. For the latter, we model inflation as an autoregressive process with one lag, i.e., an AR(1), which we estimate using rolling 20-year windows. We calculate expected inflation as the one-year-ahead forecast and unexpected inflation as actual minus expected inflation. Because of the 20-year rolling windows, the regressions on expected and unexpected inflation start in 1947.

Exhibit 4 shows a time-series plot of expected and unexpected inflation. The time-series correlation between actual and expected inflation is 0.66 with a *t*-statistic of 7.44. The standard deviation of unexpected inflation is 2.75% per year over 1947–1990, but just 1.09% per year over 1991–2020.[7]

[7] Our results are very similar if we instead model inflation as an integrated moving average process of order (1,1), i.e., an IMA(1,1). The time-series correlation between actual and expected inflation based on the IMA(1,1) model is 66.0% with a *t*-statistic of 7.46. Furthermore, the root mean squared error (RMSE) for the AR(1) estimates is 2.3% per year, while it is 2.6% per year for the IMA(1,1) estimates.

EXHIBIT 4

Expected and Unexpected US Annual Inflation

This figure shows expected and unexpected annual US inflation. We model inflation as an AR(1) process, which we estimate using rolling 20-year windows. Expected inflation is the one-year-ahead forecast and unexpected inflation is actual minus expected inflation. Data are annual, from 1927 to 2020, but expected and unexpected inflation are available starting from 1947.

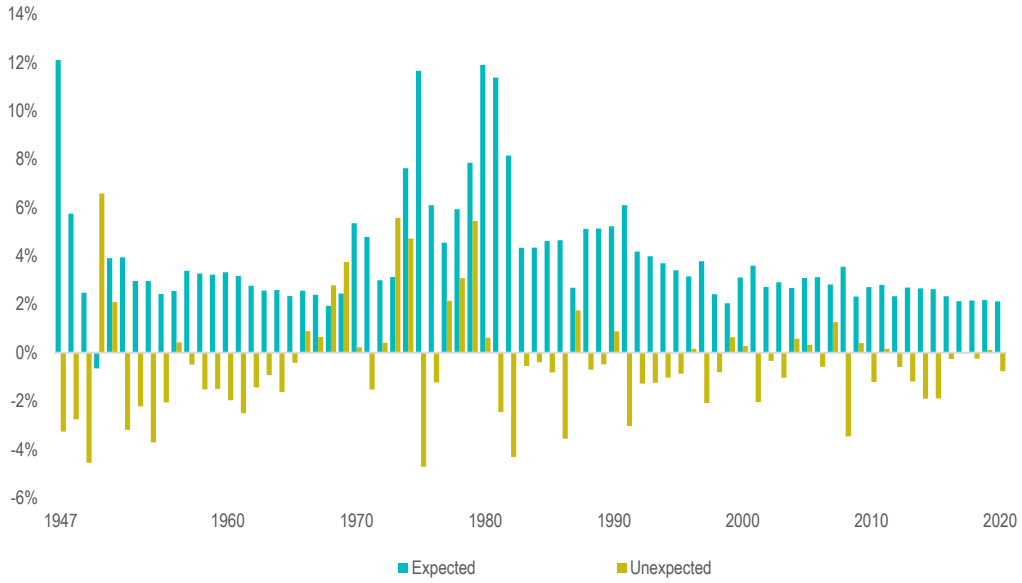


Exhibit 5 shows the regression results for the 23 assets we study over 1927–2020. Panel A shows that the nominal returns to T-bills had a positive, marginally reliable relation with contemporaneous inflation and a reliably positive relation with one-year lagged inflation. Still, the regression's adjusted R^2 of 21.8% means that almost 80% of the asset's nominal-return variation was unrelated to contemporaneous and lagged inflation. The regression for energy stocks shows a reliably positive coefficient on contemporaneous inflation, but the explanatory power is just 4.4%. For the remaining regressions, the adjusted R^2 values never top 4.5% and most of the coefficients are statistically indistinguishable from zero. The few reliable coefficients and the negligible explanatory power means that observing a high or low inflation rate—or even having perfect foresight of inflation—told investors little about asset returns or factor premiums.

EXHIBIT 5

Regression of Nominal Returns on Inflation Variables, 1927–2020

This table shows results from time-series regressions of nominal returns on inflation variables. In Panel B, expected and unexpected inflation are based an AR(1) process fitted to annual inflation and estimated using rolling 20-year windows. Data are annual, from 1927 to 2020, but the regressions in Panel B start in 1947.

	PANEL A Regressions of nominal annual returns on contemporaneous and 1-year lagged inflation (Starting from 1927; $N = 94$)					PANEL B Regressions of nominal returns on expected and unexpected inflation based on 20-year rolling AR(1) (Starting from 1947; $N = 74$)				
	Contem-poraneous Inflation	*t*-Statistic	1-Year Lagged Inflation	*t*-Statistic	Adjusted R^2	Expected Inflation	*t*-Statistic	Unexpected Inflation	*t*-Statistic	Adjusted R^2
US Bonds										
One-Month Treasury Bills	0.18	1.90	0.24	2.62	21.8%	0.85	7.25	0.49	3.89	43.6%
Five-Year Government Notes	-0.27	-1.48	0.46	2.52	4.5%	0.63	2.19	-0.51	-1.67	9.3%
Long-Term Government Bonds	-0.72	-2.19	0.59	1.79	3.2%	0.10	0.18	-1.61	-2.86	8.5%
Long-Term Corporate Bonds	-0.58	-2.03	0.40	1.40	2.2%	0.05	0.12	-1.54	-3.21	10.9%
US Stocks										
Fama/French Total US Market Research Index	-0.16	-0.23	0.33	0.48	-1.9%	-0.27	-0.31	-1.70	-1.87	2.0%
Industry Portfolios										
Nondurable Goods	-0.71	-1.13	0.94	1.50	0.3%	0.61	0.75	-2.79	-3.24	12.7%
Durable Goods	-1.20	-0.95	0.23	0.19	-0.9%	-1.04	-0.67	-4.28	-2.59	6.1%
Manufacturing	0.52	0.61	-0.76	-0.91	-1.3%	-0.84	-0.84	-1.38	-1.29	0.0%
Energy	1.80	2.44	-0.80	-1.09	4.4%	1.11	1.08	1.73	1.59	1.5%
Chemicals	0.41	0.56	-0.93	-1.30	-0.2%	-0.42	-0.52	-1.53	-1.78	1.6%
Business Equipment	-0.58	-0.61	0.42	0.45	-1.8%	-1.46	-1.16	-2.23	-1.66	2.0%
Telecommunications	-0.57	-0.88	0.66	1.03	-0.9%	0.04	0.04	-1.75	-1.74	1.6%
Utilities	-1.09	-1.54	1.64	2.33	3.6%	0.20	0.26	-2.22	-2.68	7.5%
Shops	-1.22	-1.55	1.33	1.69	1.3%	0.19	0.19	-3.81	-3.71	14.8%
Health Care	-0.01	-0.01	0.14	0.19	-2.1%	-1.08	-1.07	-1.48	-1.39	0.8%
Financial Services	-0.87	-1.06	1.27	1.55	0.4%	-0.22	-0.21	-2.26	-2.04	3.0%
Other	0.14	0.18	0.27	0.33	-1.8%	-0.08	-0.07	-1.49	-1.35	-0.2%
Style Portfolios										
Small Cap Growth	0.25	0.24	-0.45	-0.42	-2.0%	0.22	0.16	-1.31	-0.92	-1.4%
Small Cap Value	0.13	0.12	0.30	0.28	-1.9%	0.52	0.43	-1.70	-1.33	0.4%
Large Cap Growth	-0.60	-0.89	0.48	0.71	-1.3%	-0.63	-0.71	-1.98	-2.12	3.4%
Large Cap Value	0.40	0.44	-0.13	-0.14	-1.9%	0.05	0.05	-1.79	-1.55	0.8%
Premiums										
Size	-0.03	-0.06	-0.03	-0.06	-2.2%	0.50	0.81	0.06	0.09	-1.9%
Value	0.44	0.85	0.07	0.13	-0.6%	0.49	0.65	-0.10	-0.13	-2.1%

Past performance is no guarantee of future results. Indices are not available for direct investment.

Panel B shows that, over 1947–2020, nominal returns to T-bills were positively and reliably related to both expected and unexpected contemporaneous inflation with an adjusted R^2 of 43.6%. The explanatory power for the remaining regressions is, however, much lower, ranging from nil to 14.8%. The only other reliable coefficient on expected inflation is the positive one for five-year government notes. Most of the remaining assets' nominal returns were negatively related to unexpected inflation, and reliably so for long-term government bonds, long-term corporate bonds, five industry portfolios (nondurable goods, durable goods, utilities, shops and financial services), and the large cap growth portfolio. The regression for energy stocks shows positive coefficients on both components of inflation, but neither is statistically reliable and the adjusted R^2 is just 1.5%. Neither component of inflation has any explanatory power for the nominal returns to the size and value factors.

Exhibit 6 shows the regressions for the post-1991 sample. The results are more favorable but still not overwhelming in terms of the assets' ability to hedge against inflation. Panel A shows that, over this more recent period, contemporaneous and lagged inflation had notable explanatory power for three assets: T-bills (42.9%), energy stocks (42.1%), and commodities (46.1%). For T-bills, both coefficients are reliably positive. For energy stocks and commodities, the coefficients on contemporaneous inflation are positive and reliable while those on lagged inflation are negative but unreliable. The regressions for five-year government notes, the manufacturing and utilities industries, and the two non-US stock-market portfolios show positive and mostly reliable coefficients on one of the two inflation variables, but the explanatory power is at most 15%. Note also that greater positive coefficients are not necessarily better, as large coefficient estimates can be driven by high volatility of asset returns. The remaining regressions show only negligible explanatory power.

Panel B shows that expected and unexpected inflation also had notable explanatory power for T-bills (37.3%), energy stocks (41.9%), and commodities (47.9%). All three assets had nominal returns that were reliably positively related to both components of inflation. As in Panel A, we see some reliable coefficients for five-year government notes, the manufacturing and utilities industries, and the two non-US stock portfolios, but the explanatory power is at most 14.0%.

EXHIBIT 6

Regression of Nominal Returns on Inflation Variables, 1991–2020

This table shows results from time-series regressions of nominal returns on inflation variables. In Panel B, expected and unexpected inflation are based an AR(1) process fitted to annual inflation and estimated using rolling 20-year windows. Data are annual, from 1991 to 2020.

	PANEL A Regressions of nominal annual returns on contemporaneous and 1-year lagged inflation (Starting from 1991; $N = 30$)					**PANEL B** Regressions of nominal returns on expected and unexpected inflation based on 20-year rolling AR(1) (Starting from 1991; $N = 30$)				
	Contem-poraneous Inflation	*t*-Statistic	1-Year Lagged Inflation	*t*-Statistic	Adjusted R^2	Expected Inflation	*t*-Statistic	Unexpected Inflation	*t*-Statistic	Adjusted R^2
US Bonds										
One-Month Treasury Bills	1.02	3.07	0.91	3.43	42.9%	2.04	4.39	0.93	2.62	37.3%
Five-Year Government Notes	0.03	0.02	2.33	2.65	15.0%	2.87	1.95	-0.27	-0.24	14.0%
Long-Term Government Bonds	-1.38	-0.56	3.62	1.84	5.0%	2.54	0.76	-1.72	-0.68	1.8%
Long-Term Corporate Bonds	-0.47	-0.26	1.93	1.31	-0.9%	1.93	0.79	-0.72	-0.39	-1.0%
International Bonds										
FTSE Non-USD World Government Bond Index (USD Hedged)	0.31	0.34	1.24	1.71	4.0%	2.13	1.79	0.09	0.09	8.3%
Bloomberg Barclays Global Aggregate ex-USD Bond Index (USD Hedged)	0.48	0.53	1.02	1.40	1.4%	2.05	1.73	0.28	0.31	5.7%
US Stocks										
Fama/French Total US Market Research Index	3.10	0.83	-1.12	-0.37	-4.5%	2.12	0.42	3.14	0.82	-4.8%
Industry Portfolios										
Nondurable Goods	4.01	1.29	1.26	0.51	0.3%	7.62	1.89	3.35	1.09	5.1%
Durable Goods	-3.87	-0.46	-4.27	-0.63	-4.8%	-9.37	-0.84	-3.26	-0.38	-4.6%
Manufacturing	8.01	2.16	-2.49	-0.84	9.5%	5.37	1.08	8.23	2.18	8.8%
Energy	14.38	4.80	-1.32	-0.55	42.1%	12.90	3.23	14.51	4.76	41.9%
Chemicals	5.39	1.86	-0.72	-0.31	4.8%	5.10	1.32	5.33	1.81	4.5%
Business Equipment	3.60	0.59	-6.99	-1.44	0.9%	-4.77	-0.59	4.44	0.72	0.3%
Telecommunications	-0.39	-0.08	-2.36	-0.61	-5.9%	-2.70	-0.42	-0.23	-0.05	-6.5%
Utilities	8.58	2.53	-0.06	-0.02	13.3%	9.05	2.00	8.46	2.45	13.4%
Shops	-1.20	-0.32	1.77	0.59	-5.8%	1.33	0.27	-1.51	-0.40	-5.3%
Health Care	0.85	0.19	3.33	0.95	-3.6%	5.30	0.91	0.33	0.08	-3.0%
Financial Services	5.12	1.09	2.47	0.66	-0.7%	10.37	1.69	4.27	0.91	2.9%
Other	3.24	0.85	-0.95	-0.31	-4.4%	2.76	0.54	3.20	0.82	-4.8%
Style Portfolios										
Small Cap Growth	1.92	0.37	0.04	0.01	-6.9%	0.88	0.13	2.18	0.41	-6.7%
Small Cap Value	4.55	1.04	2.34	0.66	-1.1%	10.28	1.81	3.57	0.82	4.4%
Large Cap Growth	2.29	0.56	-1.16	-0.36	-5.8%	0.59	0.11	2.51	0.61	-5.6%
Large Cap Value	5.83	1.40	0.93	0.28	0.5%	7.88	1.42	5.49	1.30	1.2%
Premiums										
Size	0.00	0.00	2.26	1.29	-1.1%	3.44	1.20	-0.45	-0.20	2.4%
Value	3.08	0.82	2.20	0.73	-2.3%	8.34	1.72	2.18	0.59	4.1%
Profitability	1.62	0.72	1.96	1.09	-0.3%	5.26	1.82	1.07	0.48	6.0%
Non-US Stocks										
Fama/French International Market Index	6.81	1.76	-4.34	-1.40	8.2%	0.28	0.06	7.65	1.98	11.6%
Fama/French Emerging Markets Index	15.03	2.37	-3.62	-0.71	11.6%	10.73	1.27	15.45	2.39	11.4%
REITs and Commodities										
Dow Jones US Select REIT Index	6.45	1.74	-0.26	-0.09	3.4%	8.10	1.64	6.01	1.60	4.3%
Bloomberg Commodity Total Return Index	13.65	5.13	-2.57	-1.21	46.1%	9.65	2.77	14.19	5.34	47.9%

Past performance is no guarantee of future results. Indices are not available for direct investment.
Profitability is defined as operating income before depreciation and amortization minus interest expense divided by book equity

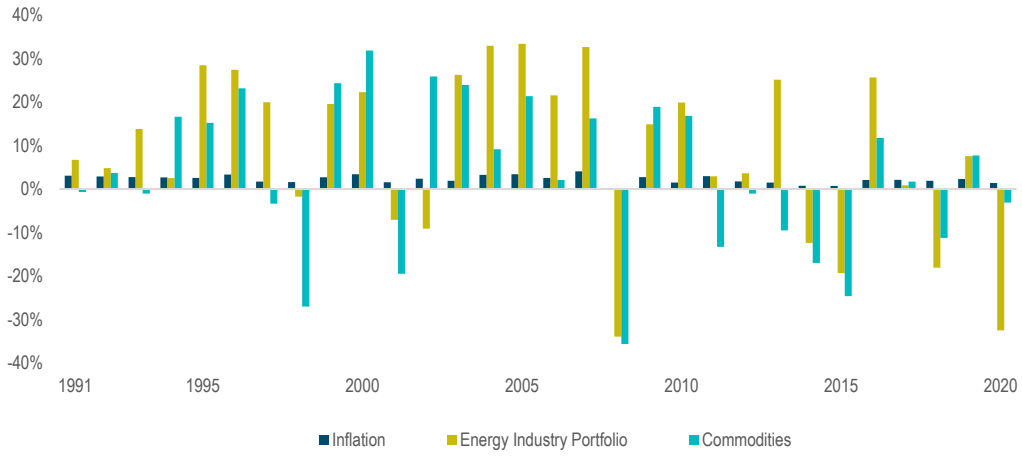
Overall, the results in Exhibits 5 and 6 suggest that inflation—whether contemporaneous, lagged, expected, or unexpected—is not a major driver of nominal asset returns and factor premiums. This should not come as a surprise; while inflation is an important consideration for investors, it is among the many factors that impact asset prices.

For T-bills, the comovement with inflation (especially unexpected inflation) is an appealing attribute for inflation hedging, but investors should keep in mind that T-bills on average delivered low returns that barely kept up with inflation (Exhibits 2 and 3). For energy stocks and commodities, which also showed meaningful comovement with inflation, it is important not to overlook that more than half of the assets' nominal-return variation was unrelated to inflation. Also, as previously discussed, nominal returns to energy stocks and commodities were roughly 20 times as volatile as inflation over 1991–2020. **Exhibit 7** further illustrates this very different variability of inflation and the two assets. In sum, while there is some merit to the intuition that energy stocks and commodities are "inflation sensitive," we do not see compelling evidence that either can serve as an effective inflation hedge.

EXHIBIT 7

US Annual Inflation and the Nominal Returns to Energy Stocks and Commodities

This figure shows annual US inflation along with the annual returns to energy stocks and commodities. Data are annual, from 1991 to 2020.



Past performance is no guarantee of future results.

Takeaways for Investors

Our results suggest that investors looking to hedge against inflation using alternatives to inflation-indexed securities should exercise caution. The nominal returns to stocks, most industry portfolios, equity factors, and REITs were at best weakly related to inflation. While energy stocks and commodities did deliver higher average real returns in high-inflation years compared to low-inflation years, most of the variation in their nominal returns is unrelated to inflation. Furthermore, the two assets have been much more volatile than inflation. Hence, inflation-indexed securities still

appear to be the most effective instruments for investors who are highly sensitive to inflation and seek to hedge against it.

But it is also important to recognize that inflation hedging is not free. Investing in, say, TIPS may forgo the inflation risk premium (the compensation demanded by nominal asset holders for bearing unexpected inflation) and the growth potential offered by assets like equities. Importantly, inflation is just one of many aspects to consider for asset allocation. The right mix of assets for growth and hedging purposes ultimately depends on an investor's goals and needs. The good news is that most of the global assets we study have been able to outpace US inflation over the long term. Hence, simply staying invested may by itself be an effective long-term solution to inflation concerns.

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