



# DO COMMODITIES ADD VALUE TO PORTFOLIO PERFORMANCE?

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## OVERVIEW

The annual performance of commodities since 2011 has been negative (with the exception of 2016), and has led some investors to question if commodities will continue to decline in the future. Furthermore, portfolio managers have discussed and debated if the inclusion of commodities as part of a diversified portfolio will continue to be a drag on portfolio performance going forward. At Washington Trust Bank, we invest in commodities futures as part of our growth assets within a diversified portfolio in an attempt to increase risk-adjusted return over the long term.

In research last year, Cloutier and Nesbitt (2016) of Washington Trust Bank revisited the commodities asset class and determined that returns were not statistically different when commodities were in contango (the futures price is greater than the current price) or backwardation (the futures price is less than the current price). The research acknowledged the recent investor concerns over performance, but found that investing in backwardation vs. contango did not lead to an improvement in the investment in commodities.

This research paper further examines the long-term performance of commodities, and attempts to answer the question of whether commodities do add value to portfolio performance by increasing risk-adjusted return. The paper also explores the correlation and performance of commodities to inflation — which erodes purchasing power and portfolio performance over time — when compared to other major asset classes.

## STUDY METHODOLOGY

The research process utilizes the S&P Goldman Sachs Commodities Index Total Return Index to represent commodities performance from 1/31/1970 to 9/30/2017. The S&P GSCI Total Return Index was used over the Bloomberg Commodity Total Return Index as it has a much earlier start date (1/31/1970 vs. 12/31/1990; respectively). Though the composition of the indices is slightly different, the two indices have a 93.1% correlation (since 12/31/1990).



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To determine if commodities do add value to portfolio performance, a portfolio of commodities (represented by the S&P GSCI Total Return Index) and stocks (represented by the S&P 500 Total Return Index) was optimized to maximize risk-adjusted return.

- Appendix 1 details the asset allocation for the stocks and commodities portfolio.

This portfolio of commodities and stocks was then compared to a commodities-only portfolio as well as a stocks-only portfolio using total return, standard deviation (risk), and Sharpe ratio (risk-adjusted return). The period of review for this study was 1/31/1970 through 9/30/2017. This extended period of study ensures that the performance analysis of the stocks and commodities portfolio is significant over multiple market cycles. The research also examined 10-year time periods (1/31/1970 to 1/31/1980, 1/31/1980 to 1/31/1990, 1/31/1990 to 1/31/2000, 1/31/2000 to 1/31/2010) and a recent time period (1/31/2010 to 9/30/2017). The review of successive 10-year time periods allows us to determine if the performance is consistent in the differing market environments. Appendices 2 and 3 present definition of terms and additional information on the study methodology.

To review the correlation and performance of commodities to inflation, the returns of Stocks (represented by the S&P 500 Total Return Index), Bonds (represented by a blended 80% Bloomberg Barclays US Govt/Credit 1-5 Year Total Return Index and 20% Bloomberg Barclays Short-term Gov/Corporate Total Return Index), Real Estate (represented by the FTSE NAREIT All Equity REITs Total Return Index), Commodities (represented by the S&P GSCI Total Return Index), and Inflation (represented by the US BLS CPI All Urban SA 1982-1984 Index) were correlated from 1/30/1976 to 9/30/2017. This was the longest available time period given the earliest common inception date for the indices. We then compared the returns of the S&P GSCI Total Return Index to inflation (from 1/31/1970 to 9/30/2017):

- Appendix 4 details the annual returns and comparisons of these indices

## ANALYSIS AND RESULTS

To determine if commodities do add value to portfolio performance, we first compared the returns of commodities (as represented by the S&P GSCI Index), stocks (as represented by the S&P 500 Index), and an optimized portfolio of stocks and commodities over the longer term (from 1/31/1970 to 9/30/2017) and in successive 10-year time periods (Table 1).

<i>Table 1</i>	<i>Total Return Annualized (1/31/1970 to 9/30/2017)</i>	<i>Total Return Annualized (1/31/1970 to 1/31/1980)</i>	<i>Total Return Annualized (1/31/1980 to 1/31/1990)</i>	<i>Total Return Annualized (1/31/1990 to 1/31/2000)</i>	<i>Total Return Annualized (1/31/2000 to 1/31/2010)</i>	<i>Total Return Annualized (1/31/2010 to 9/30/2017)</i>
<b>Goldman Sachs Commodities Index</b>	6.79	21.74	9.97	4.66	3.47	-7.35
<b>S&amp;P 500 Index</b>	10.64	7.33	16.04	18.42	-0.80	14.16
<b>Stocks and Commodities Optimized Portfolio</b>	10.39	12.25	14.62	15.34	1.34	8.57



Analysis of the commodities index since its inception shows that commodities have realized an average annual total return of 6.79% since inception on 1/31/1970. We can also determine that commodities underperformed stocks over the entire period of study. Review of the performance in the 10-year time periods shows that stocks outperformed in three of the time periods while commodities outperformed in two of the time periods. Looking at returns alone, which is only one component of performance, we can observe that the optimized portfolio did not provide better returns in any of the 10-year time periods. The return data illustrate that commodity returns have recently been negative, supporting investors' recent concerns. It also supports findings from previous research that asset class leadership will change with changes in the economic and market environments.

Standard deviation is a statistical measure of volatility, or risk, and shows dispersion of returns to the mean (return). The standard deviation data for stocks, commodities, and the stocks and commodities portfolio is presented below (Table 2).

	<i>Standard Deviation (1/31/1970 to 9/30/2017)</i>	<i>Standard Deviation (1/31/1970 to 1/31/1980)</i>	<i>Standard Deviation (1/31/1980 to 1/31/1990)</i>	<i>Standard Deviation (1/31/1990 to 1/31/2000)</i>	<i>Standard Deviation (1/31/2000 to 1/31/2010)</i>	<i>Standard Deviation (1/31/2010 to 9/30/2017)</i>
<b>Goldman Sachs Commodities Index</b>	19.92	21.35	13.67	17.71	25.37	18.96
<b>S&amp;P 500 Index</b>	15.07	15.89	16.52	13.34	16.10	12.05
<b>Stocks and Commodities Optimized Portfolio</b>	12.69	12.21	13.11	10.50	14.76	12.27

Review of the standard deviation data demonstrates that both commodities and stocks are asset classes that exhibit similarly high volatility (and should be considered volatile asset classes). However, the optimized portfolio exhibited less volatility than either commodities or stocks alone over the period of study. This finding is significant as it demonstrates a diversified portfolio of commodities and stocks would have historically had less risk. This table also shows us that the diversified portfolio had lower risk in four of the five 10-year time periods analyzed. The data is consistent with previous research by Washington Trust Bank finding that increasing portfolio diversification should lead to lower risk.

The Sharpe ratio is a measure of risk-adjusted return and indicates the amount of excess return that is received for the given level risk. It is calculated by dividing the strategy's excess return (to the risk-free rate) by the respective standard deviation. This ratio is shown for commodities, stocks, and the stocks and commodities portfolio (Table 3).

	<i>Sharpe Ratio (1/31/1970 to 9/30/2017)</i>	<i>Sharpe Ratio (1/31/1970 to 1/31/1980)</i>	<i>Sharpe Ratio (1/31/1980 to 1/31/1990)</i>	<i>Sharpe Ratio (1/31/1990 to 1/31/2000)</i>	<i>Sharpe Ratio (1/31/2000 to 1/31/2010)</i>	<i>Sharpe Ratio (1/31/2010 to 9/30/2017)</i>
<b>Goldman Sachs Commodities Index</b>	0.18	0.73	0.10	0.06	0.15	-0.32
<b>S&amp;P 500 Index</b>	0.42	0.12	0.43	0.97	-0.14	1.15
<b>Stocks and Commodities Optimized Portfolio</b>	0.46	0.48	0.41	0.95	-0.02	0.72



Analysis of the Sharpe Ratio data shows that stocks outperformed for the level of risk in three of the 10-year time periods while commodities outperformed in two of the time periods. The asset class leadership in risk-adjusted return seen here is exactly the same as the leadership seen in returns during the 10-year time periods. However, review of the entire period of study shows that the stocks and commodities portfolio outperformed for the level of risk over the long term (since 1/31/1970). This finding is consistent with research by Bodie and Rosansky (1980) which found that a portfolio of 60% stocks and 40% commodities futures reduced volatility by one-third without sacrificing any return when compared to stocks or commodities alone (from 1950 to 1976). The data demonstrate that a diversified portfolio of commodities and stocks had higher performance than investing in commodities or stocks alone.

Next, we reviewed the correlation of commodities to inflation as compared to other major asset classes. Correlation is a measure of the relative movement of two or more variables. We correlated the returns of Stocks (represented by the S&P 500 Total Return Index), Bonds (represented by a blended 80% Bloomberg Barclays US Govt/Credit 1-5 Year Total Return Index and 20% Bloomberg Barclays Short-term Gov/Corporate Total Return Index), Real Estate (represented by the FTSE NAREIT All Equity REITs Total Return Index), Commodities (represented by the S&P GSCI Total Return Index), and Inflation (represented by the US BLS CPI All Urban SA 1982-1984 Index) from 1/30/1976 to 9/30/2017 (Table 4):

	<i>Stocks</i>	<i>Bonds</i>	<i>Real Estate</i>	<i>Commodities</i>	<i>Inflation</i>
<b>Stocks</b>	1.00	0.15	0.57	0.17	-0.02
<b>Bonds</b>	0.15	1.00	0.12	0.01	-0.01
<b>Real Estate</b>	0.57	0.12	1.00	0.13	0.01
<b>Commodities</b>	0.17	0.01	0.13	1.00	0.21
<b>Inflation</b>	-0.02	-0.01	0.01	0.21	1.00

Inflation is a general increase in purchase prices seen in an economy which reduces the purchasing power of money. The correlation matrix demonstrates that commodities had the highest correlation to inflation when compared to other asset classes over the period of study at 21%. Furthermore, the other major asset classes had almost zero correlation to inflation. This correlation data demonstrate that commodities provide a better hedge to inflation to the portfolio when compared to other major asset classes (including stocks, bonds, and real estate). This finding is important and shows that as inflation increases in the economy, commodities will be more likely to rise in the portfolio at the same time.



Finally, we compared the returns of the S&P GSCI Total Return Index to inflation from 1/31/1970 to 9/30/2017 (Table 5):

<i>Table 5</i>	<i>Total Return (1/31/1970 to 9/30/2017)</i>
Goldman Sachs Commodities Index	6.79
US BLS CPI All Urban SA 1982-1984	4.01
<b>Goldman Sachs Commodities Index Average Excess Annual TR to Inflation</b>	2.78

Reviewing the data shows that Inflation averaged 4.01% from 1/31/1970 to 9/30/2017. Comparing returns shows that commodities had an average excess annual total return to inflation of 2.78 percentage points. In addition, we find that commodities returns exceeded inflation in 29 of the 48 annual time periods reviewed, or 60.4% of the time. This data is similar to research by Case, Wachter, and Worley (2011), which reviewed rolling six-month time periods from 1978 to 2011 and found that commodities protected against inflation 70.4% of the time, and were even better than stocks at doing so (60.8% of the time). Finding that commodities have outperformed inflation a majority of the time is important as we further demonstrate that commodities provide a beneficial portfolio hedge to inflation.

## CONCLUSION

Through the research process and data, we demonstrate that commodities returns can be volatile and have had negative performance in recent time, supporting investors' concerns. While we are currently unable to predict the market movements in commodities, a review of long-term historical data allows us to infer and consider how they might behave in economic environments going forward.

The data show risk-adjusted returns for a diversified stocks and commodities portfolio outperformed over the entire period of study (since 1/31/1970) when compared to commodities or stocks alone. This means that we can infer it is possible to increase return for the level of risk by building a diversified portfolio commodities and stocks.

The research also demonstrates that commodities had the highest correlation to inflation when compared to other major asset classes (including Stocks, Bonds, and Real Estate) over the period of study at 21% (1/30/1976 to 9/30/2017). We also found that commodities had an average excess annual total return to inflation of 2.78 percentage points and that commodities returns exceeded inflation in 60.4% of the annual time periods reviewed (1/31/1970 to 9/30/2017). At Washington Trust Bank, we believe that it is important to include assets classes that protect against rising inflation (and declining purchasing power) over time.

Though additional research on commodities as an asset class should be considered, we conclude that the findings validate the investment in commodities as part of diversified portfolio at this time. Commodities add value to portfolio performance by increasing

portfolio risk-adjusted return and providing an effective protection against inflation over the long term.



## REFERENCES

- Bodie, Z., and Rosansky, V. "Risk and Returns in Commodity Futures." *Financial Analysts Journal*, 1980, pp. 27–39.
- Case, B., Wachter, S., and Worley, R. "Inflation and Real Estate Investments." *U of Penn, Inst for Law & Econ Research Paper No. 11-33*, 2011.
- Cloutier, R., and Nesbitt, T. "Revisiting an Exposure to Commodities." Washington Trust Bank, Sept, 2016.



## APPENDIX 1 – ASSET ALLOCATION AND BACK-TESTED MODEL FOR THE STOCKS AND COMMODITIES PORTFOLIO

<i>Appendix 1</i> <i>Asset Class</i>	<i>Commodities and Stocks</i> <i>Back-Tested Model</i>
Goldman Sachs Commodities Index	27.53%
S&P 500 Index	72.47%
<b>Total</b>	100.00%

## APPENDIX 2 – DEFINITION OF TERMS

- **Total return** is a measure of return over time, combining both asset appreciation and income.
- **Standard deviation** is a measure of risk which shows the dispersion of returns to the mean.
- The **Sharpe ratio** is a measure of risk-adjusted return calculated by dividing the average portfolio excess return (to the risk-free rate) by the standard deviation over time.
- **Correlation** is a measure of the linear relationship between the movements in two or more variables.

## APPENDIX 3 – ADDITIONAL INFORMATION ON STUDY METHODOLOGY

- Asset class indices were used in this study as they appropriately represent asset class performance, but do not reflect investment manager bias.
- The period of review for this study was 1/31/1970 through 9/30/2017, given that the earliest common start date for the asset class indices was 1/31/1970. This period ensures that the performance analysis is significant over multiple market cycles.
- The Stocks and Commodities back-tested model was rebalanced once a year to target weights (on a rolling calendar basis).
- The study assumes that an investor was invested in the strategies for the full time period studied. We recognize that many investors may not have utilized all the asset classes shown for the full time period and that actual investment results may be different as a result.

## APPENDIX 4 – TOTAL RETURN OF COMMODITIES COMPARED TO INFLATION



<i>Appendix 4</i>	<i>Goldman Sachs Commodities Index Total Return (%)</i>	<i>US BLS CPI All Urban SA 1982-1984 (%)</i>	<i>Goldman Sachs Commodities Index Average Excess Annual TR to Inflation (%)</i>
1970	13.09	5.01	8.07
1971	15.22	3.01	12.21
1972	42.43	3.41	39.02
1973	74.96	8.94	66.01
1974	39.51	12.10	27.42
1975	-17.22	7.13	-24.35
1976	-11.92	5.04	-16.96
1977	10.37	6.68	3.69
1978	31.61	8.99	22.62
1979	33.81	13.25	20.56
1980	11.08	12.35	-1.27
1981	-23.01	8.91	-31.92
1982	11.56	3.83	7.73
1983	16.26	3.79	12.47
1984	1.05	4.04	-2.99
1985	10.01	3.79	6.22
1986	2.04	1.19	0.86
1987	23.77	4.33	19.44
1988	27.93	4.41	23.52
1989	38.28	4.64	33.64
1990	29.08	6.25	22.82
1991	-6.13	2.98	-9.11
1992	4.42	2.97	1.46
1993	-12.33	2.81	-15.14
1994	5.29	2.60	2.70
1995	20.33	2.53	17.80
1996	33.92	3.38	30.54
1997	-14.07	1.70	-15.77
1998	-35.75	1.61	-37.35
1999	40.92	2.68	38.24
2000	49.74	3.44	46.31
2001	-31.93	1.60	-33.54
2002	32.07	2.48	29.59
2003	20.72	2.04	18.68
2004	17.28	3.34	13.94
2005	25.55	3.34	22.21
2006	-15.09	2.52	-17.62
2007	32.67	4.11	28.56
2008	-46.49	-0.02	-46.47
2009	13.48	2.81	10.67
2010	9.03	1.44	7.59
2011	-1.18	3.06	-4.24
2012	0.08	1.76	-1.68
2013	-1.22	1.51	-2.73
2014	-33.06	0.67	-33.73
2015	-0.41	0.96	-1.37
2016	11.37	2.09	9.27
2017 (through 9/30)	-3.76	1.46	-5.22
<b>Total Return</b>	<b>6.79</b>	<b>4.01</b>	<b>2.78</b>
<b>Outperformance</b>			<b>60%</b>

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