



Is Inflation Hedging a Reason to Save in Gold?

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Gold is seen by some investors as the ultimate long-run hedge against the risk that inflation poses to their savings' purchasing power. This article provides a brief review of the research on why and whether gold provides an inflation hedge and then gives an alternative view on whether this was a legitimate reason for U.S. dollar-based investors to buy gold over the last 217 years.

This brief paper specifically examines gold from the perspective of an investor who starts to save towards retirement, over time horizons between 25 and 40 years, buying one unit of gold per year. This practical vantage point is very different from most academic research, which focuses on whether gold and inflation have a long-run equilibrium relationship, as assessed through cointegration tests.

Why Would Gold Be an Inflation Hedge?

Gold's total stock is limited by nature, and new supply from mining is relatively inelastic and small at about 1.6% per annum. This characteristic is in contrast with central banks' and governments' ability to drive inflation by increasing the money supply at will. One might expect as fiat money's purchasing power falls with inflation, gold's value should be maintained – protecting gold holders from losses in purchasing power.

This idea requires that the price of gold increases in terms of other currencies by at least those currencies' rates of inflation. But what channel of economic action might drive this long-run relationship into equilibrium is not clear.

Levin *et al.* (2006) point to the gold miners as the force that should hold the relationship in place. They argue that gold mining costs would be driven by general inflation, and as the miner's costs go up they would demand a higher price for gold to maintain their profit margins.

But the argument seems to have a few weaknesses. The basket of goods used to estimate inflation would be quite different from the goods and services bought by gold miners. Additionally miners have the ability to exercise a real option to close expensive loss-making mines when prices fall, note Moel and Tuffano (2002). This was shown to be the case as average costs for miners fell dramatically after 2011 in response to falling gold prices. O'Connor, Lucey and Baur (2015) formally test the direction of causality between gold prices and gold mining costs. They find that gold prices drove mining costs both globally and in most individual countries examined. Based on this finding, miners are price-takers and therefore they cannot be what would hold the relationship in equilibrium.

Fortune (1987) suggests an alternative channel: an increase in expected inflation would encourage investors to buy gold and sell any assets that give a fixed nominal return (such as bonds.) This action



drives up the price of gold in that currency, protecting savers and investors from falls in their purchasing power due to inflation. He finds a positive relationship between gold and inflation, but doesn't look at expected inflation so this channel remains untested.

Empirical Evidence on Gold and Inflation in the U.S.

There is plenty of research on whether there is a long-run equilibrium relationship between gold and inflation. Highlights for U.S. data will be discussed here; readers can consult O'Connor *et al.* (2015) for a full summary of available research.

Leven *et al.* (2006) use cointegration tests and find a 1:1 long-run relationship between the two in a World Gold Council study, pointing to gold as a good inflation hedge. Worthington and Pahlavani (2007) look at a longer period (1945 to 2006) with more advanced cointegration tests and again find a strong inflation hedging relationship. They allow for a change in the relationship at the closing of the gold window by President Nixon when gold's value was allowed to float in the 1970s due to higher inflation. Allowing for a change in the relationship at the closing of the gold window seems sensible, but higher inflation is the very thing gold is supposed to be protecting investors from: if gold is an inflation hedge, periods of higher inflation should *not* require special treatment. Taylor (1998) examined both the pre-World War II and post-1973 periods and again concluded in favor of gold as an inflation hedge. Bampinas and Panagiotidis (2015) take this research to the next logical step and use a 200-year dataset, starting in 1791, to assess whether gold is a truly long-run hedge for US dollar investors and find that it was.

Not all studies agree that the relationship exists however. Batten *et al.* (2014), for example, find no relationship between gold and U.S. C.P.I. using data from 1985 to 2012. They use 1985 as a start date to account for the finding that there was a significant statistical structural break in U.S. C.P.I., possibly due to the beginning of the so-called period of "Great Moderation." They also show that the relationship varies a lot through time with inflation's importance rising as interest rates fall.

An issue with all of these studies is that a finding in favor of cointegration is interpreted as gold being an inflation hedge. But cointegration does not mean that gold always protects an investor's wealth from inflation. It simply means that at times during the period under analysis, gold's price reached a point where investors in gold have neither gained nor lost any purchasing power. The following day prices may fall or rise and continue in that trend for long periods such that there can be long runs of time where investors have lost purchasing power (or vice versa.)

Cointegration points to occasional periods of equilibrium - not a permanent balance between gold and inflation. The half-life of the time spent in disequilibrium is estimated to be between 30 months by Levin *et al.* (1994) and 40 months by Levin *et al.* (2006). Long periods of imbalance are not uncommon when looking at inflation and asset prices. Rogoff (1996) shows a similar period of disequilibrium when surveying the literature on the theory of Purchasing Power Parity – the long-run equilibrium relationship between inflation and currencies. However, long periods where the two are not in balance does imply that not all who save in gold will have their wealth protected when they come to retire or draw down their savings.



Inflation Hedging From the Perspective of a U.S. Dollar-Based Investor

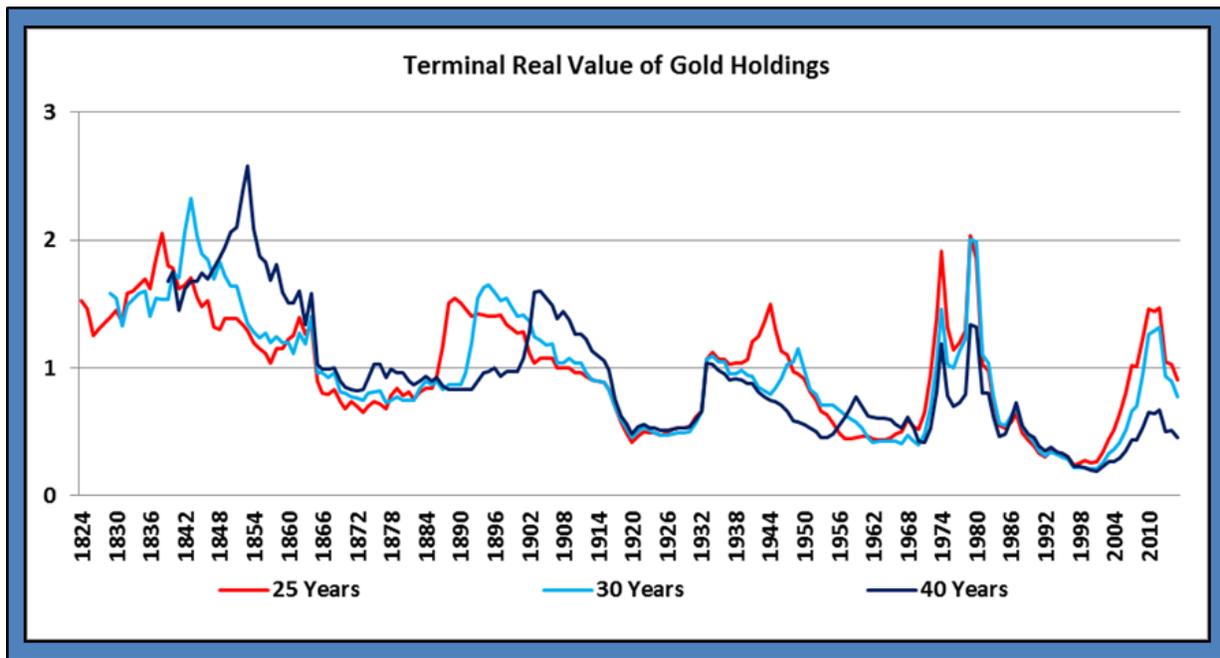
This article adds to the debate on inflation hedging by looking at the real outcomes for U.S. dollar-based investors, who have saved in gold over various horizons during the last 217 years. We examine how gold has performed for such an investor within a single lifespan, laying aside a long-run statistical idea to focus on the real outcomes savers would have achieved if they had put their money in gold. In this study, the investor buys one unit of gold per year at the annual average price. This means that the investor buys evenly over his or her investment life. Three investment horizons are chosen: 25, 30, and 40 years. These horizons were chosen as they seem reasonable approximations of what individuals saving for a pension might do.

In order to assess the usefulness of gold as an inflation hedge, the real (inflation-adjusted) value of gold holdings at the end of each investment horizon is tabulated, providing the terminal real value for our hypothetical investors. Figure 1 on the next page shows how U.S. dollar-based investors would have fared between 1800 and now. If the value shown is 1 or greater, the gold portfolio's value has matched or beaten inflation. For example, a finding of 1.1 would indicate that the investor's purchasing power was 10% greater than it would have been if gold had merely kept up with inflation.

Each year in Figure 1 indicates the year that the hypothetical gold investing ended. So for example, investors who bought one ounce of gold per year starting in 1800, ending in 1824, and saved for 25 years would have beaten inflation by 53% and increased their purchasing power. Further, if investors had begun buying gold in 1829 and continued to save for 40 years through 1868, their investment would have maintained its purchasing power, meaning that they were almost exactly hedged against inflation. Any terminal real value greater than 1 is clearly a very successful inflation hedge since beating inflation would be better than merely matching it.



Figure 1



Source: U.S. Dollar Annual Average Gold Price and U.S. Inflation from measuringworth.com

The average terminal real values of a gold saver’s holdings over 25, 30, and 40 years are 0.98, 0.95 and 0.90 respectively. As all are close to 1, this seems to indicate that gold acts as at least a weak hedge against inflation.

The above tests of gold’s hedging ability reflect the average of the terminal portfolio values, and this average seems biased upwards by some very large terminal real values for a small number of years - some showing a doubling of purchasing power as happened for investors who began saving around 1814. This seems to drag the average up and biases the results in favor of gold as an inflation hedge.

Another more practical way to look at the results for an investor is to see what the percentages of investors were that matched or beat inflation over the 217 years. Fifty percent of the 25-year investors matched or beat inflation through saving in gold; 40% of 30-year investors were successful; and only 29% of 40-year investors matched or beat inflation.

Even in the best case (with a 25-year holding period), only half of all savers over a 217-year period managed to match or beat inflation by saving in gold. Given that gold as an inflation hedge seems to have been a 50:50 bet, one could conclude that savers cannot rely on this precious metal to protect their purchasing power.

Looking at the graph, no saver with a 40-year horizon managed to beat inflation after 1980 (as a terminal year), and the average terminal portfolio value was only 0.42, a 58% loss in purchasing power. Notably, gold behaved better as an inflation hedge under the shorter-term holding periods.



These results are admittedly limited by their particular assumptions. This analysis assumes a smooth savings pattern of one unit of gold per year rather than an amount of dollars or a growing amount of money as income rises. This analysis also assumes that savers will liquidate their entire portfolio at the end of the period they were saving over rather than draw down their savings smoothly during their retirement.

The analysis also does not include transaction, storage or insurance costs, which would worsen the terminal real value of investors' portfolios. Additionally over time the costs and ways to hold gold would have varied considerably.

Another caveat is that we carefully referred to our investors as "U.S. dollar-based" rather than as U.S. investors *per se*. Recall that it was effectively illegal to own gold as an investment in America between 1933 and 1964.

Conclusion

There may be good reasons for an investor to hold gold, including portfolio diversification benefits and acting as a safe haven during major market crashes, but reliable inflation hedging properties does not appear to be one of them. This paper found that since 1800, U.S. dollar-based investors matched or beat inflation by buying gold every year in only 29% to 50% of three long-term investment horizons. This failure to reliably hedge investors against inflation shows that gold has not been a very effective way to protect the purchasing power of wealth, at least historically for US dollar investors.

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