

# **Gold and US interest rates:** a *real*ity check



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The World Gold Council is the market development organisation for the gold industry. Working within the investment, jewellery and technology sectors, as well as engaging with governments and central banks, our purpose is to provide industry leadership, whilst stimulating and sustaining demand for gold.

We develop gold-backed solutions, services and markets based on true market insight. As a result we create structural shifts in demand for gold across key market sectors.

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# Gold and US interest rates: a *real*ity check

As the US economy starts to show signs of rebalancing, paving the way for monetary policy normalisation, we explore the misconceptions surrounding the relationship gold has with real interest rates. We demonstrate that higher real rates are not unconditionally adverse for gold, as the effect of other factors needs to be considered. Thus, gold's portfolio attributes are not compromised by a return to a normal interest rate environment. In addition, we find the influence US real interest rates have on gold has receded over the last few decades as demand has shifted from West to East.



The potential cessation of QE has increased market volatility.

A return to 'normal' in the US is consistently seen as negative for gold...

...as it increases the opportunity cost for investors holding it.

Traditionally, US rates have functioned as a global benchmark.

However, while investment demand in Western markets is important, it is just one of the many variables that influence gold. Over the last few years, in the shadow of the financial crisis, a crescendo of commentary has preceded major central bank policy announcements. Positioning ahead of anticipated quantitative easing programme launches or extensions was particularly feverish, pushing short-term US **real** rates close to -2%, a level not seen since the 1970s. Now the focus has shifted to the potential end of these programmes. Though a normalised target interest rate appears some time away, the longer end of the curve has shifted in expectation of sustainable economic growth, with 10-year **nominal** yields in the US leaping 85 basis points to 2.4% between May and mid-June 2013. Talk of normalising interest rates has fuelled uncomfortable oscillations in other asset prices.

The consequences of higher interest rates are many and bear both positive and negative implications for investors, households, corporations and even governments. Yet, where most market commentators appear to agree is the negative implication a rising interest rate environment will have for gold. Why is this?

Theory will tell you that interest rates have a traditional relationship with gold through the channel of rational investment decisions. In other words, investors measure the relative attractiveness of gold by how much they can earn elsewhere. With gold viewed primarily as a currency and capital preservation asset – but without a yield – there is a cost to holding it if other assets yield more.

The relationship between gold and real rates is usually linked to US investment markets, but commentators typically extrapolate implications to global gold buyers elsewhere. The basis for the assumption that US interest rates form a benchmark for global interest rates is rooted in the following reasons:

- Gold is primarily traded in US dollars
- The US dollar is the world's reserve currency
- · US assets form the lion's share of the global investment portfolio

However, gold is not only used for investment purposes in periods of low interest rates. It is also a consumer product that can be positively influenced by economic growth – even if real rates are rising. Further, a rise in US real rates has to be seen in the context of rates cycles in other parts of the world, especially emerging markets. In fact, as developing markets continue to expand, US interest rates will likely become only one of many measures to gauge global opportunity costs. Given the structural changes that gold has experienced for more than a decade, it is likely that the US real interest rate will be less relevant than before, particularly as demand increasingly originates in emerging markets where domestic inflation rates are more relevant than the US inflation rate. Gold's portfolio attributes would still be relevant in a normal rate environment...

#### What can be inferred from gold's relationship to US real rates?

While returning to a more normal US interest rate environment should have implications for gold investment – especially in Western markets – these may not be as negative as some market commentators expect. In fact, our analysis shows that gold's attributes appear favourable in a moderate real rate environment compared to either negative or high rate environments:

- In a moderate rate environment (with real rates ranging between 0% and 4%), returns for gold are in line with the long-term average of an annualised 6 – 7%.
- Rising rates are worse for gold than falling rates, but still provide annualised returns well in excess of a conservative 0% long-term inflation-adjusted return estimate often used to show gold as a core portfolio asset.
- Gold's volatility is significantly lower in a moderate real rate environment. While rising real rates are associated with increased volatility, it is only marginally higher than the long-run average.
- The correlation between gold and global equities in a moderate real rate environment is close to zero, which forms part of the basis for gold's diversification properties.
- High rate environments (with real rates exceeding 4%) are least favourable towards gold in terms of returns, but volatility and correlations remain moderate relative to other assets.

...especially as gold's relationship to US rates has weakened over time. Finally, a re-estimation of the gold price model developed for the World Gold Council by Oxford Economics suggests that the gold price and US real rate relationship is weaker than in the past. This is likely due to the effect of the increasing relevance of emerging market demand for gold and consequently the influence of their local macro-economic factors in determining its price.

#### The established view and that well-worn chart

**Chart 1** shows one of the most common arguments with regard to holding (or selling) gold. It pits the US real rate – measured as the three-month T-bill interest rate less US headline CPI inflation – versus the gold price in US dollars per troy ounce. Advocates of the strong relationship between US real interest rates and gold point to the clustered shaded areas to the left and right, which appear to have been almost unanimously associated with rising gold prices: the bull market of the 1970s and the bull market over the last twelve years, respectively. Accordingly, they will point to the long fall in the gold price from its peak in the early 1980s through to 2001 and highlight that this occurred during a positive and often high real rate environment in the US and elsewhere. It does suggest a compelling association.



#### Chart 1: Gold is typically assumed to have a strong negative correlation to US real rates

Reference notes are listed at the end of this article. Source: Thomson Reuters Datastream, World Gold Council

But the chart does not show how different these two periods were:

- High inflation/low inflation: The low to negative real rates during the 1970s occurred amidst very high and rising inflation, while the low real rates we have mainly experienced during the 2000s (barring two episodes) have existed in a low nominal rate but low inflation environment.
- Strength of the US dollar: These two periods are also defined by very different US dollar settings. The 1970s witnessed mixed fortunes for the US dollar but with an overall modest decline. This is contrasted by the protracted decline in the US dollar over the last 10-plus years.
- Gold demand and supply: The underlying supply and demand picture for gold has changed significantly. Today, emerging markets are key components in demand, and mine production is almost evenly distributed throughout the different continents. Further, the period from the early 1980s to the late 1990s was characterised by active central bank and producer-hedging activity. Today, central banks are net buyers of gold and while producer hedging, a possible source of supply, is at negligible levels.
- Relative importance of US real rates: The advent of forward and futures markets during the 1980s provided a new vehicle for participants in the gold market. Centred on LIBOR, a US dollar-based benchmark for global interest rates, these market advances consequently had a strong link to movements in physical gold and probably to prices as well.<sup>1</sup> As developing markets increase their importance in the global economy, the predominance of the US dollar and its real rates will likely shift.

1 O'Callaghan, Gary, The structure and operation of the world gold market, December 1991.

A simple view suggests a strong and consistent negative link between real US interest rates and gold price.

#### The fundamental picture of the gold market

The supply and demand makeup of the gold market suggests that the relationship with US real interest rates is less clear than common wisdom has it.

Firstly, the established view relates gold prices to movements in the real US interest rate through investment channels. Over a five-year average, global investment constitutes 27% of gold demand (**Chart 2a**). Adding both exchange-traded funds (ETFs) and over-the-counter (OTC) demand takes this share up to 37%, well below the 48% accounted for by jewellery demand. Further, investment demand linked to the US and Europe only accounts for 18% of total demand over the last five years – even if all OTC-related demand is assumed to originate here. One therefore draws the conclusion that this is the exposure that most directly dictates the negative relationship between the gold price and US interest rates. However, it is understood that although constituting a small share of global demand (**Chart 2b**), the US and European investor markets have a strong influence on price oscillations simply because of the size of their transactions, accessibility of their markets, and to some extent their influence on investor behaviour elsewhere. But that these two markets are the sole arbiters of gold prices is guestionable in the medium- to long-term.

# Chart 2: (a) Jewellery and technological applications make up more than 50% of demand, while (b) most gold is bought in emerging markets



Reference notes are listed at the end of this article. Source: Thomson Reuters GFMS, World Gold Council

Investment demand linked to the US market is one of many factors that influence gold. Thus, why should US real rates be assumed so influential? Even local real rates appear not to have much impact on buying behaviour...

Secondly, how do the other categories of demand respond to interest rates? The historical sensitivity of jewellery demand to gold prices would, by extension, mean that jewellery demand is positively correlated to interest rates (if the rate/price relationship holds). Therefore, lower prices would stimulate gold jewellery buying. In some corners of the world this does not hold, particularly in emerging markets where buying is a consistent feature of landscapes that include cultural incentives to buy gold. In India for example, the motives for investment and jewellery buying are not mutually exclusive, and real rate sensitivity is unclear. An econometric analysis of gold demand in India by Dr. R Kannan found that the domestic real deposit rate had "no statistically significant effect on gold demand". Rural consumers, lacking access to financial services and having a strong preference for the 'physical' were seemingly indifferent to real interest rates.

The pro-cyclical nature of technology demand also tends to be positively correlated to real interest

rates. Higher or rising domestic real rates are often consistent with improving economic health,

Finally, while prior to the global financial crisis central banks had mandates more closely tied to a

search for yield, the events of 2007 - 2008 propelled risk mitigation to the core of most central

bank reserve management strategies. As such, risk management takes precedence over yield, and the response by central banks to higher interest rates is likely to be fundamentally different

...while gold 'consumption' is typically pro-cyclical.

Further, central banks' activity should be less sensitive to rates.

We determine the effect that rates have on gold and its portfolio attributes by looking at different rate environments.

Returns are highest in low real rate environments.

#### How do real rates impact gold's portfolio attributes?

which spurs the demand for gold in industrial and technological applications.

While real interest rates are one of the factors that influence gold prices, the core value of gold to an investor lies in its contribution to portfolio performance - via the attributes that make gold a foundation portfolio asset. Using a simple regression analysis with dummy variables representing different rate environments, we explore how gold's attributes have fared historically. These real rate environments are defined as follows:<sup>2</sup> high (>4%), moderate (0%-4%) and low (<0%).<sup>3</sup> All data cover the period January 1975 to May 2013. Volatilities and correlations are calculated on a rolling 52-week basis and averaged to a monthly frequency.<sup>4</sup>

#### Returns

from that of investors.

Return is the primary characteristic of interest to most investors. Clearly, very few investments are held with a complete disregard to the returns they provide, with some hedges serving as a rare exception. Table 1 shows the results of the regressions where each of three real US interest rate environments are explanatory dummy variables for gold returns.

# Real rate level Real rate trend

Table 1: Gold's return is higher under low and moderate real rate regimes

		Low	Moderate	High		
	Long term	(<0%)	(0%-4%)	(>4%)	Falling	Rising
Average monthly return	0.6%	1.5%	0.7%	-1.0%	0.8%	0.3%
Standard error	0.3%	0.5%	0.4%	0.6%	0.3%	0.4%
Statistically different from zero	No	Yes	No	No	Yes	No
Statistically different from long term?	-	No	No	Yes	No	No

Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

- 2 A simple approach is adopted here primarily to maintain consistency with perceived wisdom. Thus, the real rate we use to represent both rational and actual expectations is a straight average of two of the simplest: the US CPI inflation and the established Michigan survey of inflation expectations covering the outlook one year ahead. Our numerator is a one year continuous Treasury bond yield.
- 3 These boundaries are a logical and symmetrical extension of the neutral real interest rate (estimated at 2.25% in 2005), which is the rate at which output growth matches its potential.
- 4 Other frequencies and longer/shorter windows did not materially affect the results.

In addition, returns during moderate rate environments are in line with gold's long-term average.

While high real rates have historically coincided with lower gold returns, their effect may be overcome by changes in the US dollar or inflation expectations. The results effectively exhibit average returns for the various rate environments.<sup>5</sup> Gold's average monthly return since 1975 is 0.6%, translating to an annualised 7.5% nominal return.<sup>6</sup> The best returns have been achieved during low real rate environments (1.5% monthly). During moderate real rate environments gold's monthly rate of return is 0.7%, largely in line with the long-term average. High real rates, as might be expected, are associated with lower monthly average returns of -1%. The average returns suggest, as common wisdom has it, that real rate regimes are negatively correlated to returns. However, average returns during the various environments analysed are mostly not statistically different from the long-run average and, other than returns during low interest rate environments, they are not statistically different from zero.<sup>7</sup>

After looking at the level of real rates, let us consider their trajectories. **Chart 3** below details the trajectory of gold during high US real rate environments. There is by no means a clear-cut pattern in behaviour. Gold fell during the mid and late 1980s (2nd and 4th boxes in the chart), but showed resilience in the early part of the decade and even rose during the 1985 to 1987 period. This unexpected behaviour suggests that other macro-economic or fundamental factors are dominant. For example, previous research has also found it difficult to disentangle the effects of real rates on gold from those stemming from changes in the US dollar and inflation.<sup>8</sup>





Reference notes are listed at the end of this article. Source: Bloomberg, World Gold Council

Rising real rate environments are only marginally worse for gold than falling ones.

As **Table 1** shows, rising real interest rate environments have lower (yet positive) returns for gold than do falling ones, with 0.3% average returns versus 0.8% for falling rate environments. While the low returns for the rising environment may not thrill those who opportunistically hold gold for capital gains, they do, however, support gold's portfolio attributes. Indeed, the bulk of lower returns come from **high and rising** rate environments. By contrast, the period between October 2003 and October 2006 saw US real rates **rise from low levels** – negative 1% to almost 3% – yet gold had a cumulative return close to 60% over the period.

6 Returns are calculated using an arithmetic average.

<sup>5</sup> These results do not suggest any causal link and do not control for other factors.

<sup>7</sup> As a rough rule of thumb, estimates are considered significantly different in statistical terms only if they are more than two standard deviations away from each other.

<sup>8</sup> Sherman, Eugene J., A gold pricing model, The Journal of Portfolio Management, Spring 1983.

#### Volatility

Gold volatility is significantly influenced by the real rate environment. Return is not the only variable that matters to investors. Understanding risk is particularly important in portfolio management. Thus, we examined how gold's volatility has behaved during the three real interest rate regimes. Results suggest that volatility is significantly influenced by the prevailing real rates regime (**Table 2**).

#### Table 2: Gold's volatility is lowest in a moderate real rate regime

		Real rate level			Real rate trend	
	Long term	Low (<0%)	Moderate (0%-4%)	High (>4%)	Falling	Rising
Annnualised volatility	17.3%	20.5%	14.1%	21.2%	17.2%	17.6%
Standard error	1.0%	2.1%	1.0%	2.7%	2.6%	3.3%
Statistically different from long term?	-	Yes	Yes	No	No	No

Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

Moderate real rate environments lower volatility on average by 6 to 7 percentage points compared to high or low environments.

Gold's correlation profile with risky assets – in particular equities – changes over time...

...tending to increase when rates are high.

The long-term average for the sample is 17.3%. In fact, gold has exhibited lower volatility during moderate real rate environments. Both high and low rate environments have shown consistently higher volatility at 21.2% and 20.5%, respectively, a likely cause being that both these environments are associated with higher market uncertainty (as seen during the last few years) or high inflation (as experienced in the late 1970s). However, the volatility estimate for the high interest rate environment is not statistically different from gold's long-term volatility. Additionally, gold's volatility has displayed almost no difference during falling or rising rate environments. It appears that the level of rates is more strongly associated with gold's volatility than the direction of the moves. This makes sense as the direction of interest rates is unlikely to influence asset volatilities unless the movement is unexpected, fast or sizeable.

#### Correlation

The final characteristic to consider is correlation. Gold's unique correlation behaviour has been documented at length in our research. But few correlations are constant over time. Are changes in correlation systematic or random? In other words, are there regimes during which gold's correlation is systematically different from its long-run average? We have noted previously that gold's correlation with equities is generally asymmetrical: falling equities often lead to a negative correlation with gold, whereas rising equities are often associated with a zero or slightly positive correlation.

At first glance, there seems to be no consistent pattern in terms of correlation between gold and risk assets during different interest rate scenarios. However, one might expect some convergence in shorter-term returns between riskier assets as uncertainty prevails and a reduced number of factors drives asset returns. This is something we have seen during various periods over the last few decades (**Chart 4**).





#### A moderate regime is most beneficial for the correlation between gold and risk assets, while correlations increase during high rate environments.

**Table 3** details the results for correlations between gold and global equities during the three real rate environments.<sup>9</sup> For a moderate environment, correlations are very close to zero and slightly on the negative side, close to the sample average of 0.03. This long-term correlation is a key driver of gold's diversification benefits. During moderate real rate environments, gold has even exhibited a slightly negative correlation. High real rate environments, however, suggest that gold and equities are more likely to move together. Why is this? While such an environment was prevalent only during the 1980s, higher real interest rates can be negative for equities as well as gold stifling investment and pushing down valuations via the discount rate. However, the US dollar appears to have played a large part in this dynamic as high interest rates did not prevent gold and equities from rallying in tandem in the mid 1980s as the broad US dollar index fell. Further, an average correlation of 0.2 is still low relative to the typical correlations found between equities and other assets.

		Real rate level			Real rate trend	
	Long term	Low (<0%)	Moderate (0%-4%)	High (>4%)	Falling	Rising
Correlation	0.03	0.08	-0.06	0.20	0.00	0.09
Standard error	0.04	0.05	0.04	0.06	0.05	0.07
Statistically different from long term?	-	No	Yes	Yes	No	No

#### Table 3: Gold's correlation to equities is lowest in a moderate real rate regime

Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

#### However, other factors, such as the US dollar, can influence these correlations.

As discussed in previous sections, the relationship between gold and real interest rates is not clear cut, even in an environment where the opportunity cost may seem prohibitive. A weaker dollar may mitigate the negative effect of a rise in rates as it appeared to do in the late 1980s, when the gold price almost doubled amidst periods of high real interest rates.

9 The global equity index assumes local currency returns to minimise the US dollar impact.

Reference notes are listed at the end of this article. Source: Thomson Reuters Datastream, World Gold Council

#### Has the relationship with real interest rates changed over time?

Previously, high real rates have reduced gold's return, but the market has experienced significant changes.

Consequently, real rates may now be less influential.

High US real rates do appear to apply the brakes to gold performance. The last time such an environment existed was in the early 1980s. Has the relationship between gold and real rates changed since then? Given the aforementioned structural changes in the gold market in the last two decades, it would be conceivable to believe that some of these established relationships have shifted.

To determine whether this might be the case, we re-estimated the robust gold price model developed by Oxford Economics in 2011 over a contracting window, incrementally dropping older data, quarter-by-quarter. The original model's estimation period included the mid-1970s, so it captured the dynamics in play at the time. In addition, we also re-estimated the parameters using a 15-year moving window. The results are displayed in **Charts 5a** and **5b**. The charts suggest that ignoring the high real rate environment, which was prevalent in the late 1970s and early 1980s, the US real rate variable has little meaning for gold prices.

In fact, a closer inspection reveals that the US dollar and other variables are more relevant than US interest rates. Of the macro-economic variables in Oxford Economics model, the US dollar has the most persistent significance as a consistently negative coefficient, as the window is reduced to exclude older data or moved along with a 15-year window. The most remarkable change is the drop in the statistical significance of the real rate, to close to zero if estimated from the early 1980s until today, and the effective disappearance of its economic impact. While the other variables show shifting significance, consistent with being important only during certain regimes, only the real rate appears to have lost and not regained its significance since 1981.

#### Chart 5: The influence of US real rates has receded over time, whether estimated by (a) removing past periods, (b) or using a moving window





Reference notes are listed at the end of this article.

Source: Oxford Economics, Thomson Reuters Datastream, World Gold Council

Gold's relationship with US real rates is not linear and is changing.

A high US real rate environment has not been friendly to gold investment demand, but other factors, including the US dollar and emerging market demand, can wield significant influence.

#### Conclusion

Real rates are an important consideration when constructing the framework for understanding movements in the gold price, but an awareness of when they are important is key. While the relationship is logically and practically a driver of investment demand at times, it is only one of several. In addition, investment demand is not the sole arbiter of gold prices, nor does it originate solely in the US. Gold's relationship with US real rates is not linear and is arguably changing. As the dominant influence of both the US economy and the US dollar slowly makes room for emerging markets and their currencies, their macroeconomic factors will become structurally more important in setting prices on the global stage, including that of gold.

Results from our analysis show that contrary to the simplistic view that higher US real rates should lead to lower gold prices, moving to a moderate real rate environment promotes gold's portfolio characteristics further. Returns in such an environment are in excess of the conservative return estimate used to provide evidence of gold's portfolio contribution credentials. Volatilities fall as rates move into a moderate real rate environment, as do gold's correlation with global equities. While it is true that a high real rate environment has not been friendly to gold on average, the underlying data is mixed and obscured by movements in other driving factors, such as the US dollar. We do not know what a high real rate environment would mean for gold, as it would be contingent on so many other factors, not least of which are those that now originate in emerging markets. It is this last facet of the gold market that lends credence to the idea that the influence of the US real rate on gold has receded over the last couple of decades.

#### References

#### Chart 1: Gold is typically assumed to have a strong negative correlation to US real rates

Real rate is computed as the difference between the 3-month US Treasury bill yields less the headline US CPI inflation. Shaded areas denote negative real interest rate environments.

## Chart 2: (a) Jewellery and technological applications make up more than 50% of demand, while (b) most gold is bought in emerging markets

- (a) The figures are computing using a trailing 5-year average of gold demand by sector.
- (b) The figures are computing using a trailing 5-year average of gold demand by sector. CIS stands for Commonwealth of Independent States or the former soviet republics. Total demand includes jewellery, investment, technology and ETFs. Data assumes that the origin of buyer is the domicile of its fabrication.

#### Table 1: Gold's return is higher under low and moderate real rate regimes

Gold (US\$/oz) returns are calculated on a monthly basis from January 1975 to May 2013 as percentage changes. Standard errors correspond to the (absolute) average of each regime: moderate, high or low and falling or rising. Statistical significance reported at the 5% level.

# Chart 3: Gold's relationship with real rates is less clear cut when viewed in the context of other fundamental factors

Equities are represented by the MSCI World index denominated in local currency. Gold is shown in US dollars. Trade-weighted US dollar basket is used to represent the dollar against other major currencies. Real rate is computed as the 1-year Treasury bill yield less the average of headline US CPI inflation and Michigan 1-year-ahead inflation expectations. High real rates are defined as greater than 4%.

#### Table 2: Gold's volatility is lowest in a moderate real rate regime

The real rate is computed as it was in Table 1. Gold (US\$/oz) volatility is calculated on a monthly basis from January 1975 to May 2013. The value for each month is the annualised average of rolling 52-week volatilities for that month, using weekly log returns. Standard errors correspond to the (absolute) average of each regime: moderate, high or low and falling or rising. Statistical significance reported at the 5% level.

#### Chart 4: Relationship between gold's correlation to equities and real rate regimes is a bit less obvious

Correlation is represented by the monthly frequency of 52-week rolling correlation between MSCI global equities in local currency and gold (US\$/oz). Real interest rate is computed as the difference between the 1-year Treasury bill yield less the average of headline US CPI inflation and Michigan 1-year-ahead inflation expectations.

#### Table 3: Gold's correlation to equities is also lowest in a moderate real rate regime

The real rate is computed as it was in Table 1. Gold (US\$/oz) and equity (MSCI world equity index in local currency) correlation is calculated on a monthly basis from January 1975 to May 2013. The value for each month is the average of rolling 52-week correlations for that month. Standard errors correspond to the (absolute) average of each regime: moderate, high or low and falling or rising. Statistical significance reported at the 5% level.

## Chart 5: The influence of US real rates has receded over time, whether estimated by (a) removing past periods, (b) or using a moving window

- (a) The t-statistics were computed from the equation that was published by Oxford Economics in the paper, The effect of inflation and deflation on the case for gold, June 2011. That regression equation was re-run with a contracting estimation window. The dates shown on the x-axis are the starting points of the regression which goes to Q4 2010. What this chart shows is if the regression is run from 1983 onwards, the effect of the US real rate is negligible when seen in the context of the dollar, the Fed balance sheet, credit spreads and CPI inflation.
- (b) The t-statistics were computed from the equation that was published by Oxford Economics in the paper, The effect of inflation and deflation on the case for gold, June 2011. That regression equation was re-run with a 15 year moving estimation window. The dates shown on the x-axis are the starting points of the regression with the ending date occurring 15 years after the starting date. What this chart shows is if the regression is run from 1983 onwards, the effect of the US real rate is negligible when seen in the context of the dollar, the Fed balance sheet, credit spreads and CPI inflation.

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