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In this edition:

- Interconnections: the factors that drive gold
- Gold in a rising dollar environment
- The market may be wrong about gold and US interest rates

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About the World Gold Council

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.

We provide insights into international gold markets, helping people to better understand the wealth preservation qualities of gold and its role in meeting the social and environmental needs of society.

Based in the UK, with operations in India, the Far East, Europe and the US, the World Gold Council is an association whose members comprise the world's leading gold mining companies.

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Foreword



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Welcome to the eighth edition of *Gold Investor*.

The articles in this issue look backwards and forwards. We look back, revisiting a framework that explains what drives gold; and forward, to see how changes in the inflation-adjusted US interest rate and the US dollar may affect gold's future.

The striking feature of our two forward-looking articles is that we – in contrast to many commentators – do not believe that end is nigh for gold. Our analysis suggests that gold will survive the twin spectres of a rising dollar and higher US rates.

A comprehensive framework that helps explain gold's value and behaviour

In our first article, *Interconnections: the factors that drive gold*, we explain how gold's drivers interact with each other (the table on page 8 sets out seven main factors that influence different aspects of supply and demand). It also gives links to previous research that covers individual drivers in further detail.

A stronger dollar will not necessarily create an upheaval for gold

Beware of simple maxims. Even as we look at the interplay of factors that affect gold, it is hard to ignore the voices of those who insist that the US-dollar is gold's main and only driver. We generally see an inverse relationship between the gold and the dollar, but our analysis shows that this relationship is asymmetrical. Gold prices increase more when the dollar weakens than they fall when the dollar strengthens – and sometimes, gold and the dollar move in the same direction.

This article also explores the factors that have resulted in a rising dollar. It also highlights that the US dollar's relationship with gold has changed dramatically, and is likely to shift further as we move towards a multicurrency world.

Higher US interest rates may not affect gold as the markets expect

Cautioning against common wisdom twice in one issue may seem a little bold, but we feel we must speak up. Many commentators believe that a rise in real US interest-rates will be bad for gold.

In *The market may be wrong about gold and US interest rates*, we explain that while we see a link (high interest rates increase the opportunity-cost of investing in gold) we believe that the relationship is more complex than it appears – and less relevant than it previously was.

Our analysis shows that other factors – some positively correlated to the economic growth that often accompanies rising rates – can have more influence on gold. We also highlight gold's role as a key diversification and risk-management portfolio asset at a time when stocks and bonds look likely to deliver lower-than-average returns in coming years.

We hope you find our ideas and solid analysis informative and stimulating. Please get in touch if you have comments or questions on any of these articles. You can reach us at investmentresearch@gold.org.

I: Interconnections: the factors that drive gold

Investors can find gold perplexing. It correlates positively to excess money-supply but negatively to key currencies, and it attracts demand from investors, central banks, high-tech manufacturers and jewellers. Some of these sources of demand benefit when economies expand while others benefit when economies contract.

Complexity makes simple explanations based on a single driver – like US interest rates or the US dollar – attractive; but over-simplification can short-change investors.

In this article, we provide investors what we consider to be a more nuanced, more realistic, and more useful picture of what drives gold.

Gold's apparent complexity should not deter investors; it makes gold unique.

Interconnections that create gold's unique profile

Gold is a global asset that is driven by interconnected themes, factors and markets. The changing importance and interactions of these elements is a reminder that investors need a dynamic intellectual model for the gold market. We believe that investors should not be put off by gold's apparent complexity or swayed by single-factor theories that downplay gold's multi-faceted make up. On the contrary, the interconnections and dynamism of the gold market underpin some of the most relevant qualities for investors: low correlation to other assets, role as a store of wealth, and performance during periods of heightened uncertainty.

This article is a short-form reminder – with links to underlying detail we have covered in previous papers – of the themes and factors that drive gold, and the investment context. In it we cover:

- **Common misconceptions on the drivers of gold.** Gold has multiple, interconnected drivers. As we see it, single-factor and US-centric explanations are risky because they lead investors to pin their strategy to a skewed subset of many possible drivers.
- **A framework highlighting the main drivers of gold and their interactions.** The drivers that, in our view, best explain gold's behaviour. We will explain how these drivers interact and the relation they have to gold's underlying supply and demand dynamics.

Multifaceted gold and the lure of the single-factor explanation

In our view, many tried-and-tested financial analysis models are of no help to investors who want to analyse gold's performance. Discounted cash-flow valuation models that apply to equities and fixed income do not work for gold because gold does not deliver dividends or interest. The standard way to evaluate commodities – an analysis of supply and demand imbalance – does not work either: while gold is still scarce, its above-ground physical stock is approximately 177,000 tonnes (worth 8 trillion dollars).¹ Some of these stocks are not likely to come back to market, but some of it does trade freely and gives the gold market its significant depth and liquidity.

¹ Gold Demand Trends: Full year 2014, February 2015.

Gold has no yield because it's a real asset and not a liability. Gold is like a currency.

Many market participants cite this lack of a ready-made way to frame gold's value (and returns) as a barrier to investment. In fact, many investors believe that because gold has no yield, it has no value. However, this common misunderstanding is misplaced. Gold has no yield because it's a real asset and not a liability. Gold is like a currency. The US dollar itself does not have a yield. Cash deposit on banks, bonds, etc., take underlying assets and pay interest in return. One could create a gold-backed bond or use gold as collateral and therefore generate a yield. What is true, however, is that a model such as the discount-cash flow is not useful to analyse gold because this framework is limited by the fact that it requires assets with cash flow.

The lure – and risk – of single-factor explanations

Single-factor theories, whether applied to the climate, elections, or gold, are popular because they allow adherents to turn complex problems into simple ones. We have nothing against simple models; the purpose of much analysis is to boil complex factors down into a smaller subset.

Those that focus on a single driver when analysing the gold market may miss the significance of other, interconnected factors that weaken – or even nullify – the case for that single factor.

Two recurring, but limited themes: the US dollar and US interest rates

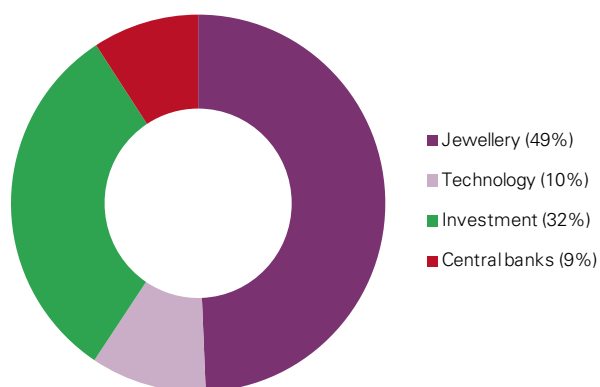
Market commentators with opinions on gold – particularly those in the US – tend to offer the same explanations for gold's price performance and future prospects: the US dollar and US interest rates.

While the US market is relevant, gold is truly global – and EM demand continues to grow.

US variables are important because the US represents a large slice of the world's financial markets (making up 55% of global foreign reserves – see *Gold in a rising dollar environment*). In particular, the US dollar has maintained a strong negative correlation with gold since the collapse of Bretton Woods in the 1970s. Yet, the gold market is truly global (**Chart 1**). Emerging-market demand for physical gold accounts for 70% of global demand while US demand for physical gold is less than 10% – and not all of this is linked to investment. Any theory that relies too heavily on US-metrics to explain the gold price may have significant flaws.

Chart 1: Jewellery and technology make up nearly 60% of demand as emerging markets buy nearly 70% of all gold

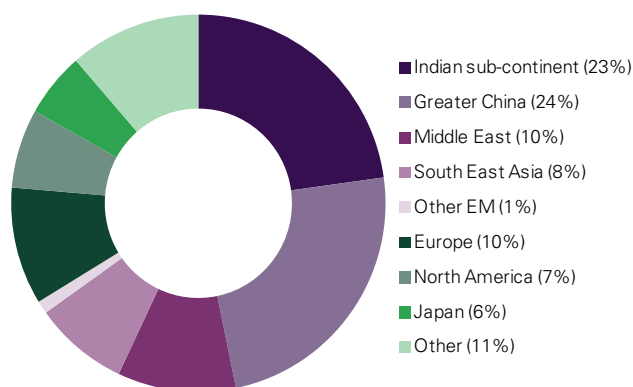
(a) Five-year average demand by sector*



* Average based on annual estimates from 2010 to 2014. It excludes over-the-counter gold demand.

Source: GFMS-Thomson Reuters, World Gold Council

(b) Five-year average demand by region†



† Average based on annual estimates from 2010 to 2014. It excludes over-the-counter and central bank gold demand.

Source: GFMS-Thomson Reuters, World Gold Council

A relevant framework that presents a fuller picture

Gold investors often get poor service from models based on excessive simplifications. An analysis that pinpoints a single cause of gold's performance, while attractive, offers a limited understanding of a complex world. Further, focusing on one subset of factors that may leave out relevant dynamics can skew the results of an analysis. Imagine, for example, a model for global corporate bond yields that only uses US Treasuries to explain their dynamics – leaving out credit conditions in other parts of the world or investor risk appetite.

There are seven factors we believe matter most for gold.

We believe that investors who want a more realistic picture of gold's value – and risks – have to see gold in the round. Our framework uses seven drivers to explain gold's performance and highlight its value as a way to manage risk and preserve value (summarised in **Table 1**).

We have broken down the drivers of gold into seven key factors: currencies, inflation/deflation, interest rates, consumer spending and income growth, systemic and tail risks, and supply-side factors.

- **Currencies.** While gold is no longer an official anchor of currencies, it has many key currency-related features. It is a well-established unit of exchange and it trades in a deep and liquid market. Of particular value to investors is gold's negative correlation to the US dollar and other developed market currencies, as well as its use as a store of value in countries with volatile foreign exchange rates. In addition, the quantity of available gold stocks can only grow by its annual mine production – in contrast to fiat currencies that can be expanded at will. This scarcity helps investors protect against losses in purchasing power.
- **Inflation/deflation.** Variables such as inflation have a profound impact on how investors and consumers view gold. Inflation and inflation expectations at the local level dictate consumers' purchasing power, driving the decisions of whether they buy something today or defer until tomorrow. High inflation can be disruptive and expectations of such an environment have a significant influence on gold demand. Yet, because gold demand is global, the effect that inflation has on gold needs to be analysed not on a country by country basis but at the global level. In addition, and perhaps surprisingly to some market participants, gold performs better than other assets (with the exception of cash) during deflationary periods.
- **Interest rates.** Interest rates are a key component in the valuation of financial assets because they measure the opportunity cost of holding cash (and high-quality short term bonds) relative to any other asset. High interest rates can increase the opportunity cost of investing in gold, but the economic environments in which they develop also coincide with strong periods of gold jewellery and technology demand. In addition, global interest rates – not only US rates – ought to be taken into consideration.
- **Consumer spending and income growth.** Jewellery, bars, coins and technological applications make up the majority of demand. Growth in disposable income and consumer spending promote purchases of these goods. As emerging market economies (which account for the largest share of demand) grow, higher levels of wealth can increase demand for gold.
- **Systemic and tail risks.** As systemic shocks and tail risks² affect global markets, investors seek high-quality, liquid assets such as gold. These types of events do not occur regularly and are difficult to predict, but they can have a devastating effect on investors' wealth. Gold has been shown to help investors mitigate these losses. In addition, the occurrence of systemic risks may structurally change investors' risk tolerance and their portfolio management practices, and favour diversifiers – like gold – as strategic components in their asset allocation.
- **Momentum (short-term investment flows).** Short-term investment flows, driven by momentum and other technical drivers can exacerbate short-term movements in the gold price – especially in periods when flows are largely driven by leveraged (often derivative) securities.³ While these flows can be a conduit of 'price discovery' and provide liquidity, they are not always correlated with the long-term drivers of demand and supply. As such, short-term flows tend to cause transient departures on the gold market long-term trend.
- **Supply-side factors.** The factors above relate to the motivations for purchasing gold. On the other side of the equation, the supply used to meet the demand for these purchases is also a factor that can influence the gold price. Gold supply can come in the form of mine production or recycled gold. All else being equal, a decline in the supply curve may increase scarcity and result in buyers being willing to pay more for gold.

These seven drivers interact with each other through various channels to affect the gold market and its price. For example, US interest rates and inflation have a large impact on the attractiveness of the US dollar. Interest rates and inflation have an impact on consumer spending and miners' decisions to expand production. Prolonged periods of low rates may inadvertently result in certain markets overheating and result in subsequent contractions. These relationships are just a few examples that could potentially complicate investors' attempts to base investment decisions involving gold on individual variables. Further, the changing nature of the gold market means that the importance of each driver and interactions among them must be revisited when structural shifts occur.

² These events, which can substantially erode the capital of an investor's portfolio in unexpected ways, produce portfolio returns that lie in the far end (or 'tail') of a probability distribution. Depending on the likelihood of these occurrences (ie, how far from the centre of distribution they lie), they are known as 2-sigma (2σ), 3-sigma (3σ) or 6-sigma (6σ) events – where σ denotes standard deviation.

³ A highly leveraged security allows an initial payment that is substantially smaller than the underlying value of the position. It tends to amplify gains and losses.

Table 1: Primary gold drivers and their relationship to demand/supply and the business cycle

Sector	Factor	Relationship	Relation to the economic cycle (expansion/contraction)	Further detail in previous research articles
Investment	US dollar	US dollar and gold generally hold a negative relationship: a weaker dollar is generally supportive of gold investment	Dependent on other factors	<i>Gold and currencies: the evolving relationship with the US dollar</i> <i>Gold in a slow-rising dollar environment</i>
	Non-dollar currencies	Gold is used as a store of wealth around the world. It competes with other currencies (sometimes the US dollar) during periods of local-currency depreciation	Dependent on other factors	<i>Gold and currencies: the evolving relationship with the US dollar</i> <i>Gold and currencies: protecting purchasing power</i>
	Inflation/deflation	Expectations of high inflation tend to support gold demand. However, gold's hedging qualities need to be analysed in the context of global – not local – and all-encompassing inflation. Gold can outperform assets (other than cash) during periods of deflation	Dependent on other factors	<i>The impact of inflation in the case for gold by Oxford Economics</i> <i>Gold and currencies: protecting purchasing power</i>
	Interest rates	High interest rates can make gold less attractive as an investment but high interest-rate environments often occur during periods of higher consumer demand for gold. Global interest rates – not just US rates – are key	Counter-cyclical	<i>The market may be wrong about gold and US interest rates</i>
	Systemic and tail risks	When market crises hit, investors tend to turn to gold as a store of value and a source of liquidity	Counter-cyclical	<i>Why invest in gold?</i> <i>Gold: hedging against tail risks</i>
	Investment flows	Momentum and other technical-driven strategies can influence gold's performance in the short (and sometimes medium) term	Counter-cyclical	<i>Investment commentary: 2013 review and 2014 outlook</i>
Consumption	Income growth	Consumer demand for gold accounts for over 58% of gold demand and 70% of that demand is from emerging markets. Higher disposable income and income growth tend to lift consumer demand.	Pro-cyclical	<i>The growth dividend: how rising GDP lifts consumer demand</i>
	Consumer confidence	Like income growth, consumer confidence can boost gold demand for jewellery and technology	Pro-cyclical	<i>The growth dividend: how rising GDP lifts consumer demand</i>
Central banks	Currencies	Central banks need a solid foreign reserve strategy. Long term view on the strength of their currency (and that of others) influence their view on gold's role in reserve asset management	Dependent on other factors	<i>Gold and foreign-reserve diversification for emerging market central banks</i> <i>Gold, the renminbi, and the multi-currency reserve system</i>
Supply	Production	Mine extraction grows or contracts in response to the underlying production costs. These are influenced by the relative strength of local currencies, labour costs, energy costs, and the success of exploration	Pro-cyclical	<i>The Ups and Downs of Gold Recycling</i>
	Recycling	Recycling generally moves in response to the gold price, but it's also inversely related to economic growth.	Counter-cyclical	<i>Gold, the renminbi, and the multi-currency reserve system</i>

Source: World Gold Council

II: Gold in a rising dollar environment

Market analysts seem to agree on two things: a strong US dollar is bad for gold, and the dollar will likely rise further.

While we agree that a strong US dollar may put pressure on gold, our analysis suggests that their relationship is asymmetric: gold prices rise more on a weak dollar than they fall on a strong dollar. Further, history shows that the portfolio benefits of gold outweigh the headwinds created by a strong dollar.

We also see gold resilience built on solid fundamentals, heightened geopolitical risk and the risk-return trade-off of other assets – and eventual pressure on the US dollar as we move toward a multi-currency world.

The US dollar is an important – but not the only – driver for gold

It is often easy to discuss relationships in binary terms. The ‘good for the dollar, bad for gold’ maxim is no exception. As we have written in the past, we believe that the reality of the gold market is far more nuanced and, in our opinion, more interesting.

What is good for the dollar is not always bad for gold. Their relationship keeps evolving and the influence of the dollar may diminish.

We agree that the US dollar (the dollar, for short) may continue to rise and that such an environment would put pressure on gold. That said, we see the relationship between the dollar and gold as more complex today than in the past.¹ It is different from what it was in the 1970s, 1980s or 1990s and is likely to continue to change. Today’s macroeconomic environment is marked by unprecedented monetary policies, low rates, expensive stock valuations, and deflation concerns in many parts of the developed world. In addition, emerging markets’ influence has grown and we are slowly but surely moving towards a multi-currency financial system. While the dollar remains an important driver for gold, its influence in our view is likely to diminish.

We examined the dollar-gold relationship to better understand what to expect in the near term. Our analysis suggests:

- The US dollar may continue to rise in the near-term, but this trend will not last forever. The dollar is up the most it has been over a 12-month period since the 1970s. This is partly due to a continuation of US economic outperformance and expected monetary policy divergence between the US and other parts of the world, but we believe the pace of dollar strength will be constrained by lower potential growth and the effects of an extended period of low real rates.
- Despite a stronger dollar, we expect prospects for gold to remain resilient. In our view, gold supply will remain constrained, putting less pressure on demand to maintain prices. Separately, the benefits of lower oil prices for consumers may be outweighed by geopolitical instability and credit risk – environments in which gold is favoured. In addition, equity and bond valuations continue to face poor risk/return profiles prompting investors to look for alternatives.
- Gold’s portfolio attributes outweigh the effect of a rising US dollar. Our analysis shows that investors still benefit from strategically including gold in periods when the dollar rises, even under conservative assumptions for gold returns and bullish scenarios for US equities and bonds. Within this framework, the study suggests an optimal allocation to gold of approximately 4% for a 60/40 portfolio – statistically consistent with previous studies suggesting a 5% long-term strategic allocation.
- The US dollar-gold relationship has evolved and continues to do so. Changes in global markets and the structure of the gold market should soften the dollar’s influence on gold in the long run. And while the fact that the gold price is quoted in US dollars gets a lot of attention, its relevance is overstated.

¹ Gold and currencies: the evolving relationship with the US dollar, Gold Investor, Volume 4, October 2013.

The dollar is up by 23% since the start of 2014, yet gold prices are merely 4% down over the same period.

The US dollar may continue to strengthen, but this trend will not last forever

A rising dollar – the current consensus view – is likely for the near future on the back of a number of factors: continued US economic outperformance; the prospect of tighter US monetary policy; economic weakness in Europe and China and some commodity-sensitive countries; and continued loose monetary policy in Japan, Europe and elsewhere. These themes have already driven the dollar up 20.3% between January 2014 and 20 March 2015 – based on the Federal Reserve (Fed) trade-weighted dollar index.² Historically, such moves have always been associated with large falls in the gold price, yet the gold price has fallen only by 1.3% over the same period.³

Although dollar strength is likely to continue, we see the pace of appreciation at a slower rate than that of the past few months.

- The dollar has already strengthened the most since the 1970s. Over the past 12 months, the dollar has appreciated the most of any 12-month rolling period since 1973.⁴ Further, the correlation between a 12-month period when the dollar moved up by more than 7.5% (or one standard deviation) and the subsequent 12-month period is -0.1, suggesting that after a period of strong appreciation the dollar tends to revert back to the mean. Only during the early 1980s did the dollar appreciate strongly for an extended period of time. And this was a period in history with dynamics very different from today's.⁵
- A flatter yield curve suggests the pace of economic growth is unsustainable. US short-term rates have been moving up while the long end of the curve has fallen steadily. The current yield curve is flatter than it has been during previous years of strong dollar rallies. This reflects less conviction by the market in both longer-term growth and the possibility of higher inflation down the road – thus a recipe for tame rate rises and a restrained currency – echoed both by authorities and market commentators.⁶ The anaemic growth in Europe and China, among other regions, is partly a cause of nascent dollar strength and is likely to weigh on US growth prospects in the future.
- The Fed will move cautiously, and elevated debt remains a thorny issue. The Fed has been clear about the 'data dependence' of its policy.⁷ Such a policy by its nature introduces a time lag. A reactive policy is more likely to keep real rates low – which in turn should stem the dollar's rise. In addition, the Fed has voiced concerns that external weakness and dollar strength could slow the US economy. Though not confined to the US, high levels of public debt are set to restrain interest rates to prevent hindering the capacity of borrowers to repay as the global economy rights itself. The restraint on interest rates should also slow the appreciation of the dollar.

Further dollar strength may bring adjustments but not upheaval

An ongoing strong dollar environment does not necessarily result in further gold weakness ahead. There are other factors at play that we expect to support gold in the presence of a stronger dollar.

Our analysis shows that, as is frequently the case with gold, factors are complex, and misconceptions are widespread (**Focus 1**). While a stronger US dollar may continue to put pressure on gold, we consider that there are many factors that would limit its influence (see *Interconnections: the factors that drive gold*).

2 The Fed's trade-weighted US dollar index, which we use as benchmark for the dollar, compares the relative value of the dollar to all of the currencies of its trading partners weighed by the size of their bilateral trade. Returns computed using the index level between 31 December 2013 and 20 March 2015.

3 Returns computed using the spot price of gold between 31 December 2013 and 20 March 2015.

4 While the US dollar became a free-floating currency in 1971, data for the Fed's trade-weighted US dollar index begins in 1973.

5 In the late 1970s the Fed funds rate was hovering around 15% as it battled soaring inflation. This is not the case today. Whereas in the 1970s total US public debt-to-GDP was under 30%, it is 75% today, and there is far less capacity or appetite for higher interest rates.

6 www.economist.com/blogs/buttonwood/2014/05/investing-2

7 Federal Reserve March 18 statement: <http://www.federalreserve.gov/newsevents/press/monetary/20150318a.htm>

Focus 1: Myths and misconceptions about the gold-dollar relationship

Quoting gold in dollars does not establish the relationship

Often, market participants make reference to gold being 'priced' in dollars as the reason the relationship exists. There are two main problems with this statement. While it is true that the gold price is often 'expressed' (or 'quoted') in dollars, it is not 'dictated' by the dollar.⁸ The relationship between gold and the dollar responds to the position of the dollar as *a* – some would say *the* – reserve currency and the effect that dollar-based demand (physical or otherwise) and supply has on the gold price.

From the demand side, the quoted price of any homogenous good (gold, oil, and commodities) is less important to investors and consumers than the price they pay in their own local currency. From the supply side, the relative strength of the reference currency may have an effect on production.

Professor Martin Feldstein of Harvard University demonstrated how this works for oil.⁹ He showed that the local price of oil only moves in relation to the dollar to reflect its move relative to the local currency. So a decline in the dollar price of gold (for example) only affects the change of the dollar relative to the price of the local currency.

A strong dollar is a relative term, especially when it comes to gold

It is common to talk about the appreciation or depreciation of a currency in a way that sounds almost absolute. In reality, currencies may strengthen against some currencies and weaken against others. To properly measure the strength of a currency, investors rely on indices that capture the relative strength of a given currency against various others at the same time.

In the case of the dollar, a popular benchmark is the Fed's trade-weighted US dollar index (see footnote 2). However, this results in an index whose direction is heavily influenced by the dollar's relationship to the euro or the Canadian dollar (large trading partners) while barely accounting for the Indian rupee or the Turkish lira (small trading partners).

In our view, to understand the relationship between the dollar and gold, it is more relevant to measure the strength (or weakness) of the dollar relative to currencies with higher levels of gold demand. For example, the value of the dollar against the Indian rupee would be more relevant than the value of the US dollar against its Canadian counterpart.

Financial markets react to expectations and, in our view, the price of gold already incorporates the market's consensus view of a strong dollar.

The market already anticipates a stronger dollar

In our view, the price of gold already reflects market expectations of a stronger dollar. We also consider that the upside on the US dollar could be limited. Most currency analysts don't expect the euro to fall below dollar parity. And while there are certain events that may trigger a flight-to-quality to the US dollar – such as a breakup in the euro area or a disorderly default of foreign-issued dollar denominated loans – these events have often boosted gold demand as a store of value.¹⁰ There are also other currencies important to the gold market, like the Indian rupee that have the potential of appreciating or the Chinese renminbi that will likely move little against the dollar.

Gold supply is tighter today than it was in strong-dollar years

Previous periods with a strong dollar, clustered around the early 1980s and mid 1990s, coincided with periods of gold weakness. But during those years, strong supply growth put an additional burden on the price. Mine production grew by 8.3% per year throughout the period against 0.9% during all other years. At the same time, central banks' net sales rose by 16.3% while all other years saw the same figure fall by 1.3%.

These days, while the dollar has strengthened over the last two years, we do not believe we will see gold supply grow at the rates seen during the 1980s. In recent years, total gold supply (including recycling) has stalled – even falling by 2% during Q4 2014. In our view, tighter supply will support the gold market, and we note that:

- Recycled gold supply has been consistently falling and is currently at a seven-year low – contracting by more than 600t between 2009 and 2014.
- Mine production could level off in the next year or so, as marginal supply increases from operations that developed during higher gold prices begin to lose momentum.¹¹
- While ETFs may provide a source of gold supply as they did in 2013, we consider that such a concentrated outflow is unlikely to occur in the near future. As we see it, many of the tactical and speculative investors in gold ETFs have left the market, leaving more strategic investors as current holders.¹²

In previous periods of a strong dollar, growth in gold supply put further pressure on the market. In current times, we may even see supply contract.

8 <http://www.forbes.com/sites/timworstall/2014/12/05/commodities-are-usually-priced-in-dollars-yes-but-this-does-not-mean-what-you-think-it-means/>

9 Feldstein, M, *The dollar and the price of oil*, Project Syndicate, 2008.

10 *Gold: hedging against tail risk*, October 2010.

11 *Gold Demand Trends, 3Q 2014*, October 2014.

12 *Ten years of gold ETFs: a wider and more efficient market*, Gold Investor, Volume 7, September 2014.

Gold's portfolio performance in a rising dollar environment

Historical performance during different dollar regimes

The US dollar is by no means the only factor that drives gold (see *Interconnections: the factors that drive gold*), but in the absence of strong market views in other variables that influence gold, investors have focused their attention on the dollar/gold relationship. We have examined years that have similar conditions to the current environment and looked at gold's performance against how fast the dollar rose and fell.

We analysed a 40-year period and classified the US dollar returns as one of three categories:

- Falling: the dollar depreciates by more than 2% over a 12-month period
- Flat: it moves up or down 2% over a 12-month period
- Rising: it appreciates by more than 2% over a 12-month period.

Gold prices rise twice as much when the dollar weakens than they fall when the dollar strengthens.

Our analysis, summarised in **Table 1**, shows that gold has performed best (+14.9%) during periods when the dollar is falling. It has similarly experienced positive, albeit lower, returns when the dollar is flat. Conversely, the gold price has historically fallen (-6.5%) in periods when the dollar rises. Gold prices have usually gone up more than twice as much when the dollar was weak compared to how much they have fallen, on average, when the dollar appreciated.

In addition, gold's correlation to equities and commodities has been lower than average in periods of a rising dollar. This becomes critical in the context of portfolio allocation, because the dollar environment is not relevant from a diversification standpoint.

Table 1: The relationship between gold and the dollar is not symmetrical: gold prices rise twice as much during weak dollar periods than they fall when the dollar strengthens

Average annualised statistics of gold performance from January 1973 through December 2014

	Full period	Conditional analysis		
		Falling US\$	Flat US\$	Rising US\$
Return (annualised)	6.2%	14.9%	7.8%	-6.5%
Volatility (annualised)	19.5%	18.4%	20.2%	19.7%
Correlation to equities	-0.06	0.07	-0.16	-0.11
Correlation to commodities	0.15	0.16	0.14	0.07

Reference notes at the end of this article.

Source: Bloomberg, World Gold Council

Gold improves portfolio performance even in the face of a rising dollar

Should investors keep an allocation to gold in the face of a rising dollar? We believe they should.

In previous studies we have shown that, over the long run, the optimal gold allocation in a well-balanced portfolio ranges from 2% to 10% (depending on an investor's risk tolerance). Investors with a 60/40 portfolio composition typically benefit from holding 5% in gold.¹³

The results in **Table 1** show that gold's correlation to other assets remains low despite the direction the dollar takes. Still, we sought to find the optimal allocation to gold under a rising dollar environment, to better understand the implications for gold within a well-balanced investment portfolio.

13 *Why invest in gold?* Gold Investor, Volume 4, October 2013.

Our analysis shows that investors should hold 4% in gold on a 60/40 portfolio, even under the expectation that a strong dollar may push gold prices down by 6%...

...and they may increase gold's allocation if they use more conservative returns for stocks and bonds.

We analysed a sample portfolio using cash, US bonds, US and international stocks, commodities and gold going back to the 1970s, after gold became a free floating market. We used the Re-sampled Efficiency technique developed by Michaud and Michaud¹⁴ to find gold's optimal allocation based on correlations and real returns during periods when the US dollar rose between 1% and 5%.¹⁵

In the face of strong US dollar performance, gold remains a valuable asset to hold in a portfolio. Our analysis shows that, optimally, investors should maintain a gold allocation.

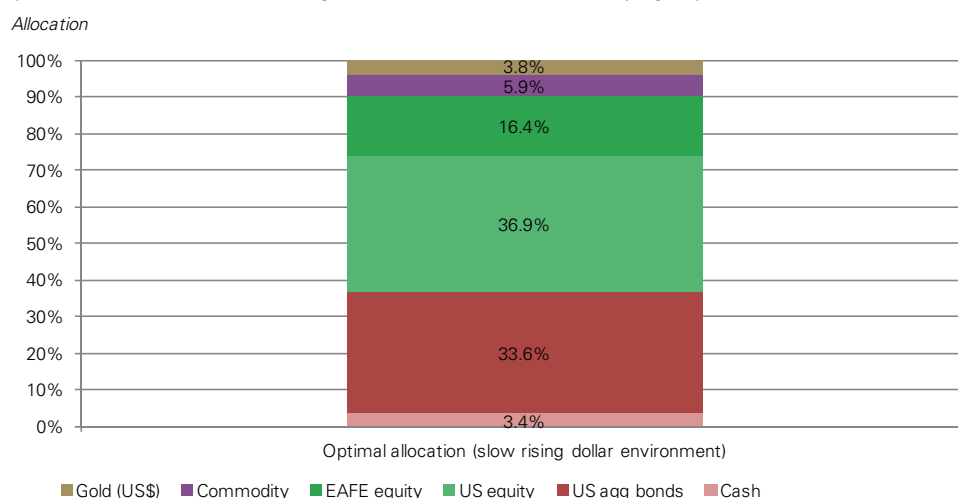
For an investor whose portfolio composition is similar to 60/40 (and roughly 8% annual volatility), gold's optimal allocation is approximately 4% (**Chart 1**). This is not statistically different from results we have obtained under unconstrained (not-dollar dependent) optimisations.

The assumptions we used were quite bullish for US assets and conservative for gold. We assumed a -2% real return for gold (equivalent to a 6% nominal price contraction based on historical data), a 6% real return for US bonds, 10% for US stocks, 8% for developed-market stocks, and 0% for cash and commodities. While these return assumptions are consistent with historical results during periods of a rising dollar, as we see it, actual returns for US bonds and stocks are likely to be lower over the coming years than those used for this analysis (see *The market may be wrong about gold and US interest rates*).

This analysis suggests that investors would benefit from holding gold as a strategic portfolio component even when the dollar rises, and in our view the next few years will be a time of adjustment in the gold market rather than upheaval.

Chart 1: Portfolio allocation in the face of a strong dollar, and equity performance

Optimal allocations across strong dollar environments with varying expected asset returns



References are listed at the end of this article.

Source: Bloomberg, New Frontier Advisors, World Gold Council

¹⁴ Michaud, R. and R. Michaud (2008) *Efficiency Asset Management: a practical guide to stock and portfolio optimization and asset allocation*, 2nd edition, Oxford Press, New York.

¹⁵ We used 'projected' returns, consistent with literature and the relevant environments of a rising dollar. We used volatility and correlation estimates based on monthly returns during relevant periods between January 1975 and September 2014. If data were not available back to January 1975, we used the longest time series available.

The world is moving, slowly but in our view surely, towards a multicurrency reserve system.

Moving towards a multi-currency world

Longer term, there are two important US dollar dynamics that we consider critical to highlight alongside the near-term developments. The first is a secular downtrend in the dollar. While the 'demise' of the dollar has been wrongly forecast for many years, there are signs that a more balanced multi-currency system is on the horizon. The second is the spectre of a weaker link between gold and the dollar.

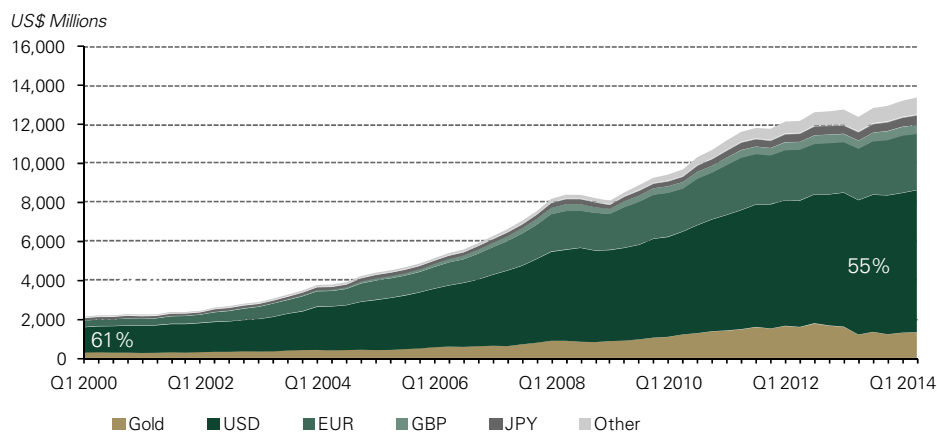
Challenges for the US dollar

In 1971, the US announced that foreign-held dollars would no longer be convertible to gold, thereby effectively ending the Bretton Woods system. Since then, the dollar has floated freely relative to foreign currencies, but generally has fallen as a host of macro-economic factors – such as falling interest rates and the rise of the euro and emerging market currencies – has weakened its value. Despite the strengthening we've seen over the past three years, we believe that a continuation of the longer-term downtrend or at the very least pressures on an uptrend will resurface in due course.

- The rise of the renminbi. China is currently the world's second largest economy,¹⁶ and its currency is likely to play a larger role in international reserves in the future. China has signed swap agreements with 23 central banks, and the renminbi's share of cross-border receipts and payments increased from 2% in 2010 to 11% in 2012.¹⁷ The importance of China on the global stage is not yet reflected in its currency. It is likely that we will see a greater renminbi footprint before long.
- Falling dollar share of global reserves. The dollar's share of global reserves has fallen slowly but steadily (see Chart 2) – from 61% in 2000 to 55% in 2014 – as the euro's share grew from 15% to 22%. Other currencies are growing too, particularly the Canadian and Australian dollars. However, as non-dollar currencies increase in their share of global reserves, their effectiveness in diversifying foreign reserves may diminish as the monetary policies of their respective central banks become more synchronised. This could make gold's value as a diversifier in foreign reserves more apparent to central banks.

Chart 2: The dollar's share of global reserves has fallen to 55% since 2000

Total global reserve assets by currency on a quarterly basis



Reference notes are listed at the end of this article.

Source: IMF IFS, World Gold Council

¹⁶ IMF Cofer Statistics.

¹⁷ According to a paper published by OMFIF, as China evolves and the renminbi becomes a larger part of reserve assets, gold will play a pivotal role in a diversifications of reserve assets. OMFIF, *Gold, the renminbi, and the multi-currency reserve system*, April 2014.

The gold market is moving from West to East diminishing the importance of the dollar-price of gold.

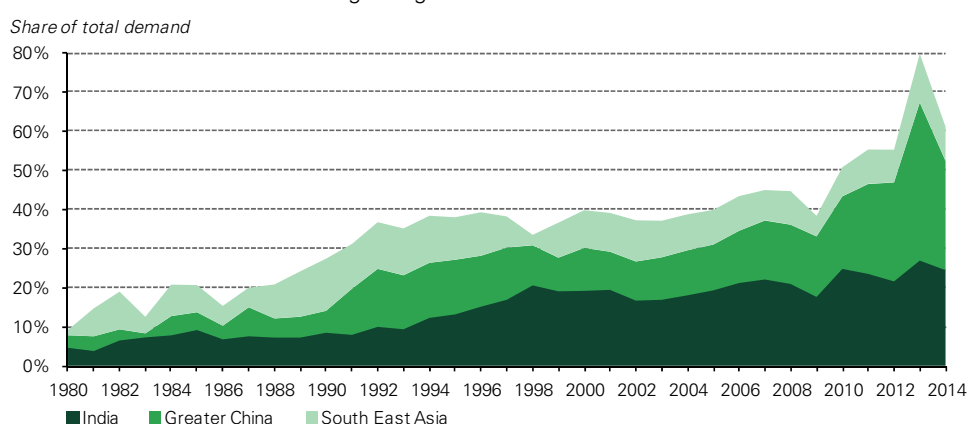
Re-examining the link

We also believe that there are signs of a burgeoning strain on the link between gold and the dollar:

- Non-dollar gold demand is not overly sensitive to dollar movements. Gold demand outside the US has no clear-cut link to dollar movements. China and India account for 50% of all gold demand; South East Asia adds an additional 9% (Chart 3).¹⁸ Chinese demand has been as likely to rise when the dollar strengthens as it has when it weakens.¹⁹ Indian demand responds more to currency volatility than the foreign exchange trend, and to cultural factors than global financial conditions.²⁰ The growing influence of East Asia, not only in gold markets but in capital markets generally, will not sever but could diminish the link between gold and the dollar.

Chart 3: Continued dispersion of gold demand across sectors and regions reduces the dollar's impact on gold

Increased share of Asian countries global gold demand*



*Includes demand for jewellery, technology, bars, coins and ETFs. Greater China includes mainland China, Hong Kong and Taiwan. South East Asia includes Thailand, Indonesia, Singapore, South Korea, Vietnam and Malaysia.

Source: GFMS-Thomson Reuters, World Gold Council

- The rise of Asia as a trading hub. The trend eastward is visible as the global gold market evolves with Asian countries such as China, Hong Kong, and Singapore playing a more active role. Examples include the launch of the international board of the Shanghai Gold Exchange; the introduction of the Kilobar Gold Contract on the Singapore Gold Exchange; the announcement of a new kilobar gold futures contract in Hong Kong by CME; and the intention of the Stock Exchange of Thailand to launch a physical gold exchange (see *Gold Demand Trends: Full year 2014*, February 2015). This will likely lead to more gold transactions being settled in non-dollar currencies as the gold market becomes less a spoke-and-wheel model (with London at the centre of the over-the-counter market)²¹ and more a regional web-like exchange structure (with other markets playing a larger role).

The dollar matters, but it does not define gold's relevance for investors

While the short term strength in the dollar may exert further pressure on gold returns, as long as that strength is moderate, gold's portfolio benefits should remain unchallenged. Over the medium term, demand from the East and supply-side constraints may provide support to the gold market. Finally, in the long run, we expect the dollar's influence on gold prices to diminish as other currencies challenge the dollar's stance as the sole global reserve currency.

18 *Gold Demand Trends, Full year 2014*, February 2015.

19 Our recent research suggests that other factors such as income are more influential on demand than the relative strength of the dollar. A simple regression on changes in quarterly 'consumer' demand for gold and changes in the dollar index reveal a negative and significant relationship for India, but a positive and insignificant relationship for China (data from Q1 2003 to Q3 2014).

20 Using data from 2003 to 2014, quarterly Indian consumer demand is on average 197 tonnes during moderate dollar moves (measured as the QoQ % change in the broad dollar index) while, for dollar moves below one standard deviation over this period (of which there were seven), demand averaged 180t. While a simple example, this mirrors previous findings that suggest large fluctuations in the Indian rupee will dampen demand as shrewd buyers are wary of transacting during an intermediate dip/peak.

21 Historically, the over-the-counter market has been closely tied to returns on dollar assets. In particular, gold-leasing terms relied on the relationship between the interest in US dollars (LIBOR) and the dollar value that gold can be swapped for in the future (GOFO rate).

References

Table 1: The relationship between gold and the dollar is not symmetrical: gold prices rise twice as much during weak dollar periods than they fall when the dollar strengthens

Returns calculated as the annualised arithmetic average of 12-month rolling returns using the spot gold price (US\$/oz) for the period between 1973 through 2014. For volatility and correlations, we used monthly returns. We used the MSCI World Index as a proxy for equities and the S&P GSCI Index as a proxy for commodities.

Chart 1: Portfolio allocation in the face of a strong dollar, and equity performance

Volatility and correlation estimates based on monthly returns from January 1975 to December 2014. The optimal portfolio reflects a diversified portfolio consisting of US Equities (S&P 500 Index), EAFE equities (MSCI EAFE Index), US aggregate bonds (Barclays Capital US Aggregate Bond Index), cash (US LIBOR cash rate), commodities (S&P GSCI Commodities Index), and gold (gold spot price in US dollar terms). We optimised the sample portfolio using a conditional variance-covariance matrix for those monthly real returns from January 1975 through December 2014 defined as rising dollar environment (dollar appreciation of more than 2%). If data were not available back to January 1975, we used the longest time series available. The return and volatility assumptions applied to the optimisation were the conditional historical real returns for the indices in a rising dollar environment, with gold set at a zero percent real return

Chart 2: The dollar's share of global reserves has fallen to 55% since 2000

Other currencies include the Canadian dollar, Swiss franc and Australian dollar.

Chart 3: Continued dispersion of gold demand across sectors and regions reduces the dollar's impact on gold

Includes demand for jewellery, technology, bars, coins and ETFs; excludes central bank demand. Greater China includes mainland China, Hong Kong and Taiwan. South East Asia includes Thailand, Indonesia, Singapore, South Korea, Vietnam and Malaysia.

III: The market may be wrong about gold and US interest rates¹

Many investors believe that higher inflation-adjusted US interest rates will always be bad news for gold. We see a link but find that the relationship between gold and interest rates is more complex than it appears and weaker than it previously was.

Our analysis shows that other factors influence gold – including some positively correlated to economic growth – highlighting its role as a key diversification and risk-management portfolio asset. This is an increasingly important role, as both stocks and bonds may deliver lower-than-average returns in coming years.

A weaker relationship and a low-return environment

Interest rates are top of mind for many investors. Quantitative easing measures around the globe have kept rates low, but US rates are expected to rise in the near future. The exact timing is up to debate as the Federal Reserve (Fed) has reiterated its data-dependent approach to policy normalisation.² Common wisdom says that higher inflation-adjusted (real) US interest rates are always bad for gold. Like many factoids, we see this as both partly right and partly wrong. Interest rates do tend to influence gold *investment*, but the reality is more complex.

We believe there are two reasons why higher US rates will not have the devastating effect on gold demand many expect:

- **The negative relationship between real rates and gold is related to investment, but not all demand is investment.** Higher interest rates increase the opportunity cost of *investing* in gold. However, jewellery and technology demand make up almost 60% of annual physical gold demand. For these markets, there is an indirect positive relationship to interest rates – higher interest rate cycles typically coincide with higher economic growth and consumer spending. Additionally, central bank demand (approx. 9% per year) is less sensitive to interest rate cycles.
- **The US interest rate argument is not as strong today as it once was.** The case was built largely on an analysis of gold and interest rate performance during the 1970s and 1980s, when economic conditions were very different from today. The gold market is different too. Developed-market gold demand has declined to less than 30% over the past decade from more than 60% in the 1970s. Emerging-market demand (circa 70% per year) is less sensitive to US rate changes, and to a great extent jewellery and technology demand is pro-cyclical.

And we see two reasons why the investment case for holding gold in a portfolio remains intact:

- **Gold's portfolio attributes survive at higher interest rates.** Our research shows that gold has been reliably effective at diversifying investment portfolios and reducing risk at real interest rates even when interest rates are positive (up to 4%, based on our analysis). Current short-term US real rates are still very low and far from that threshold. For example, as of 31 December 2014, the 3-month and 1-year US T-bills were yielding -0.73% and -0.6%, respectively, in real terms.
- **Higher interest rates will not improve fixed-income's prospects.** At current yield levels, bonds are likely to have limited upside and, in our view, would therefore be less effective than gold in mitigating equity risk. We believe that this will help gold demand because some investors will use gold to complement bonds in managing equity risk and diversifying their portfolios.

¹ We originally discussed the relationship between US real rates and gold in *Gold and US interest rates: a reality check*, Gold Investor, Volume 3, July 2013 and *Can gold replace bonds in balancing equity risk?* Gold Investor, Volume 5, March 2014. In this article, we update and summarise our analysis.

² FOMC 18 March 2015 statement: <http://www.federalreserve.gov/newsevents/press/monetary/20150318a.htm>

The misunderstood argument that US rates drive gold's performance

While there is a link between rates and gold through investment demand, we believe that gold remains attractive at higher interest rate levels.

Higher interest rates can have complex effects – both positive and negative – on investors, households, corporations and governments. Despite this complexity, many market commentators seem to have agreed on one point: higher US interest rates will be bad for gold.

While there is a link between US interest rates and gold through investment demand, we believe that gold remains attractive at real rates that are much higher than current levels.

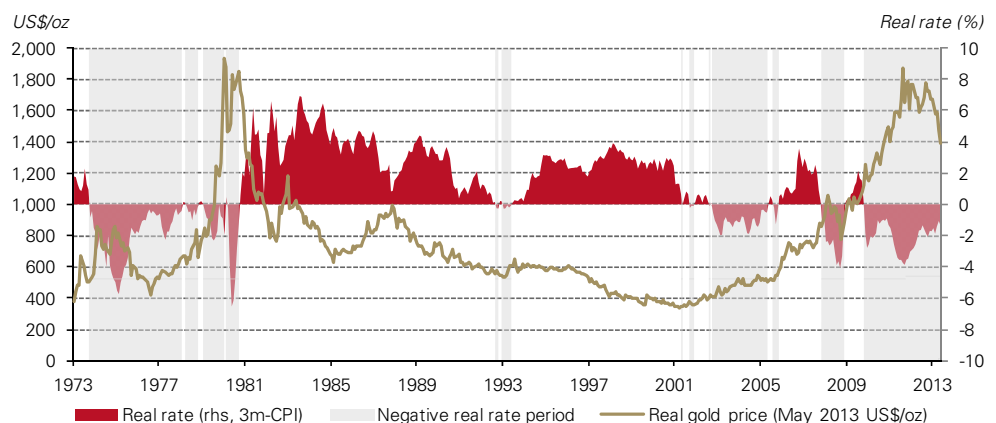
The US rate argument is not as clear cut as some believe

Chart 1 is a key exhibit for the case that high US rates drive gold's performance. It pits the US real rate – measured as the 3-month T-bill interest rate less US headline CPI inflation – against the gold price (US dollars per troy ounce).

Adherents to the strong interest rate effect on gold argument point first to the cluster of shaded areas to the left and right. These are the gold bull markets of the 1970s and the last twelve years: periods when US real rates were mainly low or negative. Then they point to the long fall in the gold price: from its peak in the early 1980s through to 2001 – a time of positive and often high real US rates.

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

Gold in US\$/oz versus 3-month T-bill rate minus headline US CPI



Reference notes are listed at the end of this article.

Source: Bloomberg, Thomson Reuters, World Gold Council

The chart looks compelling until one realises how different the economic backdrop and the structure of the gold market were in these two periods:

- **High inflation/low inflation.** The low-to-negative real rates of the 1970s coincided with high and rising inflation. Yet the low real rates of the 2000s (barring two episodes) were in periods of low rates of interest – and low inflation.
- **Strength of the US dollar.** In the 1970s the US dollar faced mixed fortunes and a modest fall – a contrast to the protracted decline of the US dollar over the last 10 years or more.

- **The role of US real rates.** Forward and futures markets that sprang up in the 1980s had a strong link to movements in physical gold and gold prices. Emerging markets are now more important to the global economy. As they have risen, the influence of the US dollar and its real rates has waned.
- **Supply and demand.** Gold's supply-and-demand picture has changed significantly. Emerging markets are now key drivers, making up 70% of annual demand. Mine production, unlike during the 1980s, has been slow to rise (and possibly heading towards a contraction), and it is spread fairly evenly across continents. Further, central banks that sold gold from the early 1980s to the late 1990s are now, as a whole, net buyers.

The influence of US interest rates is small compared to other factors that affect gold.

Our analysis shows that the US rate's influence has diminished

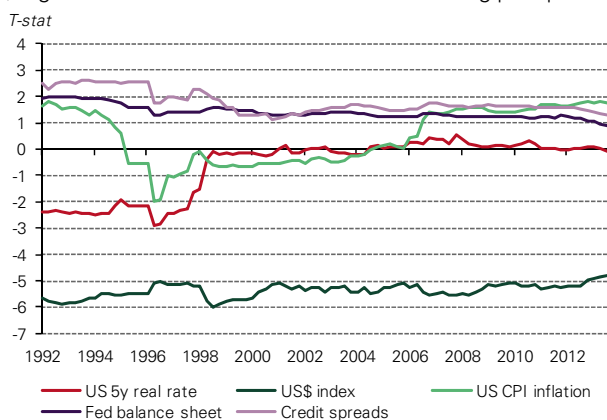
Given the difference between today and the 1970s and 1980s, we decided to take a closer look at the data. We re-estimated the gold price model that Oxford Economics developed for us in 2011.³ The model analysed: 1) a contracting window, incrementally dropping older data quarter-by-quarter; and 2) re-estimated the parameters using a 15-year moving window.

The results are shown in **Chart 2**. We found that when the dataset excludes the late 1970s and early 1980s:

- The US real rate has no statistical significant relationship to gold prices once other variables are taken into account. Its statistical significance drops to close to zero if estimated from the early 1980s until today. Other variables have shifted significance, but only the real rate has lost and not regained its significance.
- The US dollar has had the most persistent significance as a negative coefficient, but that relationship may be evolving (see *Gold in a slow-rising dollar environment* for a summary of our outlook on gold and the US dollar).

Chart 2: The influence of US real rates has receded over time, whether estimated by (a) removing past periods, or (b) using a moving window

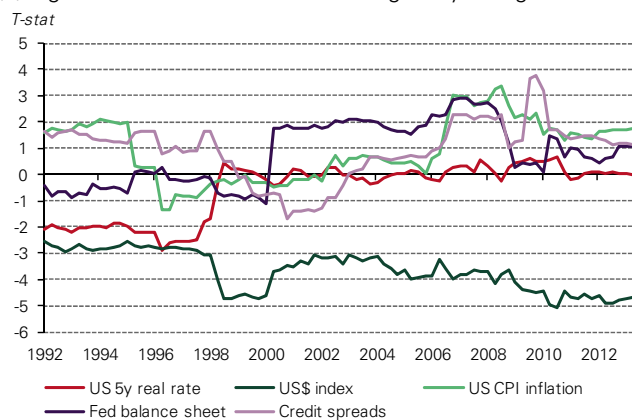
a) Significance of model variables while removing past periods



Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

(b) Significance of model variables using a 15y rolling window



Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

³ For more details on the Oxford Economics model on gold, see Oxford Economics, *The impact of inflation and deflation in the case for gold*, July 2011.

Changes in gold demand have reduced the influence of US rates

The supply and demand makeup of today's gold market undermines the 'US rate is key' argument.

Investment demand lags consumer demand. The five-year average of global investment demand, including exchange-traded funds, is 32% (**Chart 1a**). Consumer demand makes up 59% (49% from jewellery, 10% from technology).

Developed market demand is a fraction of total demand.

Europe and North America account for only 17% of total gold demand (**Chart 1b**) – and of that, only 60% is linked to investment. While the size and reach of US and European investor-markets are likely to exert a strong influence in short-term pricing, in our view it seems unlikely that these two markets are the sole arbiters of gold prices over the long run.

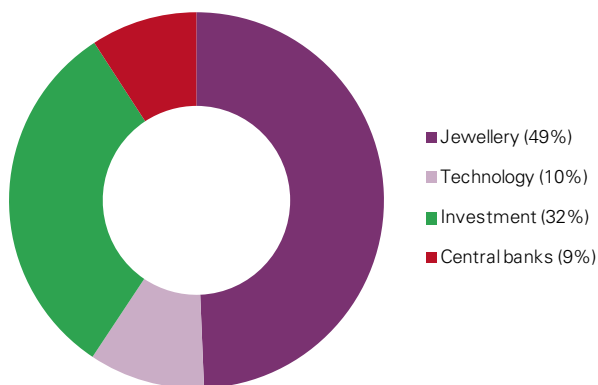
Some jewellery demand is relatively insensitive to interest rates. India accounts for 25% of annual gold demand; econometric analysis by Dr R Kannan found that the Indian real deposit rate had "no statistically significant effect on [domestic] gold demand".

Technology demand is pro-cyclical and often positively correlated to interest rates. Higher domestic real rates are often consistent with improving economic health, which spurs demand for gold in industrial and technological applications.

Finally, in the wake of the 2008 financial crisis, central banks have shifted their priorities back towards risk mitigation versus seeking yield. In our view, they are likely to continue being buyers of gold, despite interest rate movements.

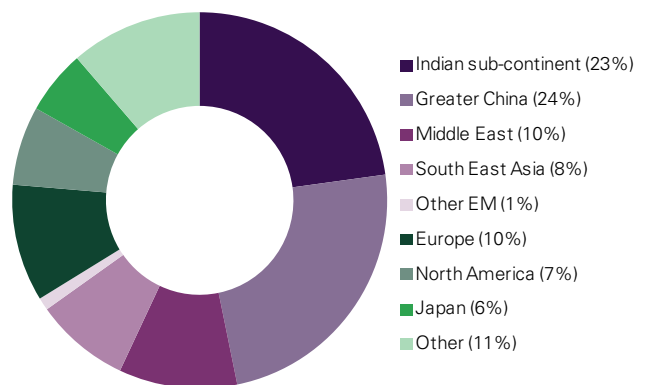
Chart 3: Jewellery and technology make up nearly 60% of demand as emerging markets buy nearly 70% of all gold

(a) Five-year average demand by sector



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

(b) Five-year average demand by region (excludes central banks)



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

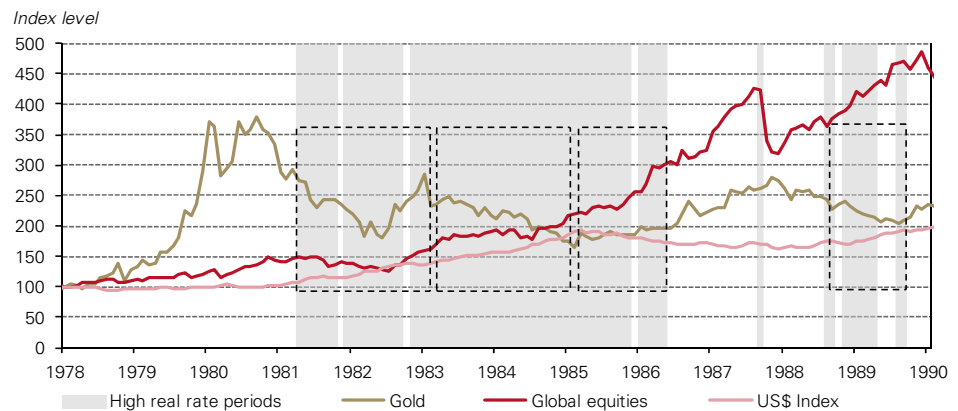
Gold remains a valuable portfolio asset even if interest rates rise

In our view, the influence of US real rates on the gold price may be fading – and we don't see it going back to what it once was. Yet, what if we were wrong and the gold price responded to US interest rates as it did in the past?

Real interest rates are one factor that influences gold prices, but the real investment value of gold is its contribution to portfolio performance – a key consideration when investing in gold.

An inspection of the trajectories of gold during *high* US real rate environments shows that there is no clear-cut pattern (**Chart 4**). Gold fell during the mid and late 1980s (second and fourth boxes in the chart) but showed resilience in the early part of the decade and even rose during the 1985 to 1987 period. Separately, 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. This suggests that other macro-economic or fundamental factors are dominant; it is difficult to separate the influence of real rates from those of the US dollar or inflation.

Chart 4: Gold's relationship with rates is less clear when viewed in the context of other drivers



Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

We used a simple regression analysis (with dummy variables to represent different rate environments) to explore gold's portfolio performance. These US real rate environments are defined as follows:

- **Low (<0%):** real interest rates below zero
- **Moderate (0%-4%):** real interest rates between zero and four per cent
- **High (>4%):** real interest rates above four per cent.

Historically, gold has performed well in periods where real rates are between 0% and 4%...

We analysed returns, volatility and correlation to global equities. All data cover the period January 1975 to December 2014. **Table 1** summarises the key results for low and moderate interest rate environments (for more details see the *Appendix* at the end of this article) and shows that:

- **Gold returns have been positive, on average, during periods of moderate US real interest rates.** While historically the gold price has increased the most during periods of negative US real interest rates, gold returns have been positive – albeit lower – during moderate real rate periods.
- **Gold is better at reducing portfolio risk during periods of moderate real rates.** Gold tends to experience lower volatility and a lower correlation to global equities during periods of moderate real rates relative to periods of low or high real rates. This helps gold better diversify risk and reduce overall portfolio volatility.

Table 1: Positive returns with low volatility and correlations under moderate interest-rate conditions

	Negative real rates (<0%)	Moderate real rates (0%-4%)	Better results during moderate real rates?
Annualised monthly returns	17.0%	6.3%	No
Annualised volatility	20.5%	14.1%	Yes
Correlation to global equities	0.08	-0.06	Yes

Computations based on monthly returns relative to different US real rate environments using data between January 1971 and December 2014. Additional reference notes at the end of this article.

Source: Bloomberg, World Gold Council

Bonds may not be as effective in balancing equity risk in a rising rate environment

...and it remains a valuable portfolio asset.

History shows that gold is still a valuable component to portfolios of investors under a moderate real rates environment. In our view, however, gold can do more than that. It could help investors balance portfolio risks in the current economic environment.

US 10-year bond yields are lower as we write than they were at the beginning of the year (c. 2.3% vs. 3.0%), but they remain close to their historic lows – with little room to fall. It seems unlikely that investors will obtain the same level of returns from bonds as they did over the past two decades, or rely solely on them to meet liabilities and reach long-term savings goals.

Bond holdings in the new fixed-income environment

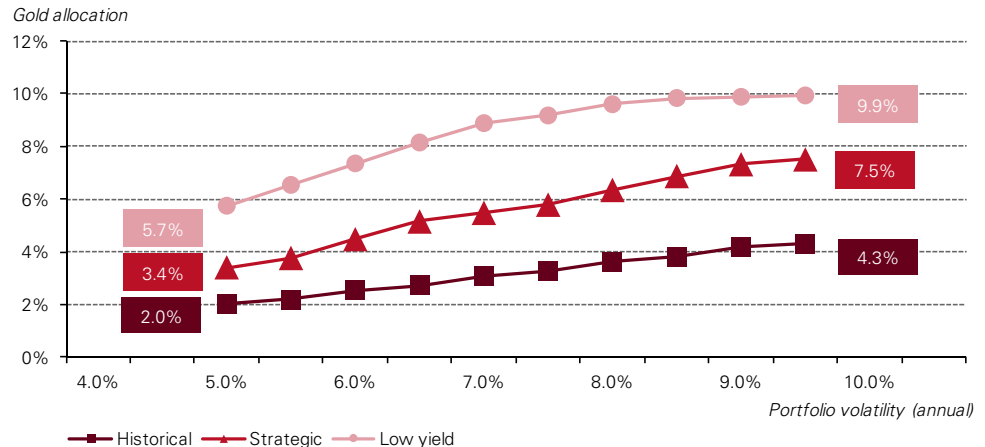
In our most recent review of bonds, *Can gold replace bonds in balancing equity risk?*⁴ we discussed whether investors should use historical bond-return assumptions in forward-looking strategies. We compared the effect that expected bond returns – historical and current – had on optimal gold holdings.

We have analysed the effect on gold as bonds break loose of long-term assumptions. In our view, they likely will have lower returns than in the previous two decades. (We summarise these assumptions in the references section at the end of this article.)

Given lower-than-average expected returns on bonds, optimal gold allocations may even be higher.

Chart 5 (reproduced from *Gold in the 'Great Rotation'*⁵) uses a broad set of portfolio assets to produce a realistic representation of the incremental optimal allocation to gold as prospective bond returns are ratcheted downwards.⁶ Real return inputs for US treasuries were 6.9% for historical, 2.0% for strategic and -1.0% for the low-yield categories. It shows that optimal allocations for gold increase when expected bond returns are lowered. Gold helps both to diversify a portfolio and to maintain lower portfolio volatility.

Chart 5: Reducing expected bond returns significantly increases the optimal weight that gold should have in portfolios



Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

4 *Can gold replace bonds in balancing equity risk?* Gold Investor, Volume 5, March 2014.

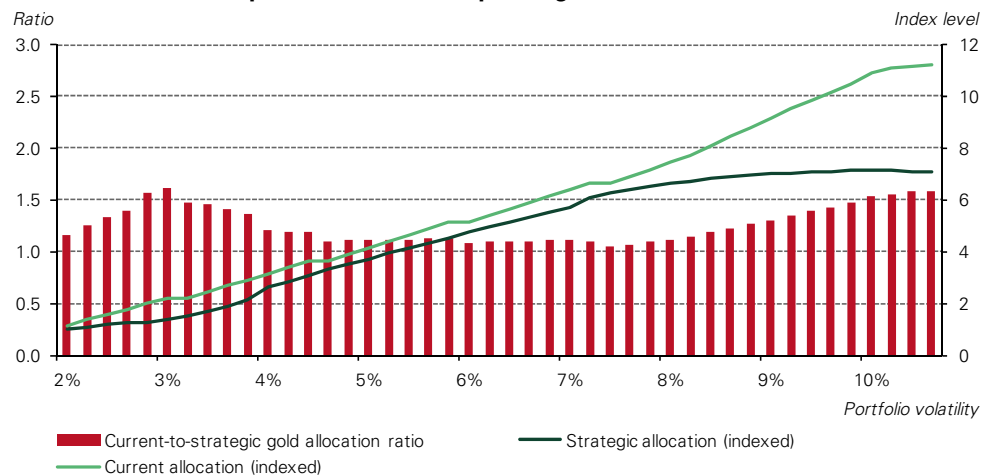
5 *Gold in the 'Great Rotation'*, Gold Investor, Volume 2, April 2013.

6 These included: cash, treasuries, inflation-linked bonds, high-grade bonds, foreign bonds, small- and large-cap US equities, other developed-market equities, emerging market equities, global REITs and commodities.

Chart 6 uses a simpler – and unconstrained – set of inputs for the US: bonds, equities, cash and gold. It shows how the optimal gold allocation shifts across the curve as we adjust bond returns down to current redemption-yield levels.

The columns measure the increased ratio – ranging from about 1.1x to over 1.5x at the higher end of the portfolio risk spectrum. The lines in the chart, indexed to the start, show the change in optimal allocation curves: as we go above an 8.5% portfolio risk level the incremental optimal gold allocation grows faster, assuming returns representative of the current environment.

Chart 6: Lower bond expectations increase optimal gold allocations across all levels of risk



Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

Equities' prospects do not offer investors much comfort

In 2013 low bond-yields and better economic sentiment shifted investors' focus towards equities. The 'Great Rotation' saw investors seek sources of income beyond bonds as equities offered dividends and growth. US equities have grown at 17% a year since their March 2009 lows, with the quantitative easing springboard lifting them way above the long-term average of 6.5%.

Investors who move from bonds to equities hope for long-term performance, but several measures suggest to us that equities are likely to underperform their long-term average return of 6.5% per year:

- Professor Robert Shiller's well-known CAPE (cyclically-adjusted price earnings) and subsequent average 10-year equity performance (consistent mean reversion in valuations) has resulted in an average subsequent real return of just 2.8%
- A simple equation using the CAPE for an expected return yields c.3.5%⁷
- Arnott and Bernstein's approach, as detailed by J.P Morgan, proposes about 3.7%-4.7% real returns for equities over the coming decade.⁸

These forecasts may seem a little oversimplified, but they agree that equities face a challenging environment. We take no position on future growth but have used these estimates to gauge the effect of a recalibration of equity prospects on an optimal allocation to gold (in line with the adjustments we made to bond prospects).

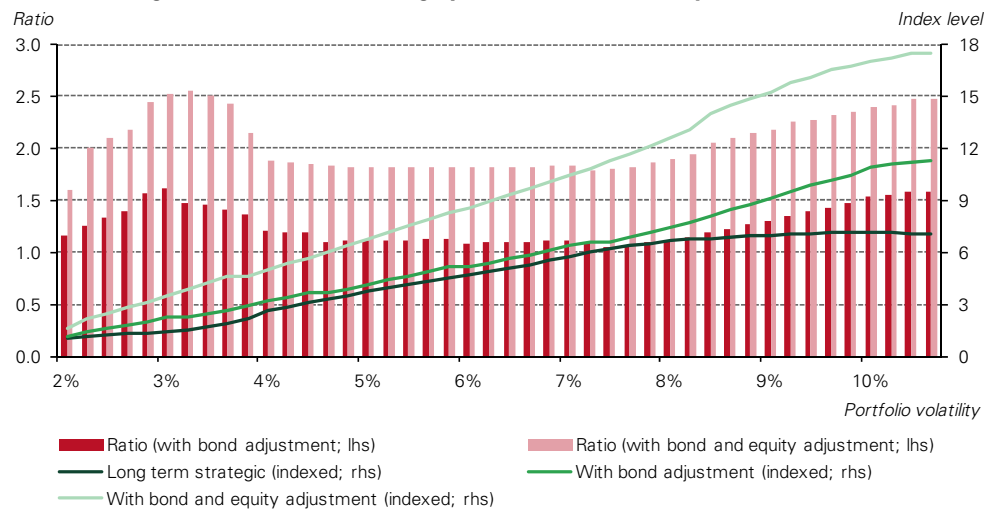
Stock valuations appear expensive by some measures.

⁷ <http://www.hussmanfunds.com/rsi/cape.htm>. Equation: $1.06 * (16 / \text{Current CAPE})^{(1/10)-1} + \text{current dividend yield}$, where 16 = long-term average CAPE excluding the 1999 dot-com bubble.

⁸ J.P. Morgan, *Long-term capital market return assumptions*. <https://am.jpmorgan.com/us/institutional/11-973a-ltcmra-2014-full>

Adjusting bond returns shifts gold's allocation curve upward. Adding the outlook for equities (Chart 7) moves it further, from 1.5x to 2.5x the base case allocation. For all three scenarios we used our standard real expected return of zero for gold. Correlations and volatilities in the current adjustments were based on 10-year historical estimates. These were higher and slightly positive for gold's volatility and correlations and penalised gold versus the long-term inputs. Importantly, these austere assumptions dented gold's portfolio benefits only a little.

Chart 7: Investors of the view that equity valuations are overextended may need to further increase their gold allocations to manage portfolio risk effectively



Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

These examples show incremental allocations to gold across the risk spectrum, which grow as portfolio risk increases, particularly above an 8% portfolio risk level. The allocations are unconstrained, and they highlight the implied increasing ratio for gold in the portfolio with adjusted returns.

Gold's portfolio attributes can benefit investors in this environment.

If we add constraints to the scenario – after all, unconstrained asset allocation is unusual – and use a standard 60/40 equity-bond mix with strategic inputs, we get estimates of optimal gold allocations that are consistent with our previous research. They range from 5% to 6% for a moderate risk portfolio. As we reduce bond returns, the optimal allocation to gold rises an additional *one percentage point* on average. A further adjustment to stocks on top of bonds raises the optimal allocation by 2.5 percentage points relative to the long-term strategic level.

Finally, we examined the effect of lower (negative) expected returns for gold on optimal weights. We found that even under the assumption that the real gold price would fall by as much as 2.5% per year – which would imply not even a nominal gain – optimal gold allocations increased.

We see this is a testament to gold's quality as a diversifier: its value lies in how it behaves relative to other assets, not just in its price performance.

Higher real interest rates will require new thinking

We believe the relationship between gold and US interest rates is more complicated than it first appears. The arguments about the impact of real rates on gold no longer apply in today's lower return markets.

When rates do move investors will have to rethink their portfolio strategy. Gold, in our view, is likely to be part of the solution for many investors. Our research also shows that gold has been quite effective at diversifying investment portfolios and reducing risk at real interest rates of up to 4%.

Appendix

In this section, we discuss in more detail the results of our analysis of the performance of gold, dividing them into three sections: gold returns, its volatility, and its correlation to stocks.

a) Returns: it is difficult to separate the influence of real rates from other factors

Below, we show the average returns between January 1971 and December 2014 for the three real interest rate environments under consideration, as well as in periods where US real interest rates were falling or rising (**Table 2**).

Gold's best returns (1.5% monthly) occurred during low real rate environments, compared to the average monthly return since 1975 of 0.6%. During moderate real-rate environments the return was 0.7% – broadly in line with the long-term average. High real rates, unsurprisingly, lowered monthly returns to -1%. The analysis also shows that gold returns are lower (but positive) under rising real rate environments (0.3%) than they are under falling ones (0.8%).

Our analysis suggests that: 1) only gold returns under falling or low interest-rate environments are statistically different from zero; and 2) generally speaking, gold's returns under various interest-rate environments are not statistically different from its long-term average (except under a high real rate environment).

Table 2: Gold's return is higher (but not significantly) than its long-term average during low, moderate or falling rate regimes

	Long-term	Real rate level			Real rate trend	
		Low (<0%)	Moderate (0%-4%)	High (>4%)	Falling	Rising
Average. monthly return	0.6%	1.5%	0.7%	-1.0%	0.8%	0.3%
Standard error	0.30%	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

b) Volatility is significantly influenced by the prevailing real interest rate regime

We examined gold's volatility under the three real interest-rate regimes under study (**Table 3**).

The long-term average for the sample is 17.3%, with lower volatility in moderate real-rate environments. We found higher volatility under both high-rate environments (21.2%) and low-rate environments (20.5%). This is probably due to higher market uncertainty (as seen during the last few years) or high inflation (as experienced in the late 1970s). Yet the volatility estimate for the high interest-rate environment is not statistically different from gold's long-term volatility. In addition, gold's volatility has held at around 17.4% during both falling and rising-rate environments. It appears that the 'level' of rates is more strongly associated with gold's volatility than the trajectory rates take. This makes sense. The direction in which interest rates move is unlikely to influence asset volatilities unless the movement is unexpected, fast or sizeable.

Table 3: Gold's volatility is lowest in a moderate real rate regime

	Long-term	Real rate level			Real rate trend	
		Low (<0%)	Moderate (0%-4%)	High (>4%)	Falling	Rising
Average 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	Yes	No	No

Reference notes are listed at the end of this article.

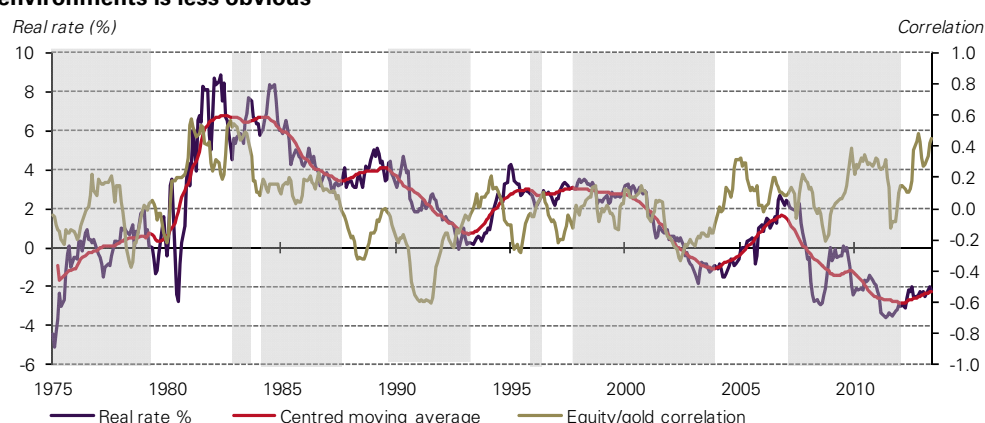
Source: Bloomberg, World Gold Council

c) Correlation: no clear link between real rates and equities-to-gold correlation

We have documented gold's unique correlation behaviour at length in our research and have found that few correlations are generally constant over time. We found that gold's correlation with equities is generally asymmetrical: falling equities often lead to a negative correlation with gold; rising equities are often associated with a zero, or slightly positive correlation.

At first glance there seems to be no consistent pattern. Yet there is some convergence over shorter-term returns between riskier assets as uncertainty prevails and fewer factors drive asset returns. This is something we have seen during several periods in the last few decades (**Chart 8**).

Chart 8: The behaviour of gold's correlation to equities under various real rate environments is less obvious



Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

Table 4 details the results for correlations between gold and global equities during the three real-rate environments.

In a moderate real-rate environment correlations are close to zero and slightly negative, near 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.

Higher real rates can increase the opportunity cost of investing in many assets, stifling investment and pushing down valuations via the discount rate. Historically, the US dollar appears to have played a large part in this: high interest rates did not prevent gold and equities from rallying in tandem in the mid-1980s as the broad US dollar index fell. But even then, an average correlation of 0.2 (as seen under high real rates in this period) is still low, relative to typical correlations between equities and other assets.

Table 4: Gold's correlation to equities is lowest in a moderate real rate environment

	Long-term	Real rate level			Real rate trend	
		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	0.06	0.05	0.05	0.07
Statistically different from long term?	-	No	Yes	Yes	No	No

Reference notes are listed at the end of this article.

Source: Bloomberg, World Gold Council

(See all reference notes on the next page)

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

- (a) The t-statistics were computed from the equation published by Oxford Economics in the paper, *The effect of inflation and deflation on the case for gold*, June 2011. We re-ran that regression equation with a contracting estimation window. 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) We re-ran the regression equation described in (a) 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.

Chart 1: Jewellery and technology make up nearly 60% of demand as emerging markets buy nearly 70% of all gold

- (a) Average demand by source using annual estimates from 2010 to 2014. It excludes over-the-counter gold demand.
- (b) Average demand by region using annual estimates from 2010 to 2014. It excludes over-the-counter and central bank gold demand.

Table 1: Positive returns with low volatility and correlations under moderate interest-rate conditions

Annualised summary results based on Table 2 through Table 4.

Chart 4: Gold's relationship with rates is less clear when viewed in the context of other drivers

Equities are represented by the MSCI World index denominated in local currency. Gold is shown in US dollars. The Fed trade-weighted US dollar basket is used to represent the dollar against other major currencies. The 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%.

Chart 5: Reducing expected bond returns significantly increases the optimal weight that gold should have in portfolios

Refer to *Gold in the 'Great Rotation'*, Gold Investor, Volume 2, April 2013, for more details. It can be downloaded at www.gold.org/download/gold_investor/2013-04/gold-investor-201304.pdf

Chart 6: Lower bond expectations increase optimal gold allocations across all levels of risk

Expected real bond returns are adjusted from their long term strategic value of 4.1% to the redemption yield (as of 31 January 2014) of 0.2%. More details and all other assumptions can be found in the reference section of *Can gold replace bonds in balancing equity risk?*, Gold Investor, Volume 5, March 2014.

Chart 7: Investors of the view that equity valuations are overextended may need to further increase their gold allocations to manage portfolio risk effectively

Adding to Chart 6 above, stock returns are adjusted to 3.5% (Table 1), which is a rounded average of CAPE-based and dividend yield-based (Arnott & Bernstein) measures consistent with outlooks provided by Credit Suisse and J.P. Morgan (referenced in this paper). More details and all other assumptions can be found in the reference section of *Can gold replace bonds in balancing equity risk?*, Gold Investor, Volume 5, March 2014.

Table 2: Gold's return is higher (but not significantly) than its long-term average during low, moderate or falling rate regimes

Gold (US\$/oz) returns are calculated on a monthly basis from January 1975 to December 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.

Table 3: Gold's volatility is lowest in a moderate real rate regime

The US real rate is computed as it was in Table 2. Gold (US\$/oz) volatility is calculated on a monthly basis from January 1975 to December 2014. 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 8: The behaviour of gold's correlation to equities under various real rate environments is 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). The 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 4: Gold's correlation to equities is lowest in a moderate real rate environment

The US real rate is computed as it was in Table 2. We calculated the gold (US\$/oz) and equity (MSCI world equity index in local currency) correlation on a monthly basis from January 1975 to December 2014. 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.

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