

The 10-year gold bull market in perspective



About the World Gold Council

The World Gold Council (WGC) is the market development organisation for the gold industry. Working within the investment, jewellery and technology sectors, as well as engaging in government affairs, its purpose is to provide industry leadership, whilst stimulating and sustaining demand for gold.

The WGC researches and gives insight on the 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, the Middle East, Europe and the USA, the WGC is an association whose members include the world's leading gold mining companies.

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Summary

Reserve managers and investors are increasingly recognising the strategic case for including gold in a portfolio due to its diversification benefits and the protection it can afford against macroeconomic risks. However, successive new records in the gold price have increased concerns that gold may be overvalued vis-à-vis other assets. Some investors and market commentators even question whether the gold market is in a “bubble.”

In this paper, the World Gold Council takes a statistical approach to these concerns and examines the prospects for future gold demand. Through our analysis we examine the statistical characteristics of prior bubbles to assess current developments in gold. Unambiguously, the results show that gold price developments do not resemble the statistical characteristics of past bubbles, including those of the US housing market, the Nasdaq technology bubble, and the Japanese Nikkei equity market bubble. Additionally, we find that the gold price is consistent with its long-run average level compared with a range of different assets including equity indices and hard assets like oil.

Furthermore, we demonstrate that the outlook for gold market demand remains robust, due among other reasons, to the strength of emerging markets, a fundamental shift in the behaviour of central banks, and a recovery and new advances in industrial demand for gold.

Lessons from prior asset bubbles

Steady increase in investment flows

Gold demand has benefited from flight-to-quality flows associated with the financial crisis and the measures put in place to remedy it (namely, quantitative easing from the world's central banks). This is evident from the sharp acceleration in gold investment that occurred in 2008, when macroeconomic and financial market uncertainties were most pronounced. However, today's gold price is by no means simply a reflection of those inflows. The financial crisis began around mid-June 2007, while the rally in the gold price began five years earlier, in 2001-2002. Over the past ten years, the gold price has increased in periods of stagnant – or even declining – investment, not just during periods of heightened investment demand. For example, between Q1 2002 and Q1 2004 identifiable investment inflows into gold fell by 21% from 126 to 99 tonnes, while the gold price increased by 41%. Also between Q2 2006 and Q2 2008, gold identifiable investment was relatively flat increasing from 146 to 152 tonnes (4%), while the gold price increased by a robust 67%.¹ More recently, the gold price has continued to appreciate while flight-to-quality flows have reversed, as investors have put money back to work in equity and other riskier markets.

Thus, while it is true that flight-to-quality related flows supported gold prices in 2008, much of these have already abated or reversed, yet gold has continued to rise. Gold's independence from these flows can also be demonstrated by comparing the gold price to the VIX index (Chart 2), a measure of volatility for the S&P500, and a general barometer of investors' risk appetite. The VIX index declined sharply from its peaks of 80 in the fall of 2008 to as low as 15 earlier this year – signifying a marked change in attitude toward risk. Despite this decline in risk aversion, gold continued to appreciate for most of this period.

Lessons from prior asset bubbles

Comparing the evolution of gold price against actual asset price bubble experiences clearly illustrates that the pace and increase in the gold price does not reflect a bubble. Asset price bubbles are extremely difficult to expose while an asset is rising in value and as such, global policy makers have often avoided addressing them as most academics believe bubbles are impossible to predict. Nevertheless, academics and contrarian investors often examine the statistical significance of asset price returns by looking at "z-scores" to determine if asset prices have risen at a statistically highly unlikely pace.

A statistical approach

A z-score is the number of standard deviations a particular data point within a data set is from the average return. In our analysis we examine the z-scores of quarterly rolling annual returns of gold, the Case Shiller 10 city US housing price index, the Nasdaq composite, and the Japanese Nikkei index. Each of these price indices experienced notable historic asset price bubbles, characterised by a significant run up in asset prices, followed by a significant decline. In the graphs in Chart 3, a high z-score, at or above two standard deviations would indicate that the returns for that year had a probability of occurring of less than five percent assuming returns are normally distributed. Thus any given annual return that has a higher z-score would be less likely to occur than a return with a lower z-score. We can thus utilise the criteria of looking for 2 sigma² or greater events as evidence of a likely bubble, as these returns are very unlikely given the normal tendency of the asset. Furthermore, in the chart we present only positive z-scores as this allows us to focus only on the appreciation of prices rather than a decline.

Gold

In examining the results for gold, two things should immediately strike the reader. First, like each of the other assets selected, gold experienced a bubble which is visible with its greater than two sigma returns in 1980. This period of rapid gold price appreciation was a bubble and reflective of a number of extreme geo-political and economic events, including the Iranian revolution, the oil price spike and the Soviet invasion of Afghanistan. The second and more important result visible from the data set is that since that period, gold has not experienced any other 2 sigma events. In fact, each of the other asset prices examined have experienced 2 sigma events in the past five years, while gold has not – reflecting that gold's annual returns appear to be in line with normal likely returns.

US housing bubble

In the second graph, we examine US house prices by using the Case Shiller 10 city index and plotting the z-scores on vertical axes.³ While housing prices have been rising steadily over past 30 years, recent "innovations" in mortgage finance, among many other factors, were largely considered to have contributed to a large run up in housing prices between 2003 and 2006. Looking at the data we note that the yearly change between 2004 and 2005 registered a 2.25 sigma return, consistent with our expectations in finding a bubble.

1 We have used Identifiable Investment; however, Total Investment yields similar findings – which rose 5% between Q1 2002 & 2004 and declined 24% between Q2 2006 & 2008. Total Investment includes "inferred investment" a balancing value between demand and supply.

2 σ Sigma, is the mathematical symbol for standard deviation. Events are often described as being an X sigma event, to illustrate the rarity of the event.

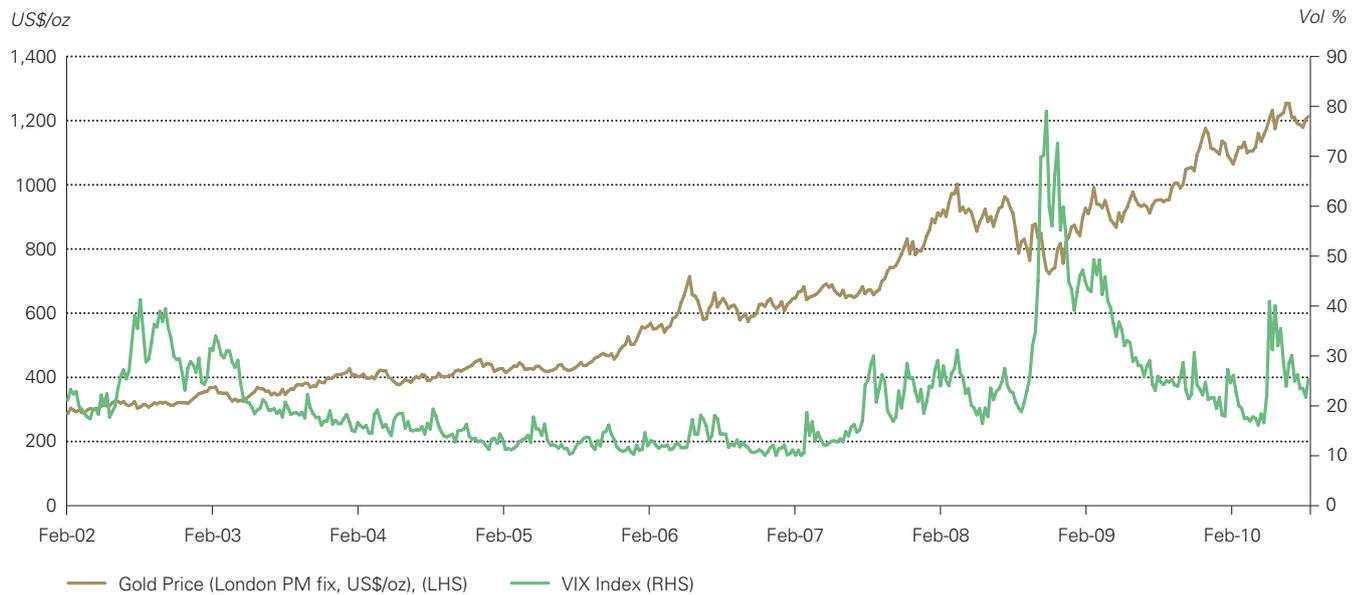
3 For this analysis we used the Case Shiller 10 city index as the OFHEO US housing index does not include non-conforming mortgages which was a critical component of the US housing bubble, as most agree that a decline in non-conforming lending standards contributed to the bubble.

Chart 1: Quarterly total identifiable investment flows (2002-2009)



Source: GFMS

Chart 2: The gold price rises in spite of shifts in risk aversion



Source: Bloomberg

US technology bubble

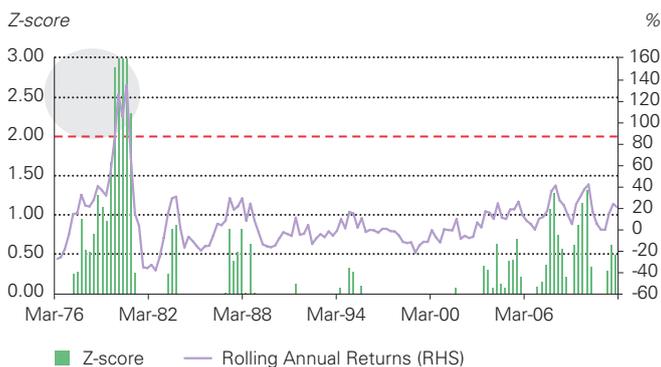
In the late 90's, the US witnessed an incredible technology boom as computer technology and the internet became an increasing presence in households. The boom was centred in the so called *Silicon Valley* of the United States, and was characterised by a rapid run up in prices of technology shares, for companies that in many cases had not yet recognised a profit. Consistent with the technology bubble, we see in the third graph in Chart 3 that the US Nasdaq composite, considered the technology index, experienced a 2.75 sigma return exactly at the peak of the technology bubble in early 2000.

Japanese bubble economy

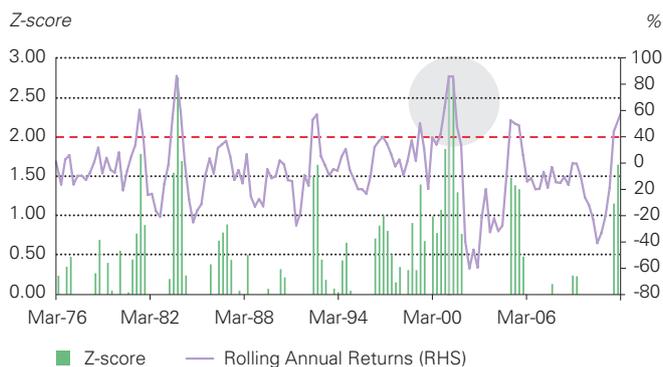
Consistent with the patterns observed in the last three bubbles examined, we see in the final graph below that the Japanese Nikkei index also experienced a 3 + sigma event in the height of its bubble between 1986 and 1987. Following WWII, Japan experienced incredible real growth, which led to Japan's emergence as the second largest economy in the world. However, in the 80s, financial assets and real estate prices rapidly increased at a disconnected level to the real economy. After the bubble finally collapsed in 1990, the stock market and real estate prices have yet to reach the highs witnessed during that period. With Japan, now experiencing its second lost decade since the so called "Bubble Economy," citizens still marvel at euphoria of that period. Interestingly, the Nikkei experienced a similar unlikely pace of appreciation in the late 90's at the same time as the technology bubble in the US.

Chart 3: Rolling annual returns (using quarterly data) and z-scores of rolling returns

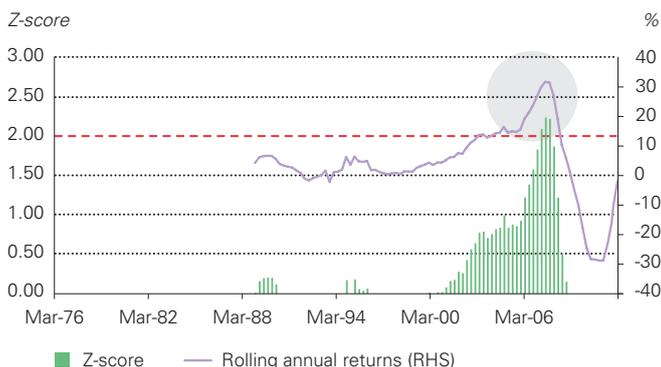
Gold prices (US/oz) (1975-2010)



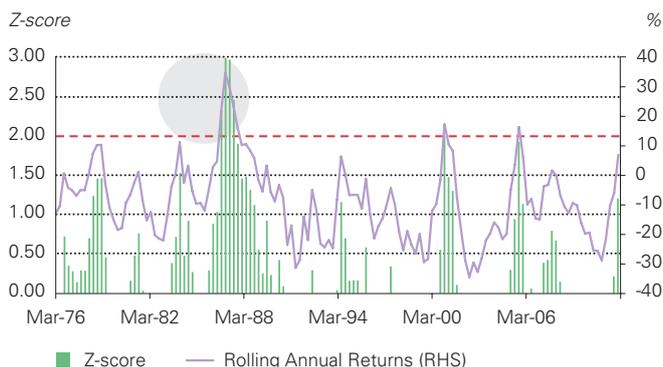
Nasdaq composite (1975-2010)



Case Shiller 10 city US house price index (1975-2010)



Japanese Nikkei equity index (1975-2010)



Note: Only positive values are plotted for z-scores. The graphs are consistently truncated at a maximum z-score of three to make it easier to see the results of the most recent events as that is the period of interest. Bubble period maximum z-scores are as follows: Gold in Q2 1980, 4.9; Case Shiller 10 city index in Q3 2005, 2.25; Nasdaq in Q1 2000, 2.75; Nikkei in Q2 1986, 3.33.

Source: Bloomberg and WGC calculations

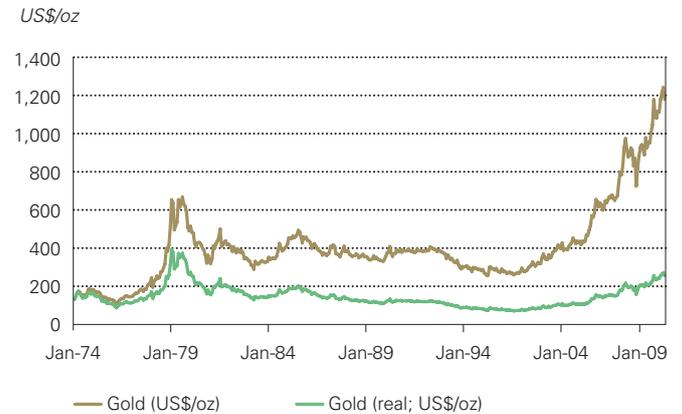
Comparing gold with global asset prices

Relative price analysis also suggests that gold is not overvalued. Before turning to ratio analysis, it's important to note that while the price of gold continues to reach successive new nominal highs, that in real terms gold remains below its all time high. Chart 4 illustrates gold in nominal and real terms.

Using a ratio of two asset prices can be another useful approach in evaluating the relationship of two assets over time. If a ratio is continually widening, one can infer that one asset has increased or decreased significantly in value relative to another. Likewise, if the ratio remains stable, one can infer that the two assets are trending in the same manner. In Chart 5 we examine a ratio of two major global equity indices (in US\$ terms), WTI crude oil, and silver relative to gold. Ratios remove the importance of particular levels – therefore it's useful to observe the trend of the ratio rather than the value.

From this chart, we can see that the ratio of the price of gold to each asset price has varied considerably over time. If the price of gold was disconnected from these assets, the ratio would be rising rapidly to extreme levels; however, the ratio of the gold price to each index is comfortably between the high and low points experienced in the past. For example, from Chart 5 you can see that the S&P500 is currently at a ratio of approximately 1 to 1 with gold, which is consistent with its 36 year average. Likewise, the ratio of the gold to oil is 15.5 as of July 31st, which is also consistent with its 30 year average of 15. Finally, examining gold to silver, we observe that the ratio is also in line with its past range at 65, near its average of 58. Therefore, in examining gold price appreciation relative to global equity markets and tangible assets like oil and silver, we find that gold's price remains consistent with long-run average levels.

Chart 4: Gold price (US\$/oz) and real gold price (US\$/oz; Jan '74 = 100)



Source: Bloomberg and WGC calculations

Ratio summary: Gold to global assets

Gold / -	30 July 2010	High	Average	Low
S&P500	1.07	5.7	1.0	0.2
MSCI World ex US	0.25	2.2	0.5	0.1
Silver	65.57	99.0	58.0	16.0
Oil	15.50	31.0	15.0	6.7

Monthly US\$ levels since 1974, WTI Crude Oil from 1980

Source: Bloomberg, Global Insight and WGC calculations

Chart 5: Ratios of gold (US\$/oz) to global asset indices (in US\$)



Source: Bloomberg, Global Insight and WGC calculations

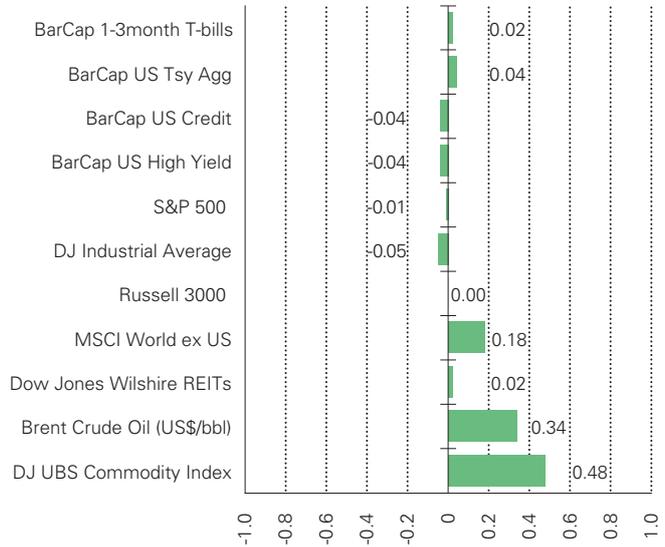
Gold and the interest rate cycle

A related concern raised among investors is that a turn in the interest rate cycle could lead to a sudden and significant decline in asset prices. These concerns are clearly important and real, especially for fixed income investors. In fact, the financial community is in quite a quandary on how to invest in fixed income, as once the rates cycle turns; fixed income investors stand to lose significant market value in their long duration securities. However, in the case of gold, as gold has historically had very little meaningful correlation with any asset, we see these concerns as unwarranted.

Examining gold's correlation with other assets, we see that there is no strong relationship with most other asset classes. Chart 6 illustrates five-year correlations of weekly returns of several major asset class groups (including fixed income) to gold and illustrates no significant relationships between these assets and gold. Many investors are attracted to gold for the very reason that gold added to a portfolio acts as an effective portfolio diversifier.

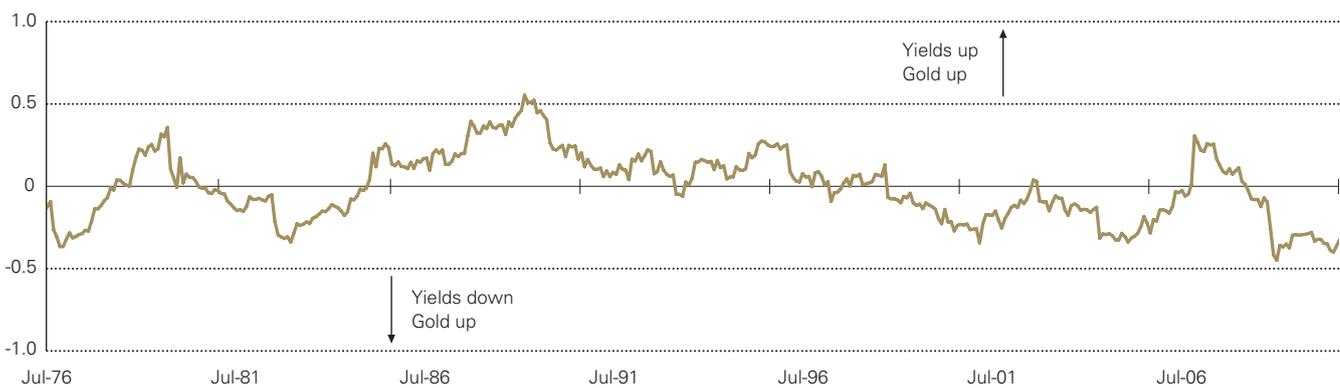
While several bond indices are illustrated in Chart 6, including two US Treasury indices, we also decided to examine the correlation between 10-year benchmark US Treasury yields and the gold price more directly. Chart 7 illustrates the rolling 30 day correlation between basis point changes in 10-year Treasury yields and percent change in gold prices. The correlation is not stable, exhibiting both negative and positive periods and is only briefly greater than 0.50. Thus, as this cycle ends, given the non-stability of this correlation, it's most likely that gold will not be directly impacted by simply a change in yields.

Chart 6: Five-year weekly return correlation on key assets and gold (US\$/oz)



Source: Global Insight, Barclays Capital, WGC

Chart 7: Rolling 30 day correlation between ten-year treasury yields (bps change) and gold



Source: Bloomberg and WGC calculations

The outlook for gold demand

Past trends and relative trends may not be reflective of future expectations of price developments, thus it's equally important to consider future demand prospects. The World Gold Council believes gold demand has abundant capacity for growth based on various factors including in particular the rapid growth of emerging markets, a fundamental shift in the behaviour of central banks, and a recovery and new advances in industrial demand for gold.

There is vast scope for growth in gold demand in China

The WGC believes Chinese gold demand has the potential to double from today's levels over the next decade. We expect gold consumption in China to catch up with the rest of the world following the deregulation of the Chinese gold market that took place in 2001. Although the country's appetite for gold has grown significantly since that time (it became the world's second largest consumer of gold in 2009, in tonnage terms), the country's per capita demand for gold remains well below that of western economies. Rising average incomes, a surplus of investable income derived from a high savings rate and improving standards of living in China should fuel significant growth in Chinese gold demand over the next decade, especially of discretionary spending in the jewellery sector.⁴ Chart 8 illustrates the intensity of gold consumption

in selected countries by examining each country's gold demand per capita versus its gross domestic product (GDP) per capita for 2009. From this chart we are able to see China's vast scope for growth in gold demand as it moves from the left of the graph toward to the right.

There is also huge scope for growth in investment demand. As the gold industry was liberalised less than a decade ago, it is still very much a developing market in China. We believe that the amount of gold coins and bars in private hands in China are much less than in countries like India and Vietnam, meaning there is ample scope for growth. In addition, total gold investment, i.e. including new products like gold exchange-traded funds and other ways to access the gold market, should be stimulated by the recent "Proposals for Promoting the Development of the Gold Market", introduced jointly by the People's Bank of China, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Finance, the State Bureau of Taxation and the Chinese Securities Regulatory Commission. The WGC is firmly committed to this goal. In April 2010, the WGC and Industrial and Commercial Bank of China (ICBC) signed a memorandum of understanding for strategic cooperation within China's gold market. This agreement will, amongst other things, see WGC and ICBC jointly develop and market new gold investment products within the country.

⁴ See the WGC's "China Gold Report: Gold in the Year of the Tiger," March 2010.

Gold's increasing role in emerging market and developing countries' foreign reserves

There is also vast scope for growth in official sector demand. The past two years have seen a fundamental shift in the behaviour of central banks with respect to gold. After being large net sellers of gold for two decades, central banks turned a net purchaser in the second quarter of 2009. Several key central banks such as China, Russia, India and the Philippines have all purchased substantial amounts of gold over the past two years, while central banks of Sri Lanka, Venezuela, Mauritius and Tajikistan have bought smaller amounts. Meanwhile, sales of gold by European central banks have ground to a complete halt.

The world's central banks currently hold an approximate cumulative 10.7% of their foreign reserves in gold – with vast differences across regions. Advanced countries hold around a third of their reserves in gold, mainly as a legacy of the gold standard days, while the rest of the world holds less than 5% of their reserves in gold. Meanwhile, developing Asia holds less than half that amount.

Given the size of Asian reserves, even a tiny increase in the percentage of reserves held in gold could have a profound effect on the gold market. For example, a one percentage point increase, from the current 2.4% of total reserves to 3.4% would amount to around 900 tonnes of extra gold demand or 36% of annual mine production in 2009. As Asian central banks' allocations to gold are at the very bottom and below the level portfolio optimisation models suggest is an optimal strategic allocation to gold⁵ – it's very likely that we could see allocations to gold in this region rise.

Moreover, these models do not take account of today's economic environment, which would strongly argue for an additional overlay to gold to protect against current macro-economic risks.

One of the biggest risks facing reserve managers at the moment is the dire fiscal situation in Europe. Recent downgrades of the growth outlook by leading central banks, such as the US Federal Reserve and the Bank of England, signal stronger fears over a double dip recession. Ongoing difficulties in the European banking sector – or a stalled global recovery – could easily see the euro area slip back into recession, leading to renewed sovereign debt downgrades and a further decline in the euro.

Since the investment guidelines of emerging market central banks often limit their reserves to being invested in a few key assets, such as deposits, government debt, quasi-government debt and gold, new fears over possible debt defaults/downgrades could see a sharp acceleration in the trend of higher gold purchases, by both official and private investors. Most such central banks cannot, for example, simply take refuge in the equity markets – if that were even an attractive option. Furthermore, a recent report by the Centre for European Policy Studies, finds that in both optimistic and gloomy scenarios for the Eurozone, gold demand is likely to be positively impacted as either global growth or a reluctance to add to euro positions will support gold demand.⁶

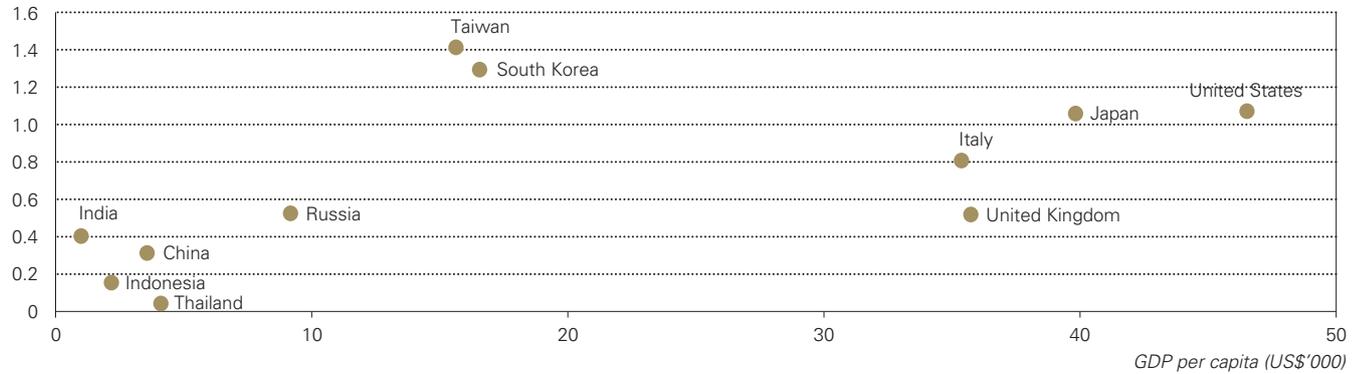
Finally, it's worth highlighting at this juncture that despite the rapid growth in gold investment in recent years, allocations to gold as a percentage of global assets under management (AUM) remains very low, roughly 1% accordingly to our estimates.

5 Dempster, Natalie, (2010), The Importance of Gold in Reserve Asset Management, WGC. For a comprehensive list of our publications, go to <http://www.gold.org>

6 Alcidi, C., De Gauwe, P., Gros, D., Oh, Y., (2010). The Future of Eurozone and Gold, Centre for European Policy Studies. Retrieved from <http://www.ceps.eu>

Chart 8: 2009 Global gold consumption intensity

Per capita gold consumption (gm)

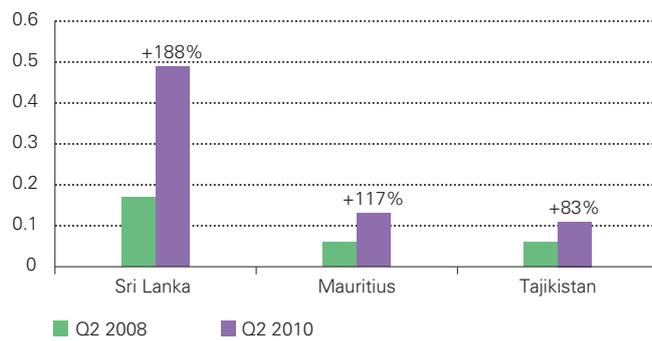


Note: Demand includes Jewellery and Investment demand and excludes central bank purchases.

Source: GFMS, IMF, WGC estimates

Chart 9: EM central banks increase gold holdings

Tonnes



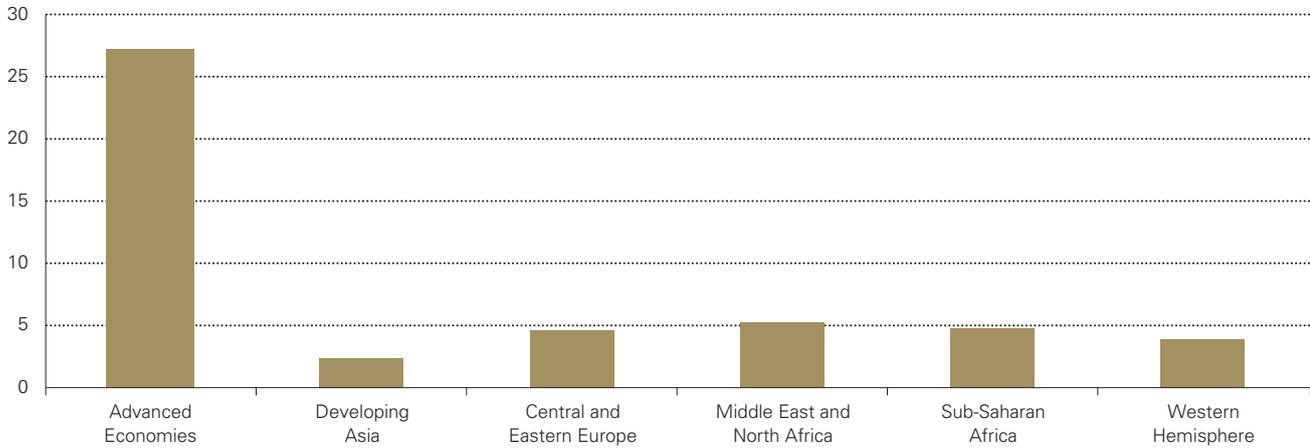
Tonnes



*Reported in April 2009, but purchases took place gradually over the preceding five years.

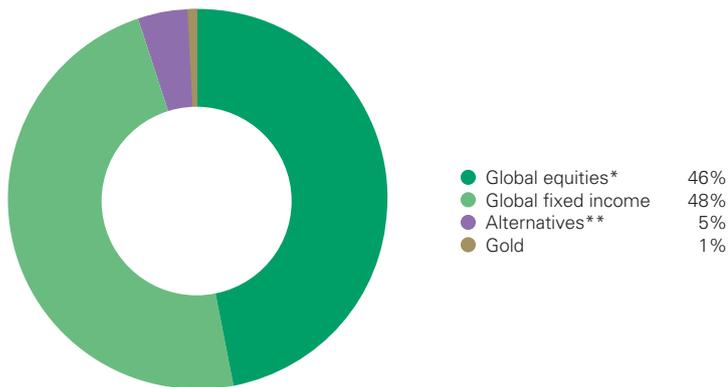
Source: IMF International Financial Statistics

Chart 10: Gold as a percentage of total reserves (2009)



Source: IMF International Financial Statistics

Chart 11: Global assets under management as of Q4 2009 (est. total US\$84.1 tn)



*Estimated using world equity and bond index data and adjusting for data overlaps.

**Includes hedge funds, private equity, real estate, and commodities (excluding gold).

Source: IMF International Financial Statistics

7 See WGC's "Gold for Good: Gold and nanotechnology in the age of innovation", January 2010. For a comprehensive list of our publications, go to <http://www.gold.org>

Industrial demand for gold to remain supportive

We see a smaller, but nonetheless important source of growth coming from industrial and medical uses of gold. The electronics market, by far the largest industrial market for gold, is expected to see a surge in demand. According to industry body SEMI, the predicted growth of the consumer electronics market will mean that semiconductor chip sales will experience very substantial growth over the next 5 years, with a likely corresponding growth in gold demand. In the short to medium term, other significant markets are expected to come on line. New advances in autocatalysts and chemical processing will generate incremental demand for gold, the size of which will depend on market penetration of the technologies. Longer term we expect advances in clean technologies such as solar cells and fuel cells to develop into significant new markets for the metal.⁷

Conclusions

With the strategic case for gold well solidified among investors and reserve managers, in this report we assessed the question of whether successive new records in the gold price are a signal that gold is overvalued or even in a bubble. In this paper, the World Gold Council used a statistical approach to these concerns and examined the prospects for future demand. Through our analysis we examined the statistical characteristics of prior bubbles to assess current developments in gold. Unambiguously, the results showed that gold price developments do not resemble statistical characteristics of past bubbles, including those of the US housing market, the Nasdaq technology bubble, and the Japanese Nikkei equity market bubble. Additionally, we found that the gold price is consistent with its long-run average level compared with a range of different assets including equity indices and hard assets like oil. Furthermore, we demonstrated that there is ample scope for continued robust growth in gold market demand, due among other reasons, to the strength of emerging markets, a fundamental shift in the behaviour of central banks, and a recovery and new advances in industrial demand for gold.

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