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Investing in gold: the strategic case

By Natalie Dempster, Investment Research Manager, World Gold Council

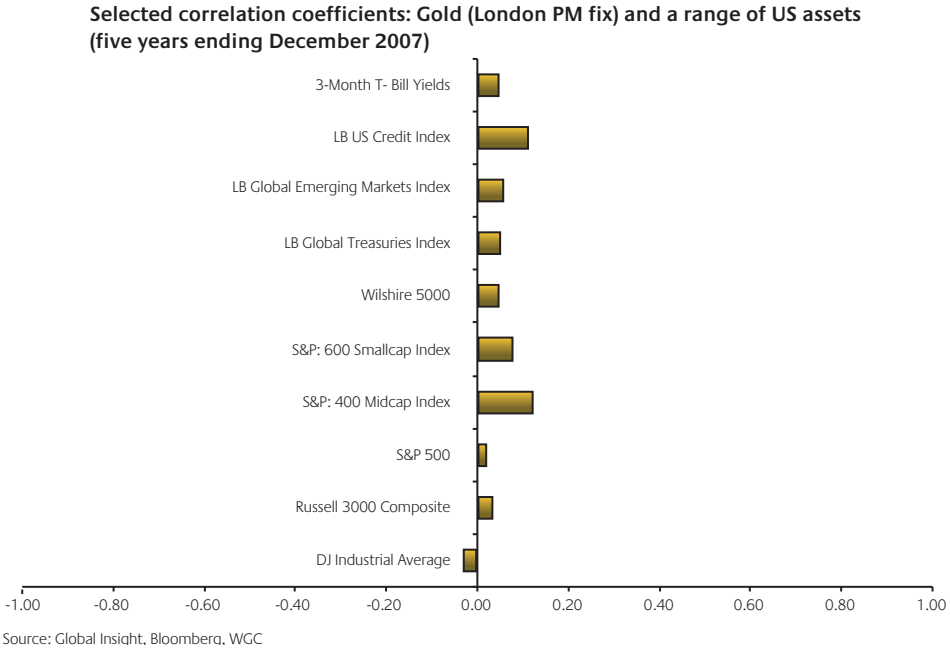
The gold market has moved firmly into the spotlight recently, as the price has rallied to an all-time high. A key factor driving the price higher has been the behaviour of investors, who bought US$14.7 billion worth of gold last year alone. There are several reasons why investors buy gold, but perhaps the most compelling is gold's role as a long-term or strategic asset. The rationale for including gold in a portfolio is fairly intuitive given its lack of correlation with other assets, which makes it an effective portfolio diversifer. What is less clear, is how much gold? A joint study by the World Gold Council (WGC) and Boston-based New Frontier Advisors (NFA) set out to answer this question in a report published in September 2006. The study confirmed gold's role in enhancing portfolio performance. Moreover, it found that only a small amount of gold is required to achieve this: 1-2% in a low risk portfolio and 2-4% in a medium-risk one. The study also found a role for gold in portfolios that already contain commodities. This reflects gold's lack of correlation with most other commodities, as well as financial assets. Gold competes well with small cap and emerging market equities as a diversifying asset, according to the report. Yet, while allocations to the former are commonplace, allocations to gold remain low. Is it time to consider gold as a strategic asset?

Portfolio diversification and gold.

Portfolio diversification is one of the cornerstones of modern finance theory. Put simply, it argues that investors should hold a range of assets in their portfolio that are diversely correlated. This reduces the likelihood of substantial losses arising from a change in macro-economic conditions that are particularly damaging for one asset class, or for a group of assets that behave in a similar fashion. It is the same principal as not putting all of your eggs in one basket. Because changes in the price of gold do not correlate with changes in the price of mainstream financial assets, the yellow metal fulfils this investment criterion. Importantly, it is a relationship that holds both across markets and over time.

The correlation coefficient between gold and a range of US assets is shown in chart 1. A correlation coefficient measures the degree to which two assets move together. It ranges in value from -1 to 1, with -1 representing assets that are perfectly negatively correlated, 0 representing assets that have no correlation, and +1 representing assets that are perfectly positively correlated. Over the past five years, the correlation coefficient between gold and each asset class has been close to zero.

Chart 1: Gold and selected asset correlations



Source: Global Insight, Bloomberg, WGC

The drivers of the gold market are unique

The lack of correlation between gold and other assets reflects the unique drivers of demand and supply in the gold market, which - as for any free market good or service – ultimately determine the price. These factors include: exploration spending, mine production, producer costs, producer hedging, seasonal demand in the jewellery

sector and changes in official gold reserve holdings. And although some of the drivers of investment demand for gold, such as inflation and dollar depreciation, may also impact other financial assets, they do not generally do so in the same manner and their effect on the correlations is simply not strong enough to negate the other influences.

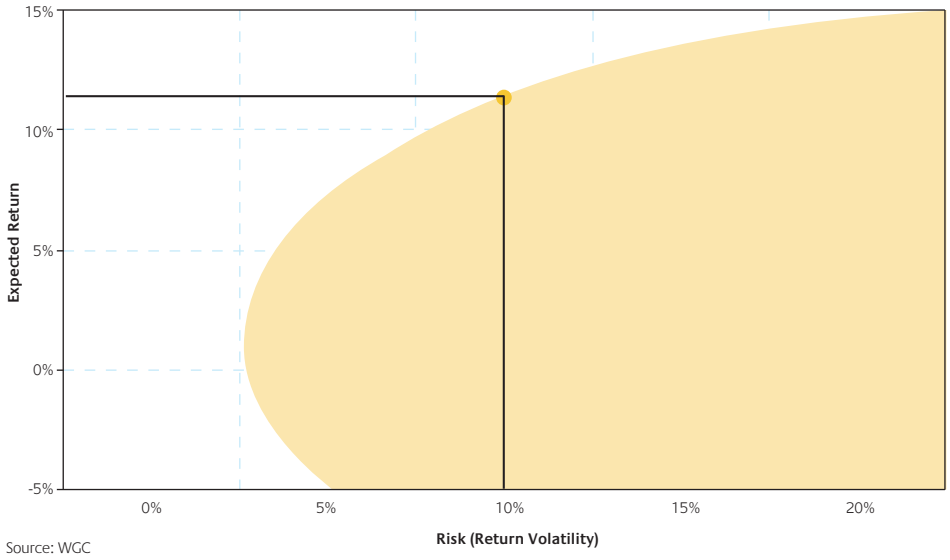
Portfolio optimisation

The rationale for including gold in a portfolio is fairly intuitive given its lack of correlation with other assets. What is less clear is how much gold?

The World Gold Council (WGC) and Boston-based New Frontier Advisors (NFA) set out to answer this question using NFA's patented portfolio optimiser in a study published in September 2006 (*Gold as a Strategic Asset*, by Richard Michaud, Robert Michaud and Katharine Pulvermacher).

By way of background, a portfolio optimiser is a computer program designed to generate "an efficient frontier". The concept of an efficient frontier was first introduced by Harry Markowitz, a pioneer of modern portfolio theory, in 1952. It centres around the notion of an "optimal" portfolio, optimal being defined as the portfolio that achieves the highest level of return for a given level of risk, or the lowest level of risk for a given level of return. For a given set of assets and return and risk assumptions, the computer programme (or optimiser) runs numerous combinations of the assets to find the most optimal portfolios. The resulting set of optimal portfolios is used to build an efficient frontier, depicted by the curved line on the chart below.

Chart 2: An efficient frontier



Source: WGC

But traditional portfolio optimisers were found to perform poorly in practice, with small changes in the inputs liable to lead to vastly different outcomes regarding the make up of an optimal portfolio. They required absolute certainty in all of the inputs, a far cry from the reality of financial markets. As a means of tackling this problem, NFA pioneered a technology called Resampled Efficiency™ (RE) optimisation.

In a nutshell, what Resampled Efficiency™ does is to generate hundreds of efficient frontiers, based on small variations in the original inputs, then averages them. The results are more stable, with small changes in the inputs typically leading to only small changes in the composition of the optimal portfolio. RE optimisation also allows the allocations to be tested for statistical significance. The allocation to gold in each of the optimal portfolios is noted, the highest and lowest 10% allocations are then discarded. The remaining allocations can be said to be significant at the 10% level.

The inputs

Using the new technology, the 2006 study set out to determine whether "typical" US institutional investors could enhance their portfolio performance by including gold. And, if so, how much gold was required?

The starting point was to define a "typical" US institutional portfolio, as well as realistic return and risk inputs for each of the "typical" assets. The study picked a portfolio of: T-bills, intermediate and long-term US government bonds, large and small capitalisation domestic equities (Russell 1000 Large Cap US Equity and Russell 2000 Small Cap Equity Indices) and developed market international equities (MSCI EAFE International Equity Index); a mix of assets that is consistent with current US institutional asset allocation practices.

Simple long-run averages were used for the risk and return inputs in order to avoid any bias associated with the economic cycle and/or the impact of any time specific events, e.g. the high-tech boom on equity prices or the current credit crisis on government bond yields. The long run data series was constrained by the fact that the gold price was pegged to the dollar for many years in the twentieth century and private investors were prohibited from owning it. As a result, the starting point was set at January 1974, well after the dollar peg was broken in 1971, and by which point private investors were allowed to hold gold. The data set ended at December 2005. Some indices were not available over the entire period (e.g. the Russell's equity

indices) and were filled using an algorithm[1]. And since gold and commodities are generally assumed to have inflation-hedging characteristics, all historical risk-return estimates were adjusted for inflation. The long-run return and standard deviation (a measure of risk) inputs, along with the corresponding correlation coefficients are shown in table 1.

Table 1: Basic Assets: Inflation-Adjusted Risk-Return Estimates January 1974 - December 2005

Asset Names	Return	Std dev	Correlations							
			US Tbills	Intrmd US Govt Bonds	Long Term US Govt Bonds	Russell 1000 Large Cap US Equity	Russell 2000 Small Cap US Equity	MSCI EAFE Interntional Equity	CRB Futures ndex	Gold, London PM Fix
US TBills	1.4%	1.1%	1.00							
Intermediate US Govt Bonds	3.6%	6.1%	0.35	1.00						
Long Term US Govt Bonds	4.9%	10.8%	0.29	0.86	1.00					
Russell 1000 Large Cap US Equity	9.3%	15.5%	0.16	0.20	0.26	1.00				
Russell 2000 Small Cap US Equity	9.8%	19.8%	0.12	0.11	0.15	0.84	1.00			
MSCI EAFE Interntional Equity	7.2%	17.0%	0.17	0.16	0.18	0.61	0.56	1.00		
CRB Futures Index	2.5%	9.7%	-0.09	-0.13	-0.10	0.14	0.18	0.26	1.00	
Gold, London PM Fix	2.1%	19.7%	-0.15	0.02	0.00	0.07	0.14	0.20	0.59	1.00

* Russell from January 1979, CRB from January 1982.
EM and Ledoit estimated

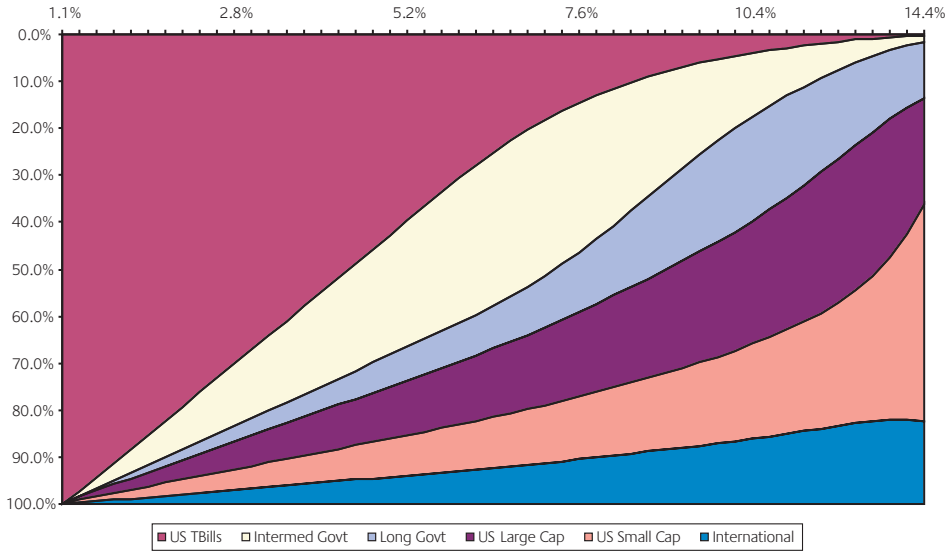
The results

The study began by defining an optimal portfolio excluding gold. The results are shown in the form of a portfolio composition map in chart 3. The x axis represents the level of risk that an investor is prepared to bear, while the y axis shows the optimal allocation of each asset. Because the institution is assumed to be fully invested (i.e. no money is left in cash), these must add up to 100 percent.

The results are pretty intuitive. The RE optimiser says that investors who are extremely risk averse should invest mainly in US treasury bonds. This is hardly surprising given that T-bills have historically been the least risky of the assets, with a standard deviation of just 1.1%. While: *"at more moderate levels of risk, intermediate government bonds are an important asset in the optimal allocation. At higher levels of risk the allocations smoothly increase for long-term government bonds, large cap stocks, small cap stocks and international equities",* Gold as a Strategic Asset, by Richard Michaud, Robert Michaud and Katharine Pulvermacher.

[1] An algorithm is a computer programme used to solve a particular problem. For details on the specific EM algorithm used, see Carlin and Louis (2006).

Chart 3: Base Case, January 1974-December 2005.

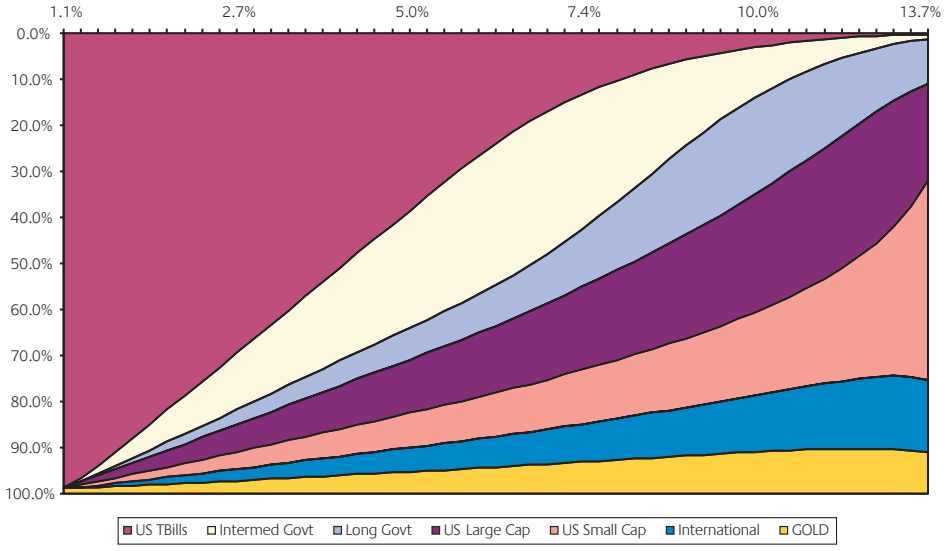


* Russell from January 1979. EM estimated.

What happens when gold is included?

The RE optimiser was then re-run with gold included as a separate asset class (chart 4). It is immediately obvious that the portfolio is more efficient, as it has become less volatile (see x axis, where the highest risk level has fallen from 14.4% to 13.7%). The amount of gold required to achieve this varies depending on the risk level: 1-2% for a low risk portfolio, 2-4% for a medium risk one and close to 10% at higher levels of risk.

Chart 4: Base case with gold, January 1974-December 2005

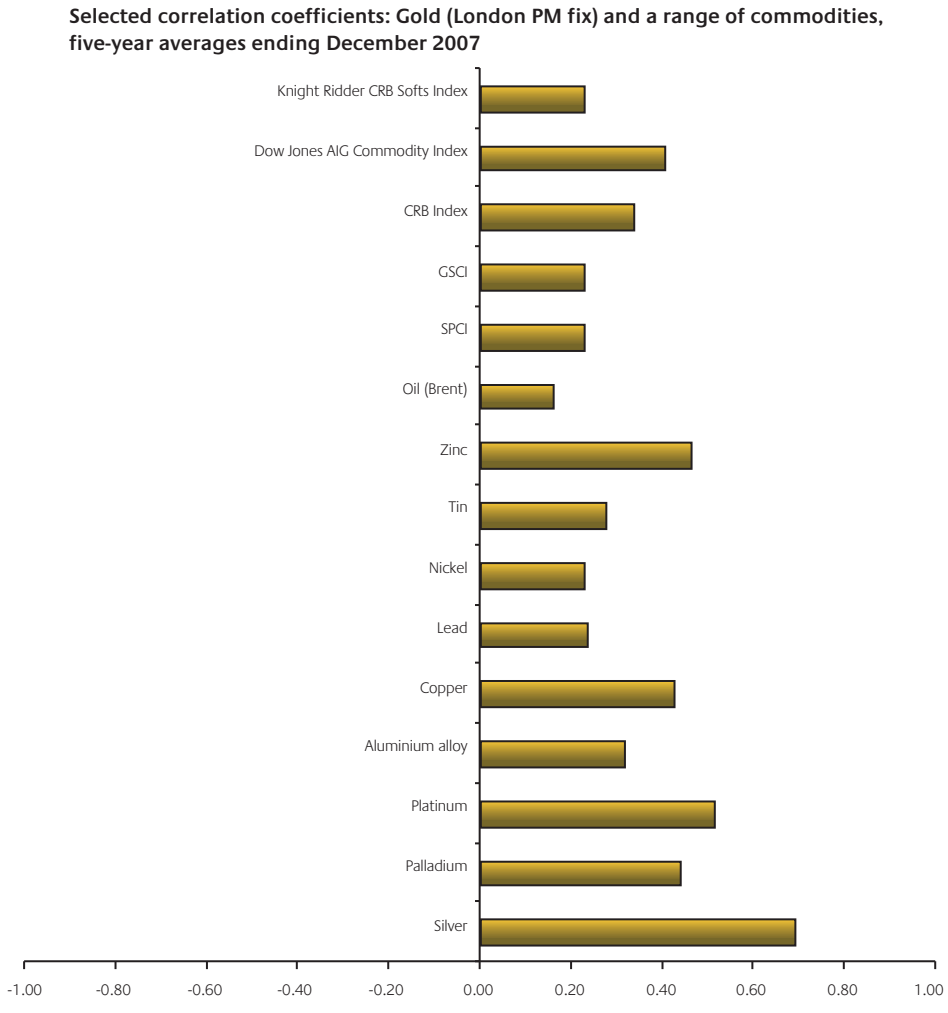


* Russell from January 1979. EM estimated.

The study notes that: *"the effect of introducing gold on the other assets is to reduce their allocations in roughly equal measures"*. In other words, the case for gold is broad based. It is not simply a substitute for one asset, but for many different assets. This comes back to our earlier point that gold does not correlate with any of the mainstream financial assets studied (chart 1, on page 2).

Gold's correlation to most other commodities, though not statistically insignificant, is low, with the notable exception of precious metals (chart 5). For example, the correlation between the dollar gold price and the S&P Goldman Sachs Commodities Index[2] in the five years to end December 2007 was just 0.22. This suggests that portfolios that already contain an allocation to commodities should still benefit from adding gold. The RE optimiser agrees.

Chart 5: Selected correlation coefficients, gold and a range of commodities

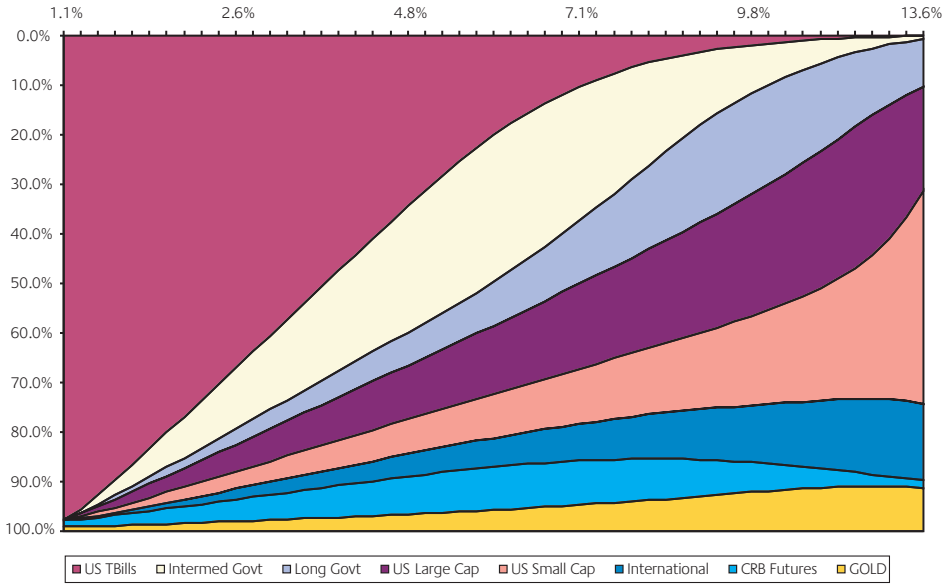


Source: Global Insight, WGC

[2] A composite commodity index with weights based on annual production quantities

When the RE optimiser was re-run including commodities (the study used the CRB Index, a measure of 22 commodities) the story did not change much: *"Gold continues to be important in defining portfolio optimality even in the presence of the commodity futures index but is less statistically significant"*. Indeed, the allocations to gold on the portfolio composition map (chart 6) look remarkably similar to the case without commodities (chart 4).

Chart 6: Base case with gold and commodities, January 1974-December 2005

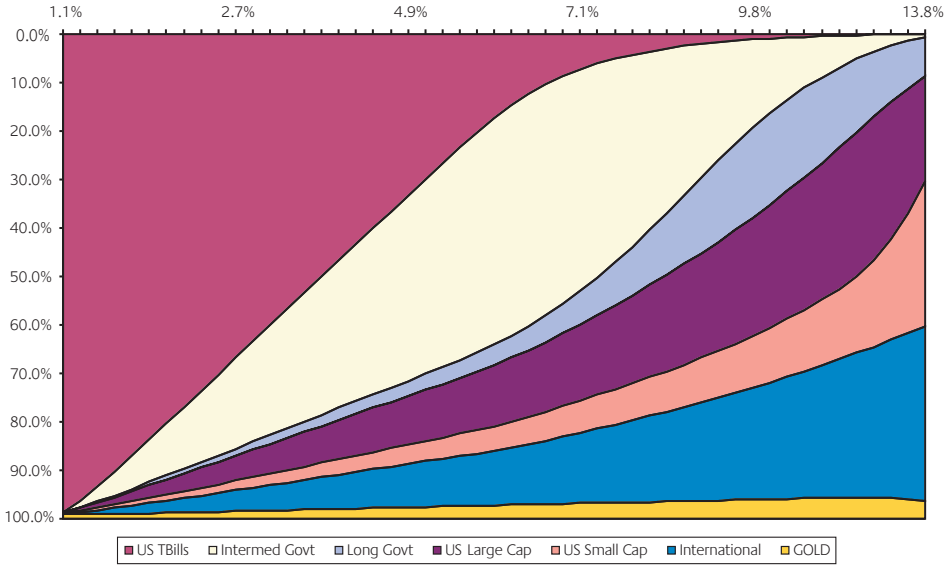


* Russell from January 1979. CRB from January 1982. EM estimated.

Alternative scenarios

The study went on to look at several other scenarios. The first alternative scenario had the dual objective of mitigating against period dependency effects (though less common with very long run data, these can still occur) and being especially stringent with respect to gold returns. The study noted that the 1.4% average inflation-adjusted return on T-bills looked high in comparison to historical standards – yields were below 1% for much of the 20th century – so this was cut to zero. And in order to be especially conservative with respect to gold, returns were also lowered to zero. Despite this, the RE optimiser still found a case for gold, although the allocations were understandably lower (chart 7). The study also noted that *"gold competes reasonably successfully with small cap as an important alternative diversifying asset at low and moderate risk levels"*. Yet while allocations to small cap equities are commonplace among US institutions, allocations to gold are rare.

Chart 7: Base case with strategic premiums and gold, January 1974-December 2005

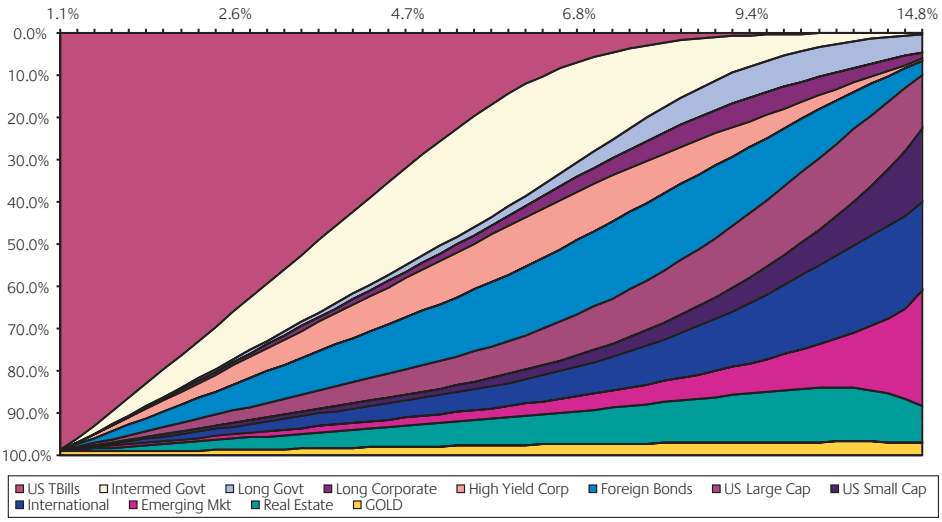


* Russell from January 1979. EM and Ledoit estimated.

An extended asset class

The next scenario looked at whether there was a case for gold in the portfolios of investors who had already included other alternatives. To do this, the study added three new bond series (long-term corporate bonds, high-yield bonds and non-US bonds), emerging markets equities, (MSCI Emerging Markets Equity) and real estate (DL Wiltshire REIT Real Estate index) to the mix. The bonds were assigned the same return as long-term government bonds, the emerging market index the same premium as the large cap domestic equities and REITs a return halfway between large cap and long-term government bonds. Inflation-adjusted returns of zero were used for gold, commodities and t-bills.

Chart 8: Expanded asset class, strategic premiums and gold, January 1974-December 2005.



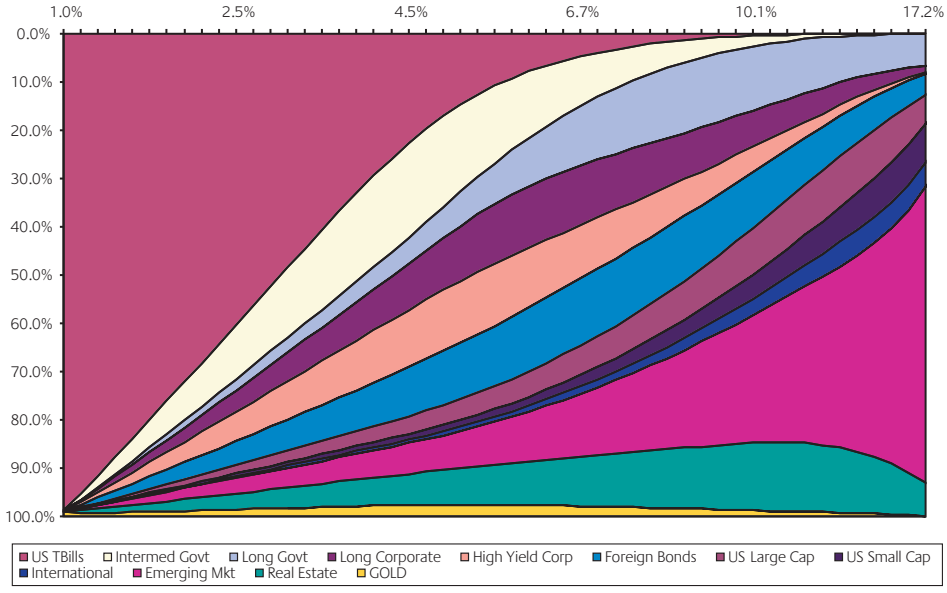
* Russell from January 1979, CRB from January 1982, High Yield from July 1983, ex-US Bonds from January 1978, Emerging Equity from January 1988, REITS from January 1978. EM and Ledoit estimated

Once again, the optimiser found a case for gold, although the allocations were again lower (chart 8). The study also noted that: *"gold competes reasonably well with the equally risky small cap or emerging markets assets as an alternative diversifying asset at low and moderate risks in spite of a much smaller real return assumption".*

The final two scenarios used different time frames to set the risk and returns parameters: January 1986 to December 2005, this was partly to avoid the 1970s and early 1980s when a variety of factors lifted the gold price to unprecedented levels; and January to December 2005, to see what happened when very recent data was used.

Results from the first scenario found gold to be only minimally important in determining an optimal portfolio (chart 9). However, this is not surprising given that the period was dominated by the worst years of the gold bear market, introducing a bias into the results.

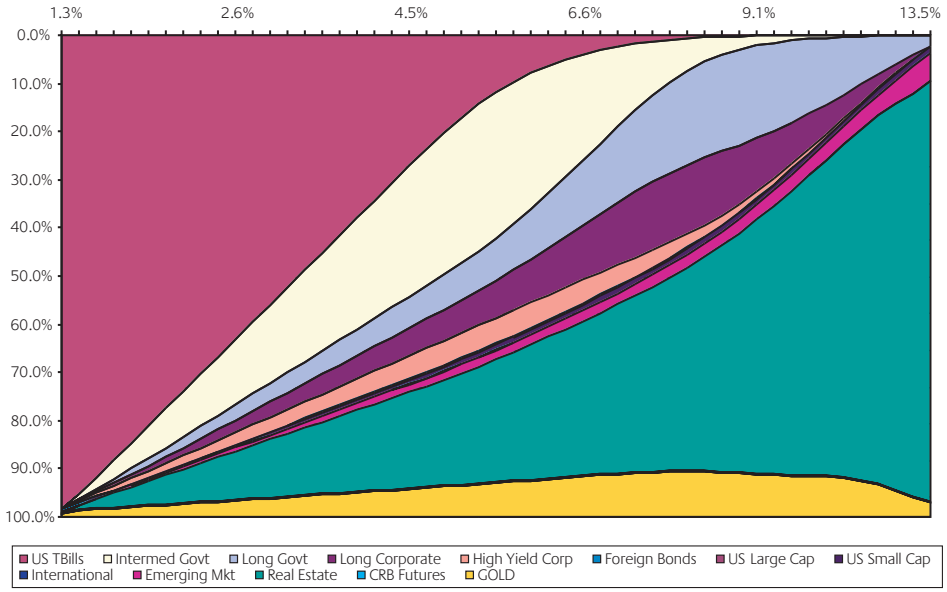
Chart 9: Expanded Asset with gold, January 1986-December 2005.



* Emerging Equity from January 1988. EM and Ledoit estimated.

By contrast, the second set of results were very positive (chart 10): *"gold allocations ranged from 0.7% at low risk to nearly 8% at high risk..."*. However, these results were also untypical, as the period was dominated by an exceptionally propitious time for gold. Both scenarios highlight the need for very long-run data in such analysis.

Chart 10: Expanded Asset with gold, January 2000-December 2005



* EM and Ledoit estimated.

All in all, the results make a compelling case for gold as a strategic asset. Moreover, they highlight that only a small amount of gold is required to enhance portfolio performance in low and medium risk portfolios. The finding that gold competes well with small cap and emerging market equities as a diversifying tool is also interesting, as although allocations to these are common among US institutions, allocations to gold are not. As a result, there is certainly a case for considering gold as a strategic asset.

The full report of *Gold as a Strategic Asset* can be downloaded from the World Gold Council website (www.gold.org).

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