



## How Gold Can Enhance a Portfolio's Return

It is not always appreciated that including gold bullion in an investment portfolio can contribute to an increase in the portfolio's overall rate of return. Contrary to conventional wisdom, gold's price does not necessarily need to appreciate for overall portfolio returns to increase. The reason for this lies in the fact that gold is negatively correlated to virtually all other asset classes and therefore can reduce portfolio volatility or risk. [The implications of gold's negative correlation are described in Gold Portfolio Letter No. 1 in this series.] Lower portfolio volatility can lead to increased returns due to a combination of two factors: (1) the mathematical effect of compounding, and (2) the ability of the investment manager to add higher-yielding, riskier assets without increasing the portfolio's target level of risk.

### 1. Lower Portfolio Volatility Leads to Higher Returns

To illustrate the beneficial effect that low volatility can have on portfolio returns, two hypothetical portfolios are compared in table 1 below. The *arithmetic* average annual return for both portfolios is the same – that is, 10%. However, the standard deviation of portfolio #1's return is lower (1.10%) than that of portfolio #2 (16.43%). This means that portfolio #1's *compound*\* annualized return of 9.996% is greater than portfolio #2's return of 8.972%. An initial \$10,000 investment in the less volatile portfolio (#1) yields \$17,711 by the end of the sixth year, greater than the \$16,746 from the more volatile portfolio (#2).

\* Compound Return equals Principal x (1 + the rate of return).  
Example, using the top line of the two left-hand columns in table 1 below: 10,000 x 1.09 = 10,900.

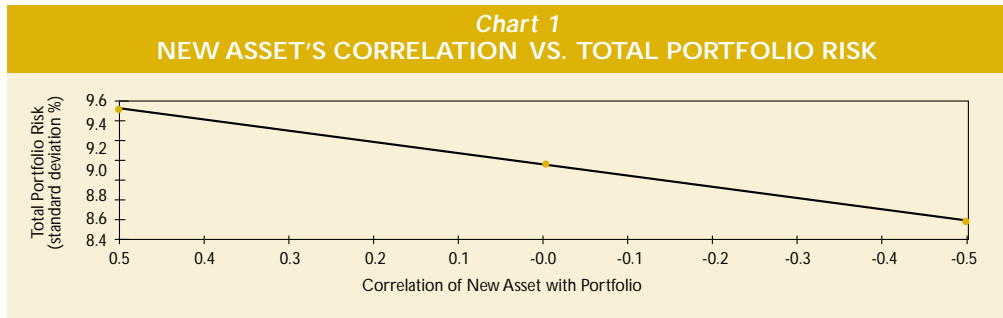
Table 1 THE COMPOUNDING EFFECT				
Year	Portfolio #1 (low volatility*)		Portfolio #2 (high volatility)	
	Annual Return**	Value	Annual Return	Value
Initial Value		\$10,000		\$10,000
Year-end 1	9%	10,900	-5%	9,500
2	11	12,099	25	11,875
3	9	13,188	-5	11,281
4	11	14,639	25	14,102
5	9	15,956	-5	13,396
6	11	17,711	25	16,746
Arithmetic Average Return	10%		10%	
Standard Deviation	1.10%		16.43%	
Compound Return	9.996%		8.972%	

\*Volatility = standard deviation of returns (measure of variability of an asset's return).

\*\* The first six numbers shown in this column have been chosen arbitrarily.

## 2. Negative Correlation Lowers Portfolio Risk

Due to its negative correlation, gold can reduce portfolio volatility. (As was explained previously in table 1, lower portfolio volatility can also lead to enhanced portfolio returns.)

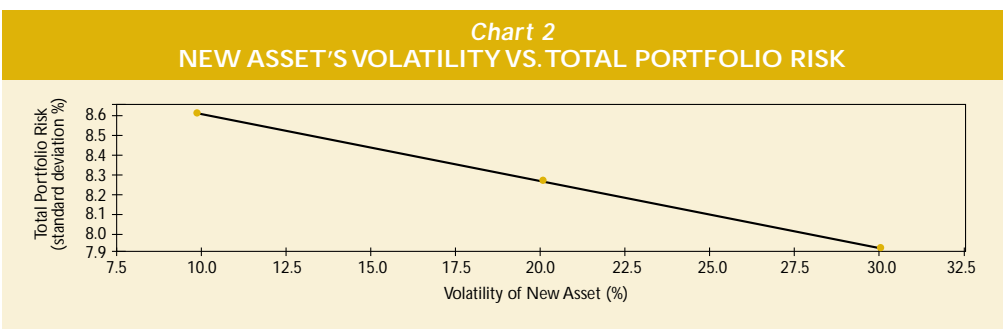


In chart 1 above, a new asset is added to a portfolio to account for 10% of its weighting. To examine the effect of the new asset's correlation on the portfolio, the new asset's volatility is held constant at 10%. The more negative the correlation between the new asset and the pre-existing portfolio, the lower the overall level of risk will be for the new portfolio. For example, if the new asset is perfectly correlated with the existing portfolio (that is, the correlation is 1), then adding any amount of the new asset will not change total portfolio risk (it will remain 10%). However, allocating 10% of the existing portfolio to a new asset with a correlation of less than 1 (say, 0.5) reduces total portfolio risk to a level of 9.5%. If the new asset has a correlation of 0 with the existing portfolio, then total portfolio risk drops to 9.1%. If the correlation of the new asset is -0.5 (similar to gold's correlation with U.S. equities), then total portfolio risk drops to 8.5%.

In this example, it has been assumed that the new asset has accounted for 10% of the portfolio's total value. However, if 20% of the existing portfolio is allocated to the new asset, and if the correlation is -0.5, then total portfolio risk is reduced even further, to a level of 7.2%.

*To summarize, the addition of assets (such as gold) whose returns have a low or negative correlation with the total portfolio, can reduce portfolio risk.*

## 3. Negative Correlation and High Volatility Lower Portfolio Risk



Aside from being negatively-correlated with most assets, gold tends to be volatile. Chart 2 above shows that when a new negatively-correlated asset such as gold is added to an existing portfolio, the higher the volatility of that asset, the more total portfolio risk is reduced. It is assumed for the purpose of this example that a new asset with a correlation of -0.5 is added to the existing portfolio to account for 10% of its total weighting (measured in market value terms). In this case, total portfolio risk is reduced to around 8.6%. If the volatility of the new asset is 20%, then total portfolio risk falls to a level of 8.2%. Finally, if the volatility of the new asset is 30%, then total portfolio risk falls to 7.9%.

To recap, when an individual asset is added to a portfolio with a negative correlation, the higher its volatility, the more it helps reduce portfolio volatility.

In this example, it has been assumed that 10% of the total portfolio's value is allocated to the new asset. If the allocation of the new asset – with a negative correlation (-0.5) and moderately high volatility (20%) – is increased to 20%, then total portfolio risk is reduced even further, to a level of 6.9%.

#### 4. Adding Gold and Higher Yielding Assets to a Portfolio

A reduction in a portfolio's volatility due to adding gold allows the portfolio manager to rearrange the asset mix to include higher-yielding, higher-volatility assets. In table 2 below, the portfolio *with* gold yields 14.41% compared to the portfolio *without* gold, which yields 14.30%.

Table 2 INCLUSION OF GOLD IN PORTFOLIOS ENHANCES RETURNS		
April 1990 – April 1998		
	Portfolio Without Gold	Portfolio With Gold
Largest Cap US Equities	55%	70%
Treasury Bills	5	0
US Fixed Income	30	25
Small Cap US Equities	10	0
Gold	0	5
	100%	100%
Portfolio Standard Deviation	8.5%	8.5%
Total Portfolio Return	14.30%	14.41%
Sharp Ratio**	1.28	1.29

\* Sharp ratio = (Portfolio return - Treasury bill rate) ÷ standard deviation of returns.  
Source: Ibbotson Associates

#### 5. Gold's Diversification and "Rebalancing" Benefits

Eugene Fama of the University of Chicago and David Booth of Dimensional Fund Advisors, Inc. have observed that the contribution of a particular asset class's return to total portfolio performance is often greater than its compound return as a stand-alone asset. The additional return is referred to as "diversification return". This results from: (1) diversifying the portfolio into more than one asset class, and (2) "rebalancing" the diversified portfolio to maintain target asset class allocation levels. Rebalancing, usually carried out by the investment manager on a quarterly basis, involves selling those assets in the portfolio which have appreciated in value to above target-levels (selling high), and then investing the proceeds in those assets which are below target levels (buying low).

Rebalancing adds particular value to a portfolio when its assets have a low or negative correlation to each other such as in the case of gold. Periodic rebalancing allows the portfolio to capture gains from one asset class (which has appreciated in value) and realign the portfolio for potential gains in other assets. This benefit does not accrue to the same extent for portfolios with positively correlated assets.

\* If an exact match of the rate of return is desired, the investor can manage the futures position with a hedging technique called "tailed hedge" (which compensates for changes in interest earned resulting from changes in margin requirements).

The results of rebalancing are illustrated in Table 3 below, using the return contributions of various asset classes to a model portfolio for the period from April 1990 through April 1998.

Table 3 GOLD'S CONTRIBUTION TO PORTFOLIO RETURNS*						
April 1990 – April 1998**						
	US Large Cap Equity	US Small Cap Equity	Gold	US Fixed Income	1 Month T-Bills	Total Portfolio
Portfolio Weighting	50%	10%	5%	30%	5%	100%
Standard Deviation	11.6%	18.9%	10.9%	4.6%	0.7%	7.7%
Correlation with portfolio	0.99	0.76	-0.47	0.55	0.12	1.00
Compound Return (est.)	17.39%	16.87%	-2.10%	8.62%	4.77%	13.10%
<b>Diversification Return</b>	<b>0.31%</b>	<b>1.23%</b>	<b>0.78%</b>	<b>-0.04%</b>	<b>-0.05%</b>	<b>0.30%</b>
Total Return Contribution	17.70%	18.10%	-1.32%	8.58%	4.72%	13.40%

Standard Deviation = measure of variability of an asset's return.

\* The following quarterly index returns are used as proxies for asset class returns in this table: (a) for US Large Cap Equity, S&P 500 Index total return; (b) for US Small Cap Equity, Ibbotson Small Cap total return; (c) for gold price return; (d) for US Fixed Income, Lehman Brothers Aggregate total return; (e) for 1 month T-Bills, 30-day Treasury Bill total return. Source: Ibbotson Associates.

\*\* All figures are annualized.

In the past eight years, gold offered greater diversification returns (determined by the combined effect of standard deviation and correlation) than Treasury bills and US Fixed Income. In this example, the portfolio's total diversification return is 0.30%. Of that total, 0.15% is attributed to the 50% portfolio weighting in US Large Cap Equities, and 0.04% is attributed to the 5% weight in gold. Thus, gold offers more than 25% of the diversification benefit contributed by US Large Cap stocks with an allocation that is only one-tenth the size. This is due again to gold's negative correlation with other asset classes in the portfolio.

## 6. Conclusion

Investment portfolios can benefit in several ways from gold, even during periods of weak price performance.

- Gold's negative correlation with other assets in the portfolio helps reduce portfolio volatility; lower volatility in turn leads to higher compound rates of return.
- The reduced volatility of the portfolio permits the asset mix of the portfolio to be rearranged so as to increase the weight of higher-volatility, higher-return asset classes – thus, further increasing the portfolio's overall returns.
- Gold's relatively high level of volatility in the 1990s combined with its negative correlation to other asset classes have resulted in portfolios enjoying a positive "diversification" return due to the effects of rebalancing.

Meanwhile, gold has continued to provide portfolios with significant intangible advantages such as providing insurance against financial and economic uncertainty. Thus, in the event that the gold price starts to rise in the coming period, portfolios will benefit to an even greater extent by including gold.

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