

GOLD PORTFOLIO LETTER NO. 12 • JUNE 2001

Using Gold to Make Portfolios More Predictable

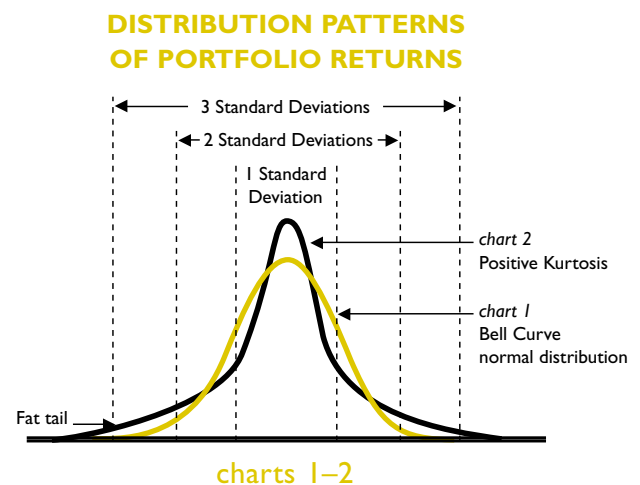
Reducing Fat Tail and Skewness Portfolio Problems

Few portfolio managers will dispute the wisdom and necessity of diversification to protect a portfolio against market fluctuations. Unfortunately, history tells us that during periods of financial stress or instability, stocks as well as traditional diversifiers such as bonds and alternative assets, tend to perform poorly. How then, can investors diversify their portfolios effectively to reduce their vulnerability during such occasions? According to a study recently commissioned by the World Gold Council, the conventional method used for asset allocation needs to be changed to produce portfolios with consistent results.

Institutional investors generally make portfolio diversification decisions based on mean-variance optimization principles. This approach leads to the construction of a series of *efficient* portfolios that either maximize returns for an acceptable level of risk¹, or minimize risk without sacrificing returns. The investor then chooses the desired level of risk/return in order to determine a portfolio's optimum asset allocation.

However, almost all asset-allocation studies that use mean-variance optimization assume that returns on the individual asset classes making up the optimum portfolio are *normally* or *log-normally* distributed (*chart 1-2*). This normal distribution is often referred to as a bell curve. In the world of the bell curve, extreme outcomes are rare.

In the real world of stock markets, however, the returns of most asset classes do not follow a normal pattern of distribution. For example, the 1987 equity crash recorded negative returns that were over 20 standard deviations from the mean. During this last year alone, the S&P 500 index has experienced four large daily moves; traditional risk indicators suggest that each should have occurred no more than once every 120 years. These unusual outcomes, known as *positive kurtosis* or the *fat tail* problem (*chart 1-2*), although widely recognized among investment professionals, are frequently ignored because of the mathematical difficulty of accounting for them when making asset-allocation calculations.



1. measured by standard deviation

The statistical measure of *kurtosis* can be used to determine if *fat tail* problems are present in a particular portfolio. Kurtosis measures the tendency of a portfolio to experience outlier returns that do not follow a normal, bell-curve distribution pattern. However, the calculation of kurtosis alone cannot overcome the difficulty of creating portfolios that are less likely to have outliers.

The fat tail problem is not the only one associated with assuming a normal distribution of returns when constructing portfolios. Most distributions are also *skewed*, meaning there is a greater likelihood of the portfolio experiencing either higher or lower returns than would be expected under normal distribution conditions (*chart 3*).

SKEWNESS

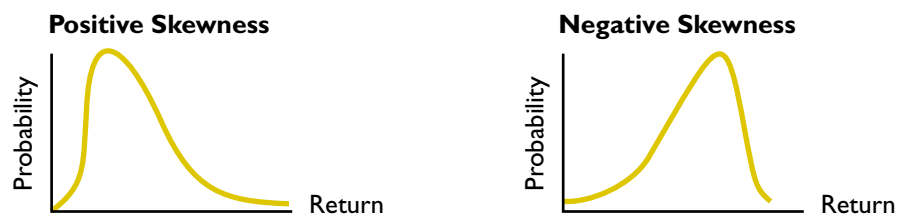


chart 3

Thus, for example, if the returns of the investment portfolio are *negatively-skewed* and have *positive kurtosis* (fat tails), the portfolio's performance may fall short of investor expectations. The realized returns are likely to be less than the expected mean value;² in addition, the realized volatility of returns may be greater than expected.

It, therefore, follows that if two portfolios have the same expected levels of return and risk – one with positive kurtosis and negative skewness, and the other with a normal distribution – the latter portfolio would be preferable because, it would more likely perform closer to investor expectations.

Making the Portfolio Distribution More Normal

As already stated, the primary purpose of asset allocation is to construct a portfolio that matches both risk and return with expectations. If the portfolio does not perform as expected, then the asset-allocation process has failed — and the investor is disappointed. One cause of such disappointment is that investment managers often use only the standard deviation measure to calculate risk when constructing portfolios without taking into account problems relating to fat-tails and skewness.

To reduce one's exposure to these aspects of risk, the portfolio must be constructed with carefully selected assets that counter the effects of skewness and kurtosis, while still meeting the desired levels of return and standard deviation. Including a modest amount of gold bullion or T-bills as a diversifier in an equity portfolio³ that is rebalanced quarterly, will help achieve this objective.

For example, as can be seen in *chart 4* on the next page, from 1970 through 2000, an allocation to gold or Treasury bills resulted in a significant reduction in the portfolio's standard deviation.

² using mean-variance optimization

³ as measured by the S&P 500

BOTH GOLD AND TREASURY BILLS REDUCE VOLATILITY IN EQUITY PORTFOLIOS

1970 through 2000

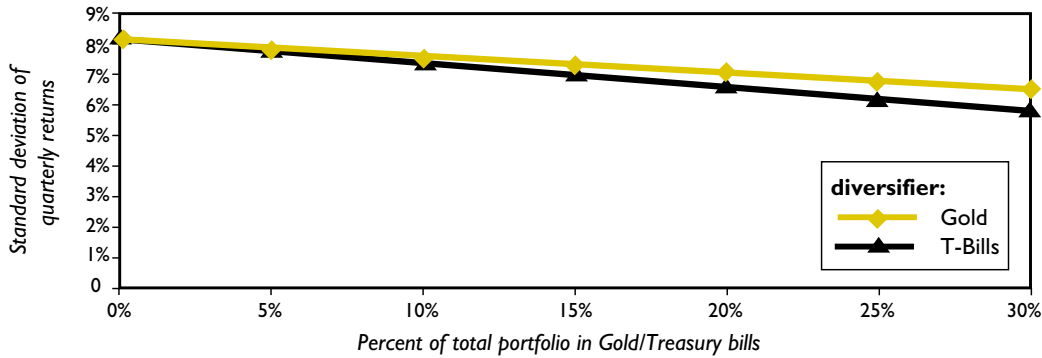


chart 4

However, diversifying the portfolio with Treasury bills did not enjoy the same advantages as diversifying the portfolio with gold. For instance, *chart 5* shows that including gold in an equity portfolio between 1970 and 2000 reduced the positive kurtosis of the portfolio to a greater extent than Treasury bills.

GOLD REDUCES POSITIVE KURTOSIS MORE EFFECTIVELY THAN T-BILLS

1970 through 2000

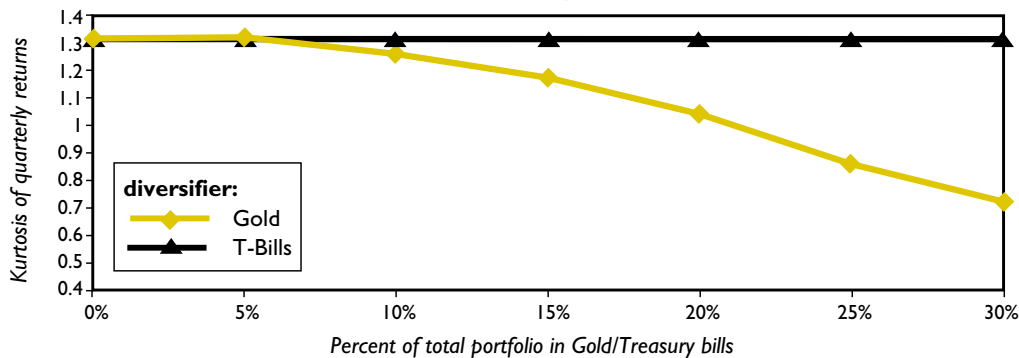
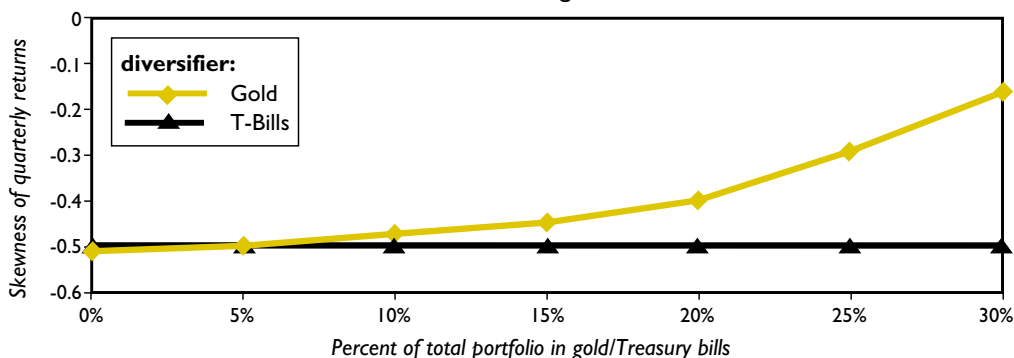


chart 5

Also, during the same time period, gold reduced the amount of negative skewness of the portfolio to a greater extent than Treasury bills (*chart 6*).

GOLD REDUCES SKEWNESS MORE EFFECTIVELY THAN T-BILLS

1970 through 2000



The results shown in *charts 5 and 6* demonstrate that an equity portfolio using gold as a diversifier enjoyed a more normal distribution of returns than a portfolio using Treasury bills - and was thus more likely to meet investor expectations.

In addition, as shown in *chart 7* below, the equity portfolio with gold enjoyed a higher rate of return than the portfolio with Treasury bills — even though both portfolios had reduced levels of risk (see *chart 4* on the previous page).

ADDING GOLD TO AN EQUITY PORTFOLIO PROVIDES BETTER RETURNS THAN TREASURY BILLS

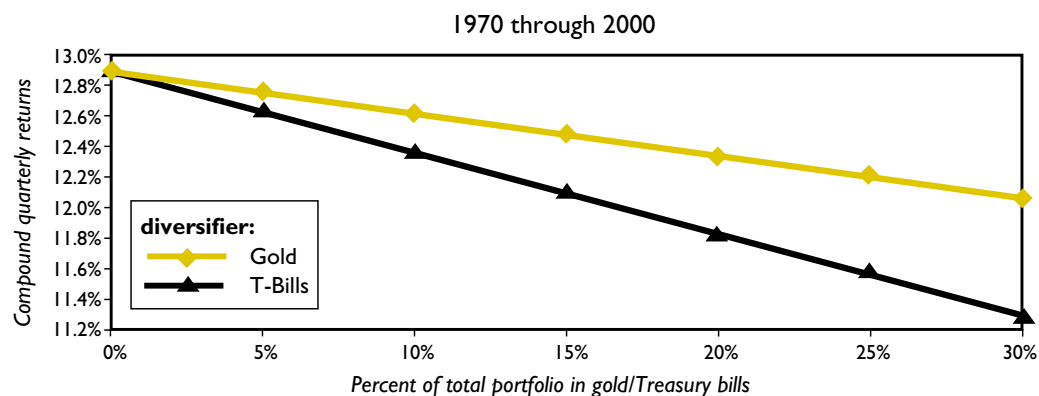


chart 7

Favorable results using gold as a diversifier are also evident in portfolio simulations carried out for shorter-time intervals than the 30-year period used in the previous examples. During the period 1980 through 2000, portfolios with gold exhibited reduced negative skewness and positive kurtosis compared to those with Treasury bills. In other words, the portfolios with gold performed more satisfactorily.

SUMMARY

Most optimum portfolios are constructed by using the mean-variance optimization procedure. The assumptions underlying this procedure are based on a normal distribution of returns. In reality, however, the distributions are abnormal. Thus, the expectations created by this asset-allocation process are doomed to failure — and the investor is bound to be dissatisfied.

The above analysis demonstrates that the inclusion of gold can reduce the effects of *fat tails* and *negative skewness*, thus making the distribution of returns more normal. The portfolio is more likely to perform according to investor expectations and therefore, more likely to satisfy the investor.

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