

The Systematic Risk of Gold and Gold Stocks: A tale of two periods

Gold stocks are without doubt risky, but just how much of this risk is systematic versus unsystematic risk? To answer this question we have recently updated our analysis of the return attributes of gold, gold company revenues, and gold stocks versus a broad index of global equity market returns. The outcome of this recent analysis is set out below.

The Theory of Risk

“Systematic or aggregate risk arises from market structure or dynamics which produce shocks or uncertainty faced by all agents in the market; such shocks could arise from government policy, international economic forces, or acts of nature. In contrast, idiosyncratic risk (sometimes called specific risk, unsystematic risk, residual risk, or diversifiable risk) is risk to which only specific agents, or industries, are vulnerable (and is uncorrelated with broad market returns). Due to the idiosyncratic nature of unsystematic risk, it can be reduced or eliminated through diversification; but since all market actors are vulnerable to systematic risk, it cannot be limited through diversification (but it may be insurable). As a result, assets whose expected returns are negatively correlated with broader market returns command higher prices (and lower expected returns) than assets not possessing this property.”¹

The shocks referred to above manifest in unexpected changes to investors' wealth.

Asset Risk Characteristics

Assets can be grouped by three broad risk characteristics²:

1. **Hedge:** A hedge is defined as an asset that is uncorrelated or negatively correlated with another asset or portfolio on average. A hedge does not have the (specific) property of reducing losses in times of market stress or turmoil since the asset could exhibit a positive correlation in such periods and a negative correlation in normal times with a negative correlation on average.
2. **Diversifier:** A diversifier is defined as an asset that is positively (but not perfectly correlated) with another asset or portfolio on average. Similar to the hedge, the diversifier does not have the (specific) property of reducing losses in extreme adverse market conditions since the correlation property is only required to hold on average.
3. **Safe haven:** A safe haven is defined as an asset that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil. The specific property of a safe haven asset is the non-positive correlation with a portfolio in extreme market conditions. This property does not force the correlation to be positive or negative on average but only to be zero or negative in specific periods. Hence, in normal times or bullish market conditions the correlation can be positive or negative. If the haven asset is negatively correlated with the other asset or portfolio in extreme adverse market conditions, it is compensating the investor for losses since the price of the haven asset rises when the price of the other asset or portfolio falls.

Another way to think of a safe have asset is that it is like financial insurance. Investors are prepared to accept lower expected returns for a large relative pay-off in times of extreme negative shocks to their wealth.

¹ http://en.wikipedia.org/wiki/Systematic_risk

² Dirk G. Baur, Brian M. Lucy, **Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold**, The Financial Review, Volume 45, (2010), pp. 217–229.

Is Gold a Safe Haven Asset?

In a recent (2010) empirical study by Baur and Lucy, they find that, "...gold is a hedge against stocks on average and a safe haven in extreme stock market conditions." They also find that gold's "safe haven property is short-lived". We evaluate their findings using different data to measure changes in investor wealth³, and then extend this analysis to gold industry revenues and gold stocks using a broad gold equity index⁴.

US Equity Market Corrections and Gold Price Changes

Chart 1 shows the correlation between the negative returns in periods of severe US equity market corrections since the end of Bretton Woods in late 1971, versus changes to the gold price in these periods. The average quantum of US equity market corrections over these periods was -36%, but varied from -57% in 2007-09 (Global Financial Crisis) to only -19% in 1976-79 (Iranian Revolution, 1979 Oil Shock) and 2011 (European Bank Liquidity Crises). The average gold price increase was +28% over these periods, but varied from +139% (Collapse of Bretton Woods, 1973 Oil Shock) to -46% in 1980-82 (Early 1980s Recession, Contractionary Monetary Policy to Control High Inflation).

The average differential between the negative returns from severe US equity market corrections and changes in the gold price over these periods was +65%. So does this make gold a 'safe haven' in periods of severe equity market corrections? Admittedly, the sample is small because of prior period gold standards, and then Bretton Woods up until 1971, but the answer is most likely yes.

However, one question still remains unanswered: How do we explain the exception to this rule in the early 1980s? I think the answer relates to the fact that this market correction was largely engineered by Paul Volker's Federal Reserve reducing money supply and increasing interest rates to force down US and global inflation, and gold being a hedge against inflation thus did quite poorly. Whereas all the other severe market corrections were related to exogenous shocks which could be expected to be dealt with by increases in money supply and lower interest rates.

³ Global Financial Data, **World Stock Return Index**. *Global Financial Data has used its database to calculate global indices going back as far as possible. To calculate these indices, the broadest domestic index available was used as the basis for the index, and if the index was in dollars, the local index values were converted into a dollar index by dividing the local index by the exchange rate. They have We have taken the total return series for Australia, Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Spain, the United Kingdom and the United States to extend the total return indices back to December 1925. The world index divided between North America (50%), Europe (40%) and Pacific (10%). Europe's weightings are France 25%, Germany 25%, Italy 12.5% and the United Kingdom 37.5% from 1925 through 1950; Europe's weightings are Belgium 7.5%, France 17.5%, Germany 17.5%, Netherlands, 7.5%, Spain 7.5%, and the United Kingdom 30% from 1951 through 1969. The Pacific region's weights are Australia 50% and Japan 50% from 1925 through 1950, and Australia 30%, Japan 70% from 1951 through 1969. The United States represents all of North America from 1925 through 1933. From 1934 through 1969, the United States represents 90% of North America and Canada 10%. From 1970 on, the indices are capitalization weighted and include the same 20 countries as are included in the MSCI World Index.*

⁴ The **Amex Gold BUGS (Basket of Unhedged Gold Stocks) Index (HUI)** is a modified equal dollar weighted index of companies involved in gold mining. The HUI Index was designed to provide significant exposure to near term movements in gold prices by including companies that do not hedge their gold production beyond 1.5 years. The HUI Index was developed was a base value of 200.00 as of March 15, 1996. Adjustments are made quarterly after the close of trading on the third Friday of March, June, September & December so that each component stock represents its assigned weight in the index. This index starts on 1996 so we have spliced it with the **Amex Gold Miners Index**. This index trades under the symbol GDM and is a modified market capitalization index currently comprised of 36 gold and silver companies. The new index includes both common stocks and ADRs (American Depository Receipts) of selected companies with a daily volume over the prior six months of a minimum 50,000 shares as well as a market capitalization of over \$100 million. Seventeen of Amex listed companies are in this new gold and silver index. The bulk of these 17 are from Canada and were listed just within the past two years. This index starts in 1993 so again we have spliced it with the **UK Financial Times Gold Index**. The sources for this include *The Financial Times, The Financial Times Indices, London, 1939, Financial Times, The Investor's Chronicle, Barron's*. The current Gold Mine indices are calculated in dollars rather than in pounds sterling, and the base is December 31, 1992 = 1000. The index was introduced in 1995, includes 31 shares, and is calculated in dollars (the old index was calculated in pounds). Three sub-indices exist for Africa (14), Australasia (6) and North America (11), which are provided as monthly sector indices.

Chart 1: Equity Market Corrections and Gold Prices Changes

Period changes

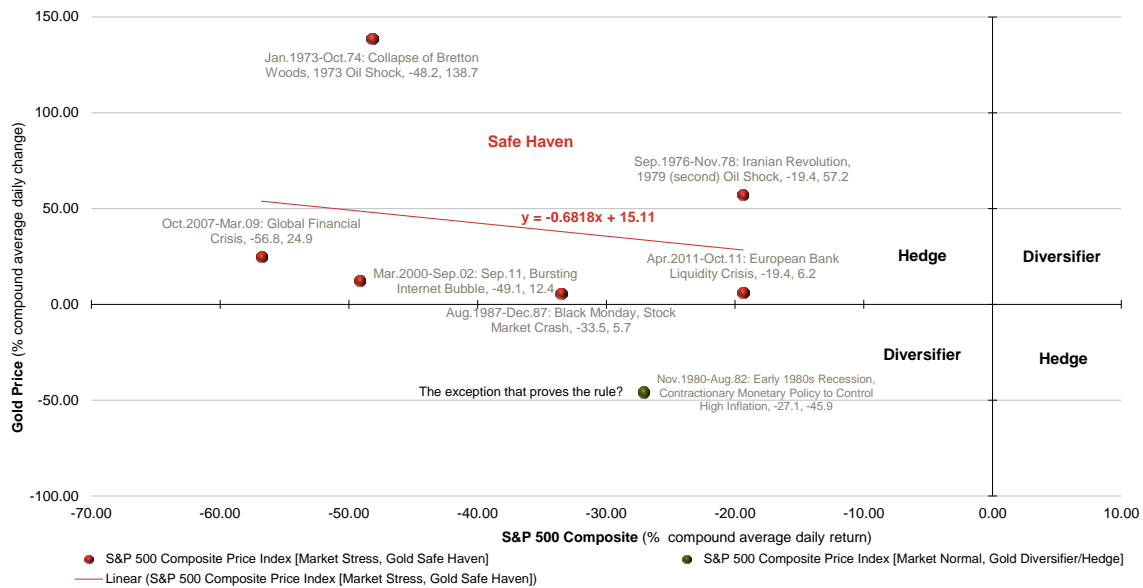


Chart 2 extends the analysis in Chart 1 to include the 'normal' or 'bull' markets (green dots) between the severe market corrections. For scaling purposes it uses daily compound average return and change figures rather than period figures. In these more 'normal' or 'bull' markets gold prices tended to move with equity returns, i.e. a beta co-efficient of 1.03.

Chart 2: Equity Market Corrections and Gold Prices Changes

Daily compound average figures

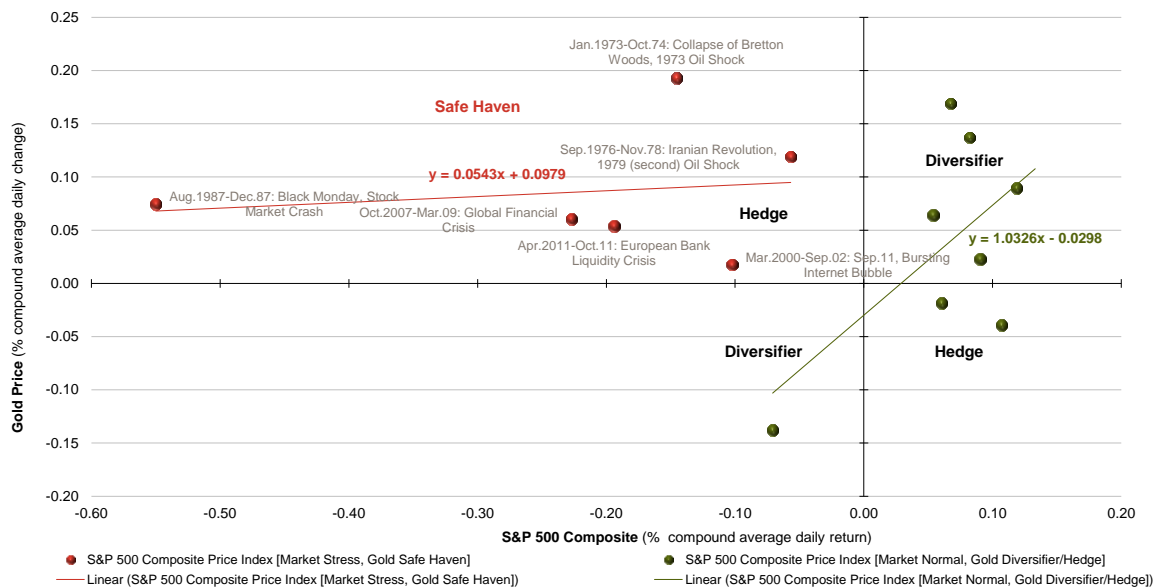
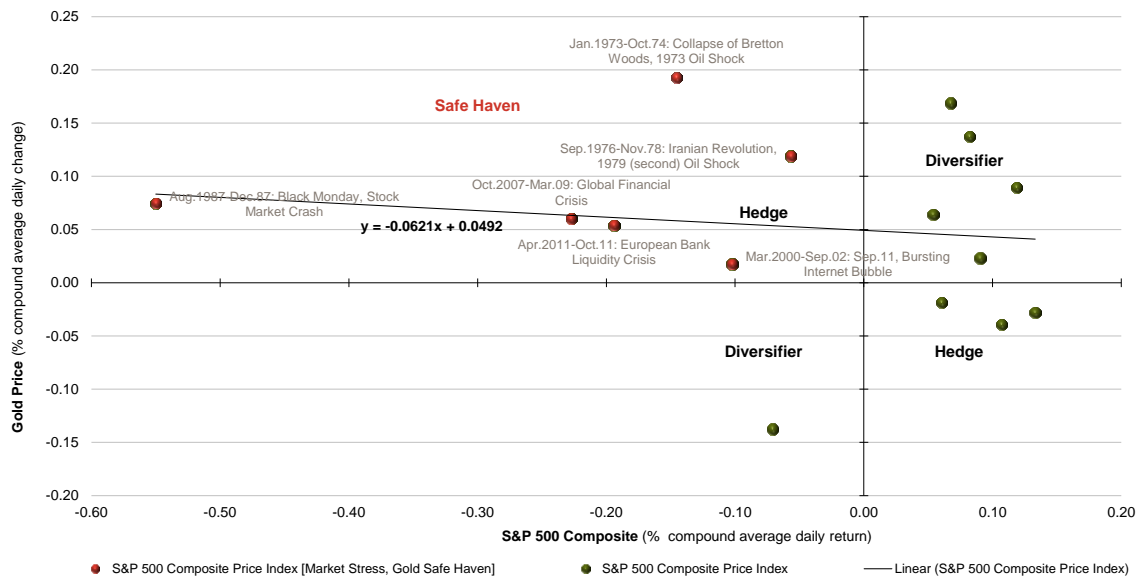


Chart 3 is the same as Chart 2, but instead of plotting the trend line through each market environment (stressed, normal/bull), we plot it through the entire data set. This shows that on average gold can be characterised of a hedge asset with a slight negative beta co-efficient of -0.06.

Chart 3: Equity Market Corrections and Gold Prices Changes

Daily compound average figures



The Systematic Risk of the Gold Price

In Chart 4 we take the same approach to that shown Chart 3, but instead use yearly data (to 31st December) back 1972 rather than period data; and a World Equity Index⁵ rather than the US S&P500 Index. This increases our sample size from 15 to 40 and also better reflects our end use of our analysis, i.e. to calculate the revenue beta (systematic risk) of an individual gold stock.

Note on Chart 4 that two of the data points (Sep. 1976-Nov. 78 and Aug. 1987-Dec. 87) have moved from the 'safe haven' quadrant (top left) to a 'diversifier' quadrant (top right). The former is a marginal move "just across the border" and relates to the weakness of the US dollar in 1977⁶, whereas the latter relates to the strength of equity markets in the earlier months up until the August 1987 crash⁷.

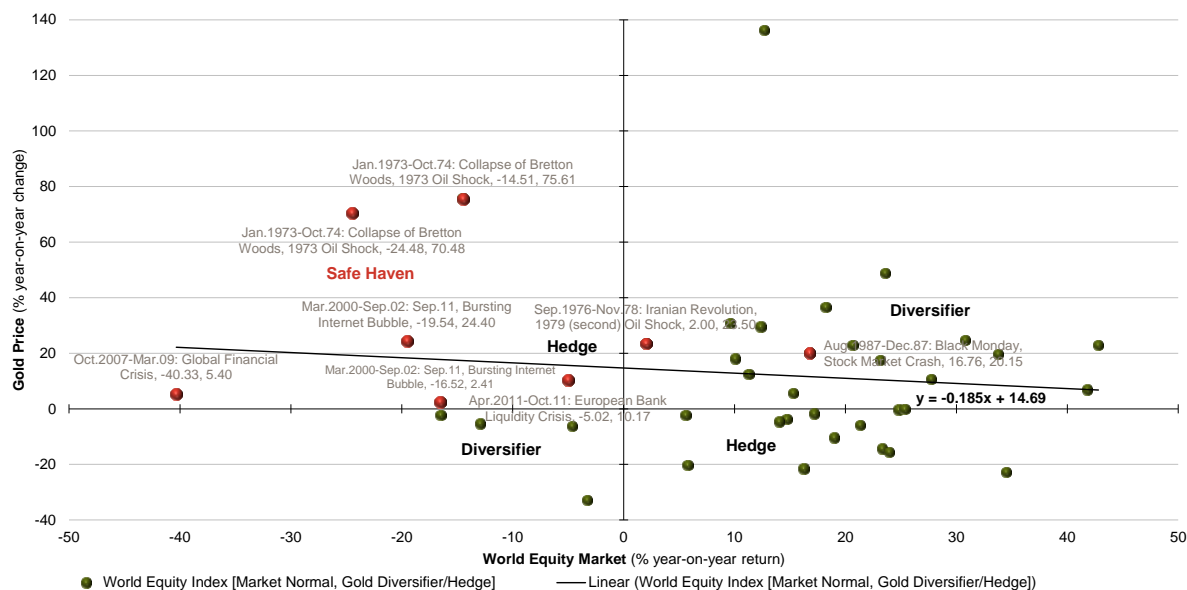
⁵ op. cit., Global Financial Data, **World Stock Return Index**.

⁶ US dollar fell against most major currencies by around 10%.

⁷ US S&P500 Index was up 39% from 31/12/1986 to 25/08/1987.

Chart 4: Equity Market Returns and Gold Prices Changes

Year-on-year figures



Negative Beta Assets

According to the Capital Asset Pricing Model (CAPM), a negative beta asset is an asset with a return below the risk-free asset. How is it possible for a risky asset to have a required return below the risk-free rate? This question is answered based on our earlier comment about gold providing financial insurance, i.e. that investors' are prepared to accept a return lower than the risk-free asset in return for a large relative pay-off in times of extreme negative shocks to their wealth.

In a blog a few years ago⁸, Aswath Damodaran deals with this question: "Can betas be negative?"

Here is a favourite question among corporate finance interviewers: "Can betas be negative? And if so, what exactly do they tell us?" The reason negative betas pose a conundrum to many finance students is that they seem to go against intuition. After all, if a beta of one is average risk and a beta of zero is riskless, how can an investment have negative risk?

Here is the answer. Yes, betas can be negative. To see how and why, consider what betas measure: the risk added by an investment to a well diversified portfolio. By that definition, any investment, that when added to a portfolio, makes the overall risk of the portfolio go down, and has a negative beta. A more intuitive way of thinking about this is that a negative beta investment represents insurance against some macro economic risk that affects the rest of your portfolio adversely. A standard example that is offered for a negative beta investment is gold, which acts as a hedge against higher inflation (which devastates financial investments such as stocks and bonds). It is also true that puts on stocks and selling forward contracts against indices will have negative betas.

What are the consequences of a negative beta? The expected return on that investment will be less than the risk-free rate; the nominal returns on gold over the last 40 years have been 2% less on average annually, than the risk-free rate. However, that makes complete sense if you think of it as buying insurance. You are paying for the insurance by settling for a very low or even negative return.

⁸ <http://aswathdamodaran.blogspot.com.au/2009/02/can-betas-be-negative-and-other-well.html>

Fundamental Perspective of Systematic Risk

In their 1984 research paper, "The Impact of the Degrees of Operating and Financial Leverage on Systematic Risk of Common Stock", Mandelker and Rhee explore the decomposition of a stock's systematic risk between its operating risk and financial risk by examining, "...the joint impact of the degrees of operating and financial leverage on the systematic risk of common stock"⁹. Their approach to calculating a company's operating risk can be characterised in the following equation:

$$\beta_{oa} = \beta_{rev} \times OLE (1 + 1 / PER)$$

Where:

β_{oa} = Systematic risk of the company's operating assets

$\beta_{rev} = \rho_{rev,m} \times \sigma_{rev} \times \sigma_m$ = Systematic risk of the company's operating revenue

$\rho_{rev,m}$ = Correlation between equity market returns and industry revenue changes

σ_{rev} = Standard deviation of industry revenue changes

σ_m = Standard deviation of equity market returns (a proxy for investor wealth)

OLE = Operating leverage effect = Contribution / EBIT

Contribution = Operating revenue - Variable costs = EBIT + Fixed costs

EBIT = Operating earnings before interest and tax

PER = Price earnings ratio

Note that the $(1 + 1 / PER)$ part of the equation converts the single period model ($\beta_{rev} \times OLE$) to a multi-period model.

The above equation shows the two fundamental aspects of leverage that impact operating risk: (1) the sensitivity of a company's revenue growth to unexpected changes in investor wealth; and (2) the sensitivity operating profit to unexpected changes in revenue given the fixed costs and profit margin of company.

Most of these items can be forecast from an individual company's financial forecasts, but to avoid company specific, or idiosyncratic risk factors, the β_{rev} is best estimated using changes to industry revenues relative to changes in the equity market (a proxy for investor wealth).

What then is our estimate of the β_{rev} for gold stocks? Given that the expected revenue for gold stocks is largely a function of the gold price and gold production, we can extend our previous analysis on the gold price to include gold production, and thereby estimate the β_{rev} for gold stocks.

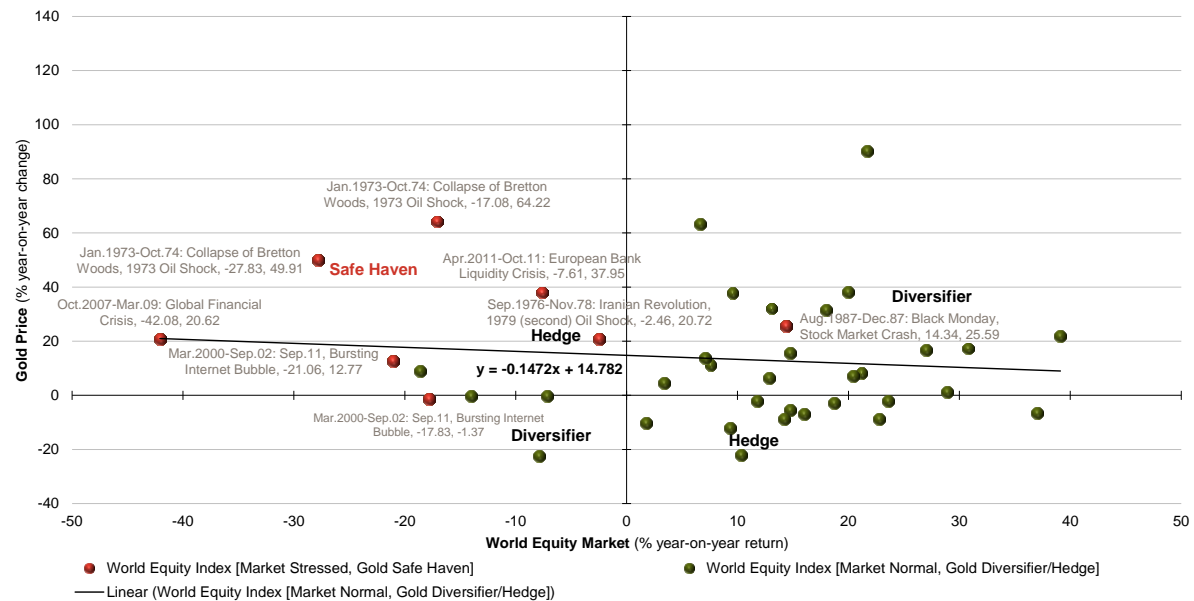
⁹ Gershon N. Mandelker and S. Ghon Rhee, **The Impact of the Degrees of Operating and Financial Leverage on the Systematic Risk of Common Stock**, Vol. 19, No. 1 (March, 1984), p. 46.

The Systematic Risk of Gold Industry Revenue

Chart 5 shows that changes to gold industry revenues appear slightly more sensitive to changes in the equity market (i.e. beta of -0.15 versus -0.19 for the gold price) primarily because of the lower volatility of gold production (i.e. annual standard deviation of only 4.4% versus 30.5% for the gold price), despite the higher correlation of gold production to the equity market (i.e. correlation of 0.19 versus -0.13).

Chart 5: Equity Market Returns and Gold Industry Revenue Changes

Year-on-year figures



The Systematic Risk of Gold Equity

Theoretically, if the systematic risk of gold industry revenues is negative, then operating and financial leverage within gold companies should result in even more negative betas. This would be akin to buying greater financial insurance by using borrowed funds. However, Chart 6 (next page) shows that the systematic risk of historic gold equity returns is slightly less than the systematic risk of gold industry revenue, i.e. -.12 versus -.15. So where's the leverage?

Part of the explanation is that the gold equity index we use in our analysis is the NYSE Arca Gold BUGS Index back to 1996 (its inception date), and prior to this the UK Financial Times Gold Index (back to 1971). Although the NYSE Arca Gold BUGS Index "was designed to provide significant exposure to near term movements in gold prices by including companies that do not hedge their gold production beyond 1.5 years", the UK Financial Times Gold Index did include gold companies with significant gold hedging books, which artificially lowered the systematic risk of these gold companies' revenues (at a substantial cost their cash flows, liquidity, and arguably their long-term fundamental value). In recent years most gold companies have seen how value destructive hedging is to shareholder returns (despite the agency benefit of lowering management employment risk!), and have largely unwound their gold hedge books.

Damodaran¹⁰ in his blog, also made the following observation about investments with negative betas:

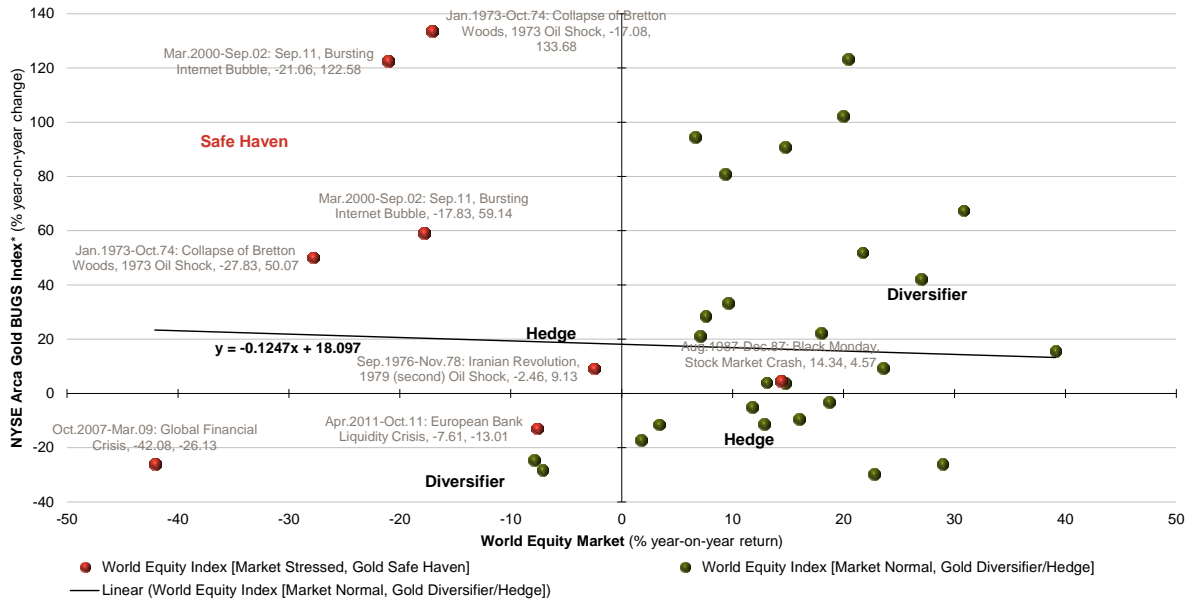
Are there actual investments out there that have negative betas? I know that there are stocks with negative regression betas, but those are the mostly the result of something strange happening during the period of the regression - an extended lawsuit or acquisition battle throwing off the correlation with the market rather the true betas. In fact, in my fifteen years of updating betas by sector, I have still not found a sector with a negative beta. Furthermore, even assets that, in theory, could have negative betas (gold, for instance) seem to have positive betas when securitized (gold shares, gold ETF). There seems

¹⁰ <http://aswathdamodaran.blogspot.com.au/2009/02/can-betas-be-negative-and-other-well.html>

to be something about the securitization process that makes real assets behave more like financial assets.

This may be true in terms of predicting the systematic risk of gold company share prices which are extremely “noisy” even over longer measurement period. Our goal is rather to predict the fundamental value of gold companies (as real assets), and therefore we are more concerned with the fundamental systematic risks of these companies, rather than the vagaries of their share prices.

Chart 6: Equity Market and Gold Equity Returns



Conclusion

To more accurately predict the *ex ante* systematic risk of a gold company (or any other company for that matter), an analyst should look to understand the fundamental non-diversifiable risk, or leverage, of the company being analysed. This leverage exists within the company’s revenues. That is, the inherent leverage of the volume and price of the company’s products to changes in investor wealth. Within a company structure, this revenue leverage is amplified via operating and financial leverage, resulting in the company’s equity systematic risk being typically greater than its revenue’s systematic risk.

Using statistically derived equity betas is fraught with not only problems of “noisy” historical data, but also changes in the degree of leverage (revenue, operating and financial) within an industry or company over time.

Based on the analysis in this paper, the best estimate of a gold company’s equity beta can be calculated by applying our estimated systematic risk for gold company revenues (i.e. -.15), and then levering this figure for that company’s operating and financial leverage using the Mandelker and Rhee formula.