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Volatility Trading For Gold: Hedging Global Instability

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BOB BIOLSI
Director,
Energy & Metals Research
& Product Development

VOLATILITY TRADING FOR GOLD: HEDGING GLOBAL INSTABILITY

This White paper is an introduction to trading volatility and the Gold VIX®. Volatility trading has become an important feature of the financial markets and has become an asset class in its own right. Gold volatility has become a key measure for gauging as well as weathering recurring turmoil in the world economy as well as the financial markets. This paper explores how Gold volatility in recent years has become an important means of financial diversification.

ROBERT A. BIOLSI
Director, Clearing Information Technology

Robert A. Biolsi has served as Director, Energy and Metals Research and Product Development of CME Group since August 2008. He is primarily responsible for developing new energy and metals options products for trading and clearing. He is also responsible for options product maintenance.

Prior to joining CME Group, Biolsi worked at NYMEX, Shearson-Lehman Brothers, The American Stock Exchange and Metropolitan Life Insurance Company. He also taught a wide variety of courses in economics and finance at numerous universities.

Biolsi received a bachelor's degree in economics from St. John's University, an MBA in finance at St. John's University and a Ph. D. in financial economics and econometrics from The Graduate Center of the City University of New York.

THE THEORY AND THE BEGINNINGS OF VOLATILITY TRADING

The notion of volatility trading can be traced to the development of Modern Portfolio Theory. At its heart, the theory guiding most asset managers attempts to optimize return for a given level of risk. Generally, asset managers taking on more risk accrue higher returns. Risk is often measured by volatility, or the magnitude of return fluctuations around the average return. Consequently, much time and resource are spent in the industry calibrating returns, volatility, correlation, betas, etc. While common practice, it has become clear in recent decades that there are times when the measure of risk itself, volatility, becomes uncertain.

This was the central idea of Frank Knight, writing in the 1920s who separated notions of risk and uncertainty: risk is measurable and uncertainty is not. Changing terminology, Modern Portfolio Theory relied on measurable risk. Where it hit a roadblock when the risk measures themselves changed. This introduced Uncertainty into market dynamics; i.e. the aspects of risk that become difficult or even impossible to measure. This has enormous implications for the financial industry in that the metrics that asset managers use to guide themselves and their trading strategies become moving targets. This modern notion of volatility trading probably finds its origin in the shocks and the linkages between different markets arising from the 1987 stock market crash.

The birth of Volatility as an asset class came about in the 1990s with the initial publication of the Volatility Index (VIX®) by the Chicago Board Options Exchange. Initially, the biggest focus was on the stock market. In 2004, the Chicago Futures Exchange launched futures contracts, and in 2006 the Chicago Board Options Exchange followed with a launch of options contracts on the "implied" volatility of options on the S&P 500. Since their launch, futures volume has averaged over 13,000 contract a day, with current open interest on futures of about 130,000 contracts. Options have been even more active, with over 170,000 average daily volume since 2006. These volumes are remarkable for such relatively new derivative products.

This modern notion of volatility trading probably finds its origin in the shocks and the linkages between different markets arising from the 1987 stock market crash

WHY COMMODITY VOLATILITY TRADING?

The first natural question that comes to the trading community is, "What are the compelling economic fundamentals behind commodity volatility?" Volatility is measured by the fluctuations in price that are derived from new information flowing into the market. For commodities like gold, this could be an inflation report, an economic disruption, or a mining strike. Sometimes, of course, it is the lack of information or uncertainty about demand and supply that causes prices to change dramatically.

For example, a political crisis where there is an uncertain outcome. The resulting magnitude of price changes induce risk into commercial or investor positions. Consequently, the extraordinary price movements in both financial and commodity markets in recent decades has compelled the trading community to look to not only the impact of volatility on a particular asset class, but also to how volatility spills across asset classes.

The last twenty-five years has witnessed a surge in financial market volatility. The reasons are too numerous to list separately here, but among the most important are increased globalization and the trend toward economic integration, the rise in emerging market economies, the increase in the number of market driven economies, technological advances in trading, and increased use of hedging instruments. Perhaps ironically, the increased level of market uncertainty has led market participants to think of volatility as an asset class in itself.

MEASURING VOLATILITY

As mentioned previously, risk assessments in the market are typically based on volatility. However, there are various means of measuring this volatility. The most common is realized or historical volatility. In measuring realized volatility, traders extrapolate the size of past returns on the asset in order to gauge the likely path of future movements. Generally, the specific measure as the standard deviation of returns. In the calculation, the percent returns from the asset are used rather than the price levels themselves. The trader also needs to make a decision as to the length of the observation period. While longer time periods add some stability to the measure by diminishing the impact of one day aberrations, shorter time periods tend to make the measure more reflective of the current environment. For the sake of uniformity, the assumption in this paper is to use a 20-day observation period, which generally corresponds to a calendar month. In addition, even though a short time horizon is often used, volatility is invariably expressed as an annualized value, i.e. the equivalent annual measure if the magnitude of the return fluctuations over the shorter time horizon were representative of the entire year.

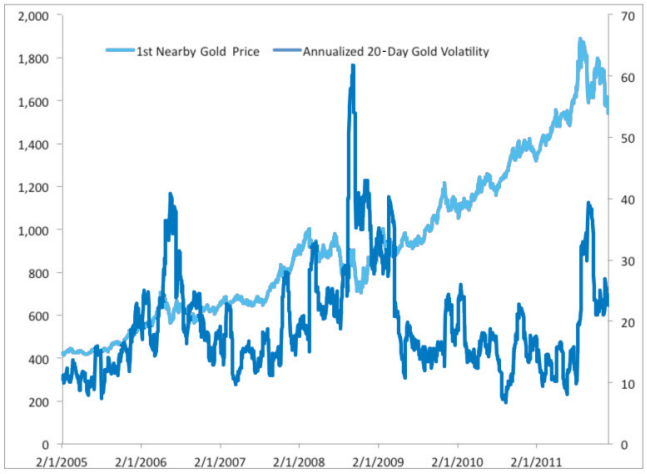
An alternative view would be to look at prospective volatility implied from current option prices. It is well established in options theory that the size of the options premium relative to the underlying asset price is sensitive to the markets assessment of future volatility over the life of the option. While sound in theory, it becomes difficult to implement in practice since different options series often yield different future implied volatilities. It is for this reason that the VIX calculation came into being. This calculation is often used to give a single composite assessment of volatility from all the different near-term option strike prices. For purposes of this paper, the VIX calculation for gold will be used to represent the market's 60 day forecast of future volatility.

CHARACTERISTICS OF VOLATILITY

The theoretical basis of volatility and the trading based upon it is the flow of information that comes into the market. As the market absorbs new information, whether positive or negative, prices have a tendency to fluctuate to a greater degree. Of course, there can also be a lack of definitive information driving price changes. As information gets incorporated into price, volatility tends to dampen. Consequently, volatility has a tendency to spike and then fall to more normal, or long-term levels as exhibited in the chart below, where the relationship between gold Price and volatility is illustrated in figure 1. The gold price per ounce is on the left axis while annualized volatility for gold is on the right axis.

figure 1.

Gold Price and Volatility

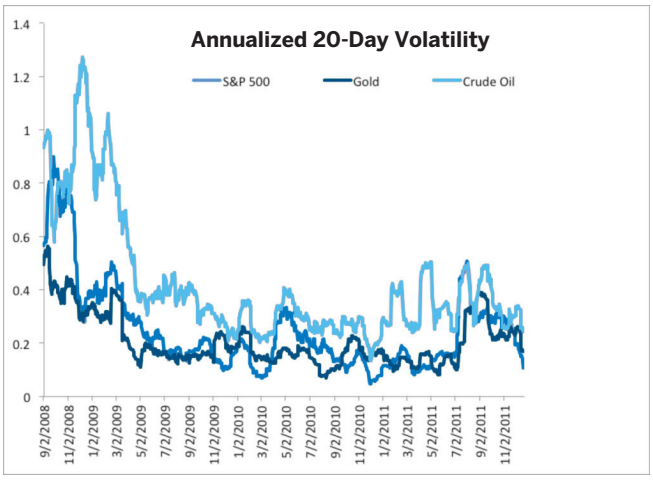


As can be seen in the graph, gold tends to have volatility in the 10-20 percent range. However, in times of turbulence, such as the financial crisis of 2008-2009, volatility spiked to 60 percent. Other notable periods were the European debt crisis of the summer of 2011 and the prolonged war in Iraq in 2006. Generally, the market will begin to assess the news more fully, and the markets will usually stabilize over time. Consequently, volatility instruments tend to be "mean reverting", i.e. tend to have spikes, followed by more normal behavior.

It is well documented in the equities markets, that volatility tends to have a negative correlation with price, i.e. market downturns tend to coincide with high volatility. This is a peculiarity of equities as equity value provides a cushion for debt levels of corporations. As that cushion deteriorates during a stock market downturn, it becomes self-reinforcing by raising doubts about creditworthiness. This in turn leads to more stock market selling and increased volatility. It is for this reason that the VIX volatility has been called the "Fear Index".

The pattern of behavior in the gold market is different. In many ways, gold can be thought of as a safe haven from economic and political turbulence. Gold prices rise typically when inflation rises, currencies (especially the U.S. Dollar) become weak, or world events go awry. Consequently, gold volatility has a much more mixed relationship with price than does the stock market. There are times price and volatility rise in tandem. The 2008-2009 financial crisis is a good example of that. Economic weakness in the U.S. led the Dollar to fall and inflation expectations to rise. As a result, gold price and volatility both rose. The acute European banking crisis in the summer and fall of 2011 had a different result. As Europe descended into economic crisis, the U.S. Dollar rallied and gold prices fell, even as volatility rose. Volatility trading for gold, unlike stocks then, can be unrelated to price levels.

There also tend to be spillover effects for different asset classes in terms of volatility. Prices, whether those of financial assets such as stocks or real assets such as gold, react to new economic information. For example, news on overall inflation tend to lead to changes in both the price movements for wheat and gold, even though the resulting price swings may be of a different direction or magnitude. The reasons are twofold. First, new economic information is likely to touch all markets in some way, leading markets to reassess price as a result. Secondly, this information is likely to cause the trading community to rebalance positions due to gains and losses in their portfolios which would lead to cross asset correlation based on volatility, if not on price. This can be seen in figure 2. The S&P 500, crude oil, and gold all are affected by market information in their own, unique ways, but in terms of volatility, i.e. the market digesting that information, there is a similar pattern to the three.



VOLATILITY TRADING

Perhaps the best means of arguing for volatility trading comes from economic theory. It was best summarized by the Economist Frank Knight who was careful to distinguish between the concepts of risk and uncertainty. He defined risk as being measurable uncertainty. Uncertainty, is defined as the markets future movements that cannot be quantified. To a large extent, volatility trading is meant to hedge uncertainty.

For example, markets have always had quantifiable measures of risk, such as the standard deviation of returns or beta. Many internal risk models such as Value at Risk (VAR) have used these measures as a means of determining how much collateral or margin would be required to mitigate the credit risk of counterparties. These risk measures are carefully measured and applied such that if the market maintains its current return distribution, the counterparties would be in a position to cover credit risk within a certain percentile such as 1 percent or 5 percent. However, it has become clear in recent decades that the entire return distribution itself can change. The 1 percent and 5 percent coverage benchmarks become moving targets as uncertainty intrudes on the markets by changing the risk measures, such as volatility, themselves. In short, the measure of risk itself becomes uncertain, and hence risk no longer be managed by traditional diversification strategies.

Volatility is often used as a proxy for systemic risk. Systemic risk essentially involves risk that diversification cannot generally alleviate. For example, the rise of modern portfolio theory calls for stock portfolios to include a broad range of stocks, including international holdings, to mitigate risk. However, the recent past has seen simultaneous sharp drops in major index across the globe. As such, even diversified portfolios can be subject to a high degree of risk that cannot be ameliorated through greater diversification. Moreover, market turbulence has been known to become self perpetuating, as sharp price moves result in margin calls, which in turn can lead to distress trading, which in turn can lead to execution of resting stop loss orders, which then can start the cycle anew.

Consequently markets have sought a means of diversifying against systemic risk, i.e. the risk that is not effectively reduced by diversifying across traditional asset classes. Since both globalization and technology advances have made financial markets ever more interconnected, information about changes in capital markets have increased correlations across asset classes. This has become particularly true during periods of economic stress, when markets seem to turn down in tandem. This of course changes the characteristics of traditional diversification strategies such as buying equities in different countries, or using commodities as a diversification tool for equities. In many events of the recent past, such as the 2008 credit crisis, diversification benefits of such strategies seem to disappear entirely.

It has become increasingly common from the recent past to look to linkages in volatility across asset classes. There are various reasons for this phenomenon. Primarily though, virtually all asset classes react to changes in economic fundamentals. With the continued momentum toward international economic integration, changes in these factors determine volatility and intersect across asset lines. Consequently, there is a growing tendency for the trading and investing community to look at volatility as an asset class in itself as a diversification tool.

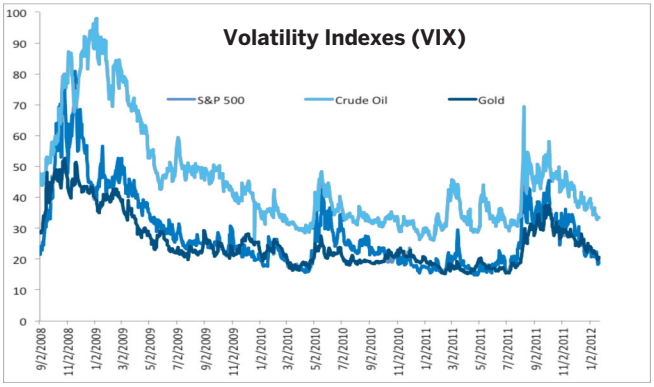
In the equity markets, prices are determined by myriad factors. While no one in these markets would ever guarantee a rising market, theory would seem to call for long-term growth prospects. In contrast, crude oil and gold are commodities that have prices determined by the interplay specific supply and demand factors. As a result, an important difference emerges between the VIX on the Standard & Poor's 500 and that of commodities such as gold and crude oil. With commodities, prices and volatility fluctuation when there are shifts in demand, supply, or both. For example, an increase in economic activity might shift the demand for crude oil higher. However, as the price rises, crude oil production is likely to rise increasing the supply. As a result, there is a large body of evidence to suggest that commodities "mean revert", i.e. as prices and volatilities change, the changes slowly dissipate over time. The fluctuations in the VIX contract would not necessarily have this mean reversion characteristic. Large price and volatility movements in the stock market, on the other hand, have no natural mechanism to return to long-term equilibrium.

FORECASTING VOLATILITY

Knowledge of past volatility is helpful, but typically arrives too late to help hedge trading positions. It is undeniably more helpful for traders to be in a position to take positions ahead of swings in volatility. It has long been known that liquid option markets have embedded the trading community's projection of future volatility over the life of the option. For this reason, index have been developed to measure this volatility. In the past, traders have noted that different strike prices from the options market, "imply" different volatilities for the future. This is no doubt due to faulty assumptions in the embedded option pricing model since obviously there can only be one future volatility for an underlying asset. Consequently, volatility index have been developed to provide a single consensus forecast of future volatility from all the nearby option strike prices. For the S&P 500 and crude oil, this consensus volatility is a 30-day projection while for gold it is a 60-day projection. The chart

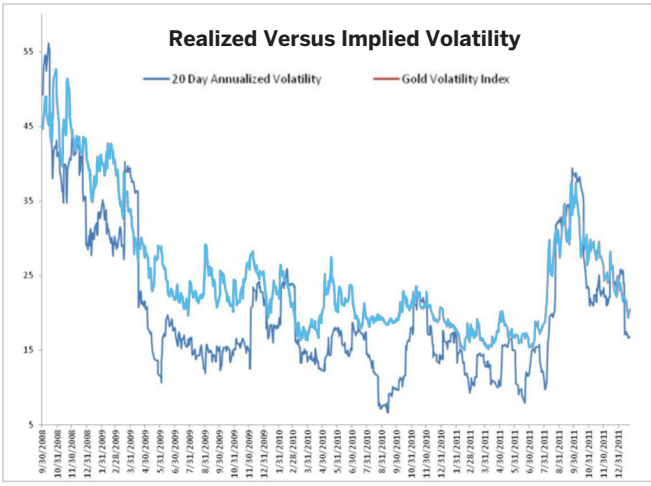
in figure 3. illustrates the movements of key asset classes in implied volatility relative to each other.

figure 3.



It is clear that these markets are all affected by the macroeconomic information as they all follow very similar patterns with one another. To illustrate the forecasting nature, the 20-day realized volatility for gold is graphed alongside that of the Gold Volatility Index in figure 4.

figure 4.



It can be seen that the options markets tend to be somewhat higher than the subsequent realized volatility. Partly this is due to the longer time period (60 days) in the implied volatility index. More importantly, there is a distinct tendency for the implied volatility index to foreshadow movements in the subsequent movements in gold.

VOLATILITY TRADING STRATEGIES

The financial markets have a long history in trading volatility. There are many options strategies that are based on the differences between expected and realized volatility. Option "straddles" (buying both a put and call option at the same strike price and same expiration) being the most prominent. In this case, if volatility were to cause the market to move higher, the call option would move in-the-money. If the market were to fall sharply, the put option would be in-the-money.

There are other strategies to trade volatility. Option "strangles", are similar to straddles in that they involve both a call and put position. However, the strike price of the call tends to be higher than the strike price of the put option. This position tends to be less expensive but requires an even greater move in underlying prices in either direction to profit. There is also a "butterfly" strategy which requires buying an out-of-the-money call (or put) and an in-the-money call (or put), while simultaneously selling two calls (or puts) in between. In this case, it profits with less extreme movements in the market. Each of these options strategies involves fluctuations in the direction of price changes as well as changes in volatility itself as part of their payoff. In general, options volatility strategies need to be periodically rebalanced in order a pure view on volatility.

APPLICATIONS

It is of course incumbent on the trading community to not just understand the impact of new information on prices, but also to apply it to their trading positions in a rational way. Specifically, the question must be answered, "What is the proper role of volatility trading, particularly for asset classes like commodities?" For the trading community, what would volatility trading add to an investor or trader's portfolio?". To answer this crucial question, the interested trader needs to understand the economic significance of volatility. As discussed above, the relationship between volatility and information (or lack of) on other assets is directly related to the role of volatility as a portfolio diversifier.

As an example, volatility in gold prices can have important implications for equity, fixed income, and currency markets. As a general rule, Gold can be thought of as currency proxy. Fluctuations in price imply a reassessment of the risk of inflation, deflation, or currency fluctuations. Volatility, as represented by the magnitude of these fluctuations would then reveal information on currency and inflation developments that would be important for other markets like stocks and bonds.

A regression was run with the returns on the S&P 500 against the return on contemporaneous Gold VIX from September of 2008 until January of 2012. The results are reported below:

S&P 500 Daily Percent Return = .00 -.08 Gold VIX, where the Gold VIX is statistically significant.

Aside from the statistically strong relationship between stock market returns and commodity volatility, there are a couple of points to note from the above regressions. First, the regression coefficients are negative. Consequently, the less volatile commodity volatility the higher the rate of return on a broad measure of stock returns. The intuition behind this is the less uncertainty for gold (and the global economy), the greater the confidence in the economy and hence stocks. For investors looking to hedge their equity positions, a long position in the Gold VIX® would offer some hedging protection.

Perhaps more interesting, is the fact that commodity volatility adds explanatory power to the returns on the S&P 500 even after accounting for the effects of the VIX contract. Over the above time period, a regression on daily S&P 500 returns against gold VIX, and S&P VIX. The coefficients and associated T-statistics are given below:

	Coefficient	T-Statistic
Gold VIX	-0.065	-4.47
S&P VIX	-0.055	-6.73

It is well known that the VIX has helped hedge stock market portfolios. The results above demonstrate that adding gold options, as a proxy for gold volatility, to the portfolio, would add more diversification and hence less risk to systemic shocks to the stock market.

SUMMARY

Volatility in gold, as well as volatility trading has become an important feature of the financial markets. In this paper, it is argued that it has become an asset class in its own right. Gold volatility has become a key measure for gauging as well as weathering the recurring turmoil in the world economy as well as the financial markets in recent years. As such, it has become an important tool for hedging systemic risk and uncertainty. The value of such a hedging instrument of course is dependent upon its correlation with the rest of the portfolio. Gold volatility has demonstrated that in recent years that it has become an important means of financial diversification. These diversification properties are enhanced further as they are shown to be leading indicators of the dependent variables.

[1] Knight, Frank H. ***Risk, Uncertainty, and Profit***. Boston: Houghton Mifflin, **1921**.

[2] The index of the volatility and variance swaps respectively are generally calculated as

$$\text{Volatility} = \sqrt{\frac{P_t}{P_o} \cdot \sum_{i=1}^{n} \left(\ln\left(\frac{S_i}{S_{i-1}} \right) \right)^2 \cdot 100}$$

$$\text{Variance} = \frac{P_t}{P_o} \cdot \sum_{i=1}^{n} \left(\ln\left(\frac{S_i}{S_{i-1}} \right) \right)^2 * 100$$

Where

P_t	Number of observable periods in a calendar year
P_o	Number of observable periods in the life of the contract
n	Number of observations taken in the life of the contract
i	The period being observed
S_i	The level observed at period i

[iii] Frank Knight, The Theory of profit

[iv] P-Value from the regression was .00001