# Volatility: The Market Price of Uncertainty

Christopher R. Cole, CFA
*Founder and Managing Partner*
*Artemis Capital Management LLC*
*Santa Monica, CA*

*Today's securities markets are pricing in yesterday's crash, the known unknown, rather than tomorrow's unknown unknown. To understand volatility as an asset class is to value the forward expectation of uncertainty, which is as much a function of human psychology as it is an expression of mathematics. Since the financial crisis, the pricing of volatility derivatives has undergone wide-scale changes that reflect classic behavioral biases. Not only is volatility an asset class, but in fact, it may end up being the most important asset class for institutional portfolios over the next decade. A strategy of "crisis alpha," defined as the strategic acquisition of mispriced volatility, is a powerful way to navigate future uncertainty.*

True knowledge is not what you know but certainty in what you do not. Volatility is simply about putting a price on that. Drawing from the famous quote by Donald Rumsfeld, former US Secretary of Defense,[1] the trader of volatility must be able to identify "known unknowns" and "unknown unknowns" while simultaneously making a market in both. My job as a volatility trader is to value investors' collective fear of an uncertain future. The premise that volatility can be valued like a stock or bond is a surprisingly new and controversial idea. Advanced volatility trading seeks to arbitrage differences in the perception of variance across time, space, and asset classes in a dynamic way. Keep in mind that the valuation of volatility, like any other asset, is about the uncertainty with which market participants discount future states of the world as compared with the present. This view is true even when the "asset" is uncertainty itself.

For Artemis, the objective of volatility trading is "crisis alpha," specifically defined as an uncorrelated return stream whereby the balance of risk and reward is skewed toward heightened market volatility without the constant negative carry associated with portfolio insurance. To achieve this end, a crisis alpha fund seeks out mispricings in the expectation of future uncertainty and may balance long volatility exposure with strategic shorts. It is important to differentiate between crisis alpha and portfolio insurance. Although related conceptually, crisis alpha does not promise protection against every negative event, but it should also perform better than portfolio insurance in low volatility markets. The fund that seeks crisis alpha should have a positive risk-to-reward ratio overall but with the best gains reserved for market crashes, such as in mid-2011 and during the financial crisis of 2008.

Volatility and the market for uncertainty have experienced massive and wide-ranging changes since the financial crisis. Although these changes are measured using mathematics, they are entirely sourced from human behavior. Volatility traders may be known for being quantitative in nature, focusing on differential equations and exposures measured with Greek measures (such as gamma, delta, or vomma), but at the end of the day, all of that math is irrelevant if it cannot be tied back to base-level human psychology. The goal of this article is to encourage you to look at volatility in a new light and to understand how volatility markets can provide insights into behavioral economics and market uncertainty. I also want to make the point that much of what investors deem as alpha is derived from hidden volatility trading. Not only is volatility an asset class, but in fact it will be the

*This presentation comes from the Financial Analysts Seminar held in Chicago on 22–25 July 2013 in partnership with CFA Society Chicago.*

*The materials are compiled from Artemis Capital Management LLC white papers titled "Volatility at World's End: Deflation, Hyperinflation and the Alchemy of Risk" and "Volatility of an Impossible Object: Risk, Fear, and Safety in Games of Perception."*

*Editor's Note*: *Artemis Capital specializes in trading volatility derivatives.*

[1]Donald Rumsfeld, "DoD News Briefing" (12 February 2002): www.defense.gov/Transcripts/Transcript.aspx?TranscriptID=2636.

most important asset class over the next decade of portfolio management. Many investment managers are already volatility traders; they just do not realize it yet.

## Volatility, the Markets, and the Unknown

Investors cannot assume that the paradigm of lower interest rates and debt expansion that has characterized the market over the last three decades will be relevant for modeling risk going forward, nor can they find shelter in the consensus rules formed around those standards. In a world of shadow banking, the abstraction of the market has become an economic reality unto itself. Today, paradox is the new paradigm, and volatility markets are a reflection of that duality.

Imagine the world economy as an armada of ships passing through a narrow and dangerous strait. On one side of that strait is the waterfall of deflation, and on the other side is the hellfire of inflation. Volatility can be thought of as the powerful waves that could cause the ships to crash into one extreme or the other.

History is filled with volatility shocks associated with deflationary crashes. Probably the most egregious instance was the Great Crash of 1929, when monthly realized volatility rose above 100% and led to the Great Depression. The 1987 Black Monday stock market crash and the 2008 crash following the Lehman Brothers collapse also represented periods of prolonged volatility. In the case of 1987, the VXO index, the predecessor to the VIX (Volatility Index), reached levels of more than 150%.

Realized volatility is a statistic that is indifferent to price direction. Volatility spikes are typically associated with declines in markets, but that is because markets typically fall faster than they rise. This market behavior is a rule and not a law. In hyperinflationary periods, rising volatility can be associated with rising stock prices. A good example is the hyperinflationary period in Weimar, Germany, in the early 1920s. In 1919, the German stock market's realized volatility was on par with realized volatility in US markets today, about 15–17%. By 1923, realized volatility in the German stock market peaked at 2,000%.

It is very difficult to imagine the VIX at 2,000%—but it is not impossible. And if it were ever to occur, it would most certainly be in a hyperinflationary environment. One example of higher volatility driven by rising equity prices is occurring right now in Japan. As a result of aggressive fiscal and monetary policy, dubbed "Abenomics," volatility and implied volatility in the Nikkei index have risen in conjunction with rising Japanese stock prices; the same dynamic, albeit far less dramatic, was experienced in Weimar, Germany. Since 2008, US options markets have priced in the risk of higher volatility driven by deflation, but the reality is that higher volatility can be caused by a melt up in market prices.[2]

To better understand the essence of volatility, let me first delineate and contemplate the "volatility" of an impossible object. The impossible object is best represented by the art of M.C. Escher and is depicted in an illustration that highlights the limitations of our perception. The concept is crucial in philosophy, art, and mathematics as well as, I believe, in the modern pricing of risk. Modern financial markets are an impossible object, and the volatility of an impossible object is the changing perception of risk. So, if bonds are viewed as safe havens today but tomorrow they are not, that is a source of great volatility. And if today the assumption is that bonds and stocks are uncorrelated with one another but tomorrow they are correlated, that is also a source of great volatility. Which direction are the staircases moving in the classic M.C. Escher illustration titled "Relativity"? Up is down, or is it down is up? It depends on your perception!

Everything you need to know about volatility trading is in this quote from Rumsfeld I referenced earlier: "There are known knowns; there are things we know that we know. There are known unknowns; that is to say there are things that we now know we don't know. But there are also unknown unknowns—there are things we do not know we don't know." Volatility trading is about putting a price on known unknowns and unknown unknowns. An example of a known unknown is a risk factor that we are aware of, such as the risk that the Federal Reserve may begin to taper bond purchases in late 2013. Another example would be a hard landing for China. These are known risks and can be quantified, and these risks are priced into volatility markets. The unknown unknowns are the true shocks. They are the risk factors that come out of the blue, such as 9/11. They can arguably be priced, through convexity and tail risk (although some disagree), but they can never be predicted.

When investors buy volatility, they are not buying realized volatility; they are buying the expectation of volatility across some time frame.

[2]A melt up is a dramatic improvement in the performance of an asset, generally driven by more investors buying the asset rather than by fundamental improvement in the economy. Gains are considered an unreliable indicator of potential market movement.

The price is based on both known unknowns and unknown unknowns. So, how is the price of known unknowns quantified? One way is to compare the implied with the realized variance risk premium. Some other ways are to consider the skew or the term structure of volatility. And how are unknown unknowns priced? This pricing is a lot more difficult, but the market actually tries to price them using the price of convexity. If the price of convexity is backed out—that is, roughly the price of tail risk, far out-of-the-money skew, or the variance to volatility swap premium—the result is a theoretical price of unknown unknowns.

Two types of market crashes can occur, depending on the knowledge base. A known unknown crash is a traditional leverage-based crash. This crash occurs over a long period of time—days or even months. It tends to occur after a leveraging cycle with long periods of very high volatility. Many people think that volatility mean-reverts, but in a systemic known unknown type of crash, volatility can remain elevated for long periods of time, whereas the volatility of volatility actually reaches an equilibrium. Examples of an unknown unknown crash would be Black Monday in 1987 and the 2010 Flash Crash. These are hyper-speed crashes with a lot of reflexivity and tremendous volatility of volatility—that is, the changes in volatility itself are massive. These crashes tend to correct as quickly as they occur. The known unknown crash is predictable in retrospect, but the unknown unknown crash is unpredictable even in retrospect; its cause is never truly understood.

## A Volatility Trader's Toolkit

Volatility derivatives are based on the concept of replication and are a post-modern asset class. I use the term post-modern to describe how volatility is recycled into new and different exposures through reproduction and reconstruction. For example, S&P 500 Index variance swaps can be replicated through strips of index options, and forward-starting variance swaps thereafter should maintain an arbitrage equilibrium range to VIX futures. So, the volatility product spectrum begins with listed calls and options, such as index or single stock call and put options. It moves from listed options to OTC volatility derivatives, such as variance and volatility swaps. Finally, it moves to listed volatility derivatives, such as VIX futures, VSTOXX futures, and exchange-traded structured products. A fund can invest and trade across all these different types of products to recombine the exposures, look for arbitrage opportunities, or gain a specific type of exposure.

In the first part of the volatility product spectrum, investors gain volatility exposure using listed calls and options and then measure that exposure through a Black–Scholes model. These instruments are path dependent because the volatility exposure must be delta hedged. Emanuel Derman was part of a team that devised a methodology using log contracts and synthetic replication to rebalance the underlying options into pure variance derivatives.[3] Through this method, market makers can buy strips of out-of-the-money puts and calls, each balanced by the inverse of its strike price squared, to produce a consistent dollar gamma and, if rebalanced accordingly, a consistent delta exposure to the underlying. The result is pure variance exposure without having to worry about the delta-hedging problem, which moves along the post-modernism spectrum. This financial engineering led to the creation of a liquid OTC variance swap market and to the creation or refinement of major volatility indices, such as the VIX. The VIX measures the implied volatility of the S&P 500 30 days in the future. Simply put, the VIX is the quoted rate of a constantly rebalanced, constant maturity, 30-day variance swap.

From a variance swap, investors then move along the spectrum to forward variance swaps. Peter Carr asserted using Jenson's inequality that an arbitrage boundary exists between a forward variance swap on the S&P 500 and a VIX future.[4] Based on this arbitrage relationship, institutions began to offer listed volatility exposure through VIX futures on the Chicago Board Options Exchange (CBOE). The VIX futures lead to options that are priced from VIX futures, and then to the creation of popular VIX exchange-traded products, such as the VXX (iPath S&P 500 VIX Short-Term Futures ETN) and XIV (Velocity Shares Daily Inverse VIX Short-Term ETN), which are at the very end of the volatility derivatives spectrum (and most easily accessible to retail investors). Today, there is a wide range of volatility derivatives beyond the VIX, including listed volatility futures on the Euro Stoxx 50, Nikkei, emerging markets, and gold, but liquidity remains challenging for many of the new products.

---

[3]Kresimir Demeterfi, Emanuel Derman, Michael Kamal, Joseph Zou, "More Than You Ever Wanted to Know about Volatility Swaps," Goldman Sachs Quantitative Research Notes (March 1999).

[4]Peter Carr and Liuren Wu, "A Tale of Two Indices," *Journal of Derivatives*, vol. 13, no. 3 (Spring 2006):13–29.

Many investors tend to think about volatility only in terms of direction: long or short volatility. Hence, within this limited view, there are either tail risk funds that lose money waiting for a black swan that may never appear or anti-fragile short volatility funds that are a 100-year flood away from the inevitable blowup. Crisis alpha, although skewed toward the long side, takes a balanced path, relying on relative value volatility trading. This approach is conceptually similar to trading fixed income across the yield curve. In the same way the yield curve represents embedded expectations for future inflation and monetary policy, volatility curves and skew contain embedded expectations for future variance, probability of asset returns, and tail risk across different asset classes. Value can be found in volatility by quantitatively valuing these expectations through time and trading over- and underpriced known unknowns in a comparative value framework. The correct combination of long and short volatility positions can yield a payoff that exhibits positive exposure to volatility while limiting cost or even earning positive carry.

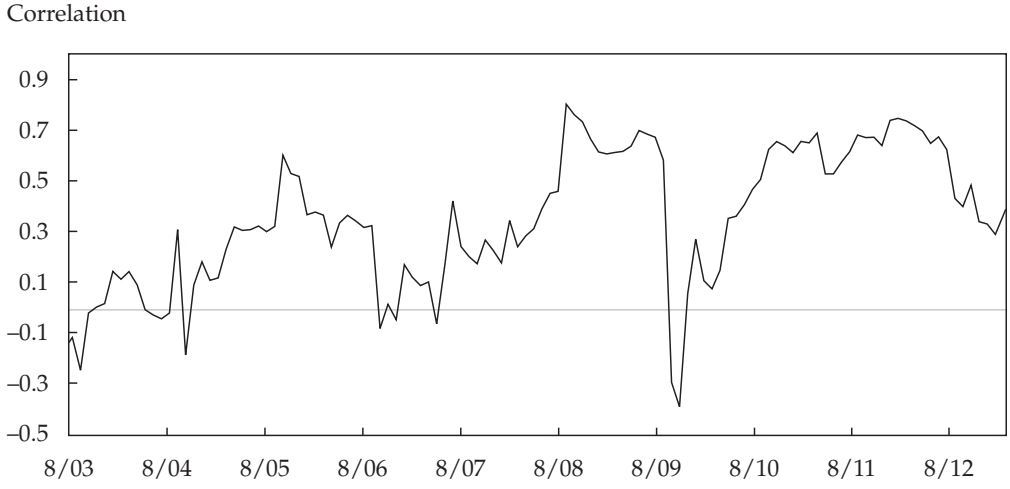
## We Are All Volatility Traders

The alpha from active management often comes down to two factors: (1) asset selection and (2) short volatility or short correlation exposure. When markets become more correlated, asset selection becomes increasingly irrelevant. The only thing that remains is the short volatility exposure. Many classic active management hedge fund strategies derive a lot of their alpha from simply being short volatility and short correlation. Long–short strategies operate in this way, as do relative value arbitrage strategies. Even buy-and-hold, classic value investing is synthetically short volatility. In fact, one of the components of replicating a short variance swap is buying on lows and selling on highs—that is, actively timing the market.

To prove my contention that nearly all active traders are hidden volatility traders, I graphed the 12-month rolling correlation of a simple short volatility position, an S&P 500 short straddle, with a cross-section of hedge fund returns for the period of August 2003 to February 2013. The result is shown in **Figure 1**. The average correlation is quite high, especially during times of crisis, and has been rising steadily over the 10 years. When the asset-selection component is removed from the investment process, all that remains is short volatility and short correlation exposure. Thus, a lot of active managers are simply short volatility traders in disguise, so it is not surprising that most underperform in a crisis.

To build on this idea, how can an investor know when alpha is real or if it is just short volatility in sheep's clothing? **Figure 2** shows the theoretical performance of two managers. Manager 1 has done a fantastic job, earning an annual return of 36.9%. His maximum drawdown is only 10%, and his Sharpe and Sortino ratios are 2.14 and 3.79, respectively. Manager 2 has been a complete disaster. He has experienced two massive drawdowns, and his

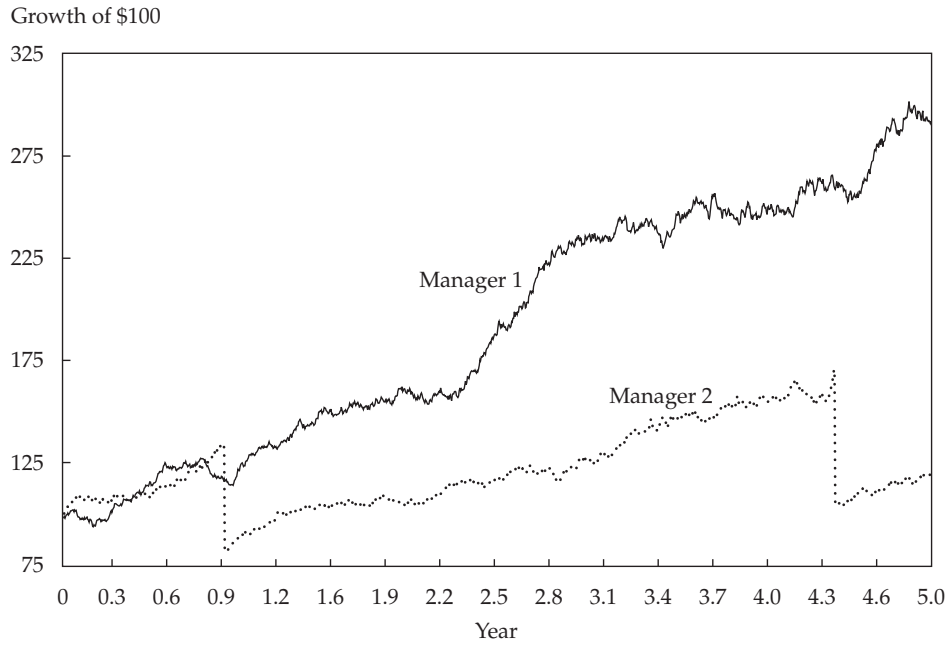
**Figure 1. Rolling Correlation of a Hedge Composite with an S&P 500 Short Straddle, August 2003–February 2013**




*Note:* Hedge composite includes the following Hedge Fund Research indices: absolute return, equity neutral, hedge, merger arbitrage, relative value arbitrage, and convertible arbitrage.

*Sources:* Based on data from Hedge Fund Research Indices and Artemis Capital.

**Figure 2. Theoretical Performance of Two Hedge Fund Managers over Five Years**




annual return is only 5%. His Sharpe and Sortino ratios are very close to zero.

On the surface, Manager 1 is a star, but I will let you in on a secret: Both managers' track records are mathematically identical in process. They were built using the same random stochastic process with an assumed +10% drift, yearly volatility of 10%, and the probability that a 3–4 standard deviation event triggers a 30% drawdown. Given a long enough time horizon, their performance records *will converge*. The point is that in the universe of active managers it becomes very hard, even over long periods of time, to determine the true future loss of the hidden short volatility component in performance. Institutional investors may fool themselves into being confident with a cross-section of diversified managers—not realizing they all share short volatility and correlation exposure, thus creating the risk of a huge correlated loss and drawdown. The "short volatility" risk in active management is largely hidden, until it is revealed—a wolf in sheep's clothing. This surprise faction is why crisis alpha is so important.

Fund managers should be classified by the nature of their returns rather than their underlying assets. I find it puzzling how institutions are focused on countless asset buckets, such as fixed income, equity value, or macro, but ignore the fact that active manager returns largely fall into two simple categories: (1) short volatility bias or (2) long volatility bias. The first group comprises the majority of active managers who are secretly short some combination of volatility, correlation, and liquidity or are simply leveraging beta. The second group contains true hedgers, the crisis alpha players, whose portfolios are uncorrelated with the markets. Please keep in mind the managers do not need to be pure volatility players. I can name a number of clever global-macro managers or systematic futures traders whose process I would define as crisis alpha even though they may never trade a volatility derivative or option. Regardless of the asset class, the true source of alpha seems to be moving between short and long volatility exposure—the volatility risk process and not the underlying asset. In 2008, many institutional investors woke up to the harsh reality that although they may have been asset-class diversified, in reality they were simply 100% short volatility.

## Bull Market in Fear

The idea of a bull market in fear is a new paradigm for pricing risk that emerged after the financial crisis. It is defined by the following four characteristics: (1) abnormally steep volatility term structure, (2) distortions in volatility from monetary policy, (3) expensive portfolio insurance, and (4) violent volatility spikes and hyper correlation. The bull market in fear is more about where markets think volatility is going tomorrow than where volatility is today. So, volatility might be low today, but the expectation of volatility tomorrow might be very high. This dynamic has wide-ranging ramifications

for anyone who trades portfolio insurance, buys portfolio insurance, or manages money.

Four factors play a role in the bull market in fear. The first is the emotional factor. An example of this factor is post-traumatic deflation disorder, which is the concept that people have a strong emotional memory of the last collapse and want to buy protection to avoid repeating that process again. The second factor is monetary. The Fed's quantitative easing and low interest rate policies have forced investors to take more risk and to chase yield. Investors do not feel comfortable doing so and want to be protected. The third factor is macro risks, which are the true geopolitical risks facing the world, such as debt levels in developed economies, unrest in the Middle East and Iran, and the tensions between Japan and China. The fourth factor is government regulation, including the Dodd–Frank Act and the Volcker Rule. New regulation has constrained the risk appetite of banks to supply volatility, but there is no one else available to take the place of banks, which has caused an increase in the term structure of volatility.

An illustration of the bull market in fear can be made using the variance swap replication process to create a term structure for volatility. Think of it as a yield curve for volatility. So, a yield curve reflects investor expectations for inflation and monetary policy, but a volatility term structure reflects expectations for tail risk, the volatility of volatility, and other risk factors. Since 2009, investors have experienced a bull market in fear whereby the volatility term structure has steepened dramatically, driving up the cost to hedge. As Alfred Hitchcock said, "There is no terror in the bang, only in the anticipation of it." The volatility term structure reflects this sentiment, which is driven mostly by market psychology.

The impact of the bull market in fear can be seen in a comparison of VIX futures from September 2008 and August 2012. On 17 August 2012, spot VIX touched a five-year low of 13.45, and the media reacted to that by saying it was a good time to buy volatility. But based on the term structure of volatility, to buy volatility for a one-year hedge would have cost more with the VIX at 13.45 than it did the day after Lehman went bankrupt, when spot VIX was at 31.70. Many investors find this almost unbelievable. The VIX is just one dimension of volatility. Just as no one should sum up the entire credit market by what the two-year Treasury is doing, no one should sum up the entire volatility market by what the VIX is doing. Volatility is multidimensional and should be viewed accordingly by using term structure, skew, and premiums to realized volatility.

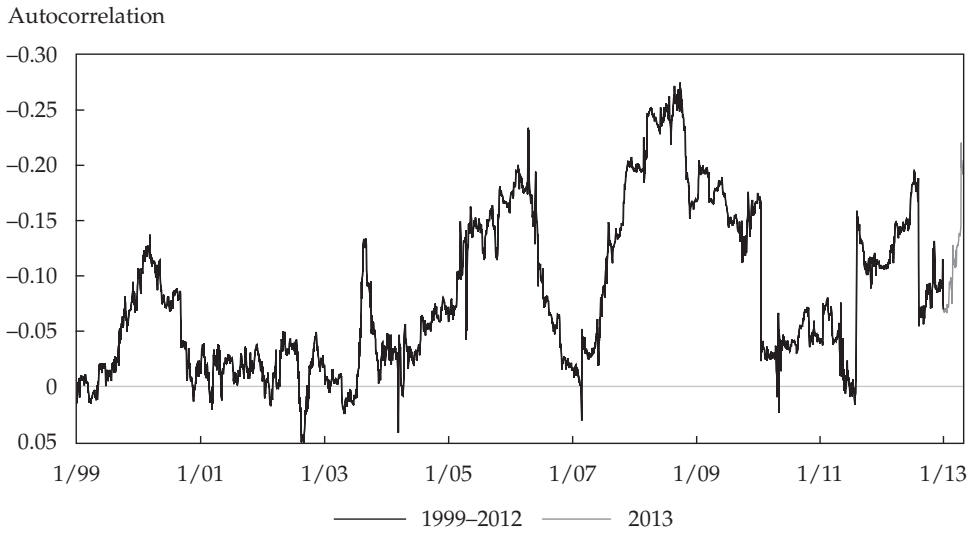
The academic literature contains many models to calculate forward expected volatility, including generalized autoregressive heteroskedasticity (GARCH); stochastic alpha, beta, rho (SABR); or Heston. Today, the most effective model for determining the future volatility is, sadly, the Fed's balance sheet. When the Fed expands its balance sheet, volatility drops. When the Fed stops expanding its balance sheet, volatility spikes. When the Fed increased its balance sheet under QE1 from May 2009 to April 2010, volatility declined, but when the Fed stopped easing, the Flash Crash occurred in May 2010 with a commensurate jump in volatility. When the Fed began QE2 in November 2010, expanding its balance sheet again, volatility dropped. When that program was stopped in July 2011, another spike in volatility occurred, accompanied by the August 2011 crash. In September 2011, the Fed launched Operation Twist and the European Central Bank undertook its Long-Term Refinancing Operation, causing volatility to drop again. This pattern makes it clear that volatility will likely spike up again when the current easing program, QE3, is halted or tapered.

Some may wonder whether the bull market in fear is over because spot volatility is low and equity markets are rising. Has Bernanke and the central bank succeeded in finally destroying volatility? Volatility is not dead, but it has been artificially suppressed. Consider the St. Louis Federal Reserve Bank's Financial Stress Index, which tracks a plethora of credit and liquidity stress conditions across markets; it has a strong correlation with the VIX and has been rising as taper talk has increased. The fact that financial stress moves in lock-step with Bernanke's words is a bad omen for volatility given any future withdrawal of stimulus.

Another indication of suppressed volatility is rising mean reversion of daily returns or negative autocorrelation. Mean reversion generally peaks before rising volatility. Post-crisis, the mean reversion of daily returns has hit historically high levels. **Figure 3** shows the negative autocorrelations—the *y*-axis is flipped—of daily movements of the VIX from January 1999 to January 2013. Negative autocorrelation means high mean reversion, and high mean reversion tends to occur before crises, as seen in the peak in 2000 before the recession in 2001–2002. The last peak in mean reversion was in 2008 before the most recent recession.

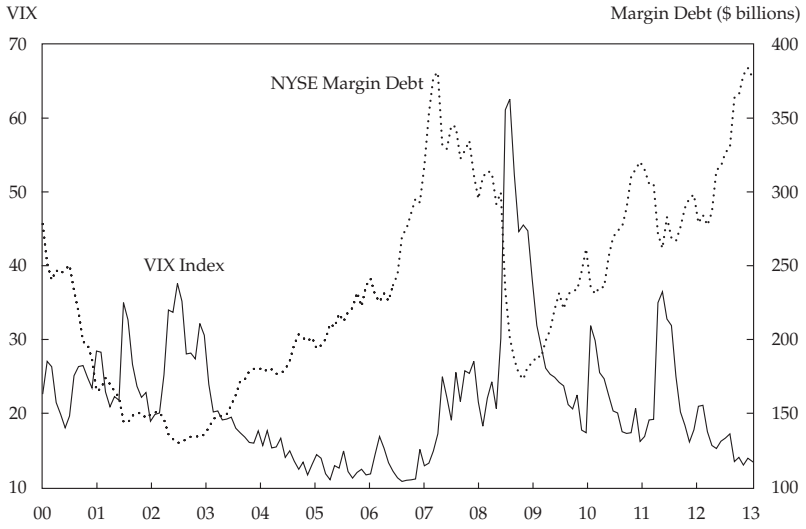
Another warning sign is illustrated in **Figure 4**, which shows the level of NYSE margin debt and the level of the VIX. Today, NYSE margin debt is at an all-time high and the VIX is close to an all-time low. The last time that happened was in 2008. The important assessment is not where volatility

**Figure 3. Negative Autocorrelation of Daily Movements of the VIX, 1999–2013**




*Note:* Autocorrelation data are based on a three-month look back.

**Figure 4. NYSE Margin Debt and the VIX, 2000–2013**




*Source:* Based on data from the NYSE.

is today but what kind of conditions may lead to higher volatility tomorrow. The VIX is reactive, not proactive.

## How to Beat a Bull Market in Fear

It is possible to beat a bull market in fear by doing three things. First, hedge unknown unknowns and sell known unknowns. When the market identifies a risk factor, it tends to be overpriced in volatility markets, which means that there is an opportunity to sell that risk to fund underpriced volatility positions elsewhere. Investors can recycle exposure to known unknowns into exposure to unknown unknowns—that is, those areas in which risk is not priced into the markets. Second, buy both tails of the return distribution. Buying both tails of the return distribution is currently a great strategy in the Japanese market. Third, when risk free is risky, do not rely on the classic rules of diversification. Later, I will discuss how the traditional portfolio can be very risky when a "bull market in fear" meets a "bubble in safety."

Crisis alpha can beat a bull market in fear. Today, the term structure of volatility is very steep, but near-term volatility is very cheap. So, investors can recycle the known unknown exposure, the overpriced uncertainty, at the back of the volatility term

structure to the more sensitive front of the curve until the next volatility spike. From a skew perspective, the option market tends to assign too much weight in the belly of the probability distribution, so buy both extreme tails—deflation and hyperinflation—and sell the middle. Ultimately, this approach creates tail risk exposure at a low cost of carry.

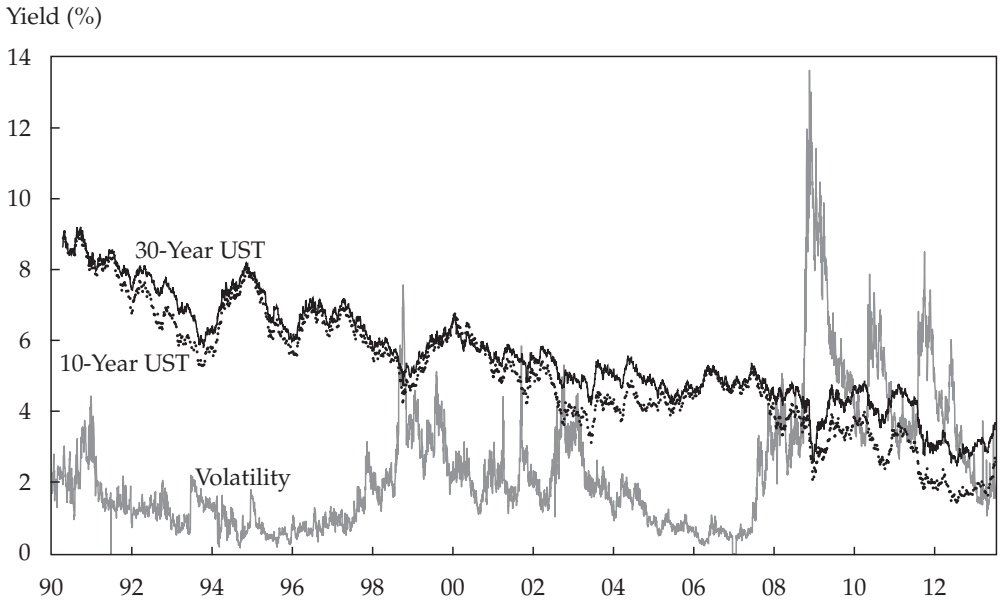
For the first time in history, the annualized short volatility yield—that is, a fully collateralized out-of-the-money S&P 500 put—is competitive with the yield on long-dated US Treasury (UST) bonds. This is the result of the bull market in fear meeting a bubble in safety. **Figure 5** shows a comparison of the yield earned from shorting a put on the S&P 500 that is 25% out of the money with the yield on 10- and 30-year UST bonds for 1990–2013. A comparison of the potential losses under various historical stress test scenarios plotted on an efficient frontier reveals that at the high end, the S&P 500 could go down by 50% and rates on UST bonds could go up by 320 bps to 600 bps. A short volatility position on a risk–return basis is conceptually very similar to a 10- or 30-year UST bond. But shorting volatility is considered dangerous, whereas Treasuries are supposed to be the safest asset in the world. To own a Treasury bond at these levels to maturity is a form of a long-term volatility short.

A mathematical connection exists between the sensitivity of volatility and the degree of correlation. As correlations increase, volatility becomes more sensitive. The propensity for the VIX to go from 10 to 40 is higher when cross-asset correlations are higher. When the correlations moved close to one in 2010 and 2011, volatility of volatility spiked dramatically. A recent dynamic has been a decline in both realized and implied correlations. It now makes more sense to hedge by using baskets of individual stocks and stock options than to buy index volatility. Despite this fact, today's "low" correlation would have been considered "high" in 2001 terms.

A few changes have occurred in the dynamics of volatility futures. In the bull market in fear, VIX skew is positively sloped and the volatility of volatility term structure is exhibiting more sensitivity—it has become steeper—as correlations have increased. These developments indicate that the market is assigning a greater potential to volatility spikes. Partial responsibility for these changes can be attributed to VIX exchange-traded notes (ETNs), but a large part is likely because of the higher correlations.

All of these changes have occurred as spot volatility of volatility has been declining, as **Figure 6** illustrates, which causes a steepening of the VIX volatility term structure. The volatility of the VIX has continued to drift lower, tempered by the bull market in equities and QE3, because volatility cannot fight the Fed. As for the VIX itself, spot volatility is low but anticipation of future volatility is higher. Likewise for derivatives on the VIX—volatility of volatility is low, but anticipation of future volatility of volatility is higher.

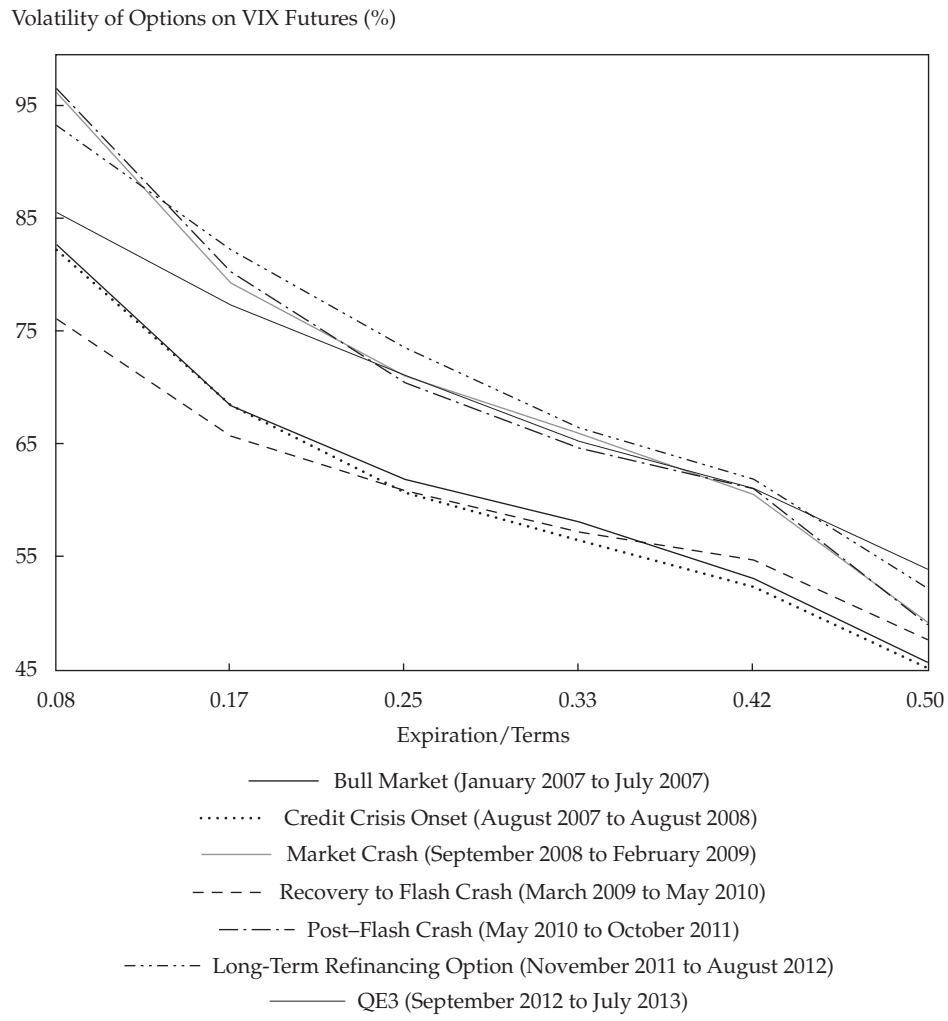
**Figure 5. Volatility Yield of S&P 500 Put Option and Yield on 10- and 30-Year UST Bonds, 1990–2013**




*Note:* S&P 500 put is 25% out of the money.

*Source:* Based on data from the Federal Reserve Economic Data and Market Data Express.

**Figure 6. Volatility of Options on VIX Futures, 2006–2013**




*Source:* Tick data are from CQG Data Factory.

## When the Shoeshine Boy Is Shorting Volatility

The old adage from the 1929 stock market crash is that if the shoeshine boy is giving stock tips, it is a sign that markets might be at their top. Today, the corollary is that the shoeshine boy is giving short volatility exchange-traded product (ETP) trading tips, which is a crowded trade. Recently, I would estimate that I have received eight pitches from traders selling systems that claim the road to wealth creation is some variation on a strategy of timing short volatility ETPs. I cannot share names, but Artemis is not the only volatility fund that is receiving such suggestions. Amateur traders are enjoying the Fed-induced liquidity spree by shorting volatility through ETPs, and they all believe they are geniuses for doing it, but in actuality they are more like the shoeshine boy of the past. As a result, the open interest—that is, the speculative shorts on VIX futures as a percentage of open interest—is now at an all-time high. This is just more kindling for the volatility fire.

One of the most popular tools for shorting volatility using VIX ETPs is the XIV short volatility ETN. If one takes a deep look at this product on a return level, it is just a less efficient version of a 3–4 times leveraged position on the S&P 500. On a risk-adjusted, equal volatility–weighted basis, the return on a strategy of consistently shorting volatility on the front of the volatility term structure using the XIV ETN is lower than the return on holding the S&P 500. Since November 2010, the annual return on the S&P 500 is 14.26%; for the risk-adjusted XIV ETN, it is 9.16%. The annual volatility for both—with the XIV risk adjusted to the S&P 500—is 17.41%. So by holding the S&P 500, an investor could have earned a higher return per unit of risk than by holding this short volatility ETP, which has large drawdowns during sharp volatility rises. In the end, shorting volatility is just a leveraged version of index beta.

The problem when many "shoeshine boys" are shorting volatility is that the volatility of VIX futures dramatically outpaces the volatility of the VIX during the last 15 minutes of the trading day when all the structured products rebalance. It even outpaced the volatility of the VIX in 2008 when volatility was extremely high. The same thing happens with some of the leveraged products that exhibit a dynamic of enhanced convexity that is introduced by rebalancing. Both large up days and large down days create the need for more rebalancing. The big question, which is still up for debate, is whether this activity and the popularity of the futures market is then recycling into the underlying VIX because now, increasingly, VIX futures and options are becoming even more popular than some of the classic hedging or classic option strategies.

## Three Possible Macro-VIX Regimes for the Next Decade

I see three possible macro-VIX regimes that could play out over the next 10 years. The first is that the bull market in fear is the new normal and that the steep volatility term structure is here to stay. Traders would short the front of the volatility curve and buy the back, but the result would be violent corrections. High implied correlations and high volatility of volatility would be the norm, but spot volatility would be low.

A second possibility is a bear market in fear, which is what Japan is in right now. This scenario is characterized by positive real rates that lead to volatility as a fixed-income alternative, long-term volatility and skew collapsing when short rich volatility, and an increase of volatility short sellers that builds systemic risk. These are all byproducts of central bank intervention that artificially incentivize investors to become volatility short sellers, which creates a tremendous powder keg of risk in the markets.

The third possibility is an inflationary volatility spiral. Japan may be moving toward this regime. This scenario is probably far down the road for the United States, but it is characterized by runaway inflation that drives volatility higher. Options skew would "flip" to compensate, and out-of-the-money calls would be re-priced because the market would have been hedging the wrong tail. The potential for the United States to move from a bull market in fear to a bear market in fear is high. It will be interesting to see whether Japan makes this jump.

Markowitz's modern portfolio theory (MPT) actually explains the bull market in fear. Long volatility exposure is more valuable to a portfolio in a period of financial repression despite negative carry because it hedges a forced overallocation to equity. In a portfolio of bonds and stocks, one of the reasons to hold bonds is for their yield, but another is because they are uncorrelated with equity. That is part of the concept of MPT. But in a period of financial repression when the real return on bonds is nothing, and maybe even negative, an exposure to long volatility, which maybe has negative carry but is also uncorrelated with equities, becomes increasingly more valuable compared with exposure to fixed income. In this instance, portfolio optimization suggests an allocation of 5–12% to volatility. The diversification benefits of volatility compared with bonds are much more valuable.

For 20 years, Japan has been in a deflationary environment. But today Japan has the most structurally flat volatility market in the world, and the skew for the Nikkei is at the lowest levels in the world. The reason is because Japan has positive real interest rates. In that environment, MPT is flipped—a portfolio optimization indicates a short in volatility as a yield enhancement for fixed income. So, the result is a market with no volatility, but the use of volatility for income rather than hedging is building a dangerous shadow volatility in Japan's volatility regime.

Japan's monetary policy has awakened a dormant volatility monster. Two volatility shorts are in play. One volatility short is theoretical in nature. It is Japan's radical monetary policy and yen devaluation. The other is a true volatility short. Japanese investors and financial institutions are structurally short volatility and convexity through the annual issuance of ¥1.2 trillion to ¥1.5 trillion of complex equity-linked structured products called "uridashi."

Nikkei-linked uridashi notes are very popular income-type structured products that can have a significant impact on Japanese equity volatility markets. These products sell volatility on the long end of the volatility term structure and recycle it into a bond-like coupon. If the Nikkei drops 20–30%, then uridashi investors own the stock index at a 20–30% discount. These products have become very popular as a fixed-income alternative, which makes sense based on the portfolio optimization. But excessive use of these products has flattened the skew and term structure of the Japanese market, which has led to a very dangerous hidden convexity. The volatility fire risk is quite high. Uridashi hedging amplifies dislocations in Nikkei volatility by artificially suppressing long-dated implied volatility in skew, creates positive correlation between equity markets and volatility, and results in huge rallies to cover short vega during large discontinuities in both up and down equity markets.

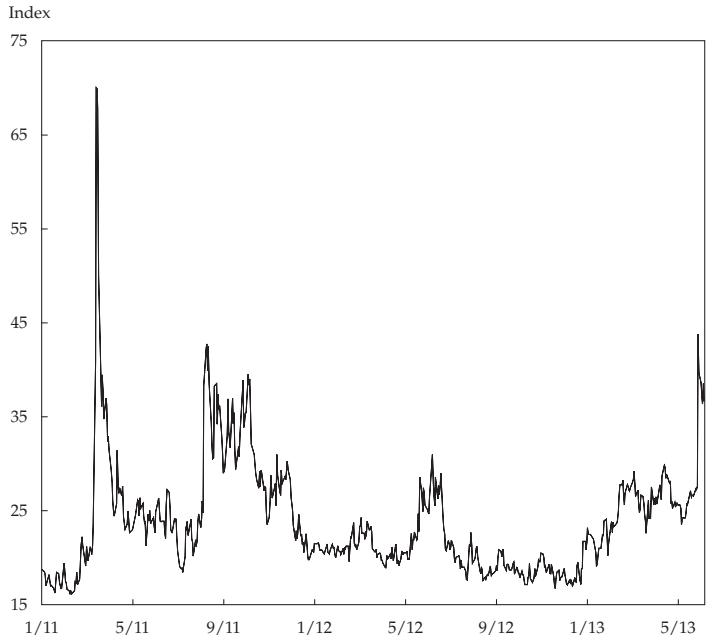
**Figure 7** shows the Nikkei Volatility Index and illustrates the impact of Japan's shadow volatility that has resulted from a decade of selling volatility as a yield substitute. Volatility after the Fukushima earthquake in April 2011 jumped from the mid-teens to nearly 75. And volatility jumped as high as 45 intraday in April 2013 during the Nikkei selloff when Japanese

government bonds hit a 1% yield to maturity. These jumps are rallies to cover short volatility. The dealer community ends up being extremely short in volatility exposure, and they have to buy it back all at once.

An interesting and perhaps inconvenient truth for MPT is that bond prices do not always move in the opposite direction of stock prices. MPT has been built on the basis of anti-correlation between bonds and stocks. But is there a risk of a paradigm shift? Recall the concept of the impossible object. Is it possible to enter into an environment where stocks and bonds collapse together?

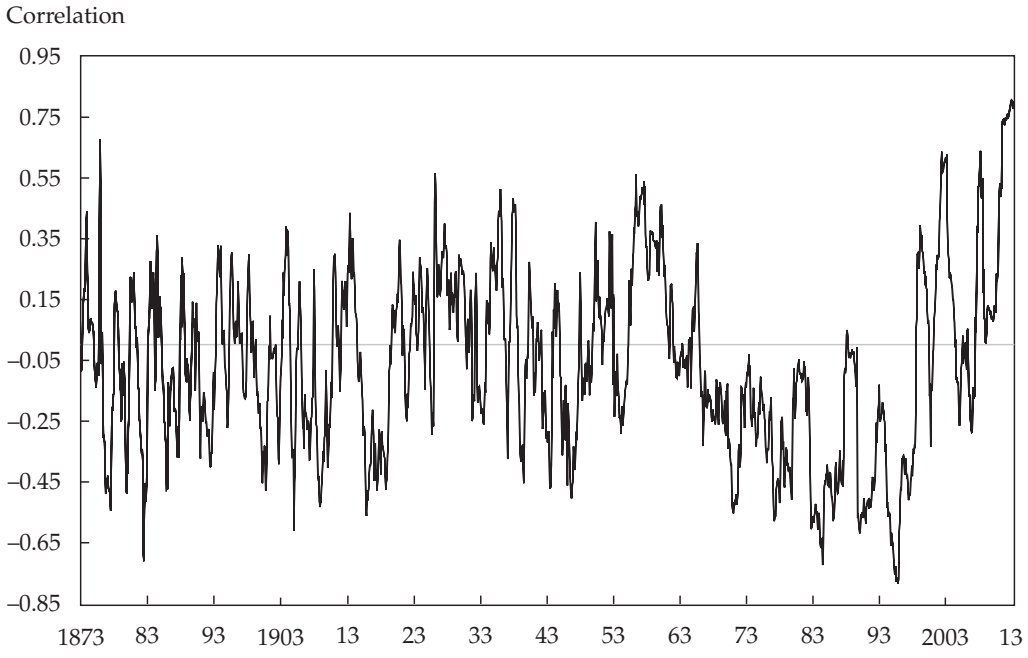
Historical precedent exists for just such a scenario. **Figure 8** shows the two-year rolling correlation of the 10-year US Treasury yield with US equity prices from 1873 to 2013. The anti-correlation

**Figure 7. Nikkei Volatility Index, 1 January 2011 to 1 May 2013**




*Source:* Based on data from the Osaka Securities Exchange.

**Figure 8. Two-Year Rolling Correlation of the 10-Year US Treasury with US Equity, 1873–2013**




*Source:* Based on data from Robert Shiller.

between stocks and bonds, or positive correlation between yields and stock prices, was amplified during the cheap Greenspan–Bernanke era, but there are long periods of time when that relationship has not held true and stocks and bonds have either gone up or gone down together. If stocks and bonds decline together, investors will definitely want to own volatility.

## Conclusion

Today's bull market in fear is prepared for yesterday's crash. I want investors to be prepared for tomorrow's crash. Preparation will require that they change their perception of risk from the known unknown to the unknown unknown. The chief fear today seems to be a recurrence of 2008. I am afraid of the next 1987, possibly for stocks but more likely for bonds, or both at the same time. It is very easy to forget that after gains of more than 100% in equity markets since the last crisis, great risks are hidden in the unintended consequences of the greatest global monetary experiment in economic history. I cannot predict the future, but what I do know is that crisis alpha and volatility trading will represent one of the most important developments in institutional portfolio management over the next few decades. That is one known unknown I have confidence in.

This article qualifies for 0.5 CE credit.