



Demand  
Derivatives

# S RealVol<sup>®</sup> strategies

## Over Hill, Over Dale, Overlays

*Hedging an equity-index portfolio with an active allocation to RealVol<sup>™</sup> futures contracts was shown to increase returns without adding to risk.*

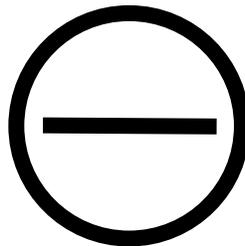
### Pioneering Research

In a paper published in October 2012 and updated in February 2013, Sixiang Li explained the concept of adding a volatility overlay to a buy & hold equity portfolio. Mr. Li showed that continual hedging with a long volatility position would most likely not be a worthwhile endeavor. However, adding a fairly simple moving-average indicator so as to adjust the allocation of a RealVol futures overlay showed interesting historical outcomes. For a thorough review of the methods and results, please see Mr. Li's paper entitled "RealVol Futures Overlay on an S&P 500<sup>®</sup> Portfolio" located on the realvol.com web site. In this RealVol Strategies issue #4, some of the key findings are summarized and highlighted.

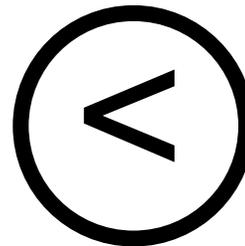


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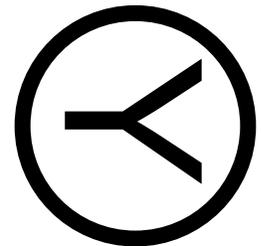
### Three Main Strategies



Buy & Hold



Simple MA

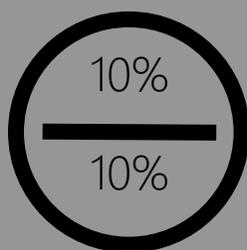


Dual MA

$$\sqrt{\frac{252}{n} \sum_{t=1}^n R_t^2}$$

All approaches held a long equity portfolio in the S&P 500 Total Return Index<sup>®</sup>. In addition, Mr. Li studied three strategic RealVol futures "overlays":

1. *Buy & Hold* — Continually buy volatility at 10% allocation
2. *Simple MA* — Use moving averages to decide on a 0% or 10% allocation
3. *Dual MA* — Use long- and short-term MAs in an allocation scheme



The buy & hold overlay portfolio reduced risk but at a significant cost ...

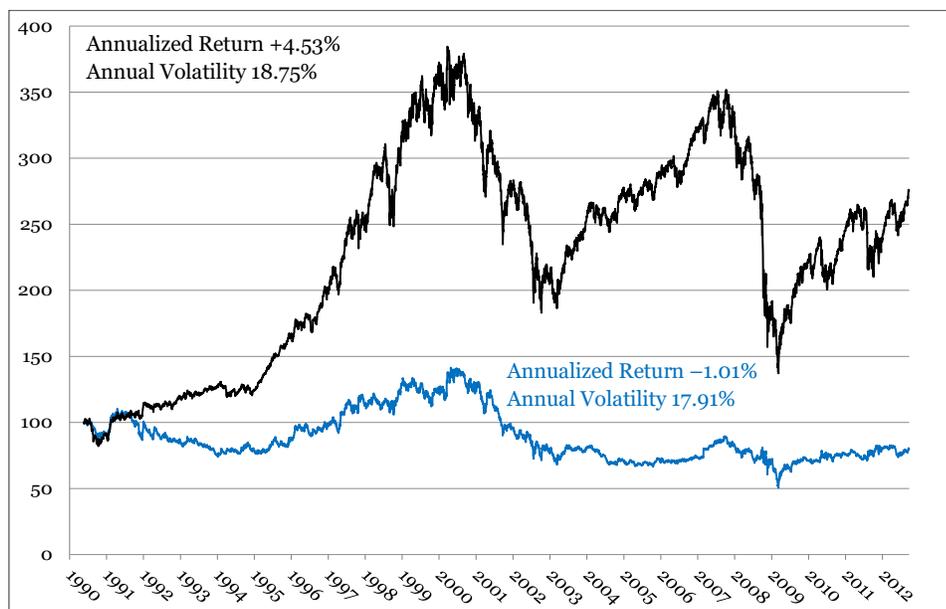
### Theoretical Value

It is important to note that as of this writing, RealVol futures on indices are not yet listed. To have some indication of historical value, Mr. Li used the Heston Model to calculate theoretical volatility-swap prices based on S&P index options. First, he calculated such theoretical swap prices, because volatility swaps function similarly to RealVol futures. However, an additional adjustment was needed — employing a root-mean-square formula — to address the forward-starting feature of RealVol futures.

### Buy and Hold

The first pass through the data was a “buy & hold” approach. In essence, an S&P 500 index portfolio was purchased and held continuously. Then, a long RealVol futures overlay was added. Since RealVol futures expire, to keep a continuous exposure, a roll was performed at each monthly expiration, at which time the entire portfolio was also rebalanced in order to keep a near-constant 10% allocation to long volatility. Exhibit 1 shows the rather disappointing results.

Exhibit 1 — Buy & Hold

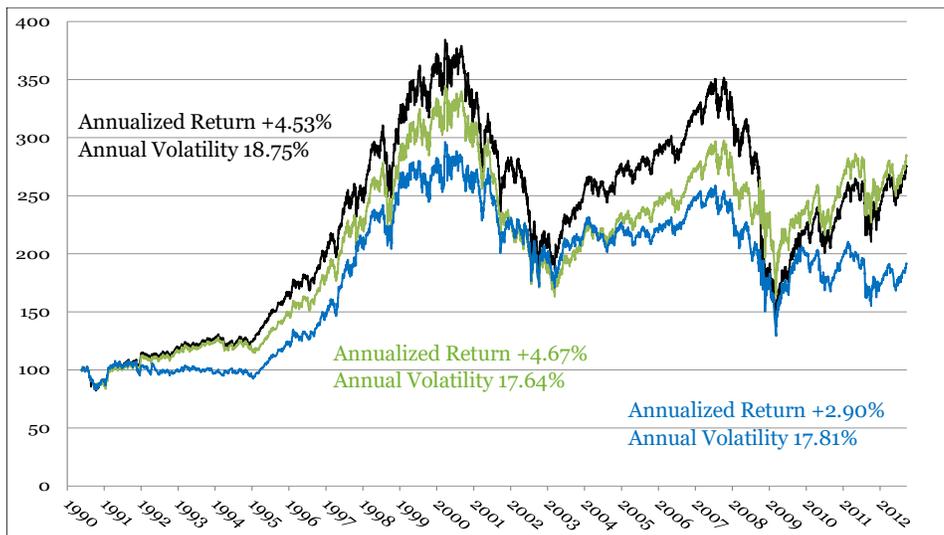


In the two plots above, the black line is the S&P Total Return Index and the blue line is the S&P TRI including a buy & hold 1-month RealVol futures overlay. The historical results of buying instruments on realized volatility as a continuous hedge showed that although the standard deviation of the overlay portfolio was, indeed, reduced, the drag on performance was significant.

### Simple MA Approach

Mr. Li postulated that moving-average (MA) indicators might improve performance, and the paper describes three MAs: For each, a simple strategy was tested: When the MA was rising (↑), the allocation to RealVol Futures was 0%; when the MA was falling (↓), the allocation was 10%. The results of two of these MA indicators (long-term and short-term) are shown in Exhibit 2.

Exhibit 2 — Simple MA Approach

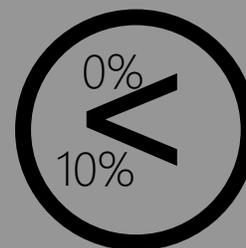
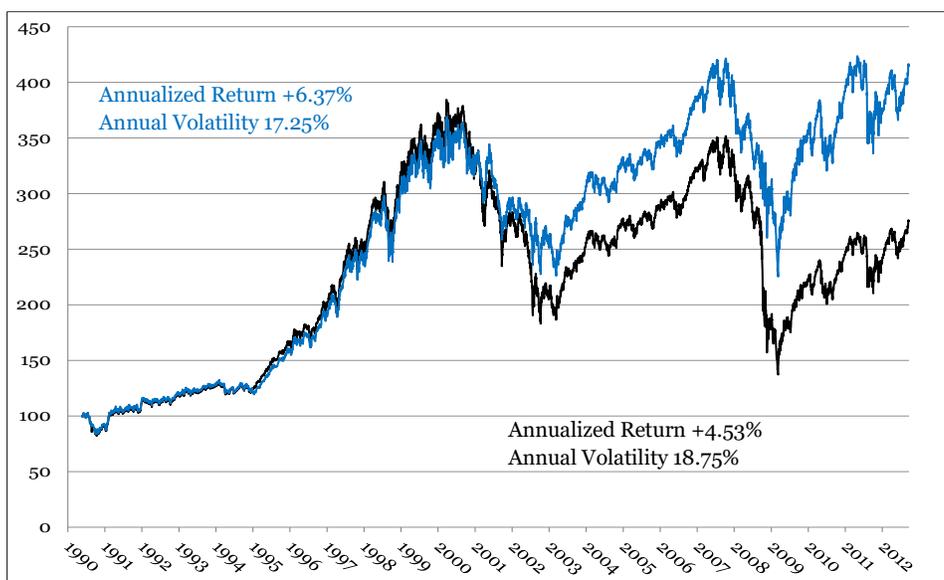


In Exhibit 2, the result using the long-term indicator is the green line, and the result using the short-term indicator is the blue line. While the results were considerably better than those of the buy & hold approach, the performance of each one was still not ideal. It was clear that a more opportunistic strategy was needed in order to more profitably employ RealVol futures as an overlay to an equity-index portfolio.

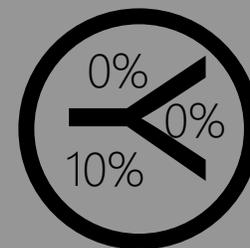
Dual MA Approach

The academic literature is rife with discussions regarding the high inverse correlation of implied volatility to equity prices when the underlying index is falling, and the much lower correlation when the index is rising. This suggested that a “bifurcated” approach was needed. The use of a dual MA combines the long-term and short-term MAs (LMA and SMA, respectively) into one approach. When the LMA is  $\uparrow$ , allocate 0%; when LMA is  $\downarrow$ , then look to the SMA. If the SMA is  $\uparrow$ , allocate 0%; if the SMA is  $\downarrow$ , allocate 10% (see Exhibit 3).

Exhibit 3 — Dual MA Approach



Judicious use of RealVol futures in an active allocation approach may enhance returns and/or reduce risk in an equity index portfolio.

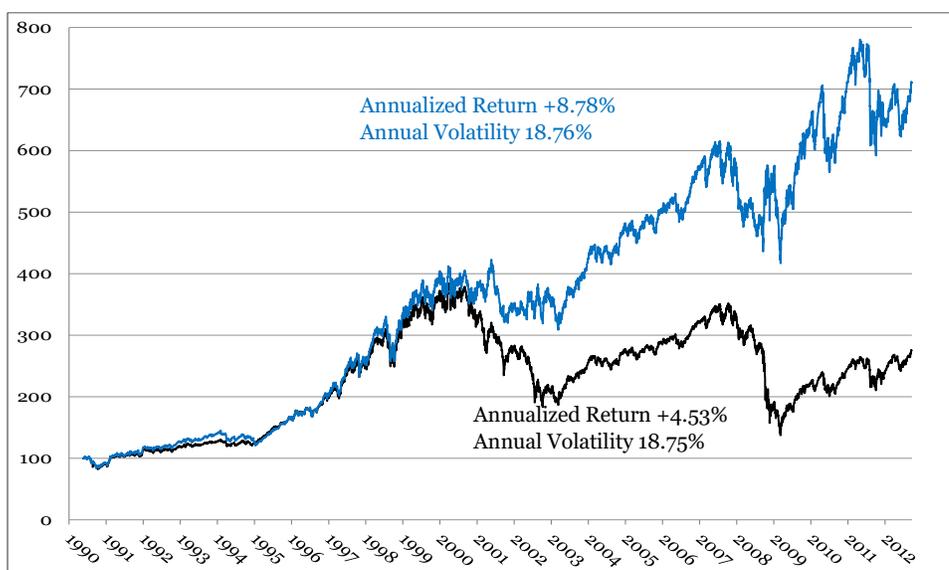


In Exhibit 3, the results were very good. The standard deviation of the portfolio dropped significantly and performance outpaced the S&P.

### Strategic Short Positions

Something that becomes readily apparent with any volatility-based research is the positive expected return from selling volatility. This makes intuitive sense. It is unlikely that anyone would want to accept the high risk of a short-volatility position unless it had a positive expected return. In Exhibit 4, a small (-2% allocation) short-volatility position was added but only when the LMA was rising. When both the LMA and SMA were falling, the hedge was doubled to +20% in order to better protect the portfolio from large downward moves in the underlying index.

Exhibit 4 — Dual MA (with active short and double active long)



The 20% allocation to RealVol futures when SMA was dropping helped reduce portfolio risk considerably, but the small allocation to short volatility offset much of this risk reduction. Overall, however, portfolio performance was substantially increased. The result was a portfolio with approximately the same standard deviation as the index but with significantly higher performance.

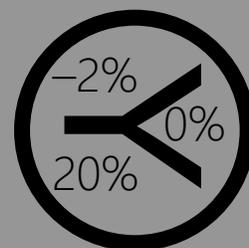
### Summary

From a historical perspective, it became clear that using RealVol futures in a continuous buy & hold process did not provide desirable results. However, an active allocation approach provided increased returns for roughly the same level of risk, validating the usefulness of RealVol futures for such purposes.

### Warning

As of this writing, RealVol futures on equity indices have not yet begun trading. All results are hypothetical and historical. The hypothetical results derive from a pricing model. All models have assumptions that may or may not be valid. Actual market prices, had they been available, may not have coincided with the model's calculations. In addition, even if the model's prices had been available in the marketplace, historical performance is not an indication of future results.

The basis for this Vol Strategies brochure was a paper written by Sxiang Li entitled "RealVol Futures Overlay on an S&P 500 Portfolio." While steps have been taken to ensure that the data are reliable, Demand Derivatives Corp. and its subsidiaries accept no liability for errors, omissions, or misstatements in Mr. Li's paper or in this brochure.



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