

Highlights from: “VIX Futures and Options – A Case Study of Portfolio Diversification During the 2008 Financial Crisis”

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INTRODUCTION

This two-page paper provides highlights from the study: “VIX Futures and Options – A Case Study of Portfolio Diversification During the 2008 Financial Crisis.” (forthcoming in The Journal of Alternative Investments in mid-2009).

It has been well-documented that the CBOE Volatility Index (VIX[®]) often has had a negative correlation to the S&P 500 Index, particularly in times of market stress. This has led many investors to ask “Could VIX futures (introduced in 2004) or VIX options (introduced in 2006) have served as effective portfolio diversification tools during the 2008 financial crisis?”

METHODOLOGY

To analyze the diversification impacts of VIX exposure during the crisis, three different portfolios are considered:

- Equity: 100% stocks
- Equity/Bond: 60% stocks / 40% bonds
- Equity/Bond/Alternative: 60.5% Stocks / 30.5% Bonds / 1.3% High Yield Bonds / 1.2% Hedge Funds / 0.1% Managed Futures / 0.3% Commodity / 1.6% Private Equity / 4.5% Real Estate

To these portfolios a long VIX exposure is added:

- 2.5% or 10% allocation to fully collateralized near-month VIX futures, or
- 1% and 3% long allocation to one-month VIX ATM and 25% OTM calls
- 1% and 3% long allocation to one-month VIX 25% OTM calls

Only the results for the Equity/Bond/Alternatives (E/B/A) portfolio are provided in this summary. The analysis covers the period from the first VIX option expiration in March 2006 to the end of 2008. To assess the impact of a long VIX exposure in the peak of the crisis, the period from August 1 to December 31, 2008 is also considered separately. Figure 1 graphically illustrates the benefits of the addition of VIX exposure to the base portfolio.

VIX

VIX was originally introduced by Whaley [1993] as an index of implied volatility on the S&P 100. In 2003 the new VIX was introduced which is based on the S&P 500 and is the basis for this paper. The level of VIX represents a measure of the implied volatilities of the entire smile for a constant 30-day to maturity option chain. Generally, references to the current level of VIX are based on spot VIX, which is currently not investable. Investors can invest in VIX through VIX futures or VIX options. While spot VIX represents a measure of the expected volatility of the S&P 500 over the next 30-days, the prices of VIX futures and options are based on the current expectation of what the expected 30-day volatility will be at a particular time in the future (on the expiration date).

RESULTS

VIX Futures

Figure 1 provides summary statistics for the peak of the crisis in 2008 (August to December 2008).

Figure 1: Summary Statistics with VIX Futures Aug. 2008 to Dec. 2008

Aug. 1, 2008 to Dec. 31, 2008	100% E/B/A Portfolio	97.5% E/B/A Portfolio / 2.5% VIX Futures	90% E/B/A Portfolio / 10% VIX Futures
Period Return	-19.68%	-15.85%	-4.02%
Period Std Deviation	25.25%	22.65%	16.33%
Maximum Drawdown	-32.17%	-27.72%	-14.00%
Period Sharpe Ratio	-0.79	-0.71	-0.26
Skew	0.05	0.07	0.17
Kurtosis	0.65	0.58	0.77
%Up days	49%	48%	47%
% Down Days	51%	52%	53%
Daily Stutzer Index	-0.0730	-0.0014	-0.0003
Leland Beta	0.67	2.92	1.12
Leland Daily Alpha	-0.017%	0.004%	0.067%

Figure 1: Performance with VIX futures in late 2008 –

- Total returns are improved from -19.7% to -15.9% by adding 2.5% VIX futures and further improved to -4.0% by adding 10% VIX futures.
- Standard deviations are also reduced significantly (from 25.3% to 22.7% and 16.3%, respectively).
- Thus, the addition of 10% VIX futures cuts the losses to about 1/5 their initial level while reducing standard deviation by 1/3.
- Maximum drawdown is reduced from -32.2% to -14.0%.
- Leland daily alpha of the portfolio is improved from -1.7 basis points to 0.4 basis points and then to 6.7 basis points.

Figure 2: Portfolio Performance with VIX Futures Mar. 2006 to Dec. 2008

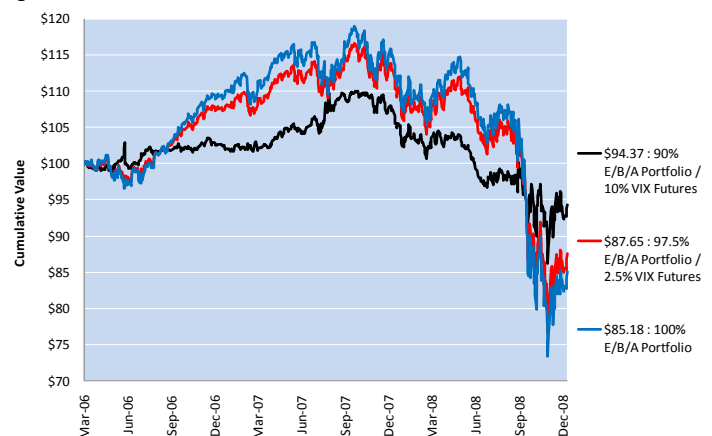


Figure 2: With a 10% allocation of VIX futures to the Equity/Bond/Alternative portfolio over the 34-month time period ending in December 2008 -

- The portfolio's annualized return was improved by 3.5 percentage points (increased from -5.6% to -2.1%), and
- The standard deviation was cut by one-third (drops from 17.9% to 11.3%).

ATM and 25% OTM VIX Calls

The impact of a 3% allocation of ATM VIX calls is dramatic in the latter half of 2008. Figure 3 illustrates the impressive increases in returns with moderate reductions in standard deviations. Not surprisingly, the results for the 25% OTM calls are more extreme than for the ATM calls. The extra leverage provided by the deep OTM calls results in greater return benefits in market drops, but with a corresponding increase in standard deviation. The improvements in risk adjusted returns are evident in the Stutzer index and Leland alpha.

Figure 3: Summary Statistics for VIX Calls Aug. 2008 to Dec. 2008

Aug. 1, 2008 to Dec. 31, 2008	100% E/B/A Portfolio	99% E/B/A Portfolio / 1% ATM VIX Calls	97% E/B/A Portfolio / 3% ATM VIX Calls	99% E/B/A Portfolio / 1% 25% OTM VIX Calls	97% E/B/A Portfolio / 3% 25% OTM VIX Calls
Period Return	-19.68%	-6.72%	20.78%	17.70%	97.18%
Period Std Deviation	25.25%	20.48%	21.08%	28.70%	51.86%
Maximum Drawdown	-32.17%	-18.82%	-15.41%	-24.37%	-27.40%
Period Sharpe Ratio	-0.79	-0.34	0.98	0.61	1.87
Skew	0.05	0.18	-0.22	-0.28	0.60
Kurtosis	0.65	0.84	6.13	7.02	11.34
%Up days	49%	50%	52%	55%	54%
% Down Days	51%	50%	48%	45%	46%
Daily Stutzer Index	-0.0730	-0.0241	0.0963	0.0685	0.1533
Leland Beta	0.67	0.49	0.19	0.23	-0.31
Leland Daily Alpha	-0.017%	0.071%	0.245%	0.247%	0.691%

Figure 3: Performance with VIX calls in late 2008 - With a 3% allocation of ATM VIX calls -

- Period returns are increased from -19.7% to +20.8%,
- Period standard deviation is reduced from 25.3% to 21.1%, and
- Maximum drawdown is cut in half from -32.1% to -15.4%.

With 25% OTM VIX calls -

- Period returns increase from -19.7% to +17.7% and then to +97.2% with the addition of 1% and 3% OTM VIX calls, respectively. While,
- The period standard deviation increases from 25.3% to 28.7% and to 51.9%, and
- Maximum drawdown decreases mildly (-32.2%, -24.4% and -27.4%).
- The daily Stutzer index improves from -0.07 to 0.07 then 0.15, while
- The Leland daily alpha increases from -1.7 basis points to 24.7 basis points and finally 69.1 basis points.

Figure 4: Portfolio Performance with ATM VIX Calls Mar. 2006 to Dec. 2008

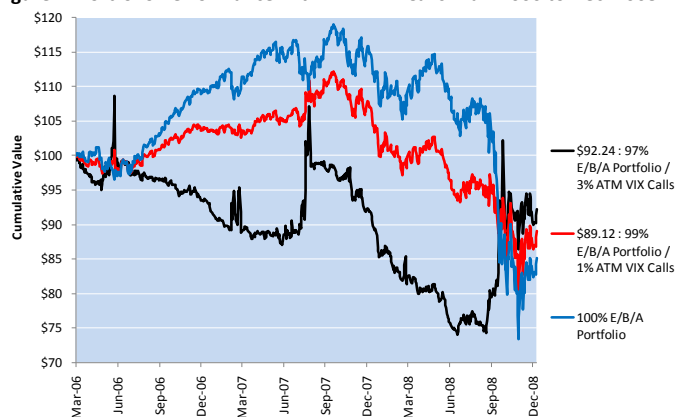


Figure 4: With a 3% allocation of ATM VIX calls to the Equity/Bond/Alternative portfolio over the 34-month time period ending in December 2008 -

- The portfolio's annualized return was increased by 2.7 percentage points (from -5.6% to -2.9%), and
- The portfolio's standard deviation was increased slightly from 17.9% to 18.8%.

Figure 5: Portfolio Performance with 25% OTM VIX Calls Mar. 2006 to Dec. 2008

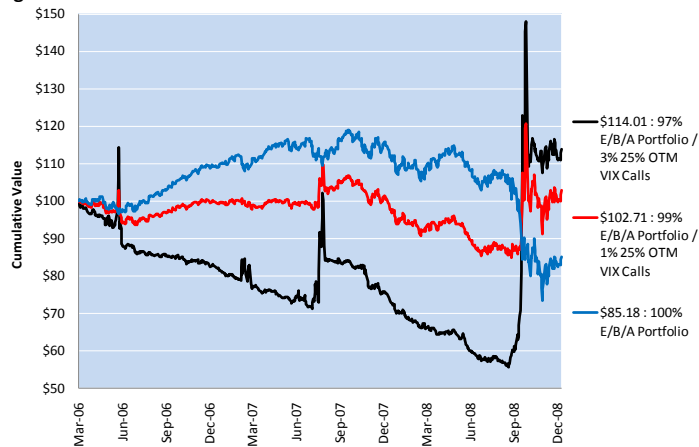


Figure 5: With a 3% allocation of 25% OTM VIX calls to the Equity/Bond/Alternative portfolio over the 34-month time period ending in December 2008 -

- The portfolio's annualized return was increased by 10.4 percentage points (from -5.6% to +4.8%), and
- The portfolio's standard deviation was approximately doubled from 17.9% to 39.1%.

Figure 6, illustrates the efficient frontier that is possible from the addition of ATM VIX calls to an Equity/Bond/Alternative portfolio. The diversification benefits are clearly evident.

Figure 6: Efficient Frontier with ATM VIX Calls Mar. 2006 to Dec. 2008

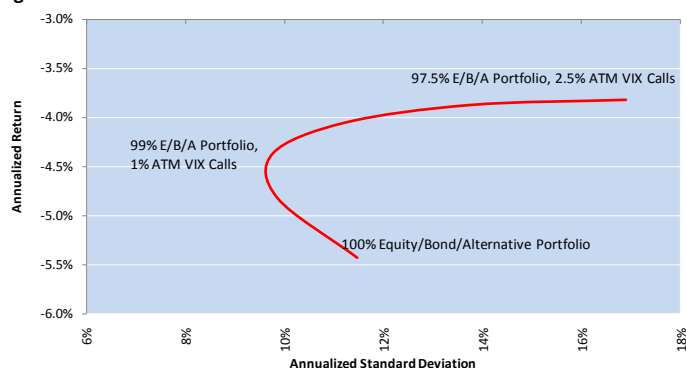


Figure 6: Efficient frontier shows that with a 1% allocation of ATM VIX calls to the Equity/Bond/Alternative portfolio over the 34-month time period ending in December 2008 -

- The portfolio's annualized monthly return was increased by 1.0 percentage points (from -5.4% to -4.4%), and
- The portfolio's standard deviation was reduced by one twelfth from 11.5% to 9.8%.

CONCLUSION

The increased correlations among diverse asset classes in the latter half of 2008 generated significant losses for many investors who had previously considered themselves well diversified. It is clear from the results of the analysis that, while a passive long volatility exposure may result in negative returns in the long term, it may provide significant protection in downturns. In particular, investable VIX products could have been used to provide some much needed diversification during the 2008 financial crisis.

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