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Diversifying a Portfolio using VIX Options

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Diversifying A Portfolio Using VIX Options

**An Honors Thesis in partial fulfillment of the requirements for the degrees Bachelor of
Science in Business Administration in Finance and Accounting**

By

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Finance and Accounting, May 2014

Executive Summary

Ubiquitous investment strategies often include similar forms of diversification – holding stocks of differing industries, exposed to different business cycles, in order to reduce idiosyncratic risk. During the recession, these strategies failed as the markets fell substantially leaving investors exposed to great amounts of systematic, or “un-diversifiable” risk. Throughout this paper, I will examine the effects of diversifying a portfolio using call options on the CBOE Volatility Index (VIX) to try and alleviate systematic risk from a portfolio, allowing an investor to capitalize from short-term market fluctuations arising from financial, economic, and geopolitical risks.

Acknowledgement Page

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Introduction

Throughout history, Financial Markets have been volatile. Personal fortunes have been gained and lost over and over through the various movements of the financial markets. In recent years, investors seeking to protect themselves, or capitalize off of specific events, have spawned the evolution of many complex and innovative financial derivatives. Many of these instruments can hedge, or even appreciate one's financial well-being.

In 1993, the Chicago Board Options Exchange established the Volatility Index, or VIX (Kennedy, n.d.). The Volatility Index was first introduced by Professor Robert E. Whaley of Duke University in his paper "Derivatives on Market Volatility: Hedging Tools Long Overdue," (The Wharton School, n.d.). The VIX was originally created to measure the United States financial market's expectation of near-term, 30-day volatility implied by the at-the-money S&P 100 Index option prices (CBOE, n.d.). Over time, the VIX Index became the leading indicator of volatility and sentiment in the market, eventually being labeled the "fear index" (CBOE, n.d.).

One decade later, in 2003, the CBOE paired with Goldman Sachs to tweak the index into its modern-day form. The new VIX index was based on the broader S&P 500, which gives a market-weighted value to each of the equities within its index, providing a more accurate representation of the economy (CBOE, n.d.).

The VIX Index became more widely accepted after the switch to the S&P 500, as many financial analysts began to accept it as an accurate measurement of consumer sentiment. Three years later in February 2006, the CBOE launched options on the VIX, which was well accepted by the overall marketplace (CBOE, n.d.). According to the CBOE, "In less than five years, the

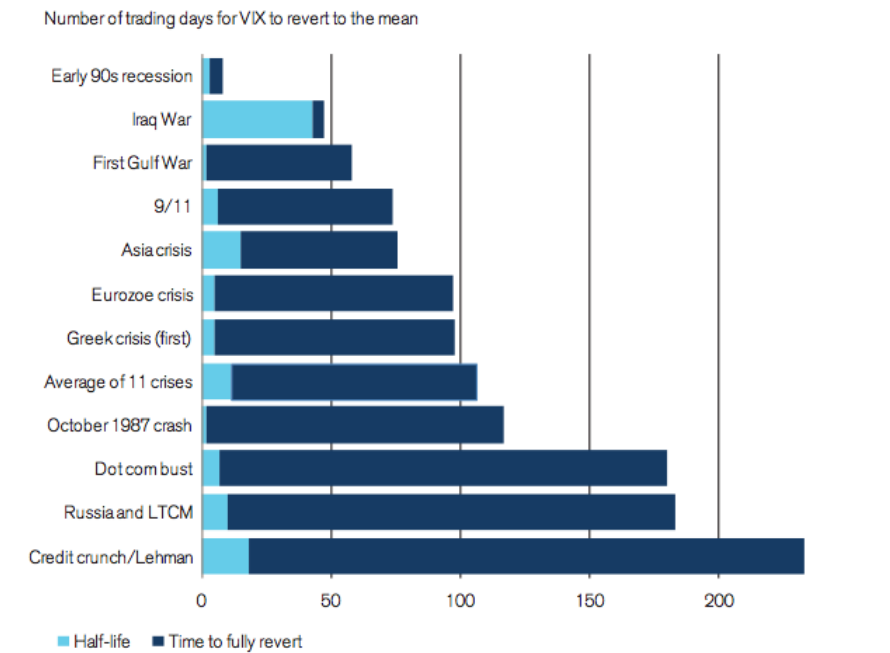
combined trading activity in VIX options and futures has grown to more than 100,000 contracts per day.”

The CBOE continues to state that “The negative correlation of volatility to the stock market returns is well documented and suggests a diversification benefit to including volatility in an investment portfolio.”

Another interesting topic of discussion regarding the volatility index is the fact that it has what is called ‘Mean Reversion.’ What this means is that when the Index itself spikes up or retracts, over-time it will eventually go back to its average trading level. This can be very a very useful piece of information when playing the index, as you can infer after a big move up/down it will always come back to the mean trading price – the only problem with this is correctly timing the action, which by itself, is an art. The below chart depicts the history of VIX mean reversion.

Time taken for VIX volatility to revert from peak to the mean

Source: Chicago Board of Exchange and Elroy Dimson, Paul Marsh, and Mike Staunton



Option Review

There are many investment vehicles in the world of finance, one of the most profitable, however, is an options contract. Most commonly referred to as “Calls” or “Puts”, options can provide substantial returns or protect an investor from downside loss on an investment.

According to the NASDAQ, “A call option is a contract that gives the buyer the right to buy 100 shares of an underlying equity at a predetermined price (the strike price) for a preset period of time. The seller of a call option is obligated to sell the underlying security if the call buyer exercises his or her option to buy on or before the option expiration date (NASDAQ, n.d.)” Additionally, “A put option is a contract that gives the buyer the right to sell 100 shares of an underlying stock at a predetermined price for a preset time period. The seller of a put option is obligated to buy the underlying security if the put buyer exercises his or her option to sell on or before the option expiration date (NASDAQ, n.d.)”

In this study, call options on the VIX will be examined as a vehicle in which to protect an investor from depreciations in asset prices in the financial markets resulting from tumultuous macroeconomic scenarios. The idea is that an investor can protect a portfolio by buying call options on the VIX in anticipation of uncertainty in the economy. Whether this volatility arises from war, large swings in interest rates, or financial crises, buying a VIX call should provide hedged protection and profitability to a portfolio. Options are not suitable for the average investor due to their complex nature, however, if implemented properly and in reasonable fashion, they can be extremely beneficial to a portfolio.

Research and Data

In this section, I will explore the possibilities offered by the VIX index through times of crisis. I will first analyze the 2008 financial crisis and then touch upon the recent 2013 debt ceiling debacle and January 2014 market pullback as case studies for my research. After I have presented data from each of these scenarios, you will hopefully have grasped the importance of investing in the VIX in times of uncertainty in order to maintain and grow one's wealth throughout time. For assuming a well-diversified portfolio of equities I am going to use the SPX Index and SPY ETF. To incorporate fixed income into the portfolios, I will be using the TLT ETF. I will then compare these returns to the Volatility Indices: VIX, VXX, VXZ, and XIV in order to illustrate a range of return possibilities, based on portfolio allocation weights, through the case study time periods.

According to Bloomberg, the SPX Index (Standard and Poor's 500 Index) "is a capitalization-weighted index designed to measure performance of the broad domestic economy through changes in the aggregate market value of 500 stocks representing all major industries. The Index was developed with a base level of 10 for the 1941-43 base period." In my opinion, the S&P 500 is a better measurement of the U.S. economy than rival indices like the Dow Jones Industrial average. This is because the Dow Jones is a Price-Weighted Index, which gives more weight to companies with higher prices – ignoring the size of the company altogether. The S&P 500 seems to measure, more specifically, the true growth of companies – and to extension, is reflected properly in its index.

The SPX is very similar to the SPY, a metric that I will also be using. The SPY, or SPDR S&P 500 ETF, is a trust whose holdings are comprised of the stocks included in the S&P 500

index. The main objective of the fund is to replicate the total return of the S&P 500 index. The SPX and SPY are essentially identical in the returns that they produce, the only difference being that the SPX is not directly available to trade, however, you can trade derivatives (futures and options) based upon the SPX prices. The SPY is a more suitable investment vehicle for the average investors because it is an ETF (Exchange Traded Fund), which allows it to act similar to that of a stock, composed as a basket of individual equities.

Additionally, the TLT ETF (iShares 20+ Year Treasury Bond ETF) is the metric that I will be using for fixed income. According to CNBC, “The iShares Lehman 20+ Year Treasury Bond Fund seeks results that correspond generally to the price and yield performance, before fees and expenses, of the long-term sector of the United States Treasury market as defined by the Lehman Brothers 20+ Year Treasury Index. The Index measures the performance of public obligations of the U.S. Treasury that have a remaining maturity greater than 20 years. The Index is market capitalization weighted and includes all publicly issued, U.S. Treasury securities that have a remaining maturity greater than 20 years, are non-convertible, are denominated in U.S. dollars, are rated investment grade (Baa3 or better) by Moody’s Investors Service, Inc., are fixed rate, and have more than \$150 million par outstanding.”

The volatility index itself can be extremely difficult to play, as you are only able to trade options on it and since there are no suitable ETF vehicles to play it (as the time value of the options skews the asset prices and is hard to properly reflect investable returns). Because of this, I will be forecasting the returns on the VIX for illustration purposes, but also running the returns of the VXX, VXZ, and XIV as potential vehicles to utilize the returns from the VIX.

The VXX, or iPath S&P 500 VIX Short-Term Futures ETN is an exchange-traded note originating in the U.S. The note provides investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, the S&P 500 Short-Term VIX Futures TR Index. Going long on the VXX would be similar to that of going long on the VIX Index.

The VXZ Index, or iPath S&P 500 VIX Mid-Term Futures ETN is almost identical to that of the VXX (mentioned above). However, its underlying basis is actually the S&P 500 Mid-Term VIX Futures TR Index. Similar to the VXX, going long VXZ resembles going long VIX.

Finally, The XIV, or VelocityShares Daily Inverse VIX Short-Term ETN is also an exchange traded note originating in the U.S. The XIV is based on the inverse performance of the underlying Index, the S&P 500 VIX Short-Term Futures Index less the investor fee. Essentially, shorting the XIV is nearly equivalent to going long the VIX Index.

The Financial Crisis



Figure 1 Bloomberg Chart VIX vs. SPX Financial Crisis

There is still a stigma towards big banks even some six years later. The financial crisis of 2008 put into perspective how volatile markets can be, and how even AAA assets can see monstrous declines and in some cases, even defaults. In figure 1, you can see the S&P's performance (White Line) versus the Volatility Index's return (Green Line) throughout the financial crisis of 2008.

Returns in this study are based on the assumption that the financial crisis began on August 9, 2007, the day the interbank lending market had to step in with liquidity to the banking market. The end of the crisis is assumed to be March 6, 2009, when the markets bottomed, stabilized, and began trending upward later that week.

Figure 2 below illustrates the drop in market value in the S&P 500 during the 2008 financial crisis. Note the depreciation in price is 52.97% (When Adjusted for dividends via Bloomberg Excel Total Return, the depreciation in asset prices is -51.12%).

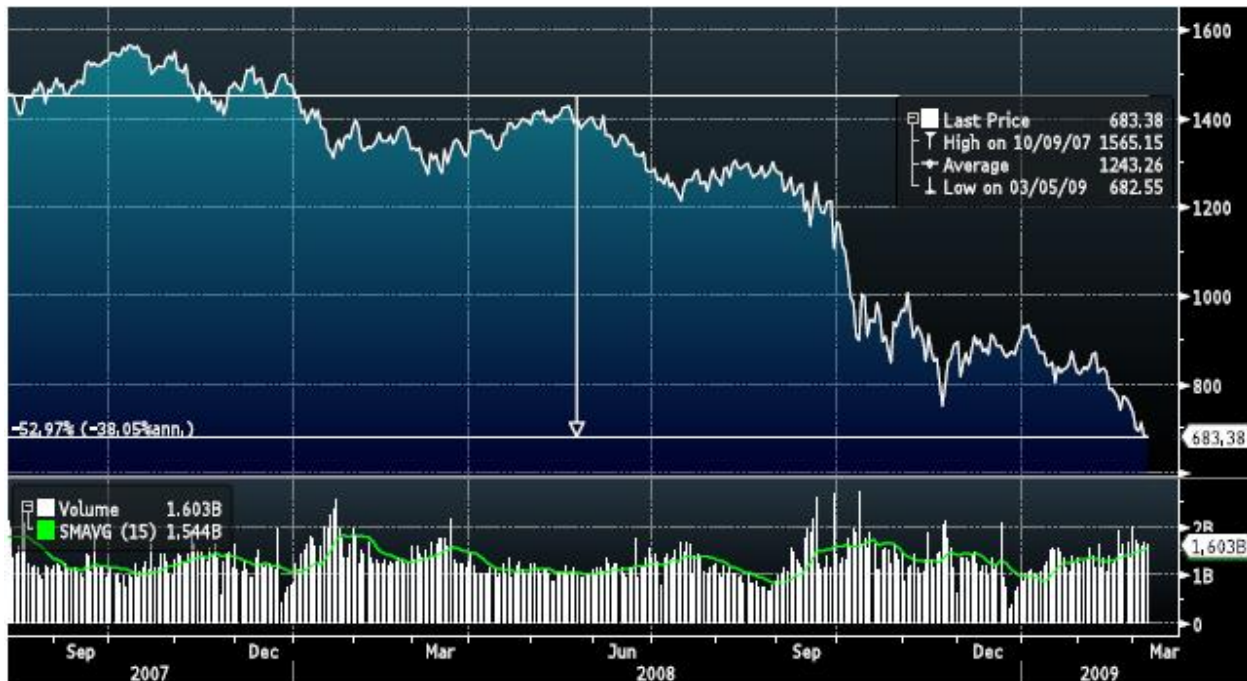


Figure 2 Bloomberg Chart SPX Financial Crisis

The loss posted by the S&P 500 throughout this time was significant. Many investors, average Americans, lost everything. However, much of this distress and loss could have been prevented if these investors had been well-informed about the Volatility Index. Figure 3 illustrates the positive return that the VIX Index posted throughout the same time period.

The below chart of the VIX Index measures returns from the same dates as figure 2. Note a positive return of 86.29% was given to investors of the VIX, while at the same time the SPX lost 51.12% and the TNX lost 40.96%. Also note that at the Index's high on November 20, 2008, as represented by figure 4, the Index was returning 276.97%.

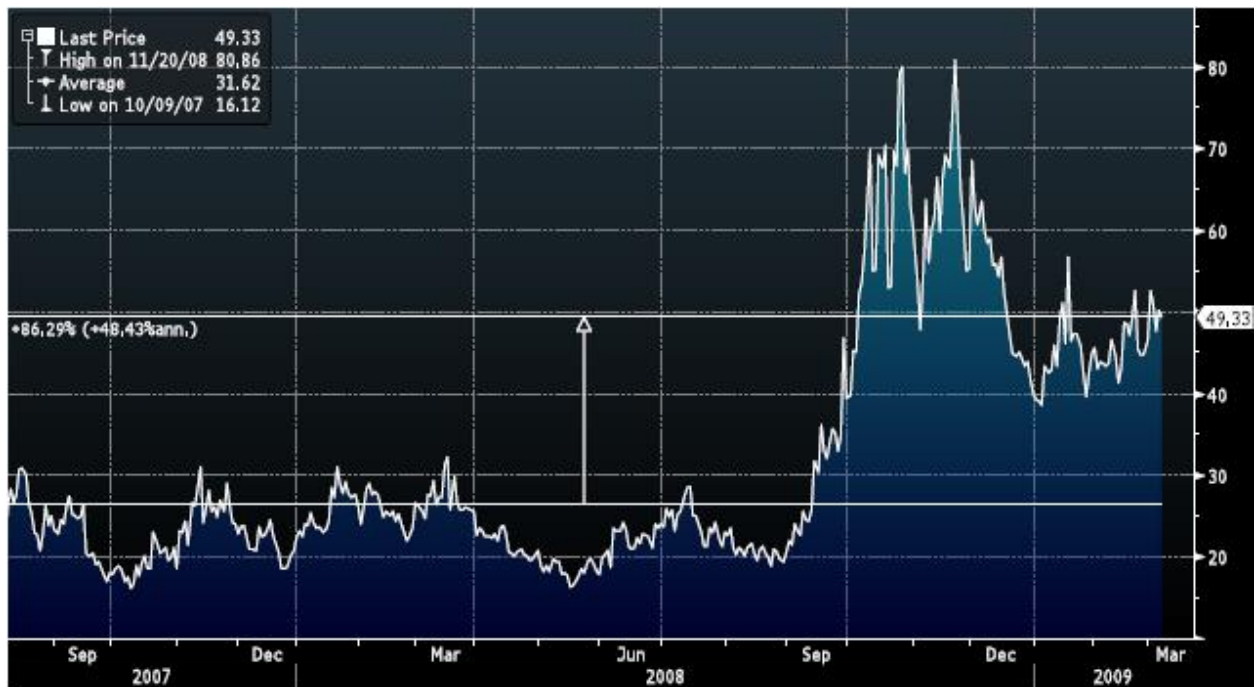


Figure 3 Bloomberg Chart VIX Financial Crisis

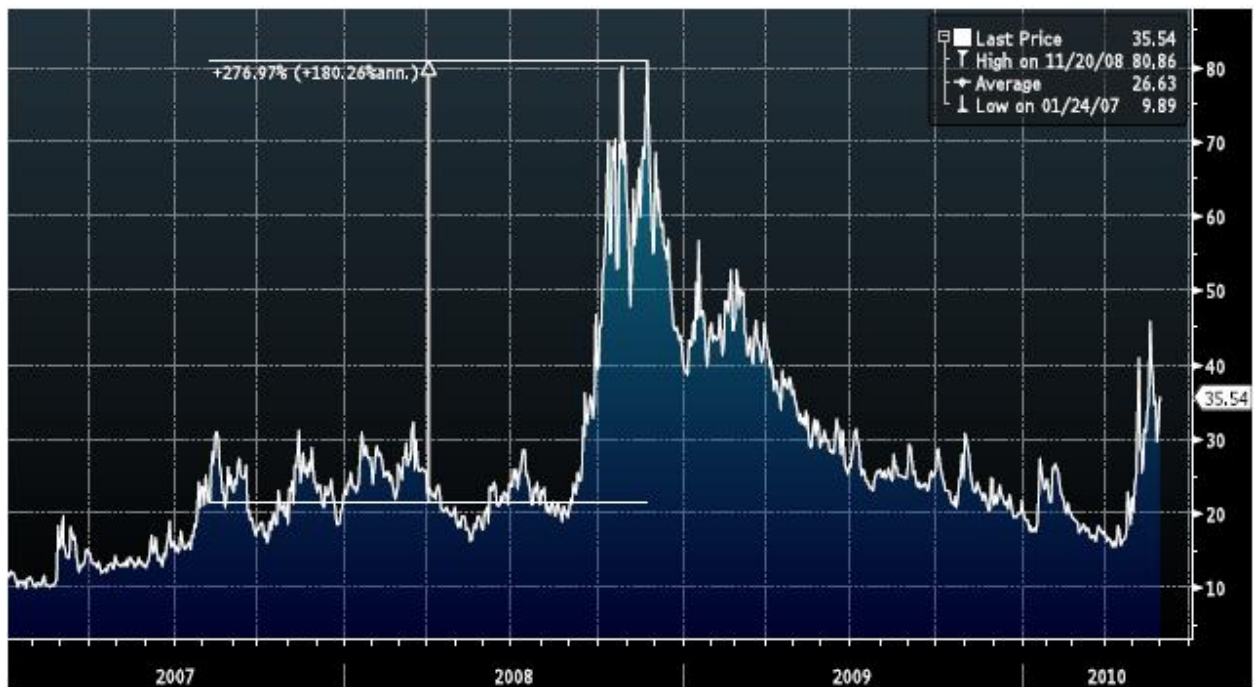


Figure 4 Bloomberg Chart VIX Financial Crisis

Figure 5 is indexing both the SPX and the VIX starting from August 9, 2007 and ending on March 6, 2009. This is a great illustration of the different direction asset prices moved between the two securities during the financial crisis.



Figure 5 Bloomberg Chart VIX Financial Crisis

Debt Ceiling Debacle

In order to analyze the potential gains from this event by buying calls on the VIX, I will be assuming the dates of September 17, 2013 and October 17, 2013 (The resolution of the crisis) in order to give a one month result. Referring to Figure 6, at the lows of the session, the S&P 500 (SPX) had lost a whopping 2.89% (-2.78% when adjusted for dividends), the TLT ETF gained 2.60%, all while the VIX was able to post a return of 40%. This discrepancy illustrates, yet, another great example of how a portfolio could have better been protected by use of incorporating the VIX Index into a portfolio of equities and bonds.

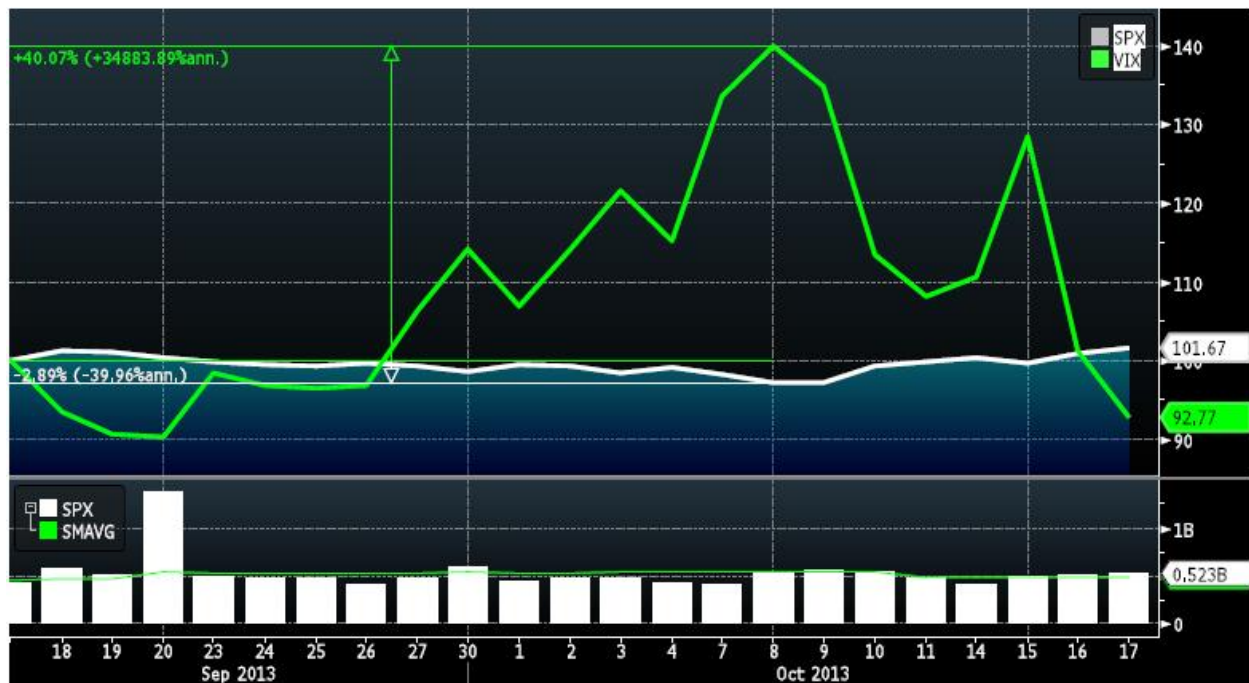


Figure 6 Bloomberg Chart Debt Ceiling VIX vs. SPX

Conclusion

Following this page are theoretical portfolios I have constructed to project potential benefits/losses that could have been results of each strategy in each time period – The financial crisis, January 2014 market pullback and the 2013 debt-ceiling debacle. I am assuming a starting portfolio value for each time period of \$100,000.00. I believe that the data will speak for itself, that at least minor exposure to Volatility at key tumultuous economic times will benefit the investor substantially. Of course, as your exposure to Volatility increases, so do both your risk & return.

Notice below: there is only one instance where this statement does not hold true (SPY, TLT, & VXZ during January 2014), but as you increase your exposure to volatility in these time periods and decrease your allocation to fixed income while holding your equity allocation constant, your overall returns increase. This is significant as it provides data that investing in volatility is, in fact, extremely profitable. It is illustrated by the tables that going long the VXX or going short the XIV are the two most profitable ways to play volatility (in comparison to investing in the VXZ).

As it appears below, the ideal portfolio would consist of majority SPX, with the second highest allocation going towards volatility and Fixed Income being given the smallest portion of the investor's portfolio. Also note that the VXX, VXZ and XIV Indices were not yet established during the financial crisis time period. For this, I have used the VIX returns to estimate the potential portfolio values. Notice the correlation in the financial crisis table below between Volatility Index exposure and portfolio net return. As your exposure to the VIX increase so does your overall portfolio gain/minimal loss possible.

Financial Crisis

Time Period: 8-9-07 to 3-6-09			Beginning:	\$100,000.00	
Portfolio 1					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPX Index	50%	\$50,000.00	-51.1%	\$24,438.27	
TLT Equity	50%	\$50,000.00	29.4%	\$64,720.04	
VIX Index	0%	\$0.00	86.3%	\$0.00	
				\$89,158.31	-10.84%
Portfolio 2					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPX Index	50%	\$50,000.00	-51.1%	\$24,438.27	
TLT Equity	40%	\$40,000.00	29.4%	\$51,776.03	
VIX Index	10%	\$10,000.00	86.3%	\$18,629.16	
				\$94,843.46	-5.16%
Portfolio 3					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPX Index	50%	\$50,000.00	-51.1%	\$24,438.27	
TLT Equity	30%	\$30,000.00	29.4%	\$38,832.02	
VIX Index	20%	\$20,000.00	86.3%	\$37,258.31	
				\$100,528.60	0.53%
Portfolio 4					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPX Index	50%	\$50,000.00	-51.1%	\$24,438.27	
TLT Equity	20%	\$20,000.00	29.4%	\$25,888.02	
VIX Index	30%	\$30,000.00	86.3%	\$55,887.47	
				\$106,213.75	6.21%
Portfolio 5					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPX Index	50%	\$50,000.00	-51.1%	\$24,438.27	
TLT Equity	10%	\$10,000.00	29.4%	\$12,944.01	
VIX Index	40%	\$40,000.00	86.3%	\$74,516.62	
				\$111,898.90	11.90%
Portfolio 6					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPX Index	50%	\$50,000.00	-51.1%	\$24,438.27	
TLT Equity	0%	\$0.00	29.4%	\$0.00	
VIX Index	50%	\$50,000.00	86.3%	\$93,145.78	
				\$117,584.05	17.58%

January 2014 Market Pullback

Time Period: Jan 2014				Beginning:	\$100,000.00	
Portfolio 1						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59		
TLT Equity	50%	\$50,000.00	6.3%	\$53,151.38		
VXX Index	0%	\$0.00	16.4%	\$0.00		
				\$101,388.97	1.39%	
Portfolio 2						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59		
TLT Equity	40%	\$40,000.00	6.3%	\$42,521.11		
VXX Index	10%	\$10,000.00	16.4%	\$11,635.72		
				\$102,394.42	2.39%	
Portfolio 3						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59		
TLT Equity	30%	\$30,000.00	6.3%	\$31,890.83		
VXX Index	20%	\$20,000.00	16.4%	\$23,271.45		
				\$103,399.86	3.40%	
Portfolio 4						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59		
TLT Equity	20%	\$20,000.00	6.3%	\$21,260.55		
VXX Index	30%	\$30,000.00	16.4%	\$34,907.17		
				\$104,405.31	4.41%	
Portfolio 5						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59		
TLT Equity	10%	\$10,000.00	6.3%	\$10,630.28		
VXX Index	40%	\$40,000.00	16.4%	\$46,542.89		
				\$105,410.76	5.41%	
Portfolio 6						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59		
TLT Equity	0%	\$0.00	6.3%	\$0.00		
VXX Index	50%	\$50,000.00	16.4%	\$58,178.62		
				\$106,416.20	6.42%	

Time Period: Jan 2014			Beginning:	\$100,000.00	
Portfolio 1					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	50%	\$50,000.00	6.3%	\$53,151.38	
VXZ Index	0%	\$0.00	4.3%	\$0.00	
				\$101,388.97	1.39%
Portfolio 2					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	40%	\$40,000.00	6.3%	\$42,521.11	
VXZ Index	10%	\$10,000.00	4.3%	\$10,432.57	
				\$101,191.27	1.19%
Portfolio 3					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	30%	\$30,000.00	6.3%	\$31,890.83	
VXZ Index	20%	\$20,000.00	4.3%	\$20,865.14	
				\$100,993.56	0.99%
Portfolio 4					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	20%	\$20,000.00	6.3%	\$21,260.55	
VXZ Index	30%	\$30,000.00	4.3%	\$31,297.71	
				\$100,795.85	0.80%
Portfolio 5					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	10%	\$10,000.00	6.3%	\$10,630.28	
VXZ Index	40%	\$40,000.00	4.3%	\$41,730.28	
				\$100,598.14	0.60%
Portfolio 6					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	0%	\$0.00	6.3%	\$0.00	
VXZ Index	50%	\$50,000.00	4.3%	\$52,162.85	
				\$100,400.44	0.40%

Time Period: Jan 2014			Beginning:	\$100,000.00	
*Note You are short-XIV					
Portfolio 1					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	50%	\$50,000.00	6.3%	\$53,151.38	
XIV Index	0%	\$0.00	-16.8%	\$0.00	
				\$101,388.97	1.39%
Portfolio 2					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	40%	\$40,000.00	6.3%	\$42,521.11	
XIV Index	10%	\$10,000.00	-16.8%	\$11,678.30	
				\$102,437.00	2.44%
Portfolio 3					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	30%	\$30,000.00	6.3%	\$31,890.83	
XIV Index	20%	\$20,000.00	-16.8%	\$23,356.60	
				\$103,485.02	3.49%
Portfolio 4					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	20%	\$20,000.00	6.3%	\$21,260.55	
XIV Index	30%	\$30,000.00	-16.8%	\$35,034.90	
				\$104,533.04	4.53%
Portfolio 5					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	10%	\$10,000.00	6.3%	\$10,630.28	
XIV Index	40%	\$40,000.00	-16.8%	\$46,713.20	
				\$105,581.07	5.58%
Portfolio 6					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-3.5%	\$48,237.59	
TLT Equity	0%	\$0.00	6.3%	\$0.00	
XIV Index	50%	\$50,000.00	-16.8%	\$58,391.51	
				\$106,629.09	6.63%

2013 Debt-Ceiling-Debacle

Time Period: 9-17-13 to 10-8-13				Beginning:	\$100,000.00	
Portfolio 1						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56		
TLT Equity	50%	\$50,000.00	2.6%	\$51,320.36		
VXX Index	0%	\$0.00	19.6%	\$0.00		
				\$99,923.93	-0.08%	
Portfolio 2						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56		
TLT Equity	40%	\$40,000.00	2.6%	\$41,056.29		
VXX Index	10%	\$10,000.00	19.6%	\$11,960.51		
				\$101,620.36	1.62%	
Portfolio 3						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56		
TLT Equity	30%	\$30,000.00	2.6%	\$30,792.22		
VXX Index	20%	\$20,000.00	19.6%	\$23,921.02		
				\$103,316.80	3.32%	
Portfolio 4						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56		
TLT Equity	20%	\$20,000.00	2.6%	\$20,528.14		
VXX Index	30%	\$30,000.00	19.6%	\$35,881.52		
				\$105,013.23	5.01%	
Portfolio 5						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56		
TLT Equity	10%	\$10,000.00	2.6%	\$10,264.07		
VXX Index	40%	\$40,000.00	19.6%	\$47,842.03		
				\$106,709.67	6.71%	
Portfolio 6						
Security	Weights	Amount Invested	Return	Ending Balance	Total Return	
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56		
TLT Equity	0%	\$0.00	2.6%	\$0.00		
VXX Index	50%	\$50,000.00	19.6%	\$59,802.54		
				\$108,406.10	8.41%	

Time Period: 9-17-13 to 10-8-13			Beginning:	\$100,000.00	
Portfolio 1					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	50%	\$50,000.00	2.6%	\$51,320.36	
VXZ Index	0%	\$0.00	9.0%	\$0.00	
				\$99,923.93	-0.08%
Portfolio 2					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	40%	\$40,000.00	2.6%	\$41,056.29	
VXZ Index	10%	\$10,000.00	9.0%	\$10,904.63	
				\$100,564.48	0.56%
Portfolio 3					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	30%	\$30,000.00	2.6%	\$30,792.22	
VXZ Index	20%	\$20,000.00	9.0%	\$21,809.26	
				\$101,205.04	1.21%
Portfolio 4					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	20%	\$20,000.00	2.6%	\$20,528.14	
VXZ Index	30%	\$30,000.00	9.0%	\$32,713.90	
				\$101,845.60	1.85%
Portfolio 5					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	10%	\$10,000.00	2.6%	\$10,264.07	
VXZ Index	40%	\$40,000.00	9.0%	\$43,618.53	
				\$102,486.16	2.49%
Portfolio 6					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	0%	\$0.00	2.6%	\$0.00	
VXZ Index	50%	\$50,000.00	9.0%	\$54,523.16	
				\$103,126.72	3.13%

Time Period: 9-17-13 to 10-8-13			Beginning:	\$100,000.00	
*Note You are short-XIV					
Portfolio 1					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	50%	\$50,000.00	2.6%	\$51,320.36	
XIV Index	0%	\$0.00	-18.2%	\$0.00	
				\$99,923.93	-0.08%
Portfolio 2					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	40%	\$40,000.00	2.6%	\$41,056.29	
XIV Index	10%	\$10,000.00	-18.2%	\$11,824.69	
				\$101,484.54	1.48%
Portfolio 3					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	30%	\$30,000.00	2.6%	\$30,792.22	
XIV Index	20%	\$20,000.00	-18.2%	\$23,649.37	
				\$103,045.15	3.05%
Portfolio 4					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	20%	\$20,000.00	2.6%	\$20,528.14	
XIV Index	30%	\$30,000.00	-18.2%	\$35,474.06	
				\$104,605.77	4.61%
Portfolio 5					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	10%	\$10,000.00	2.6%	\$10,264.07	
XIV Index	40%	\$40,000.00	-18.2%	\$47,298.75	
				\$106,166.38	6.17%
Portfolio 6					
Security	Weights	Amount Invested	Return	Ending Balance	Total Return
SPY Equity	50%	\$50,000.00	-2.8%	\$48,603.56	
TLT Equity	0%	\$0.00	2.6%	\$0.00	
XIV Index	50%	\$50,000.00	-18.2%	\$59,123.44	
				\$107,727.00	7.73%

Total Return Calculator: Bloomberg-Excel

Bloomberg Multiple Security/Index Total Return

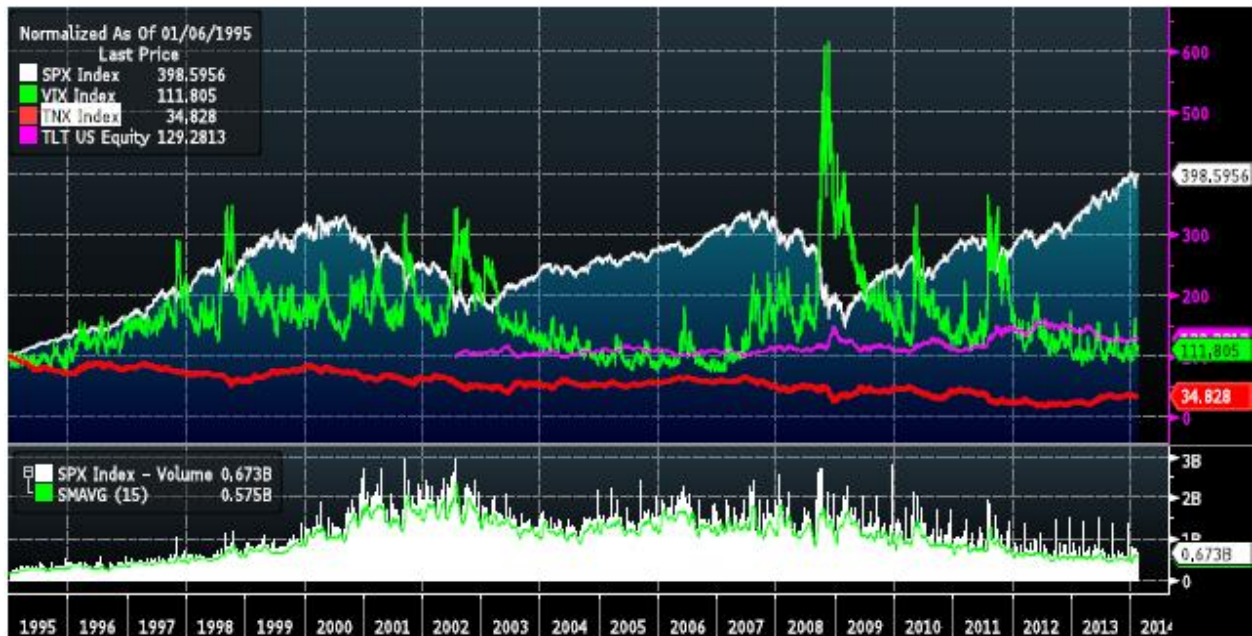
Historical Total Return Chart Settings

Benchmark 1: Total Return From: Cumulative Total Return (Gross Dividends)
 Benchmark 2: Start Date: Periodicity:
 Benchmark 3: End Date: Currency:

Don't chart data
 Show/Hide Chart Settings

Securities	Name	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9
VIX Index	CBOE SPX VOLATILITY INDX	11.805%	86.292%	33.386%	34.194%	-61.261%	-18.490%	34.184%	-70.223%	-8.479%
SPX Index	S&P 500 INDEX	470.353%	-51.123%	-2.775%	-3.457%	148.243%	60.649%	-3.457%	165.360%	37.434%
TNX Index	10-YR YIELD INDX	-65.712%	-40.360%	-1.606%	-11.831%	-3.868%	-3.360%	-11.831%	-1.371%	-33.285%
VXX Index	IPATH S&P 500 VIX Short-Term F	-	-	19.805%	16.357%	-39.357%	-39.451%	16.357%	-33.407%	-
VXZ Index	PATH S&P 500 VIX Mid-Term F	-	-	9.046%	4.326%	-85.273%	-77.823%	4.326%	-85.305%	-
XIV Index	VelocityShares Daily Inverse V	-	-	-18.247%	-16.783%	-	188.651%	-16.783%	-	-
TLT Equity	iShares 20+ Year Treasury Bond	23.440%	2.641%	6.303%	22.657%	24.458%	6.303%	22.125%	82.453%	-
SPY Equity	SPDR S&P 500 ETF Trust	460.335%	-50.380%	-2.793%	-3.525%	146.606%	60.145%	-3.525%	163.838%	35.840%

The above chart computes and illustrates the total returns (Dividend-Adjusted) of the Volatility Index (VIX), SPX Index, TNX Index, VXX Index, VXZ Index, and XIV Index over the time periods I have discussed throughout this paper. Data was pulled from Bloomberg via the Bloomberg-Microsoft Excel Add-in feature.



The chart above is indexing the SPX (white), VIX (green), TNX (red), and TLT (purple) from January 6, 1995 to February 21, 2014 on a weekly basis (unadjusted for dividends on the

SPX). Notice the SPX posts a 298.60% return, the TNX Index posts a -65.17% return, the TLT ETF presents a 29.28% return, and the VIX gives an 11.81% return. What this chart illustrates is that the Volatility Index is a short-term investment, in other words, your opportunity cost of foregoing investment in the SPX long-term outweighs going long - in the long-term - the Volatility Index. The ideal, and most profitable strategy involves the investor playing the VIX, or its derivative vehicles, in the short-term in order to prosper from those market movements, and then to reinvest the principal and its interest back into the S&P 500 index or debt instrument of choice for the long-term.

To conclude, I believe that the data presented in this paper has illustrated a strong, negative correlation between general market declines and the appreciation of the CBOE Volatility Index and its peer investment vehicles. It is up to the investor to incorporate volatility into their portfolio, but the decision to do so will make the investor a substantial amount of money, when implemented correctly. Investing in the VIX at the first signs of economic, financial, and geopolitical risk is where money can not only be saved – but can provide large profits to an investor.

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