Using VIX Data to Enhance Technical Trading Signals

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Abstract

The purpose of this paper is to provide new insights into the relationship between technical analysis and implied market volatility (VIX) by calculating technical trading rules with the VIX price data, as opposed to the stock prices. Three trending trading rule signals are calculated on the prices of three major U.S. indices and the VIX prices. The results reveal that the trading signals calculated with the VIX level provides large, statistically significant profits that are in excess of the profits from the traditional computation. Sub-period analysis reveals that technical trading rules were most (least) profitable during the period with the highest (lowest) volatility levels.

Keywords: Technical analysis; volatility; VIX

JEL: C4; C22; G14; G19

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I. Introduction

Traditionally, technical analysis relies on a security's historical price and volume data to generate buy and sell signals for that security (Murphy 1999). However, this study provides a novel approach to technical analysis by utilizing the historical price data for the Chicago Board Options Exchange Volatility Index (VIX) observed through the prices of S&P 500 index options to generate buy and sell signals for technical trading rules.

The rational for this novel approach is based on the fact there exists a positive (negative) relationship between forward-looking returns and extremely high (low) levels of the implied volatility (Giot 2006). An increase in the VIX level could coincide with a market moving either upward or downward, however increases are typically associated with declining markets (Whaley 2009). Specifically, positive (negative) returns tend to follow extremely high (low) levels of implied volatility. Essentially, Giot (2006) suggested that very large volatility levels may suggest an over-sold market. Technical analysis, like the VIX, is intended to be forward-looking. Therefore, it is postulated that combining these two forward-looking signals may create a synthesis whereby the whole is greater than the sum of its parts.

The results reveal that technical analysis was more profitable when calculated with the VIX prices than when calculated with stock prices. Using the VIX prices to calculate technical trading rule significantly increased the frequency in which profits were generated and the naïve buy-and-hold strategy was outperformed. The results are tested for statistical significance and robustness through a bootstrapping simulation and sub-period analysis, respectively.

II. Data Description

The daily closing prices of the S&P 500, NASDAQ, DJIA and VIX comprise the dataset. The time period under investigation spans from 1 January, 1999 to 31 July, 2009, resulting in a total of 2661 observations per index. Daily holding period returns are calculated for each index.

III. Methodology

The adjusted excess returns (AER) from the moving-average cross-over rule, filter rule, and trading-range break-out rule are calculated by using both the S&P 500, NASDAQ, DJIA price data, and with the VIX price data. The adjusted excess returns are the profits, adjusted for both the return on the buy-and-hold strategy and transaction costs.

Upon a buy signal, an investor is assumed to be long the market and will earn the return on the respective index until a sell signal is generated. An investor will be short the market upon a sell signal, meaning that the investor will earn the inverse of the return on the market. The respective long and short positions are assumed to be opened the day following the generation of a buy or sell signal. The return from the buy-and-hold strategy is calculated by assuming that the investor goes long the market for the entire period under consideration. Transaction costs are applied at the time a position is opened and closed, and are comprised of the bid-ask spread and a brokerage fee (Lento, 2009; Gencay, 1999).

The results are tested for significance through a bootstrapping simulation (Levich and Thomas, 1993). The following three sub-periods are analyzed to test the robustness: January 1, 1999 – June 25, 2003; June 26, 2003 – August 17, 2007; and August 18, 2007 – July 31, 2009. The sub-periods are selected based on breaks in the trends of the overall dataset. Further sensitivity analysis is conducted by measuring the daily profits within the three sub-periods by distinguishing between the returns on days in which the investor is long the market, and days in which the investor is short the market.

IV. Empirical Results

Table 1 presents the AER for the trading rules as calculated with the security returns and VIX returns, respectively. In addition, the differential between these two computations is presented.

Table 1. Adjusted excess returns of the trading strategy

	Moving Average Crossover			TRBO Rule			Filter Rule		
	(1, 50)	(5, 150)	(1, 200)	50 Days	150 Days	200 Days	1% Filter	2% Filter	5% Filter
DJIA									
VIX AER	12.9%	1.9%	4.3%	5.0%	5.7%	-6.0%	17.3%	15.6%	10.0%
Security AER	-6.8%	-6.7%	-7.8%	-9.3%	-8.1%	-5.4%	-22.2%	-17.4%	-8.3%
Differential	19.7%	8.6%	12.1%	14.3%	13.8%	-0.6%	39.5%	33.0%	18.3%
p-value for VIX Profits	0.10	0.32	0.32	0.34	0.28	0.72	0.00	0.02	0.14
S&P 500									
VIX AER	13.5%	1.6%	1.7%	10.0%	6.5%	-2.5%	16.2%	17.2%	14.5%
Security AER	-5.4%	5.7%	2.3%	3.6%	10.3%	12.7%	-19.3%	-16.5%	-1.6%
Differential	18.9%	-4.1%	-0.6%	6.4%	-3.8%	-15.2%	35.5%	33.7%	16.1%
p-value for VIX Profits	0.14	0.40	0.44	0.22	0.16	0.68	0.02	0.00	0.04
NASDAQ									
VIX AER	-8.0%	-3.3%	-8.5%	14.0%	17.0%	4.9%	3.4%	2.8%	2.5%
Security AER	8.9%	4.1%	9.2%	15.0%	11.7%	7.7%	-24.9%	-23.4%	-8.2%
Differential	-16.9%	-7.4%	-17.7%	-1.0%	5.3%	-2.8%	28.3%	26.2%	10.7%
p-value for VIX Profits	0.54	0.60	0.64	0.04	0.10	0.24	0.34	0.26	0.38

The DJIA, previously unable to beat the buy-and-hold return, outperforms the strategy for eight of the nine trading rules. Only the 200 day TRBO rule failed to yield a positive differential. The S&P 500 Index enjoyed similar success, as eight of nine trading rules generating positive AER, compared to five of nine. Finally, six of the nine trading rules tested were able to generate positive AER on the NASDAQ. Overall, 17 of 27 (63%) trading rules generated greater AER when using the VIX data compared to the security data. The bootstrapping simulations reveal that the filter rule profits were significant, with five of nine being significant at the 5% significance level.

Table 2 presents the adjusted excess returns for the trading rules calculated with the VIX data for three sub-periods. The average VIX level for sub-period 1, 2, and 3 is 25.3, 14.5, and 32.0, respectively.

Table 2. Adjusted excess returns by sub-period

	Moving Average Crossover			TRBO Rule			Filter Rule		
	(1, 50)	(5, 150)	(1, 200)	50 Days	150 Days	200 Days	1%	2%	5%
DJIA									
Sub-period 1	0.5%	14.9%	11.7%	5.6%	22.6%	18.9%	3.8%	4.5%	0.5%
Sub-period 2	-6.3%	-5.6%	-8.0%	1.3%	-14.0%	-24.0%	-8.6%	-13.1%	-14.3%
Sub-period 3	48.3%	-5.5%	13.5%	10.5%	12.4%	-10.0%	118.5%	118.3%	90.9%
S&P 500									
Sub-period 1	4.8%	21.5%	14.4%	26.3%	27.8%	29.6%	3.6%	8.4%	4.8%
Sub-period 2	-8.0%	-8.5%	-13.0%	-2.5%	-16.7%	-24.8%	-9.4%	-14.6%	-12.2%
Sub-period 3	38.2%	-11.2%	6.4%	2.6%	12.5%	-9.2%	114.0%	121.7%	104.1%
NASDAQ									
Sub-period 1	-9.1%	15.1%	-1.4%	45.7%	68.0%	62.1%	-2.4%	2.7%	-9.1%
Sub-period 2	-14.1%	-10.3%	-16.5%	1.9%	-19.4%	-30.4%	-23.6%	-29.0%	-20.0%
Sub-period 3	5.2%	-20.5%	-6.5%	-16.3%	6.6%	-11.1%	89.6%	84.8%	99.1%

During sub-periods one and three, the technical trading rules were able to generate positive excess returns 78% of the observations (42 of 54 times). During sub-period two, the technical trading rules underperformed the buy-and-hold strategy in 25 of the 27 observations, or 93% of the time. VIX levels during the profitable sub-periods were far greater than during the unprofitable sub-period, as the average VIX levels were 25.3 and 32.0 respectively during sub-periods one and three, and were only 14.5 during the second sub-period.

Table 3 presents the average daily return for days in which the investor holds a long position, as well as the average daily return for days in which the investor holds a short position.

Table 3. Average daily returns over three sub-periods

		Sub-Period 1		Sub-Period 2		Sub-Period 3	
		Long Returns	Short Returns	Long Returns	Short Returns	Long Returns	Short Returns
(1, 50) MACO	**DJIA**	0.04%	0.03%	0.07%	-0.01%	0.04%	0.12%
	S&P 500	0.02%	0.05%	0.07%	-0.02%	0.01%	0.10%
	NASDAQ	-0.06%	-0.03%	0.07%	-0.03%	-0.03%	0.01%
(5, 150) MACO	**DJIA**	0.03%	0.03%	0.09%	-0.01%	-0.11%	-0.02%
	S&P 500	0.02%	0.05%	0.09%	-0.02%	-0.13%	-0.05%
	NASDAQ	0.01%	0.04%	0.10%	-0.02%	-0.10%	-0.09%
(1, 200) MACO	**DJIA**	0.03%	0.03%	0.09%	-0.01%	-0.05%	0.06%
	S&P 500	0.01%	0.04%	0.08%	-0.02%	-0.06%	0.03%
	NASDAQ	-0.06%	0.00%	0.08%	-0.03%	-0.05%	-0.03%
50 Day TRBO	**DJIA**	0.02%	0.02%	0.09%	0.00%	-0.07%	0.04%
	S&P 500	0.04%	0.07%	0.08%	-0.01%	-0.09%	0.01%
	NASDAQ	0.10%	0.12%	0.11%	0.00%	-0.10%	-0.06%
150 Day TRBO	**DJIA**	0.03%	0.10%	0.07%	-0.02%	-0.05%	0.07%
	S&P 500	0.02%	0.14%	0.07%	-0.03%	-0.05%	0.07%
	NASDAQ	0.08%	0.33%	0.08%	-0.03%	-0.02%	0.03%
200 Day TRBO	**DJIA**	0.03%	0.09%	0.00%	-0.04%	-0.07%	-0.67%
	S&P 500	0.02%	0.14%	0.05%	-0.04%	-0.07%	-0.67%
	NASDAQ	0.06%	0.29%	0.03%	-0.05%	-0.04%	-0.69%
1% Filter Rule	**DJIA**	0.02%	0.02%	0.05%	-0.03%	0.13%	0.31%
	S&P 500	-0.01%	0.02%	0.05%	-0.03%	0.13%	0.31%
	NASDAQ	-0.01%	0.02%	0.03%	-0.08%	0.13%	0.24%
2% Filter Rule	**DJIA**	0.02%	0.02%	0.04%	-0.04%	0.14%	0.30%
	S&P 500	0.00%	0.04%	0.04%	-0.04%	0.14%	0.30%
	NASDAQ	-0.01%	-0.01%	0.02%	-0.06%	0.27%	0.10%
5% Filter Rule	**DJIA**	0.01%	0.00%	0.04%	-0.04%	0.11%	0.22%
	S&P 500	-0.01%	0.02%	0.05%	-0.03%	0.13%	0.25%
	NASDAQ	-0.01%	-0.07%	0.03%	-0.01%	0.26%	0.15%

Average daily returns on short positions for the first and third sub-periods were positive for 80% of the trading rules tested. These returns were more volatile than those seen during the second sub-period, with slightly larger returns being observed more frequently. However, larger losses also occurred on occasion.

The average daily short return was greatest during the third sub-period for 52% of the trading rules, while the remaining 48% of the trading rules experienced the largest average daily short return during the first sub-period. These results indicate that short signals will generate greater profits when the VIX level is increasing, as these sub-periods were substantially more volatile than the second.

V. Conclusion

This study set out to examine the relationship between the level of market volatility and the profitability of technical analysis. It is postulated that because both technical analysis and the VIX are forward-looking, merging them together should create a more powerful forward-looking signal. Therefore, trading rules were calculated by using VIX prices to generate the buy and sell signals.

The results reveal that using the VIX data, as opposed to the security data, increase profits for each filter rule test. Profitability was also increased for 44% of the moving average crossover rules and trading range breakout rules. Overall, the 63% of the trading rules generated greater profits when using the VIX prices to calculate the trading rules. The findings suggest that a relationship exists between the level of market volatility and the profitability of technical analysis.

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