Volatility spread as a measure of investor sentiment

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September 27, 2018

The VIX, the CBOE volatility index, is widely used as an indicator of investor fear. High levels of VIX are associated with market turmoils while low levels with calm confident markets. The upward spikes in the VIX usually occur in periods of strongly declining markets. For example, during the market crash of 1997 the VIX exceeded level of 100%. During the financial crisis of 2008, the VIX reached highs of 80%. Market volatility, however, does not result only from the fear in the market but from any new information that disturbs current levels of the S&P 500 index. Therefore, we can observe periods of simultaneous increases in the value of the S&P 500 and the VIX as well.

The VIX is constructed from at-the-money and out-of-the-money nearby and second-nearby SPX call and put options (Whaley (2000), Whaley (2008b)). It is widely documented that implied volatility is not constant across different moneyness levels leading to well known volatility smile (figure 1).

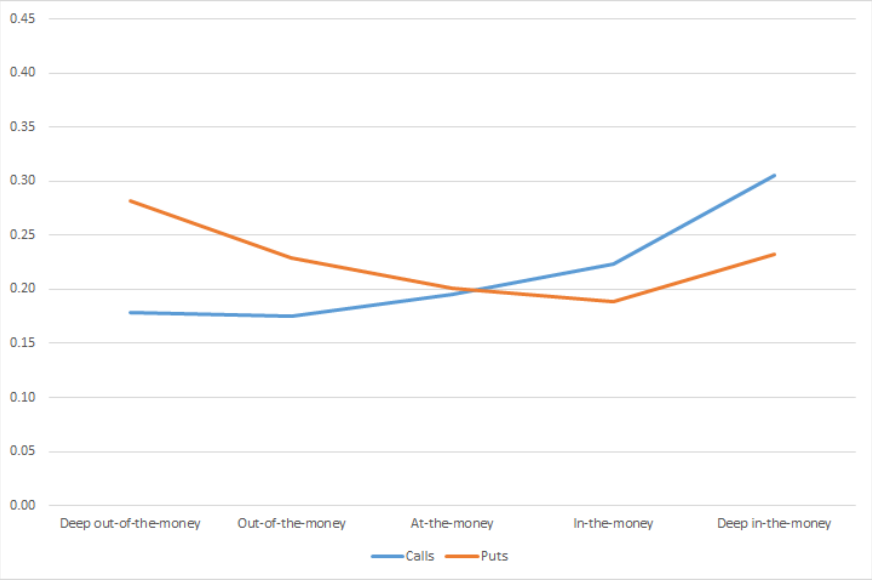

Figure 1: Implied volatility function of SPX (time period)

Implied volatilities estimated from deep-out-of-money and out-of-money put options are higher than those estimated from deep-out-of-money and out-of-money call options. Bollen and Whaley (2004) attribute this difference in implied volatilities to the high demand for out-of-the-money puts by hedgers. Hedgers buy index puts, such as SPX puts, to hedge their portfolios. The demand for puts is especially strong during

time of low market sentiment when investors fear potentially increases in the market. In fact, for this very reason the out-of-the-money options were added to the VIX calculation in 2003 (Whaley (2008a)). Figure 2 illustrates the implied volatilities during periods of low market sentiment.

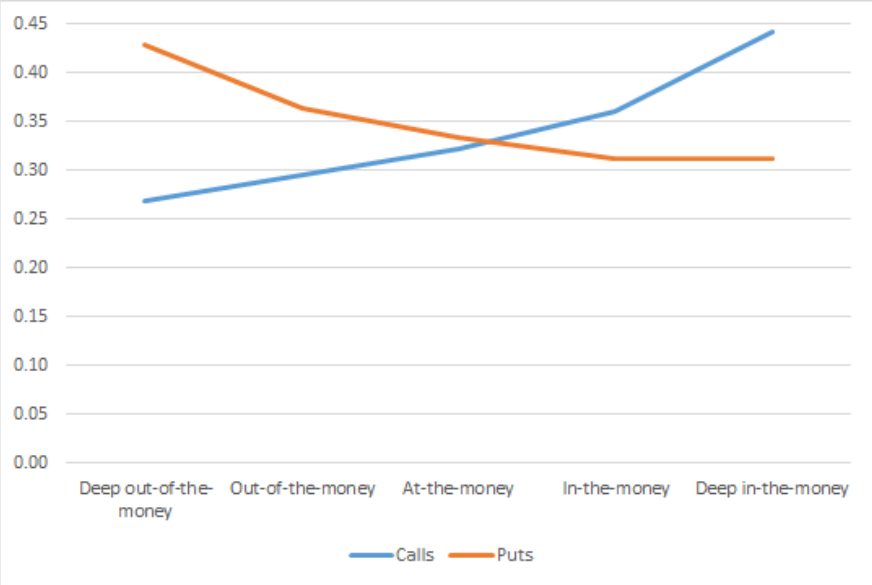

Figure 2: Implied volatility function for bottom 20% sentiment periods

We observe not only increased volatility during periods of low market sentiment but also larger difference between implied volatilities estimated from deep-out-of-the-money and out-of-the-money calls and puts (IV spread). Figure 3 shows this spread for implied volatilities estimated from SPX puts and calls.

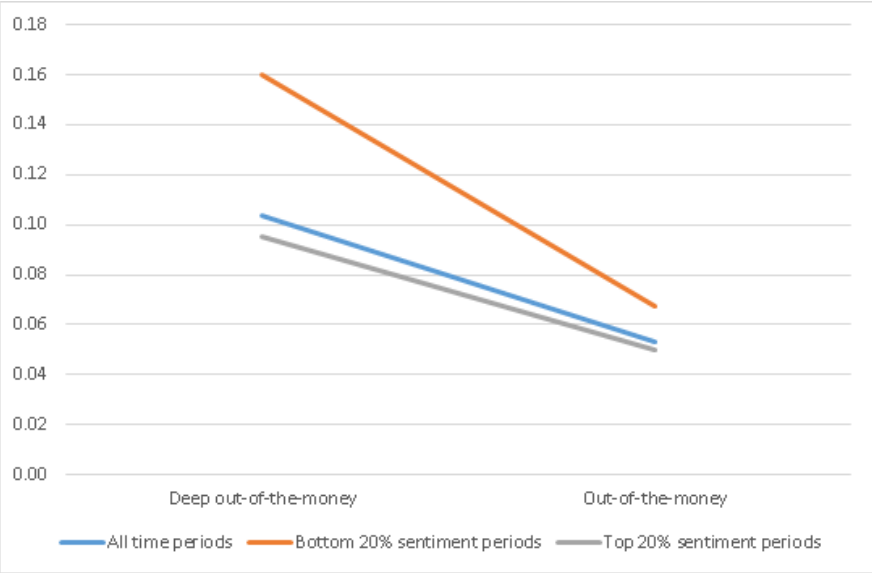

Figure 3: Implied volatility spread for SPX options for all maturity levels

Short-term options may reveal different information about demand for hedging than long-term options. Investors with short time horizon or market speculators create demand for short-term options while investors with longer horizon may choose to trade long-term options to avoid costly renewal of hedges. Figures 4 shows IV spread for maturities 14 to 40 days (***Add here the 40 to 70 days maturity category***) . In the short horizon, the IV spread is downward sloping during low sentiment periods suggesting that investors hedge (or bet) for large losses. The IV spread during high sentiment periods is upward sloping suggesting relatively lower demand for deep-out-of-money and out-of-money puts and relatively large demand for the deep-out-of-money and out-of-money calls. This change in demand could be generated by short term speculations during extremely optimistic times.

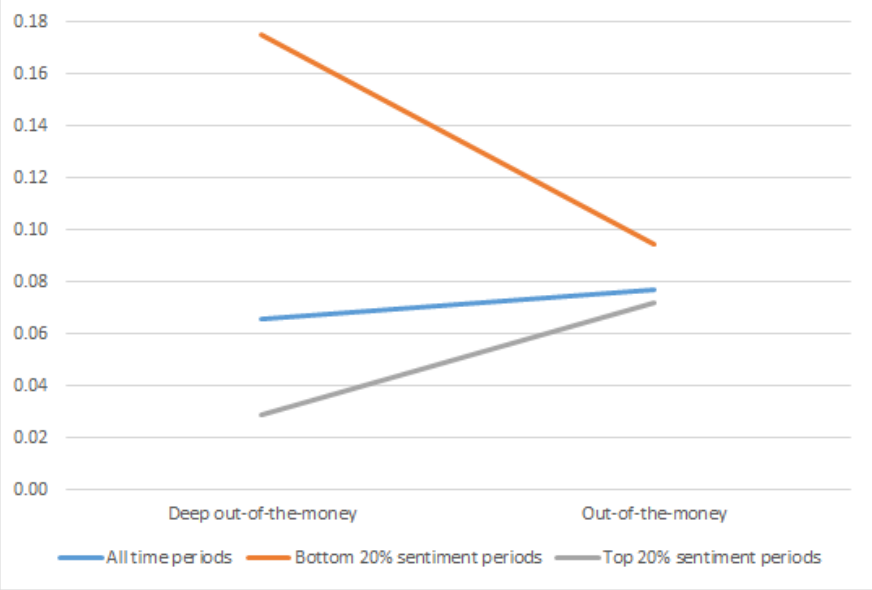

Figure 4: Implied volatility spread for SPX options with maturity 14 to 40 days

Figure 5 shows IV spread for SPX options with maturities 100 to 360 days. The IV spread is downward sloping for all sentiment regimes. Larger spread is observed during low sentiment periods which is consistent with higher hedging demand.

Figure 6 plots monthly S&P 500 index and implied volatility spread for both deep-out-of-the-money and out-of-the-money options. I use only options with maturity within 14 - 40 days. DOTM spread exhibits greater fluctuation. Similar to VIX, IV spreads tend to move in the opposite direction of S&P 500.

Figure 7 compares IV spreads and VIX. It seems that they have very similar movements. The correlations between VIX and DOTM spread and VIX and OTM spread are 0.7 and 0.58, respectively. Both are significant at 1% level.

In this paper, we elaborate on the idea that the difference in implied volatilities estimated from index puts and calls may contain information about market sentiment that is not fully represented in the VIX. The volatility implied from deep-out-of-the money and out-of-the money index puts contains information about the market demand for portfolio insurance (bearish signal) while the volatility implied from calls may reflect

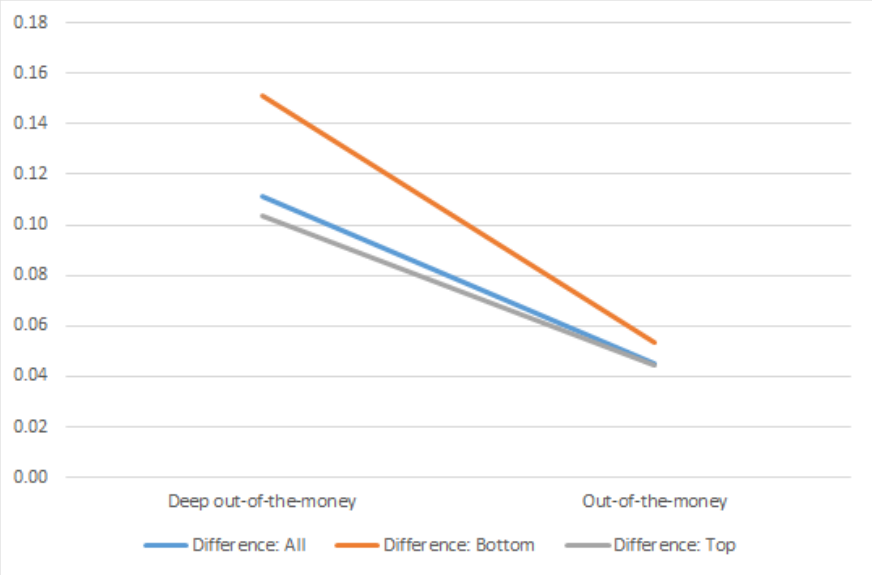

Figure 5: Implied volatility spread for SPX options with maturity 100 to 360 days

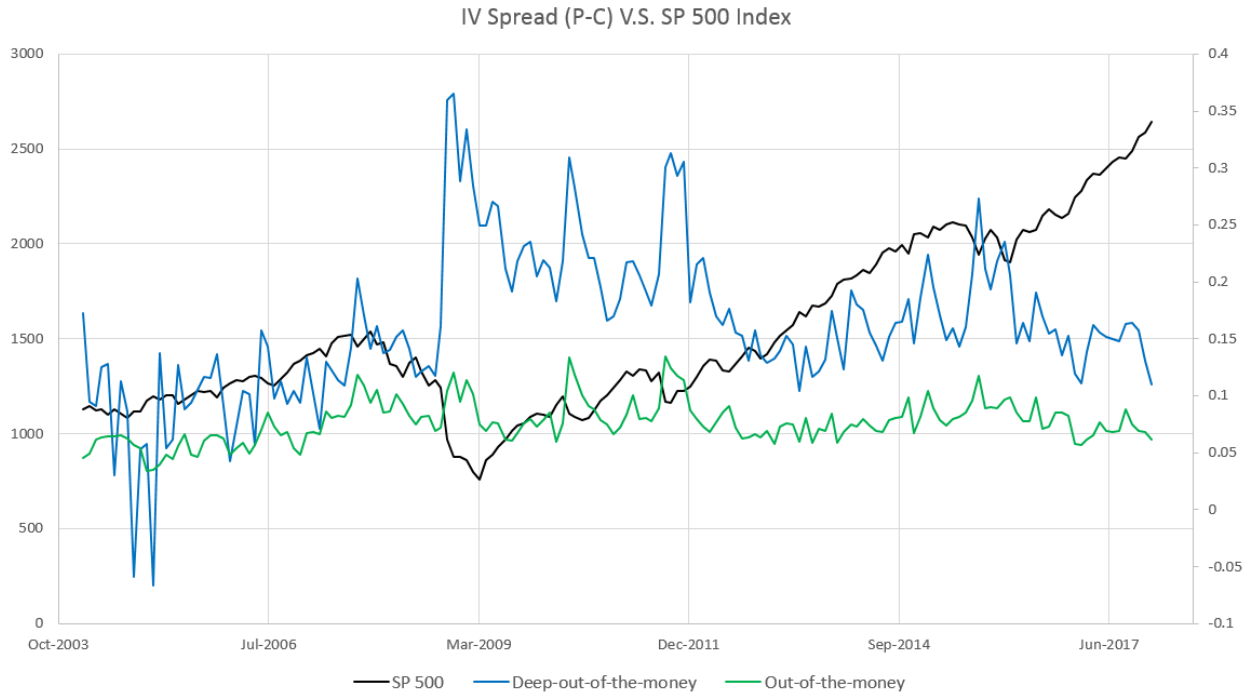

Figure 6: This is a caption

information about market speculators (bullish signal). The volatility spread should be inversely related to market sentiment.

In addition, market sentiment is a variable that is hard to observe. It is usually inferred from other data, often the VIX itself. If the IV spread is highly correlated with II sentiment, and has some predictive power

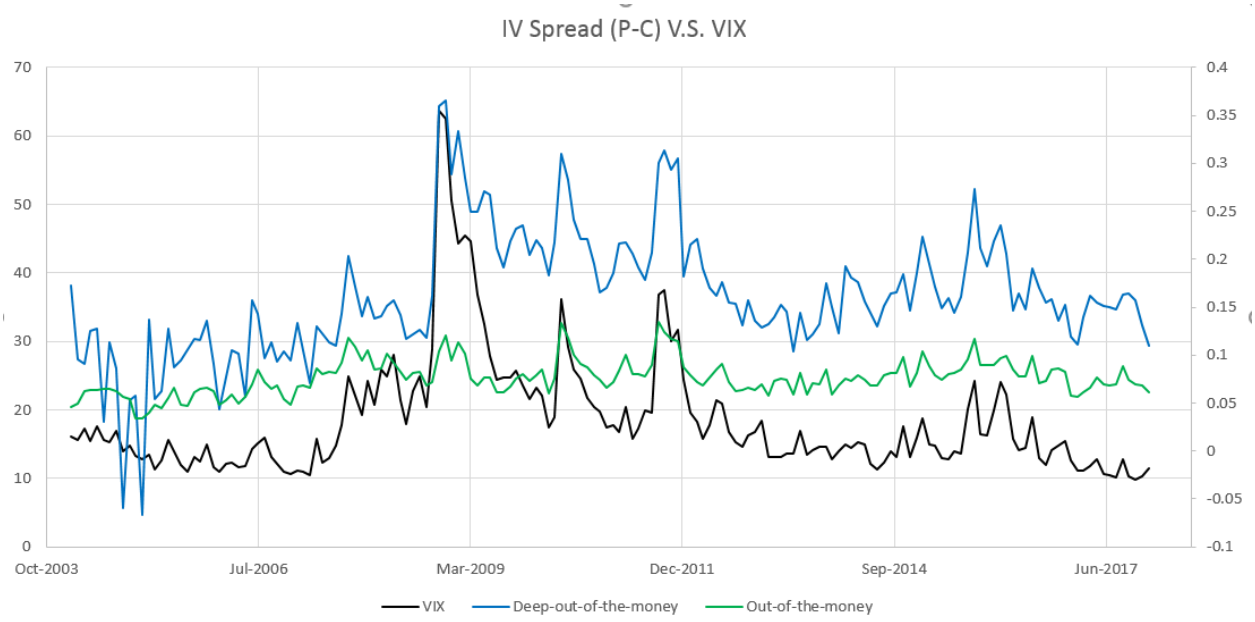

Figure 7: IV Difference and S&P 500 Index

for levels of S&P 500 index (probably short-term), then it could be used as an easily observable proxy for market sentiment.

Data

VIX (http://www.cboe.com/products/vix-index-volatility/vix-options-and-futures/vix-index/vix-historical-data)

Investor Intelligence Sentiment Data

S&P 500 index

Option metrics

Results

Correlations

Plan

To start:

	Volatility Spread	VIX	Sentiment	Orthogonalized sentiment
Volatility Spread	1			
VIX	0.71	1		
Sentiment	-0.38	-0.72	1	
Orthogonalized sentiment	-0.18	-0.38	0.79	1

Table 1: Correlation between volatility spread and other sentiment measures

1. (Done) Plot the IV difference and S&P 500 index in the same graph. Use only deep-out-of-the money and out-of-the money puts and calls on sentiment. Do not worry about at-the-money or (deep)in-the-money options.)
2. (Done) Plot the IV difference and the VIX in the same graph.
3. (Done) The same for short-term maturity options.
4. (Done) Calculate correlations between the differences in IV estimated from deep-out-of-the money and out-of-the money puts and calls on sentiment.
5. (Done) The same with short maturity options.
6. The same with long maturity options - probably 100 to 360 days.
7. Regressions: to think about. I like the approach of Whaley (2008)
8. Trading strategy

References

Nicolas P. B. Bollen and Robert E. Whaley. Does Net Buying Pressure Affect the Shape of Implied Volatility Functions? *The Journal of Finance*, 59(2):711–753, mar 2004. doi: 10.1111/j.1540-6261.2004.00647.x. URL https://doi.org/10.1111%2Fj.1540-6261.2004.00647.x.

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