Using Option Open Interest to Develop Short Term Price Targets

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Using Option Open Interest as a way to Develop Short Term Price Targets

Introduction

On March 24th, 2004 the University of Illinois presented striking evidence that option trading changes the prices of underlying stock. A paper titled Stock Price Clustering on Option Expiration Dates, co-authored by Sophie Xiaoyan Ni[1], Neil D. Pearson[1] and Allen M. Poteshman[1], showed that on expiration dates the closing prices of stocks with listed options cluster at option strike prices. They stated, "On each expiration date, the returns [1]of optionable stocks are altered by an average of at least 16.50 basis points, which translates into aggregate market capitalization shifts on the order of $9 billion." They also provided enough evidence to show that hedge re-balancing by option market-makers and stock price manipulation by firm proprietary traders contribute to the clustering.

The intent of this paper is to provide the complementary strategies used by option traders in support of the evidence published by the University of Illinois. This paper also brings us a new tool, the Pin Pressure Indicator © 2005, that could help the trader not only establish more reliable short term price targets but also provide the fund manager with reliable risk parameters.

Measuring the open interest of option contracts at specific strike prices can help us develop short term price targets especially in stocks that have high average daily trading volumes and high beta coefficients. Before one attempts to use the open interest of options as a technical indicator, it's important to understand how the option trader captures profit from the long and short side of the market. For the most part there are two kinds of option traders: those who buy options, expecting to profit from volatility in the market, and those who sell options with the expectation that the underlying stock will stay flat or in a well defined trading range. The option seller, also referred to as "*the writer,*" relies on the fact that options are a wasting asset meaning that once a trader takes a short option position the premium, over time, erodes from the option contract. This erosion, known as time decay, is calculated as a return on investment (ROI) for the option writer. In the examples that follow, we will calculate *total investment* as the cost of the options held long plus the cost to carry an option position on the short side. We will also look at the delta of the option as the change in price of the option as compared to a one dollar move in the underlying stock. These principles can be applied to all markets where options are made available. However, for the examples used in our discussion, we will be referring only to stock options.

Without having to dig very deeply into the *Black Scholes Model* we will be able to see why certain hedging strategies, used mostly by professional option traders, drive stock prices to certain levels. These hedging strategies have a tremendous influence on stock prices and as our markets become more global, the more we will see these hedging strategies affect stock prices as we approach options expiration. In fact, as we explore these principles you will notice, for the most part, that stock prices are driven to levels

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that carry the highest open interest for that particular expiration month. This reaction is also known as *pinning the strike*.

Background on the Black-Scholes Model, and Delta Neutral Trading

The Black-Scholes model utilizes the stock price, strike price, expiration date, risk-free return, and the standard deviation (volatility) of the stock's return to calculate the fair value of an option contract. It also provides the trader with the much needed *delta* or *hedge ratio*. The delta helps determine how many shares the trader needs to buy or sell in order to hedge the options they've bought or sold.

The first series of strategies below highlights what the trader might do to stay hedged in a current call position. First proposed by Avellandeda and Lipkin in 2003 it was also brought into the body of evidence by Ni, Pearson and Poteshman as one of the four potential explanations for a move to a particular strike price.

Example #1: Trader buys 500 call contracts. Each contract having a delta of 0.50

To calculate the proper hedge:

The trader would multiply the number of shares represented in the option position, which in this case is 50,000 (500 contracts x 100 shares per contract), by the delta (0.50). In the eyes of the option trader, this CALL position is equivalent to a long position of 25,000 shares in the underlying stock *at that moment*. In order to hedge this position the trader might sell 25,000 shares of the underlying stock. In doing so the trader is equivalently long 25,000 from the call option and short 25,000 shares of the underlying stock. This position is considered to be *delta neutral*. However, it is only delta neutral at that moment in time. As the delta changes, the trader must make adjustments to those short shares of stock to maintain a delta neutral position.

The first priority for this delta neutral portfolio manager is to establish a well defined risk management plan and maintaining a delta neutral portfolio is just one way the option trader might manage risk in a large option portfolio.

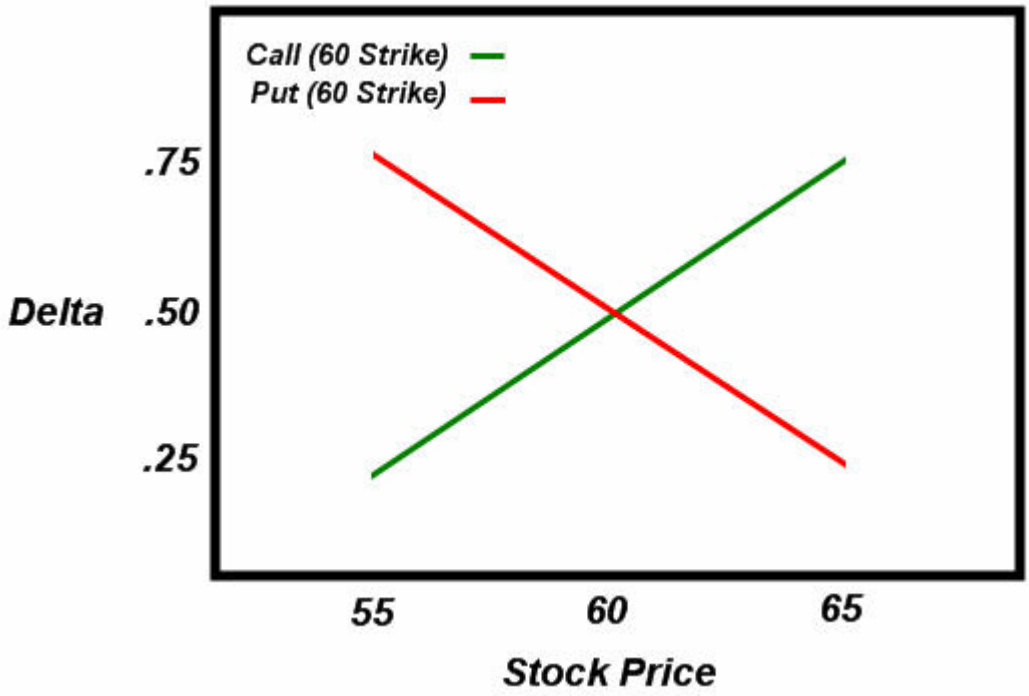
Example #2: Trader buys 500 put contracts. Each contract having a delta of 0.50

Like example #1, the trader would multiply the number of shares represented in the option position, 50,000 (500 contracts x 100 shares per contract), by the delta (0.50). In the eyes of the option trader, this PUT position is the same as having a short position equivalent to 25,000 shares in the underlying stock. In order to hedge this position the trader might buy 25,000 shares of the underlying stock to balance out the position. This also creates a *delta neutral* position at that moment in time. Just like the call trader in the previous example, this put trader must make adjustments to those long shares of stock to maintain a delta neutral portfolio.

If we were to combine both of the option positions seen in examples #1 and #2, this would eliminate the need to have an equity hedge altogether. Reason being, the calls, which are equivalent to a long stock position, hedge the puts which are a short equivalent. At this point, the long call + long put position (also known as a straddle) is delta neutral as long as both options carry the same delta. However, the interesting thing about deltas is that they change as the price of the stock changes. For instance, a call option with a delta of 0.50 might change to a delta of .75 should there be a significant upward move in the stock. If the stock continues to climb, the call option will be drawn towards a delta of 1.0, which means that the option is trading dollar-for-dollar with the stock. On the other side, with puts as the example, the delta of the put contract increases (in absolute terms) as the stock drops to lower price levels.

Figure 1.0 displays the change in delta relative to the change in price of the underlying security.

Fig 1.0



This change in delta, known as the *Gamma*, is what causes stock prices to be driven back to the strike price with the highest open interest. The option trader who has an overall long option position will be adjusting their hedge as the price of the underlying stock changes.

To get a better picture of how this works we will have to look at a few more examples. Then, after we have discussed how the option trader handles a delta neutral position from the long side, we look at how the option writer handles a position from the short side.

Example #1

Initial Trade

- Stock trading $60
- Long 500 at the money calls (60 strike)
- Delta = 0.50

Trader has an option position that is equivalent to being long 25,000 shares of the stock (500 contracts x 100 shares per contract) x .050 delta = 25,000 shares

The necessary hedge, while the stock is trading $60, is to short 25,000 shares of stock.

Adjustment #1

Stock moves $5 higher and is now trading $65
Trader is still long 500 option contracts
However, the delta is now 0.75

Taking a look at what the change in delta has done to the hedge; you will see that the trader is getting longer as the price of the stock increases.

Long 500 options contracts x 100 shares per contract x 0.75 delta = long equivalent of 37,500 shares of stock

So if the trader wants to stay in a delta neutral position he must sell 12,500 shares and it's this selling action that puts pressure on the stock driving it back towards the strike of $60.

Option traders who trade options from the long side want price movement. Therefore many traders look for stocks that have higher beta coefficients. Should the stock drop back down to a price where the delta returns to 0.50 the option trader then buys back 12,500 shares to bring the position back to delta neutral. This would result in a profit of roughly $62,500.

Example:

- Short sale of 12500 shares at $65 to adjust for change in delta
- Bought 12500 shares at $60 to re-adjust hedge
- Profit = $62500

Figure 2.0 displays how the hedge is affected at different price levels of the stock.

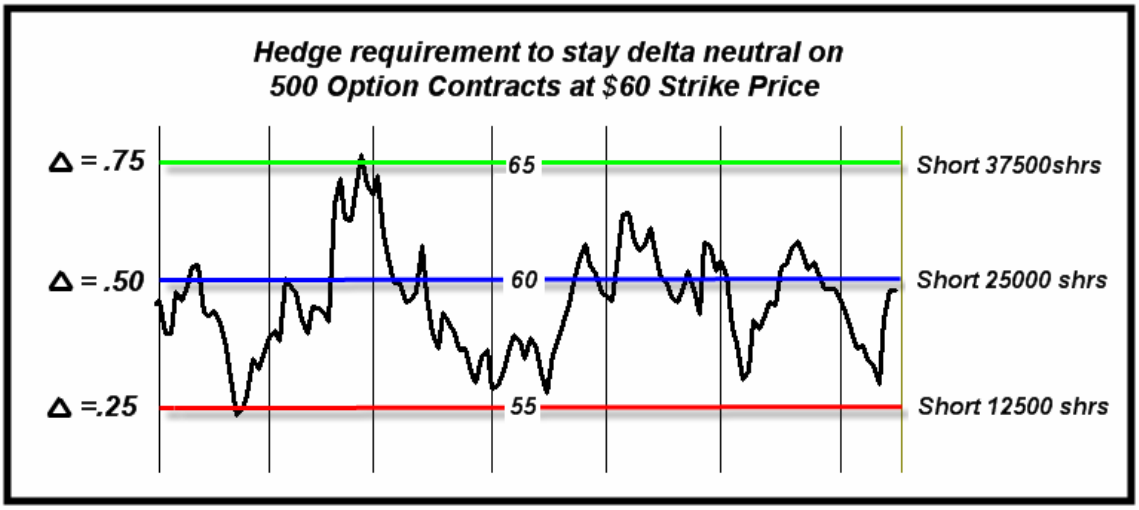


Fig 2.0

Adjustment #2

Should the stock drop to $55, the delta of the $60 calls changes once again giving the trader an opportunity to buy more stock to stay in a delta neutral hedge.

Stock moves $5 lower and is now trading $55
Trader is still long 500 option contracts
Delta is now 0.25
Trader is still short 25,000 shares from the time the trader put the hedge on at the $60 price level

Looking at the hedge requirement you will see that 50,000 x 0.25 delta requires a short hedge of 12,500 shares, so in order to get back into delta neutral position the trader must buy 12,500 shares leaving a short position of 12,500 shares for the hedge. This buy action helps support the price of the stock and once again the stock moves back to the strike with the highest open interest.

How Traders Would Hedge a Short Straddle Position.

The trader who is long the option contracts would favor an increase in volatility and as was demonstrated in the previous examples, the adjustments in the hedge would result in profitable trades to the trader due to the changes in delta of the options held on the long side. With that said, there is little the trader is doing to drive the price away from the strike price held on the long side so this results in a narrowing range in the price action as the option contract approaches expiration.

For the trader who has taken the other side of this option position, the strategy is much different. Although the price fluctuations are uncomfortable for the trader who is short the straddle (short both call and put) the strategy is to wait out the time decay. The trader

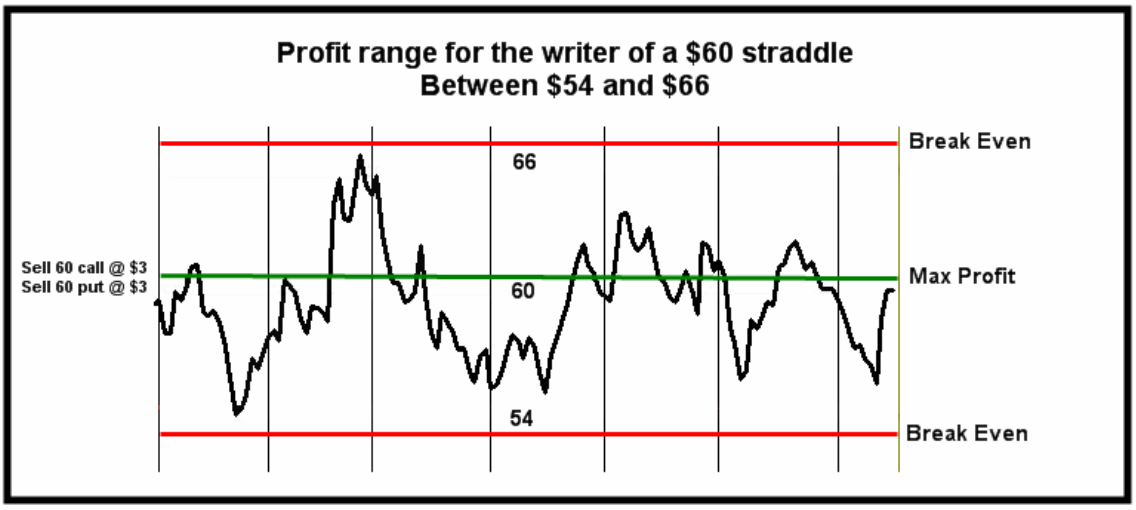
who has sold the option short is looking at time decay as a return on investment taken in on the margin requirement for any options held on the short side. Therefore, the option "writer" will not be aggressively hedging their position with the underlying stock but rather waiting out the time till expiration. This lack of activity is confirmed by a drop in volume during expiration week.

Example:

- Trader #2 has sold the $60 Straddle for $6. (Sold 60 call at $3, Sold 60 put at $3)
- Stock is trading at $60
- Should the stock close at $60 on expiration, the trader will realize maximum profit.

However, the trader also understands that a price move away from the strike price of $60, in either direction, will result in less of a profit and break even points of $66 to the upside and $54 to the downside.

Fig. 3.0



Another point to make with regard to the short straddle trader is that there's room for manipulation in the price of the stock. As mentioned previously, you will see that the break even points straddle the current strike price that has been sold in the short position (i.e. 60); therefore, there is a tendency to protect the position at those price boundaries. In other words, once the short trader has recognized the strategy of the long straddle trader, any buying pressure that enters the market at $54, as seen in the chart above, is an opportunity for the short option trader to add to the buying pressure therefore driving the stock back to the strike of $60 (maximum profit area for the short straddle trader). Although this would increase the risk for the short option trader at this point, and not every short option trader will participate, this is a common practice seen on many trading floors. The rest of the option sellers, who choose not to add to their risk in this fashion,

will simply not participate in any price manipulation whatsoever. This results in a decrease in volume in the underlying stock as expiration day approaches. This group of option traders simply sits on the sidelines with their positions with a strategy to wait out the time decay.

The Trading Day after Options Expiration

One observation made in the week after options expiration, which may make for good content in another paper, is the increase in volatility that takes place as the pressure is relieved from the strike price that has been pinned on the previous option expiration day. Once the professional option trader has closed their front month positions, the strategy is to look out towards the next month for a new strike to target, and the cycle continues.

Trading Psychology

The psychology of the market varies greatly between the professional trader, who is more grounded in risk management, and the highly emotional, less experienced retail trader. It is this "emotional premium" that is most attractive to the professional option writer and tracking the open interest of the option contracts can give us valuable clues as to what the majority of retail investors are holding in their positions. The general public is conditioned to buy low and sell high and their approach to the option market is no different. Unfortunately for less experienced option trader, they get what they pay for in the world of options. If you buy cheap options then most likely you will get cheap performance. The novice will reach for the cheapest option price on the board and once time decay has taken its toll on the premium this person will do what they have to in order to get back to the break even point. This also has an affect on the "Pin Pressure" as option expiration day approaches. For instance, as call owners stress over losses brought on by holding on to the option position too long, they will sell these options in a last ditch effort to salvage what they can from their positions. This selling action puts pressure on the stock and results in a drop in price towards the at-the-money strike prices. For those who are long out-of-the-money puts, their selling action adds to the buying pressure brought on by the trader who buys stock in an attempt hedge their new long put position. This also helps drive the price back up to strike prices that include the more valuable options. So this "option magnet," if you will, exists on many levels previously unseen by most money managers. One of the most exciting things to know about this psychological mindset is that it will not change. American culture conditions investors to buy at the lows, whether it is a consumer staple or stock and as long as this way of thinking persists, the more we will see this influence on option prices.

According to the Options Clearing Corporation (OCC), the long term average for the number of option contracts that expire worthless is about 30% with only 10% of the options being exercised and 60% of the option positions being closed in the open market. This activity once again supports the behavior patterns seen by the general public, many of which are pursuing the strategy of "break even". If 60% of the options –the majority-, are being closed prior to expiration then the professional option traders who take the other side of these trades are also unwinding their hedges as they take positions off the

books and again, as describe in the examples mentioned earlier, helps to drive the stock to the strike prices with the highest open interest.

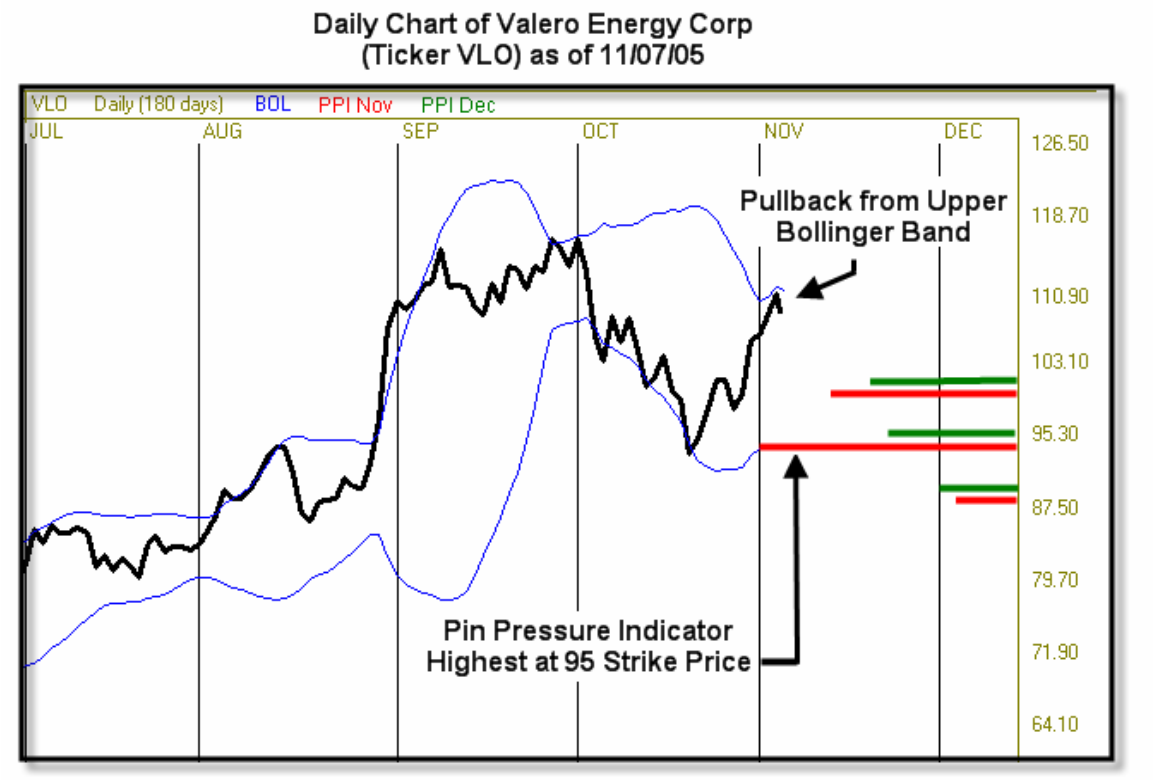
Trading Ideas that Combine the Open Interest of Options and Bollinger Bands.

<u>Trading from the long side</u>

One of the techniques that can be used to profit in the options markets is to use Bollinger Bands along with the open interest of the option contracts. Because standard deviation is a measure of volatility it is also used in the calculation for implied volatility in option pricing models; therefore, Bollinger Bands are the perfect complement to this technique for setting price targets. If the strategy is to take a new long position, then the price action of a particular stock should be seen bouncing off of the lower Bollinger Band and the highest concentration of open interest should be at a strike price closest to the 20-day moving average. This will give us a good four-week price target which is the price that has the highest open interest. The stop loss would then be set at a well defined low beneath the bottom Bollinger Band. Depending on what type of stock scanner you are using, it's not hard to find stocks like these and the filters are not hard to construct.

The *Pin Pressure Indicator* © 2005 is nothing more than a histogram seen on the right side of the chart color coded to identify the expiration month along with the strike prices that carry the highest open interest. Used in combination with Bollinger Bands it becomes a very valuable tool for setting short term price targets. (See Fig. 4.0)

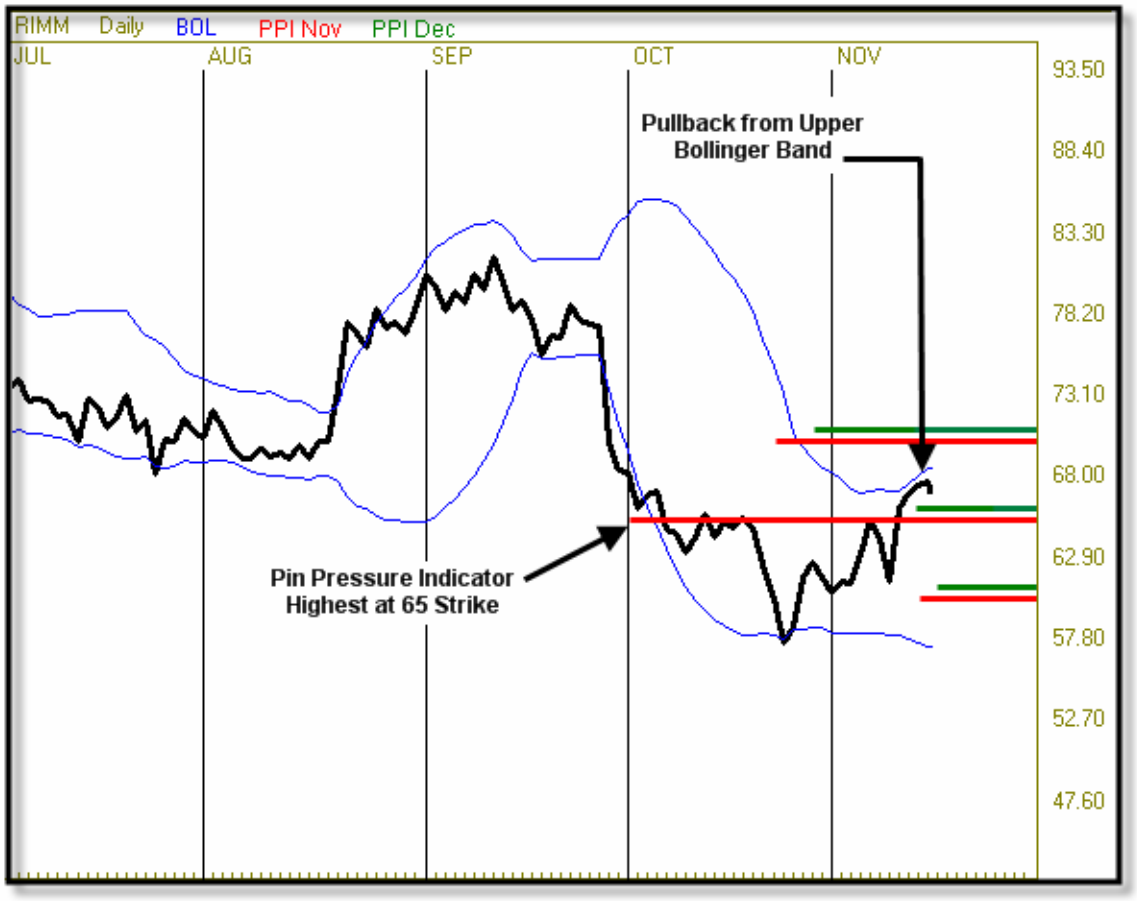
Fig.4.0



Trading from the short side

The short position is taken when the stock is pulling back from the upper Bollinger Band when the concentration of open interest is at lower price levels. Then the stop should be placed above the previous high that has most recently touched the upper band. (Fig. 4.1)

Fig. 4.1 Daily Chart of Research in Motion (Ticker RIMM) as of 11/15/05



Summary

In summary I must say that I was fortunate to find the research put out by the University of Illinois while preparing for this paper. I've realized that one of the greatest things the MTA brings to the world of technical analysis is the ability to bring open minded individuals to a place where ideas can be shared with the academics of the world, and vice versa. Together, our ideas bring forth other new ideas and this is just one example of how this has happened. Evidence that puts to rest the age old argument of the relevance of options and the influence they have on the price action of underlying equities and futures contracts. We also have a new tool, the Pin Pressure Indicator © 2005 that can help us not only pick short-term price targets with more accuracy but give us clearer boundaries for managing risk. Hedging strategies, delta neutral position traders, short-term speculators all have an influence on price action and I'm sure there will be more

work done in this area. As Electronic Communication Networks, or ECNs, take hold of our markets we will eventually see a 24-hour trading clock with people from around the world learning how to trade the US Equity and Option markets. Technical Analysis is not just a tool that can help us profit by looking at trends in the market, it's also a powerful risk management tool that helps both professional money managers and private individuals have more control over their portfolios while at the same time being able to remove emotions from the decision making process.

References

Ni, Sophie Xiaoyan, Pearson, Neil D., Poteshman, Allen M., August 27, 2004. Stock Price Clustering on Option Expiration Dates. University of Illinois at Urbana-Champaign - Department of Finance

Avellaneda, M. Lipkin, M., 2003. A market-induced mechanism for stock pinning. Quantitative Finance. 3, 417-425.

Option Clearing Corp. Expiration statistics

Glossary of Terms

[1]Black Scholes Model - Developed in 1973 by Fisher Black and Myron Scholes, it utilizes the stock price, strike price, expiration date, risk-free return, and the standard deviation (volatility) of the stock's return to calculate the fair value of an option contract

Pinning the Strike - The tendency of a stock's price to close near the strike price of heavily traded options (in the same stock) as the expiration date nears.

Delta or hedge ratio - The ratio comparing the change in the price of the underlying asset to the corresponding change in the price of a derivative.

Delta neutral - A portfolio consisting of positions with offsetting positive and negative deltas. The deltas balance out to bring the net change of the position to zero.

Gamma - The rate of change for delta with respect to the underlying asset's price. *Mathematically, gamma is the first derivative of delta and is used when trying to gauge the price of an option relative to the amount it is in or out of the money. When the option being measured is deep in or out of the money, gamma is small. When the option is near the money, gamma is largest*