BOLLINGER BANDS: USING VOLATILITY by Matthew Claassen

While most investors and traders who use technical analysis have a host of momentum oscillators and even a few volume indicators they consult with in their daily analysis, few use the tools available to measure volatility. I believe volatility is one of the most under-used and least understood market attributes, yet one of the most reliable and effective tools we have at our disposal.

Figure 1. S&P 500 with Historical Volatility and the Volatility Index (VIX). Note from 1993 to 22 September 2003 the VIX represented implied volatility of the S&P 100. As of September 2003 the symbol for the S&P 100's volatility index was changed to VXO. The VIX now represents implied volatility for the S&P 500. Prices shown include historical data calculated by the CBOE for what the new VIX would have been had it been in existence prior to September 2003.

There have been numerous studies of volatility and the markets. These studies reach two important conclusions. One is that volatility is mean reverting. The result of mean reversion is that volatility cycles from periods of high volatility to periods of low volatility. A second characteristic of volatility is that it is auto-correlated. Auto-correlation refers to the fact that if volatility rises today it is probable that it will rise tomorrow. It's these two characteristics of volatility that result in a degree of predictability that can benefit the analyst and investor.

For most US equity investors their exposure to measuring volatility in the markets is limited to the Volatility Index (VIX) for the S&P 500 and (VIXN) for the Nasdaq 100. These implied measures of volatility are derived from the option premiums for the underlying index. However, the VIX and the VIXN are limited in that the implied volatility they measure is restricted to the indices themselves and not individual issues. Because it could be perilous to assume that the volatility reading of an index can be substituted for any one of its components, market technicians have developed numerous tools to measure the

volatility of an individual stock. Examples include the Relative Volatility Index by D. Dorsey, Chaiken's Volatility by Marc Chaiken and Bollinger Bands developed by John Bollinger.

With the tools we now have at our disposal there is no reason an analyst can't create a volatility index for any stock or any index. In this article I am going to show a simple method for how we can create a volatility index for any individual stock using Bollinger Bands and discuss how we can use volatility to improve our investment timing and analysis.

Bollinger Bands as a measure of volatility

To start, we should first explore the relationship between implied volatility and historical volatility. (Historical volatility for this discussion is defined as the standard deviation of the logarithmic price change of closing prices over a trailing ten week peri-

od). There have been numerous academic studies exploring the relationship between implied and actual (historical) volatility. Although some studies have reported mixed results, for the most part we can conclude that historical volatility does not provide much incremental information beyond that of implied volatility. We can see that in Figure 1. Here I have plotted the S&P 500 in the upper panel, historical volatility in the center panel and the Volatility Index (VIX) in the lower panel. As expected, the Volatility Index and historical volatility correlate very well. The VIX almost appears to be a smoothed version of historical volatility with the peaks and troughs of each lining up perfectly. We can conclude, therefore, that the Volatility Index provides a reasonable representation of actual volatility.

Now let's look at a different measure of volatility. Figure 2 shows the S&P 500 with a Bollinger Band overlay. For this illustration the default settings used are those
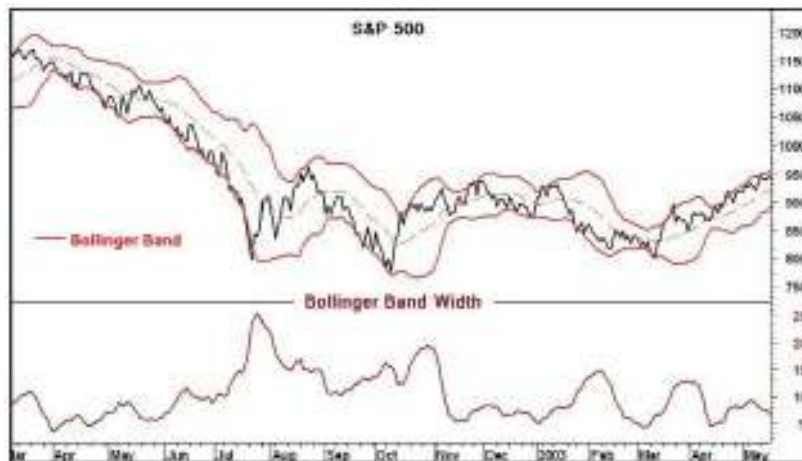
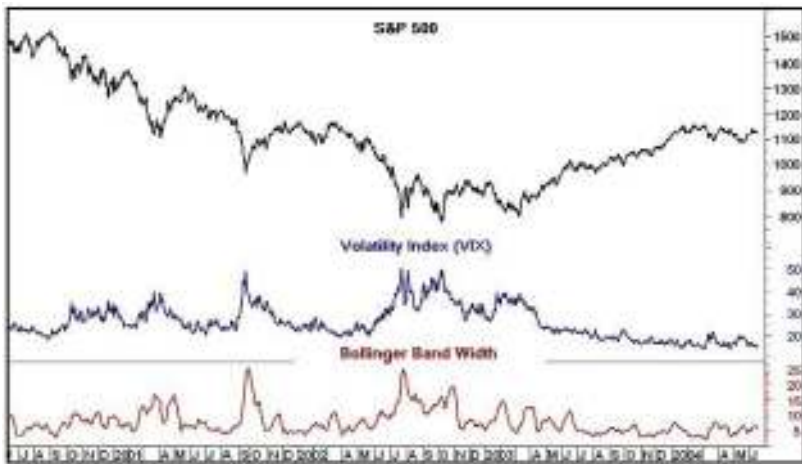**Figure 2.** S&P 500 with Bollinger Band & Bollinger Band Width

Figure 3. S&P 500, Volatility Index (VIX) and Bollinger Band Width

found in most technical analysis software where Bollinger Bands are two standard deviations of a 20-period time horizon. The upper band represents + two standard deviations, the lower band - two standard deviations and the center line a 20-period simple moving average. When we look carefully at the Bollinger Bands we can see that as the S&P 500 becomes more volatile the width of the bands increases. As the S&P 500 becomes less volatile the width of the

bands decreases. The easy way to see this is by displaying the Bollinger Band Width in the lower panel. The band width increases during periods of high volatility and decreases during periods of low volatility. But how good a measure of volatility are Bollinger Bands?

We compare the Bollinger Band Width measure of volatility to the Volatility Index in Figure 3. Here we can clearly see that the

width of Bollinger Bands compares very well with the Volatility Index. Virtually every peak in the VIX is matched with a peak of similar magnitude in the Bollinger Band Width. Every major trough or low period in the VIX is matched with a similar trough and similar low period. What you are seeing is that the Bollinger Band Width can be used as a reasonable substitute for the Volatility Index. The difference is that the Bollinger Band Width can be easily applied to any stock or any index.

Volatility as an indicator

So how can this benefit us? First, by monitoring a stocks volatility range we can better identify the best periods to purchase or sell a security. Second, volatility can be used as a confirming indicator in conjunction with price or volume oscillators. Third, volatility can be used as a stand alone entry signal for stocks already identified as potential buy candidates.

Since volatility reverts to its mean we know that extreme high volatility should be followed by lower volatility and extreme low volatility should be followed by higher volatility. Thus if we identify a stock that our indicators suggest is an attractive purchase but find that it is already at an extreme level of high volatility we may benefit from holding back our purchase until volatility has reverted towards its mean.

An example of how this might work is found in the chart of TASR Intl (TASR), Figure 4. TASR Int. was one of the most popular stocks for 2003 and the first few months of 2004. It advanced from literally pennies per share to nearly $60 in one year. Although in hindsight we can say all an investor had to do was buy and hold, it wasn't so easy in real-time. Momentum oscillators are of little value during such periods because of their tendency to remain overbought. However, using what we know

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about volatility we could time our entry and exits with confidence.

The first thing I want you to notice about the Bollinger Band Width measure of volatility in Figure 4 is its cyclical nature. We can see volatility moving to an extreme and reverting to its mean. Second, notice I placed a moving average (in this case, a five period exponential MA) on the Bollinger Band Width. Using this moving average we can more easily identify when volatility is expanding or contracting (remember the auto-correlating nature of volatility).

In August of 2003 at point "A" TASER broke to a new high on record volume after a brief retracement. An investor using a breakout system would expect prices to continue and may have used that signal as a "safe" entry point. The investor using the Bollinger Band Width to measure volatility would see that volatility had expanded to a range that was equal to the last volatility extreme in early May. Since volatility is mean reverting we would know that the probability of a substantial expansion from this point is low and would have waited for a better opportunity. From that point

TASER went sideways for six weeks while volatility contracted. The better entry point came with another sharp breakout in mid-September (point B). This time volatility was the lowest it had been in six months.

From the September breakout to the peak in volatility on late October (point C) TASER gained more than 100%. Many investors were tempted to chase the stock along the way. Momentum oscillators like the stochastic and Wilders RSI stayed above 50, which is bullish, but provides little confidence because of their nature to stay overbought for so long. Using volatility we can see that in late October volatility began to contract from a record high extreme. Rather than chase the stock, we could wait for our volatility signal for a safe entry. In the next ten weeks, using the moving average as a signal line, we received two buy signals. The first came in late November on a price breakout to a new high and relatively low volatility. The second occurred at point D in early January 2004. Here again we have a price breakout to new highs from a point of low volatility only this time volatility was the lowest it had been in ten months.

A similar buy signal occurs at point E where the stock begins to advance off a base with volatility expanding from a low level. As TASER approached point F in early April
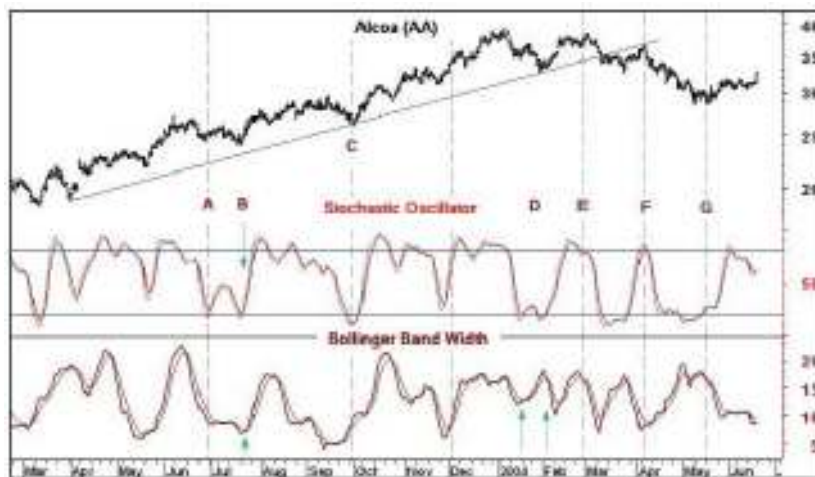

Figure 4. TASR Intl. (TASR)

Figure 5. Alcoa (AA)

2004, we know that volatility has expanded to its highest point in six months and is overbought. At point F, volatility is beginning to contract from this high level and shortly after TASER tested its trend-line. It's after point F that I believe volatility provides us with the most intriguing signal.

From its April 2004 peak, volatility at first contracts along with TASER's price. Then in mid-April volatility expands as the price of TASER continues to decline. Up to this point volatility expanded when the stock was advancing and contracted during counter trend moves. This is the first time since TASER began its up-trend that volatility expanded while the stock's price declined. This brings us to another important characteristic of volatility; volatility is not directional. In other words volatility can expand or contract while the underlying security is moving in either direction.

To the analyst, the expansion of volatility while the stock price of TASER declined in late April 2004 should tell us that the stock has undergone an important change of character. That this change is occurring shortly after an important trend-line break

supports the conclusion that the up-trend from April 2003 to April 2004 is being corrected.

A supporting role

One shouldn't use a price-based indicator to confirm another price-based indicator. It's like asking your mother if she's proud of you. Of course we know what the answer will be. Instead I prefer to combine indicators based on price, volume and volatility. This way our indicators are each based on different aspects of the market. When they all confirm I know the probability is they are sending me the correct message.

I had suggested earlier that volatility can be used as a confirming indicator in support of momentum oscillators. The Bollinger Band Width is an ideal tool to combine with price and volume indicators to help analyse an investment.

Figure 5 offers an example of combining the Bollinger Band Width measure of volatility with the Stochastic Oscillator to

evaluate Alcoa (AA). At point A the stochastic oscillator gave a buy signal as it hooked up from an oversold level.

However, volatility had not yet reached near a previous low and hadn't turned upward to indicate an expansion. The resulting move in Alcoa from that stochastic buy signal was disappointing. A better signal occurred at point B and point C where the stochastic gave the same buy signal but this time volatility was beginning to expand from a lower level.

Volatility was also useful at point D in early 2004. Here too the stochastic oscillator was oversold and turning up. Volatility was indicating that Alcoa was not as oversold as the price based oscillator suggested and that it may not be worthwhile acting upon the stochastic signal. The resulting move to the double top high in March (point E) proved to be minimal.

At point E, both the stochastic oscillator and volatility worked in concert to provide a strong signal that prices were not going higher in the immediate future. The sto-
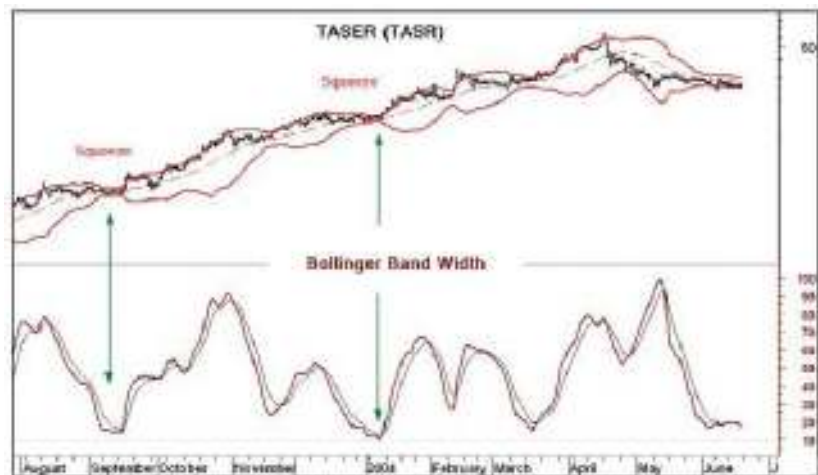
Figure 6. TASER (TASR) & the Bollinger Squeeze

chastic oscillator gave a sell signal from its overbought range while volatility turned down from a high point that had held for four months.

When Alcoa appeared to be testing its trend-line resistance at point F the stochastic oscillator indicated that Alcoa was overbought. At the same time volatility had contracted telling us that an expansion in volatility was likely and that the ensuing price trend could be strong. The price went down to point G where again both indicators worked in concert, this time to mark the low in price.

Rather than simply mimic the price oscillator, the Bollinger Band Width adds value by showing us a characteristic of the market that the price oscillator is simply not programmed to do.

The Bollinger Squeeze

The Squeeze is one way of using the Bollinger Band Width as a stand alone tool. It got its name from the look of the Bollinger Bands during a period of protracted low volatility. As volatility contracts the bands narrow to a where they appear to squeeze together. The expectation is that this period of extreme low volatility should be followed by a period of extreme high volatility. More often than not, the ensuing expansion of volatility that is born from a Bollinger Squeeze includes an explosive move in the underlying stock.

The Bollinger Band Width allows us to use one of the simpler definitions of The Squeeze as defined in John Bollinger's book "Bollinger on Bollinger Bands". A squeeze occurs when the Bollinger Band Width is the lowest value (narrowest) it has been in six months.

With the TASER example there were two occasions where volatility had declined such that the Bollinger Band Width was the lowest it had been in six or months. On both occasions the resulting move in TASER was strong. In Figure 6, I show TASER again, this time with the Bollinger Bands.

The Bollinger Band Squeeze set-up takes advantage of the fact that volatility is mean reverting. Although there are numerous traders that search for this Squeeze set up for short to intermediate term trades, we don't have to actively search for them to take advantage of the opportunities they provide. If we can simply recognize this special case of extreme low volatility in the course of our analysis we will know when the ensuing move warrants a higher commitment of funds and greater confidence in our action.

Analysing in 3D

Using volatility adds a dimension to our technical analysis not found in price and volume based oscillators. It can add value as a supporting tool or as a stand-alone indicator to help us understand and predict the price behavior of any security.

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