Measure Volatility With Average True Range

by Michael Carr,CMT (Contact Author | Biography)

J. Welles Wilder is one of the most innovative minds in the field of technical analysis. In 1978, he introduced the world to the indicators known as true range and average true range as measures of volatility. Although they are used less frequently than standard indicators by many technicians, these tools can help a technician enter and exit trades, and should be looked at by all systems traders as a way to help increase profitability.

What Is the Average True Range?
A stock's range is the difference between the high and low price on any given day. It reveals information about how volatile a stock is. Large ranges indicate high volatility and small ranges indicate low volatility. The range is measured the same way for options and commodities - high minus low - as they are for stocks.

One difference between stocks and commodity markets is that the major futures exchanges attempt to prevent extremely erratic price moves by putting a ceiling on the amount that a market can move in a single day. This is known as a lock limit, and represents the maximum change in a commodity's price for one day. During the 1970s, as inflation reached unprecedented levels, grains, pork bellies and other commodities frequently experienced limit moves. On these days, a bull market would open limit up and no further trading would occur. The range proved to be an inadequate measure of volatility given the limit moves and the daily range indicated there was extremely low volatility in markets that were actually more volatile than they'd ever been.

Wilder was a futures trader at that time, when those markets were less orderly than they are today. Opening gaps were a common occurrence and markets moved limit up or limit down frequently. This made it difficult for him to implement some of the systems he was developing. His idea was that high volatility would follow periods of low volatility. This would form the basis of an intraday trading system. (For related reading, see *Using Historical Volatility To Gauge Future Risk*.)

As an example of how that could lead to profits, remember that high volatility should occur after low volatility. We can find low volatility by comparing the daily range to a 10-day moving average of the range. If today's range is less than the 10-day average range, we can add the value of that range to the opening price and buy a breakout.

When the stock or commodity breaks out of a narrow range, it is likely to continue moving for some time in the direction of the breakout. The problem with opening gaps is that they hide volatility when looking at the daily range. If a commodity opens limit up, the range will be very small, and adding this small value to the next day's open is likely to lead to frequent trading. Because the volatility is likely to decrease after a limit move, it is actually a time that traders might want to look for markets offering better trading opportunities.

Calculating the Average True Range
The true range was developed by Wilder to address this problem by accounting for the gap

and more accurately measuring the daily volatility than was possible by using the simple range calculation. True range is the largest value found by solving the following three equations:

1. TR = H – L
2. TR = H – C.1
3. TR = C.1 – L

Where:
TR represents the true range
H represents today's high
L represents today's low
C.1 represents yesterday's close

If the market has gapped higher, equation No.2 will accurately show the volatility of the day as measured from the high to the previous close. Subtracting the previous close from the day's low, as done in equation No.3, will account for days that open with a gap down.

Average True Range
The average true range (ATR) is an exponential moving average of the true range. Wilder used a 14-day ATR to explain the concept. Traders can use shorter or longer timeframes based on their trading preferences. Longer timeframes will be slower and will likely lead to fewer trading signals, while shorter timeframes will increase trading activity. The TR and ATR indicators are shown in Figure 1.

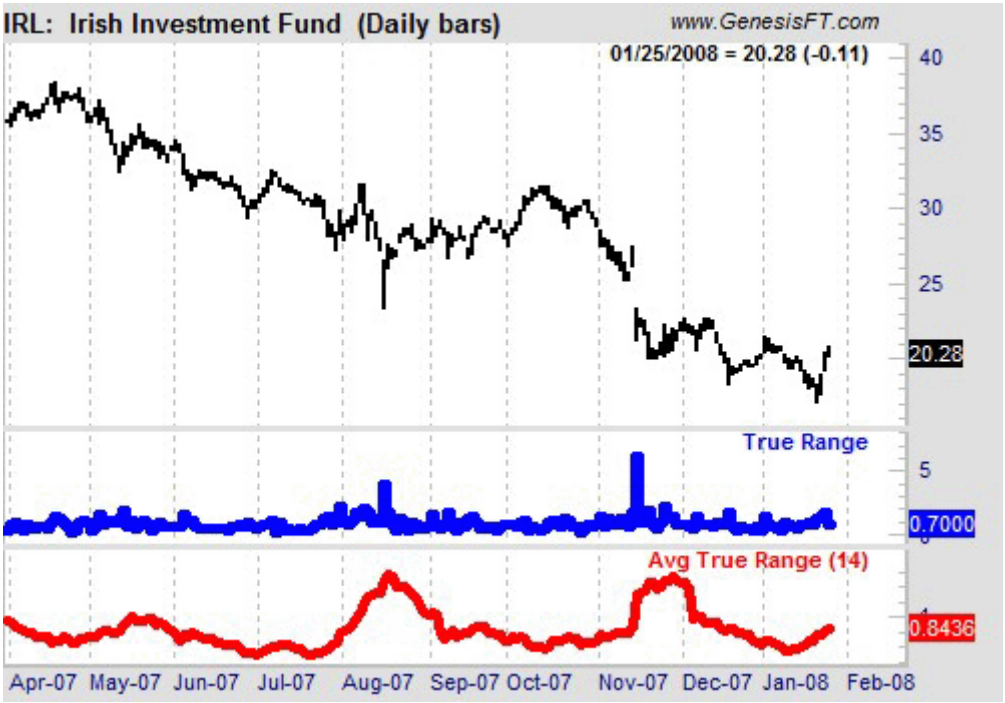

Figure 1: True range and average true range indicators

Figure 1 illustrates how spikes in the TR are followed by periods of time with lower values for TR. The ATR smooths the data and makes it better suited to a trading system. Using raw inputs for the true range would lead to erratic signals.

Applying the Average True Range
Most traders agree that volatility shows clear cycles and relying on this belief, ATR can be used to set up entry signals. ATR breakout systems are commonly used by short-term traders to time entries. This system adds the ATR, or a multiple of the ATR, to the next day's open and buys when prices move above that level. Short trades are the opposite; the ATR or a multiple of the ATR is subtracted from the open and entries occur when that level is broken.

The ATR breakout system can be used as a longer term system by entering at the open following a day that closes above the close plus the ATR or below the close minus the ATR.

The ideas behind the ATR can also be used to place stops for trading strategies, and this strategy can work no matter what type of entry is used. ATR forms the basis of the stops used in the famed "turtle" trading system. Another example of stops using ATR is the "chandelier exit" developed by Chuck LeBeau, which places a trailing stop from either the highest high of the trade or the highest close of the trade. The distance from the high price to the trailing stop is usually set at three ATRs. It is moved upward as the price goes higher. Stops on long positions should never be lowered because that defeats the purpose of having a stop in place. (For more, see *A Logical Method Of Stop Placement*.)

Conclusion
The ATR is a versatile tool that helps traders measure volatility and can provide entry and exit locations. An entire trading system can be built from this single idea. It's an indicator that should be studied by serious market students.

The Average True Range Is An Awesome Measure Of Volatility And Market Noise But What Makes It So Fantasic For Setting Stops?

Provided By Trading Secrets Revealed

You may have read that many traders use the average true range for setting their stop losses. The reason is that the average true range is a fantastic measure of volatility and market noise.

Very simply, the average true range (ATR) determines a security's volatility over a given period. That is, the tendency of a security to move, in either direction.

More specifically, the average true range is the (moving) average of the true range for a given period. The true range is the greatest of the following:

- The difference between the current high and the current low
- The difference between the current high and the previous close
- The difference between the current low and the previous close

The average true range is then calculated by taking an average of the true ranges over a set number of previous periods. Care should be taken to use sufficient periods in the averaging process in order to obtain a suitable sample size, i.e. an average true range using only 3 periods would not provide a large enough sample to give you an accurate indication of the true range of the security's price movement. A more useful period to use for the average true range would be 14.

The value returned by the average true range is simply an indication as to how much a stock has moved either up or down on average over the defined period. High values indicate that prices are changing a large amount during the day. Low values indicate that prices are staying relatively constant. Note that both trending and level prices can have high or low volatility.

So, how can we use the average true range in calculating our stop loss? All you do is you subtract a multiple of the average true range from the entry price. I might take two times the average true range and subtract it from my entry price. For example, if we had a one dollar stock and its average true range value was five cents, I would simply take a multiple of the average true range, which I said we'll use two in this example, and we'd subtract it from our entry price. So, two times our average true range is ten cents, subtracted from our entry price gives us a stop loss value of 90 cents.

Now, by adhering to this pre-defined point at which I sell, I know that if the share price

doesn't move in my favored direction, and actually moves against me, I already know the point at which I'm going to sell. My emotions are removed from the equation, and I just simply follow what my stop loss says. This is how most successful traders limit their losses. They know when they're going to sell and they have this pre-defined before they even begin trading. Although their methods of calculating the average true range and the stop loss may be different the one common element here is that they have a stop loss in place.

Here's a little extra finesse point that you might look at including in your trading plan. I sometimes introduce a time stop depending on the type of system I'm trading. This type of stop simply takes you out of a position after a fixed amount of time if I haven't made enough profit.

To successfully implement this type of stop, you're going to have to work out the average true range and do some sort of back testing, to find out if it's appropriate for the particular instrument you're trading. I just thought I'd throw that in there to make sure you have all your bases covered.

When you first begin calculating your average true range and outlining your stop losses, just keep in mind what Tom Baldwin, the successful trader said. He said the best traders have no ego. You have to swallow your pride and get out of your losses. He's simply referring to having a stop loss set, and more importantly, having the discipline to stick to it.