



BRIAN AUHAR

Combining Stochastic RSI And Bollinger Bands

Developing A Trading System

If you've ever tried it, you know that developing a trading system is no easy task. But you may find that following a series of steps could help you reduce the learning curve. Here's an example.

by Dennis D. Peterson

There are three key features when it comes to developing a trading system: entry and exit signals, a plan for the type of stop, and a money management strategy. The first involves generating the signals, which can be purely visual, a result of technical indicators, or a combination of both. Most mechanical trading systems use indicators to

encode visual signals. In this article I will take two of the better-known technical indicators and go through the steps involved in developing a trading system.

The two indicators I will be using are Bollinger Bands and stochastic relative strength index (StochRSI). StochRSI, which combines the features of stochastics and RSI, was detailed in Tushar S. Chande and Stanley Kroll's book, *The New Technical Trader*. I selected this combination because it is a useful way to determine when prices will stop tagging a Bollinger Band and are likely to move all the way from one band to the next. Of course, those prices may not move all the way, so you will need to use stops for protection. You will also want to use a simple money

management strategy of allocating only a portion of your capital to any one position.

GROUND RULES: THE BIGGER PICTURE

First, let's take a look at RSI and StochRSI. Stochastics, you will recall, is simply a way of measuring, for a given period of time, where today's close is relative to the lowest low, and where within the range of the highest high and lowest low the price falls over the same time period. The formula for stochastics for a 14-day period is:

$$\frac{(\text{Today's close} - \text{Lowest low of the last 14 days})}{(\text{Highest high of the last 14 days} - \text{Lowest low of the last 14 days})}$$

Note the use of range — high minus low — in the denominator of the calculation. Many trading techniques and strategies are built around range in some form, and if you use several indicators, you want independent sources, so that the indicators independently confirm one another.

Independent confirmation is one part of Dow theory you should consider embracing. For example, Larry Williams' %R is the reverse of stochastics, substituting the difference of highest high over a given period minus today's close for the numerator. So if you want to use this indicator together with stochastics, you are not using independent indicators. Instead, you should consider using an indicator that does not involve a range, such as volume, or one that is statistical in nature, such as Bollinger Bands.

The next step is to identify the type of stock that will work best. If you are going to use an indicator that relies on price volatility such as StochRSI, then you should examine your charts to see the nature of the current volatility. For example, I have used AOL Time Warner (AOL) in Figure 1. What differentiates the four areas (A, B, C, and D) is the combination of price and volume volatility. Area A has low price and high volume volatility. Area B has both high price and volume volatility. Area C has high price volatility, and low volume volatility for the stock. Finally, area D has moderate volume and price volatility.

A useful rule to remember is that a price is "in gear" — that is, in sync — if price goes up on high volume or down on lowered volume. Prices that reflect such moves are prices that the market is comfortable with. If you were long in area A or short in area D, you would have done well. A trading system designed for areas A and D — "in-gear" moves — is likely to have a terrible time in areas B and C. As you will discover shortly, AOL represents the good, the bad, the ugly, and the *really* ugly when it comes to using a trading system that only takes long positions.

PAY ATTENTION TO THE MARKET: USE MONEY MANAGEMENT

Since there is no crystal ball when it comes to the markets, it's important to protect yourself by using stops and money management methods. You spread your risk with money management; for example, you might decide to only invest 10% of your total capital in any one position.

Remember that not all stocks trade in the same fashion. One group of stocks might do better than another, making it necessary to build watchlists of stocks to compare your system's performance. You also need to realize that just as individual stocks behave differently within a single market, each market also behaves differently from the others.

The commodities markets are generally a more closed

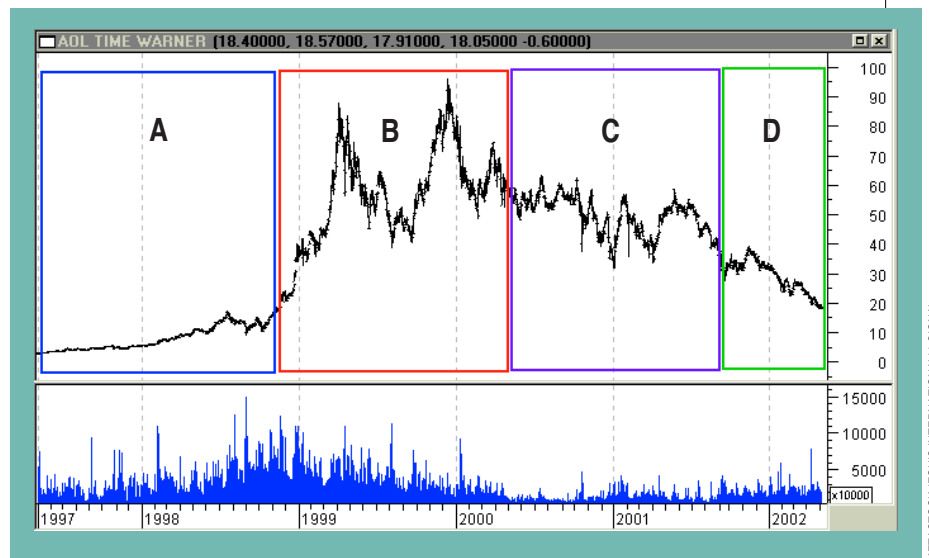


FIGURE 1: DAILY AOL PRICE AND VOLUME. Price volatility is less before June 1998. For indicators that use price volatility such as StochRSI, you want to use fewer periods in the calculation to generate trading signals than you would prior to June 1998.

system: The price of pork bellies is less dependent on earnings figures stated by accounting firms than, say, a company traded on a stock exchange would be. Even among stock exchanges, trading systems generate different results. A system that takes long positions on extreme gapdowns, for example, might produce a few trades a year for stocks traded on the New York Stock Exchange (NYSE), while producing many more trading the Nasdaq.

Within a given exchange, the behavior of an individual stock — or possibly almost the entire exchange if it contains similar stocks — can change because of shifts in expectations. Remember that the market participants' expectations are a major factor in shaping the market's behavior, and when you start analyzing them, the apparent randomness of the markets starts to disappear.

In addition, keep in mind that it is difficult to predict what the market will do. Sideways price movements accompanied by low volume will be random in nature and can be detrimental to your trading capital, as you will see in a later example. You

should always trade stocks that have trading volumes above 500,000 shares per day, or even better, those that trade above one million shares daily, on average. Thus, this trading system is for swing traders, not scalpers (who trade noise).

RSI vs. STOCHRSI

If you compare RSI and StochRSI measurements over a few months, you will notice a difference: One of them will hit the extreme faster and tend to stay near the extreme better than the other. The formula for StochRSI for a 14-day period is:

$$\frac{(\text{RSI} - \text{Lowest RSI over the last 14 days})}{(\text{Highest RSI over the last 14 days} - \text{Lowest RSI over the last 14 days})}$$

If you build this indicator, of course, you can make the RSI use a 14-day period or you can, for example, make the RSI based on a nine-day period and retain the 14 days for the stochastics portion. As you can see from Figure 2, StochRSI does a better job of hitting its extreme and staying there than RSI does. StochRSI allows you to draw a line that acts as a threshold line better than RSI (black lines drawn within green boxes). While both RSI and StochRSI range between zero and one — although cosmetic adjustments are made to RSI so it appears to range between zero and 100 — StochRSI hits its extreme faster because you are only looking at the RSI over a recent lookback period. Still, there are times, as in April, when StochRSI gives you a mixed message. This is where Bollinger Bands can help.

If you overlay price with Bollinger Bands, as in Figure 3, you begin to get an idea of the setup for a long position: Act when prices are tagging the lower band (point A) with a move up (point B), while StochRSI shows a significant gain in value (point C).

However, this setup has potential problems for long trades; look at the red box in the chart. In April and May 2000, you have examples of prices tagging the lower band and then closing above. In one instance (event D), StochRSI would potentially give a confirming signal that you should go long, but then prices go back down to the lower band. This is an example of the problem I referred to earlier, that low volume is often

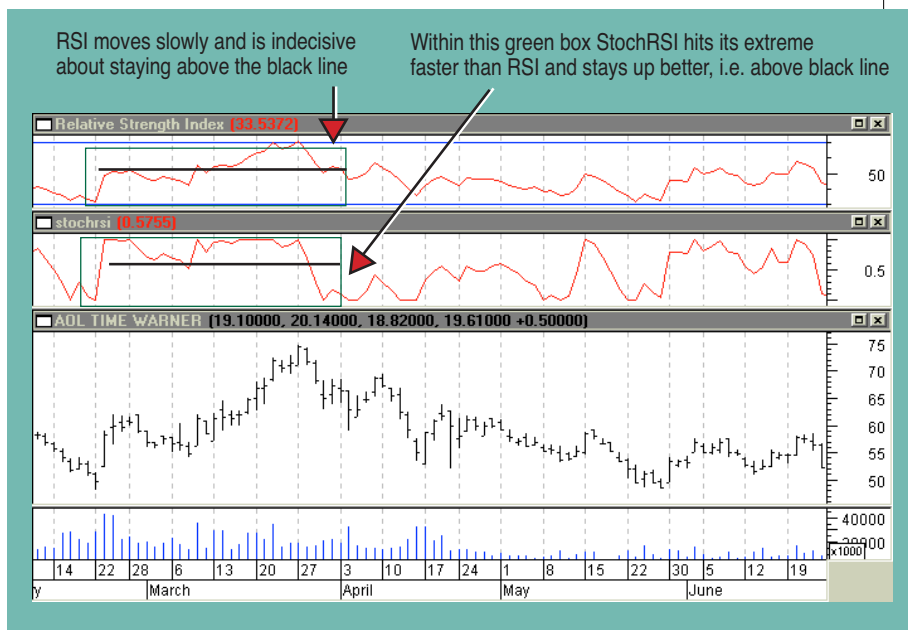


FIGURE 2: DAILY AOL PRICE AND VOLUME 2000 WITH RSI (TOP CHART) AND STOCHRSI (SECOND FROM TOP CHART). StochRSI not only responds quickly to price changes, but also hits its extreme and stays there better than RSI (see green boxes); 14-day periods are used for both RSI and StochRSI.

accompanied by randomness. Note that volume in late April and May is significantly lower than in the preceding time frame. I will try to incorporate some rules into the trading system to account for this, but in such a situation it is often best to exit and find another stock.

I will now execute a trading system, without stops and money management, to see what it can do. The trading system is going to have the following trading rules for a long position:

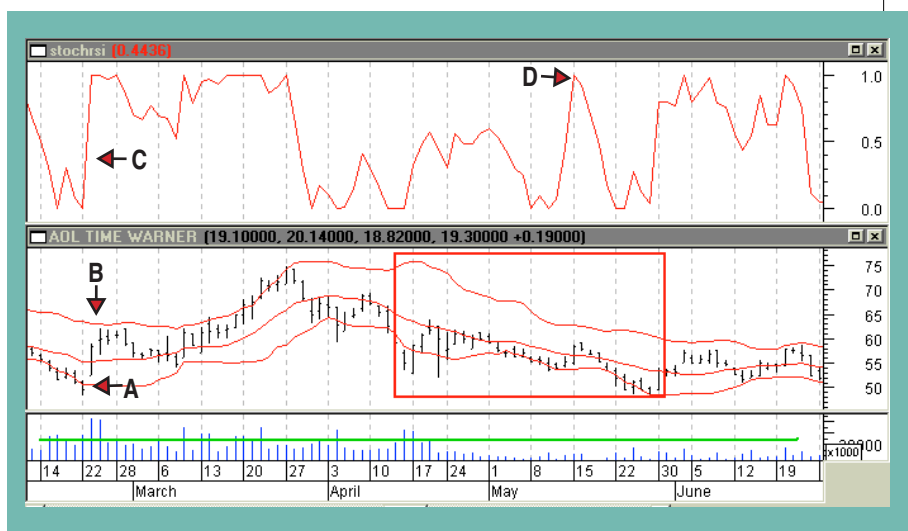


FIGURE 3: DAILY AOL AND VOLUME AND STOCHRSI (UPPER CHART): FEBRUARY/JUNE 2000. A 20-day, two standard deviation Bollinger Band is overlaid on the price chart. On the left hand side is a setup that promises to enter a long position. It starts with prices tagging the lower band, event A. Prices close above the lower band, event B, and at the same time StochRSI has moved up to a value of 0.4, event C. What is distressing is the action in the red box, especially in view of event D, a spike in StochRSI and a close above the lower band followed by a retreat of prices. But if you look at volume below, the problem mentioned earlier is obviously apparent: low volume giving you a random price movement.

Entry:

- 1 Look for prices tagging the lower Bollinger Band
- 2 Look for a closing price of an up day, that is (close>open), that is above the lower band after having prices follow (1)
- 3 Volume of this up day should be greater than the volume of the previous up day
- 4 StochRSI should be above a threshold to ensure some momentum is associated with the push up
- 5 The (close-open)/(high-low)>0.2, to avoid days that have short candlestick bodies.

Exit:

- 1 StochRSI should be less than a threshold to assure loss of momentum
- 2 Look for prices to reach the upper band
- 3 Closing price should be near the top Bollinger Band.

You are looking for the stock to continue up if it has been tagging a lower Bollinger Band and then made a convincing move up, so that it conforms to entry rules 2 through 5 above. I used weighted closes in calculating the Bollinger Bands: $(2 * \text{close} + \text{high} + \text{low}) / 4$.

From Figure 4 you can see that investing \$1,000 in 1997 and using this trading system without stops resulted in \$58,000 (second chart from top), which beat buy/hold by more than \$47,000. However, there are serious drawdowns in each of the areas B, C, and D. The only factor that varied in this trading system was the number of periods for StochRSI and Bollinger Bands. When using the initial version of this system I optimized the StochRSI thresholds as well. The equity looked better in terms of drawdowns and ended up with \$300,000+, which led me to believe that there might be something to this approach.

Optimizing on everything — from periods to thresholds — results in spectacular equity performance (Figure 5), and although it is curve-fitting, it shows the potential you are trying to achieve. It also shows the trading system is biased to take advantage of strong uptrends: During uptrends, prices that tag the bottom Bollinger Band will

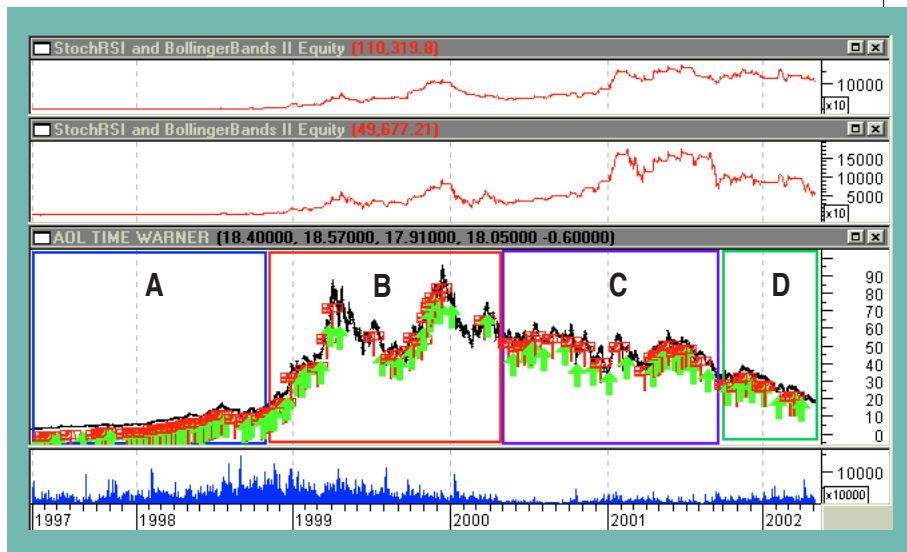


FIGURE 4: DAILY AOL AND VOLUME WITH EQUITY PERFORMANCE. Starting with \$1,000, a trading system that goes long using Bollinger Bands and StochRSI is seen to have four trading behaviors, as indicated by areas A, B, C, and D. Note the equity scales are X10. The second chart from the top is the equity performance without stops. In area A, the system makes little money despite rising prices, breaks even in B, has a better performance in C, and then performs poorly during D. Even area C is not especially appealing because you are faced with serious drawdowns, unless you use stops (as seen in top chart). The top chart, using maximum stop-losses of 5%, provides better performance.

move to the upper band, resulting in a trading system that can do much better than buy and hold. But letting thresholds optimize curve-fits the performance too much, so I set the thresholds visually.

To get rid of the serious drawdowns, I used maximum-loss stops of 5%, which improved the equity performance (Figure 4: top chart). Still, area B just eats away at your equity, although it does appear I took care of the low-volume problem in area C.

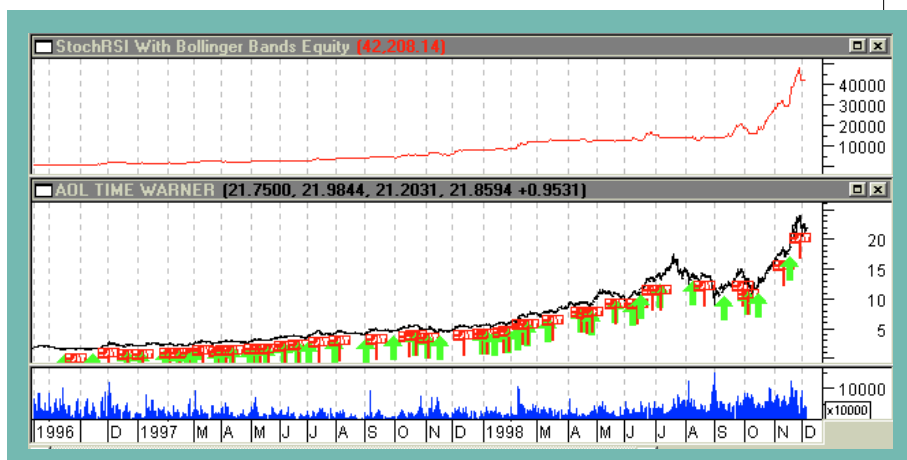


FIGURE 5: DAILY AOL AND VOLUME WITH EQUITY PERFORMANCE FOR AREA A. A \$1,000 equity investment reaches \$45,000+, while buy and hold reaches \$20,000+. While this kind of equity performance (top chart) is spectacular, it comes from letting all the variables in the trading system be optimized — curve-fitting. What this shows, however, is the potential of the system if the periods and thresholds are chosen correctly, along with the right (strong uptrend) price movement. It also reflects the bias of the trading system, which takes advantage of the fact that in a strong uptrend, prices that tag the lower Bollinger Band do so only briefly.

METASTOCK AND WEALTH-LAB SCRIPT

Here is the MetaStock script I captured for the StochRSI trading system, with explanations from MetaStock's Help function (the "syntax," "function," and "example" text). I have also annotated the various sections of code with my comments in italics.

Following that is the Wealth-Lab script. My thanks to Wealth-Lab developer Dion Kurczek for writing the Wealth-Lab chartscript.

METASTOCK CODE

Fix the periods for finding the standard deviations (standarddev) and the number of periods used in RSI:

```
standarddev:= 60;
periods:= 14;
```

LLV is the lowest low value: see below.

Here is the explanation from MetaStocks's Help function:

Syntax LLV(Data Array, Periods)
Function Calculates the lowest value in the Data Array over the preceding Periods (Periods includes the current day).
Example The formula "LLV(Close, 14)" returns the lowest closing price over the preceding 14 periods.

HHV does a like thing for highest high value:

```
StochRSI:=(RSI(periods)-LLV(RSI(periods),periods))/
(HHV(RSI(periods),periods)-LLV(RSI(periods),periods));
```

Syntax round(Data Array)
Function Rounds Data Array to the nearest integer.
Example The formula "round(+10.5)" returns +11. The formula "round(-10.4)" returns -10.

Syntax stdev(Data Array, Periods)
Function Calculates the predefined Standard Deviation indicator.
Example stdev(Close, 21)

Use the rounding functions to get an integer to be used for periods:

```
rdp1:=Round(Stdev(stochrsi,standarddev)/.053);
rdp2:=Round(Stdev(stochrsi,standarddev)/.035);
rdv1:=Round(Stdev(Mov(V,periods,S)/
1000000,standarddev));
```

I need two adjustments. If the initial calculation is less than 8, then set adjust1 to 8, and if it's greater than 12, set adjust1 to 12. This is because I want RSI to range between eight and 12 periods. Similarly for adjust2, if the initial calculation is less than 12, then set it to 12, and if greater than 20, set it equal to 20. This way the Bollinger Band periods will range between 12 and 20.

```
adjust1:= rdv1-rdp1+11;
adjust1:=if(adjust1<8,8,adjust1);
adjust1:=if(adjust1>12,12,adjust1);
adjust2:=rdv1-rdp2+14;
adjust2:=if(adjust1<12,12,adjust2);
adjust2:=if(adjust1>20,20,adjust2);
```

ENTRY CONDITIONS

```
periods:=adjust1;
BBpds:=adjust2;
```

Both thresholds (howclosetoBBbot and longthresholdentry) need to be a factor of either adjust1 or adjust2, but here they will be set to constants, and I will substitute in the code of what I want to use.

```
howclosetoBBbot:=0.9;
longthresholdentry:=0.3;
```

```
wprice:=(2*C+H+L)/4;
deviations:=.0625*BBpds+0.75;
```

```
StochRSI:=(RSI(periods)-LLV(RSI(periods),periods))/
(HHV(RSI(periods),periods)-LLV(RSI(periods),periods));
```

Syntax BBandBot(Data Array, Periods, Method, Deviations)
Function Calculates the bottom Bollinger Band of data array using method calculation method and shifted downward deviation standard deviations. Valid methods are simple, exponential, weighted, time series, triangular, and variable (these can be abbreviated as S, E, W, T, TRI, and Var).
Example BBandBot(close, 10, S, 2)

Syntax BBandTop(Data Array, Periods, Method, Deviations)
Function Calculates the top Bollinger Band of data array using method calculation method and shifted upward deviation standard deviations. Valid methods are simple, exponential, weighted, time series, triangular, and variable (these can be abbreviated as S, E, W, T, TRI, and Var).
Example BBandTop(close, 10, S, 2)

```
botpercentage:=Abs((wprice-
BBandBot(wprice,BBpds,S,deviations))/
(BBandTop(wprice,BBpds,S,deviations)-
BBandBot(wprice,BBpds,S,deviations)));
```

```
{entry conditions}
entry1:=botpercentage-howclosetoBBbot<0.3;
```

The constant 1.05 in the following statement may also need adjustment, but will require further testing.

```
entry2:=C*1.05>BBandBot(wprice,BBpds,S,deviations) and
StochRSI>longthresholdentry;
volbb:=If(C>Ref(C,-1),V,0);
```

I can't get MetaStock to do the right thing with this next statement. Volbb is the volume for an up day (today's close > yesterday's close). What I want for an entry condition is: if today is an up day and the volume for today is greater than the last up day, set entry3 to be true.

```
entry3:=Volbb>Ref(volbb,-1);
```

```
entry4:=(C-O)/(H-L)>.2;
```

If all four entry conditions are true, then enter:

```
entry1 and entry2 and entry3 and entry4
```

EXIT CONDITIONS

```
standarddev:= 60;
periods:= 14;
StochRSI:=(RSI(periods)-LLV(RSI(periods),periods))/
(HHV(RSI(periods),periods)-LLV(RSI(periods),periods));
rdp1:=Round(Stdev(stochrsi,standarddev)/.053);
rdp2:=Round(Stdev(stochrsi,standarddev)/.035);
StochRSIvol:=(V-LLV(V,periods))/(HHV(V,periods)-
LLV(V,periods));
rdv1:=Round(Stdev(Mov(V,periods,S)/
1000000,standarddev));
adjust1:=rdv1-rdp2+14;
adjust1:=if(adjust1<8,8,adjust1);
adjust1:=if(adjust1>12,12,adjust1);
adjust2:=rdv1-rdp2+14;
adjust2:=if(adjust2<12,12,adjust2);
adjust2:=if(adjust2>20,20,adjust2);
```

```
periods:=adjust1;
BBpds:=adjust2;
```

Same comment as above — both of these thresholds need to be adjusted slightly, but until I see how the trades go, I won't know. For now, I'll just set them equal to two constants.

```
longthresholdexit:=0.7;
howclosetoBBtop:=0.8;
```

```
wprice:=(2*C+H+L)/4;
deviations:=.0625*BBpds+0.75;
StochRSI:=(RSI(periods)-LLV(RSI(periods),periods))/
(HHV(RSI(periods),periods)-
LLV(RSI(periods),periods));
toppercentage:=Abs((wprice-
BBandTop(wprice,BBpds,S,deviations))/
(BBandTop(wprice,BBpds,S,deviations)-
BBandBot(wprice,BBpds,S,deviations)));
```

```
{exit conditions}
exit1:=stochrsi<longthresholdexit;
exit2:=toppercentage<howclosetoBBtop;
exit3:=C>0.95*BBandTop(wprice,BBpds,S,deviations);
exit4:=C<BBandBot(wprice,BBpds,S,deviations);
```

```
(exit1 and exit2 and exit3) or exit4
```

WEALTH-LAB CHARTSCRIPT

This is the actual Wealth-Lab code that resulted:

```
var Bar, StandardDev, Periods, ExitBar123, EntryBar1234:
integer;
var StochRSISer, VolSer, MyBBandLower, MyBBandUpper,
WPrice: integer;
var rdp1, rdp2, rdv1, adjust1, adjust2, BBpds: integer;
var deviations, x, xPrice, bbBottom, bbTop: float;
var HowCloseToBBot, HowCloseToBBTop: float;
var LongThresholdEntry, BotPercentage,
LongThresholdExit, TopPercentage: float;
var Entry1, Entry2, Entry3, Entry4: boolean;
var Exit1, Exit2, Exit3, Exit4, Exit5, Exit6, Exit7: boolean;
var y, Vol, LastUpVol: float;
```

```
procedure PlotEntryRule( b: boolean; s: string );
begin
if b then
begin
y := y * 0.995;
AnnotateChart( s, 0, Bar, y, #Gray, 7 );
end;
end;
```

```
procedure PlotExitRule( b: boolean; s: string );
begin
if b then
begin
y := y * 1.005;
AnnotateChart( s, 0, Bar, y, #Gray, 7 );
end;
end;
```

```
StandardDev := 60;
Periods := 14;
```

```
{ Set up base StochRSI Series }
StochRSISer := StochRSISeries( #Close, Periods );
```

```
{ Set up average Volume Series }
VolSer := SMAseries( #Volume, Periods );
VolSer := DivideSeriesValue( VolSer, 1000000 );
```

```
{ Create Price Series to Hold Custom BBands }
MyBBandLower := CreateSeries;
MyBBandUpper := CreateSeries;
```

```
{ Create and Populate Weighted Price Series }
WPrice := CreateSeries;
for Bar := 0 to BarCount - 1 do
begin
x := ( 2 * PriceClose( Bar ) + PriceHigh( Bar ) + PriceLow( Bar ) ) / 4;
SetSeriesValue( Bar, WPrice, x );
end;
```

```
{ Main Loop ... executes once for each bar on chart }
ExitBar123 := 0;
EntryBar1234 := 0;
for Bar := StandardDev to BarCount - 1 do
begin
rdp1 := Round( StdDev( Bar, StochRSISer, StandardDev ) /
```

```

0.053 );
rdp2 := Round( StdDev( Bar, StochRSISer, StandardDev ) /
0.035 );
rdv1 := Round( StdDev( Bar, VolSer, StandardDev ) );
adjust1 := rdv1 - rdp1 + 11;
if adjust1 < 8 then
adjust1 := 8;
if adjust1 > 12 then
adjust1 := 12;
adjust2 := rdv1 - rdp2 + 14;
if adjust2 < 12 then
adjust2 := 12;
if adjust2 > 20 then
adjust2 := 20;
Periods := adjust1;
BBpds := adjust2;
deviations := 0.0625 * BBpds + 0.75;
bbBottom := BBandLower( Bar, WPrice, BBPds, deviations );
bbTop := BBandUpper( Bar, WPrice, BBPds, deviations );
SetSeriesValue( Bar, MyBBandLower, bbBottom );
SetSeriesValue( Bar, MyBBandUpper, bbTop );
HowCloseToBBot := 0.9;
LongThresholdEntry := 30;
xPrice := GetSeriesValue( Bar, WPrice );
botpercentage := Abs( ( xPrice - bbBottom ) / ( bbTop -
bbBottom ) );
Entry1 := botpercentage - HowCloseToBBot < 0.3;
Entry2 := ( PriceClose( Bar ) * 1.05 > BBandLower( Bar,
WPrice, BBpds, deviations ) ) and
( StochRSI( Bar, #Close, Periods ) > LongThresholdEntry );
Entry3 := false;
if PriceClose( Bar ) > PriceClose( Bar - 1 ) then
begin
Vol := Volume( Bar );
if Vol > LastUpVol then
Entry3 := true;
LastUpVol := Vol;
end;
Entry4 := ( PriceClose( Bar ) - PriceOpen( Bar ) ) /
( PriceHigh( Bar ) - PriceLow( Bar ) ) > 0.2;
{ Position Entry Rules }
if not LastPositionActive then
begin
if Entry1 and Entry2 and Entry3 and Entry4 then
BuyAtMarket( Bar + 1, "" );
{ See which Entry Conditions were met }
y := PriceLow( Bar );
PlotEntryRule( Entry1, '1' );
PlotEntryRule( Entry2, '2' );
PlotEntryRule( Entry3, '3' );
PlotEntryRule( Entry4, '4' );
PlotEntryRule( Entry1, '3' );
PlotEntryRule( Entry2, '4' );
PlotEntryRule( Entry3, '5' );
PlotEntryRule( Entry4, '6' );
PlotEntryRule( Entry1, '7' );
end;
end;

{ Plot Weighted Price }
PlotSeries( WPrice, 0, #Red, #Thin );

{ Plot Custom BBands }
PlotSeries( MyBBandUpper, 0, 337, #Thick );
PlotSeries( MyBBandLower, 0, 337, #Thick );
PlotEntryRule( Entry3, '3' );
PlotEntryRule( Entry4, '4' );
end
else
{ Position Exit Rules }
begin
HowCloseToBBTop := 0.7;
LongThresholdExit := 70;
xPrice := GetSeriesValue( Bar, WPrice );
toppercentage := Abs( ( xPrice - bbTop ) / ( bbTop -
bbBottom ) );
Exit1 := StochRSI( Bar, #Close, Periods ) < LongThresholdExit;
Exit2 := TopPercentage < HowCloseToBBTop;
Print( FloatToStr( TopPercentage ) + #9 + FloatToStr(
HowCloseToBBTop ) );
Exit3 := PriceClose( Bar ) > 0.95 * BBandUpper( Bar, #Close,
BBpds, deviations );
if Exit1 and Exit2 and Exit3 then
ExitBar123 := Bar;
Exit4 := PriceClose( Bar ) < BBandLower( Bar, #Close,
BBpds, deviations );
Exit5 := ( Bar - ExitBar123 < 4 );
Exit6 := PriceClose( Bar - 1 ) - PriceOpen( Bar - 1 ) < 0;
if Entry1 and Entry2 and Entry3 and Entry4 then
EntryBar1234 := Bar;
Exit7 := ( Bar - EntryBar1234 ) < 2;
if ( Exit5 and Exit4 ) then
SellAtMarket( Bar + 1, LastPosition, '4&5' )
else if ( Exit6 and Exit7 ) then
SellAtMarket( Bar + 1, LastPosition, '6&7' );
{ See which Exit Conditions were met }
y := PriceHigh( Bar );
PlotExitRule( Exit1, '1' );
PlotExitRule( Exit2, '2' );
PlotExitRule( Exit3, '3' );
PlotExitRule( Exit4, '4' );
PlotExitRule( Exit5, '5' );
PlotExitRule( Exit6, '6' );
PlotExitRule( Exit7, '7' );
end;
end;

{ Plot Custom BBands }
PlotSeries( MyBBandUpper, 0, 337, #Thick );
PlotSeries( MyBBandLower, 0, 337, #Thick );

```

—D.D.P.

One of the problems I ran into was a limitation in MetaStock for determining the volume of the previous up day. Further, I wanted to see what asset allocation with various watchlists would do. To find out, I turned to Wealth-Lab Developer.

Wealth-Lab Developer has some chartscripting features not available in MetaStock. For example, the number of periods used in StochRSI and the Bollinger Bands can be calculated, rather than using a fixed number. Rather than optimizing on the periods, I could now calculate them as a function of price and volume volatility. After several runs optimizing on periods, I found that in area A longer periods were favorable, whereas in areas B, C, and D shorter periods

worked better. By optimizing, I was able to get an idea on how I wanted to bias the choice of periods.

Another improvement I could make was to have the volume for the up day (the day before I enter) be greater than the volume for the previous up day. Since the previous up day might be several bars back, encoding this kind of rule without a loop is difficult, and I actually hit MetaStock's code limit when I tried using several nested *if* statements.

Having used AOL Time Warner (AOL) to lay out the general approach, I used General Electric (GE) for refinements, because GE has been all over the volatility map as well, and I wanted to avoid tailoring too much to AOL. The results can

be seen in Figure 6. Entries are generally chosen exactly the way I would want them to be, but some exits caused losses that seemed unnecessary.

It appeared that many of my losing trades actually had gains before I took the loss at exit — obviously, my exit coding was still deficient. For example, one trade entered in mid-May and exited in mid-June had a gain before ending with a loss. So how many of this system’s trades have a profit before seeing a loss?

One of the features of Wealth-Lab Developer is that it allows you to look at maximum adverse excursion† (MAE) and maximum favorable excursion† (MFE). What I find from Figure 7 is that 26 losing trades made a profit of 3% and 13 losing trades made a profit of 5% before finishing as losing trades.

What all this suggests is that rather than fixing the exit rules, a shortcut might simply be to use a trailing stop to lock in profits. From Figure 6, I can visually determine that I should encode a rule that states if the midline of the Bollinger Band is crossed after tagging the upper band and losing enough momentum, it is time to exit.

I then traded the Dow 30 stocks using \$5,000 per trade out of an initial capital of \$100,000 (Figure 8). The results surprised me: 758 losing trades made approximately 10% profit before becoming losing trades. This suggests that trailing stops used in conjunction with Dow 30 stocks could shift 758 trades into the winning box, which would boost the winning average well above 60%.

Sounds good, doesn’t it? Here’s the catch. Some of my biggest winners were more than 10%. Now I am faced with two different questions: Is it better to take the smaller profits and run, or continue to work on the logic for exit? Obviously, it is just a matter of time and skill to achieve a successful exit strategy, but of course the enormous advantage is that if you can encode what your eye can see, then you have the option of running several watchlists and seeing how they perform. These concerns are typical when developing a trading system, and what we have here is the start of one, not a final product.



FIGURE 6: GENERAL ELECTRIC (GE) DAILY PRICE AND VOLUME. The Wealth-Lab chart shows long positions entered at blue up arrows and exits at red down arrows. The profit for each trade is shown as a green number and the loss as a red number. The strengths and weaknesses of the trading system can be seen when an entry is made in mid-March 2001 and the exit two months later in the beginning of May 2001 for a \$1,028.96 profit, but then followed with a trade entered in mid-May 2001 and an exit in mid-June 2001, for a \$186.71 loss. Clearly the logic that needs to be encoded is that once reaching the top of the band, the exit should occur when price passes below the simple moving average for the Bollinger Band. While easy to visualize, it is difficult to code that kind of rule.

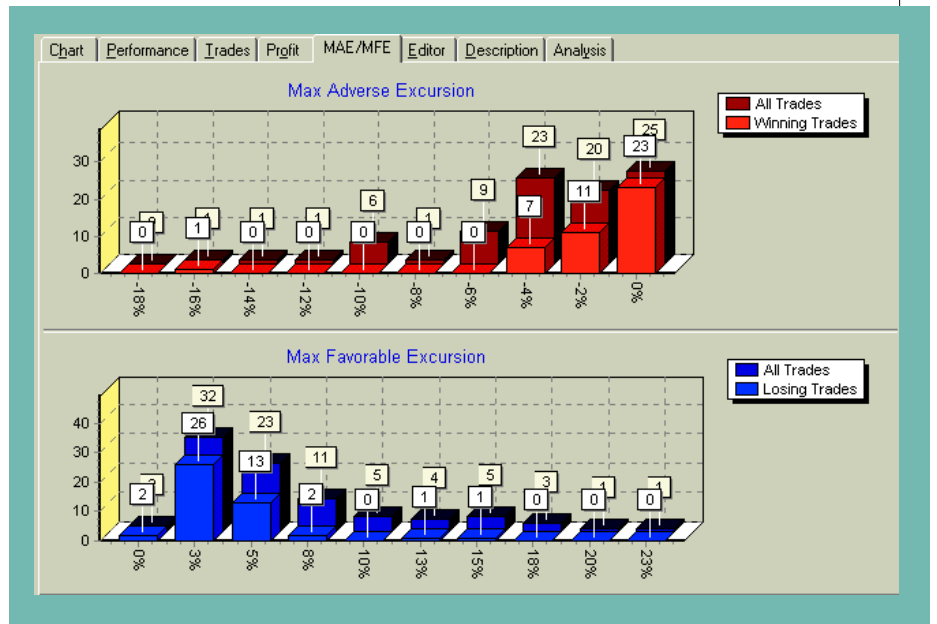


FIGURE 7: MAXIMUM ADVERSE EXCURSION (MAE) AND MAXIMUM FAVORABLE EXCURSION (MFE) FOR GENERAL ELECTRIC. MAE/MFE shows that 26 losing trades actually had a 3% gain before resulting in a loss. Conversely, 18 winning trades took a 2% and 4% loss before resulting in a profit. This suggests that locking in profits with a trailing stop might be one way to avoid further encoding.

SUMMARY

With few exceptions, StochRSI is a better indicator than RSI. Since it is a momentum indicator, it would be natural to use it to buy when price is moving up. Bollinger Bands provide

a way to see if price has been changing to the low side (lower-band walkers) or changing to the upside (upper-band walkers). It is possible to build a solid trading system with these two indicators. But every trading system has a bias, which could apply to the entire market and not just a few stocks or commodities.

Software that can test your ideas is available, and as you do your evaluation, you might see the potential of the system. If you start with something that is fundamentally flawed, money management and stops can help, but it will be difficult to make a profit. In the trading system found in the sidebar “Wealth-Lab and MetaStock script,” the Wealth-Lab script allows you to further adjust the periods for RSI and the Bollinger Bands. Another improvement would be to make the thresholds self-adapting.

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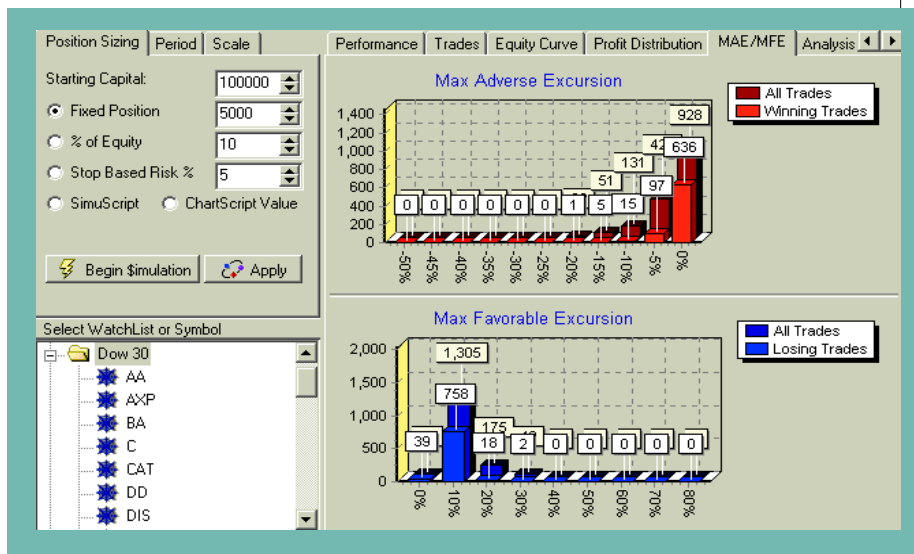


FIGURE 8: MAE/MFE FOR DOW 30. A bit of a surprise is that 758 of the losing trades made close to 10% profit before turning into losing trades. The money management scheme uses, at most, 10% of your current capital in any one trade.

SUGGESTED READING

Chande, Tushar, and Stanley Kroll [1994]. *The New Technical Trader*, John Wiley & Sons.

†See *Traders' Glossary* for definition

