

MEASURING INTERNAL STRENGTH: WILDER'S RSI INDICATOR

By Wayne A. Thorp

Wilder's relative strength index measures a stock's price relative to itself over time. Its popularity lies in its versatility in identifying market extremes and illustrating points of divergence that may indicate an approaching reversal of price trend.

In his 1978 book, "New Concepts in Technical Trading Systems," J. Welles Wilder (Trade Research) introduced the relative strength index (RSI). This indicator, which has gone on to become one of the most widely used technical indicators, is a momentum indicator that belongs to a family of indicators called oscillators. An oscillator gets its name from the fact that it moves or oscillates between two fixed values based on the price movement of a security or index.

Wilder's RSI should not be confused with relative strength figures that appear in publications such as the Investor's Business Daily and AAI's *Stock Investor* program. Those relative strength calculations compare the price movement of a security or index against the price movement of some broad market measure such as the S&P 500. In other words, they show how well a particular index or security has done relative to the *broader market*. Perhaps a better name for the Wilder RSI would be the *internal* strength index—the RSI compares the price relative to *itself*.

The RSI has been found to have the most favorable results when used in the futures and commodities markets. Furthermore, the RSI is most used over a short trading period—both of which make the RSI best-suited for active trading or short-term investors. However, it is also used with equities, mutual funds, and indexes. The reason for its popularity lies in its versatility, mainly in identifying market extremes and illustrating points of divergence that may indicate an approaching reversal of the price trend. Furthermore, research indicates that for shorter periods, RSIs are leading indicators, meaning that they signal price tops and bottoms before they actually occur.

This article focuses on two of the more popular uses of the RSIs—identifying market extremes and divergences.

CALCULATING RSI

Before you begin using the RSI in your trading, you need to decide on the period length you wish to use. When Wilder developed the relative strength index, he based it on 14 periods. A period can be a day, week, month, etc.; therefore, using a 14-period relative strength index would give you a 14-day, 14-week, or 14-month calculation. While 14 periods is the default value for most technical analysis software programs and Web sites, nine- and 25-period relative strength indexes are also gaining in popularity.

The Wilder RSI is a ratio of the average points gained during "up" periods over the past n periods divided by the average points lost during "down" periods over the same period. Most technical analysis software programs will perform this calculation for you. However, the formula is:

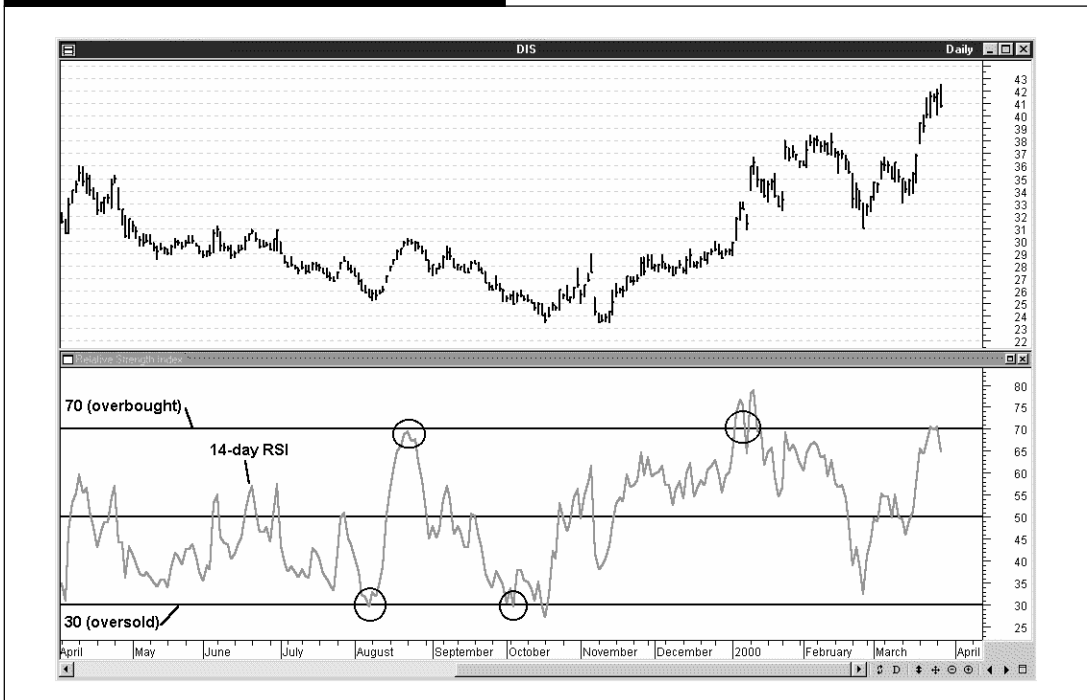
$$RS = \text{Avg. price change on up days} \div \text{Avg. price change on down days}$$

The RS value is then entered into this formula to give you the relative strength index:

$$RSI = 100 - [100 \div (1 + RS)]$$

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FIGURE 1. WALT DISNEY 14-DAY RSI



The resulting value will range, or oscillate, between zero and 100. As you will see, the RSI spends most of its time fluctuating between 30 and 70, unless strong price movements force the RSI outside of this range.

In Figure 1, you can see the 14-day RSI plotted for Walt Disney Co. When looking at an RSI graph, you should note several items. First of all, horizontal lines at the 30 and 70 levels indicate the predetermined oversold and overbought levels. It is important to note that the vast majority of the movement is *between* the 30 and 70 levels. The crossing of these lines indicates that a security or index may be oversold or overbought. Secondly, there is the RSI line itself, which has experienced a wide range of movement over this three-year period.

TOPS AND BOTTOMS

Historically, levels above 70 have been considered overbought—where continued buy interest is overex-

tended—and levels below 30 are oversold, where selling pressure has reached its maximum. Today, 80–20 is becoming more prevalent as regions of overbought and oversold, especially with the increased use of the nine-day RSI. The nine-day RSI tends to be more volatile as compared to RSIs of longer time periods. Furthermore, today's markets are more volatile, which may cause the RSI to exhibit wider fluctuations.

For the sake of continuity, this article will use the 70–30 levels throughout. When the RSI crosses above 70, the possibility of a reversal of the upward trend greatly increases. Likewise, when the RSI crosses

FIGURE 2. MICROSOFT: TRADING ON RSI CROSSOVER SIGNALS

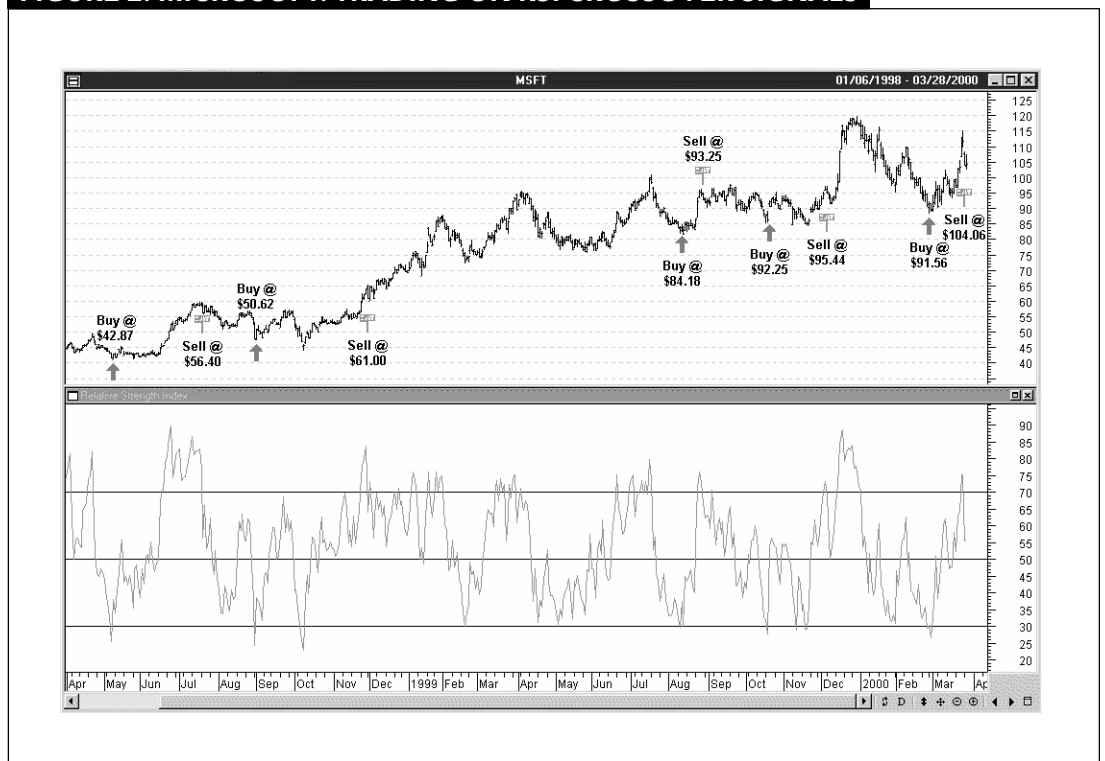
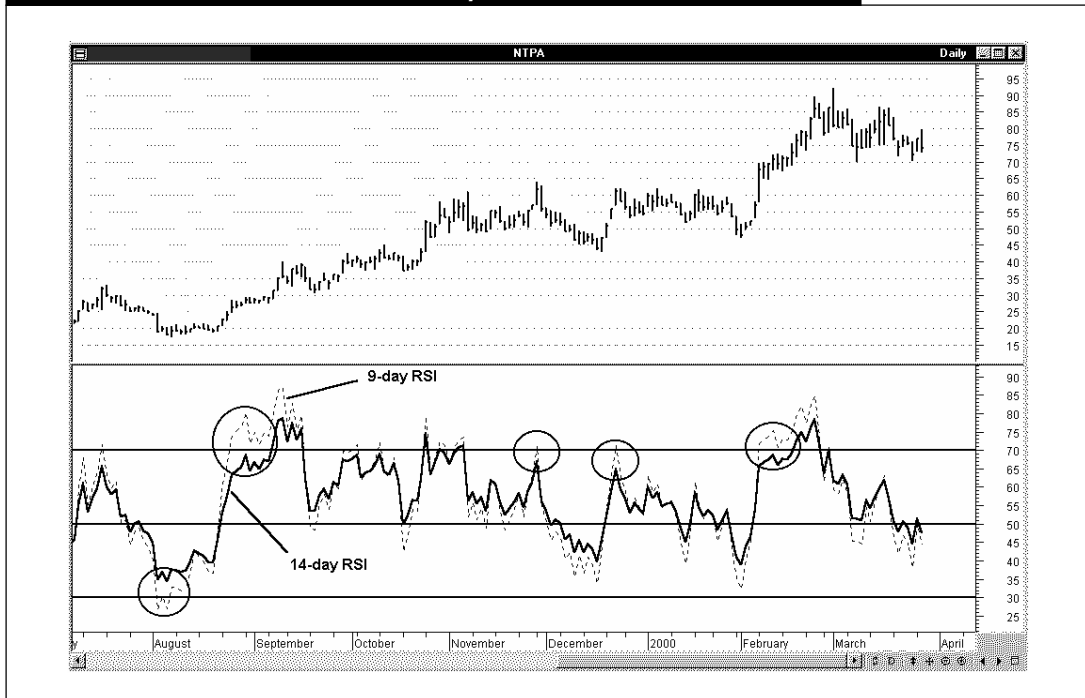


FIGURE 3. NETOPIA PRICE CHART, NINE-DAY RSI & 14-DAY RSI

below 30, the possibility of the downtrend reversing also increases. Be aware, however, that these levels are by no means fixed. It may be beneficial to view RSI behavior for a security or index over time to gauge where the extremes exist. In doing so, you will find that different securities have varying overbought and oversold levels. Furthermore, just because the RSI enters into these extreme levels, it does not mean you necessarily need to buy or sell, depending on the RSI level. At a minimum, such movements should alert you to the possibility that a trend reversal is imminent.

There are several ways to trade the RSI based on its movement above 70 and below 30. First of all, you could buy when the RSI falls below 30 or sell once it crosses above 70. The main drawback to this approach, however, is that you may be entering into a trade before the trend has run its course. Often, the price will continue to rise even after the RSI crosses above 70, meaning you will miss out on some profits. Furthermore, you may have to carry a loss for an uncertain

amount of time if you buy when the RSI crosses below 30 and the price continues to fall.

You could also sell when the RSI crosses below 70 and buy when it crosses above 30. This also happens to be a popular trading strategy when using the nine-day RSI. Figure 2 illustrates this approach for Microsoft. From March 30, 1998, to March 28, 2000, this system generated five round-trip trades. These five trades returned a 106.5% profit over this two-year period. Be aware, however, that selling when the RSI crosses below 70 and buying when it crosses above 30 will have you entering trades once the uptrend has already begun and exiting after a downtrend has taken form.

Taking a more centrist approach, you can sell when you see the RSI begin to turn downward above 70 and buy when the RSI begins bottoming out below 30. Depending on the trading behavior of a particular security, however, this strategy may also be less than optimal. During strong price trends, the RSI tends to move to the extremes and then may give off false signals that

could have you entering or exiting trades prematurely (as we will see later).

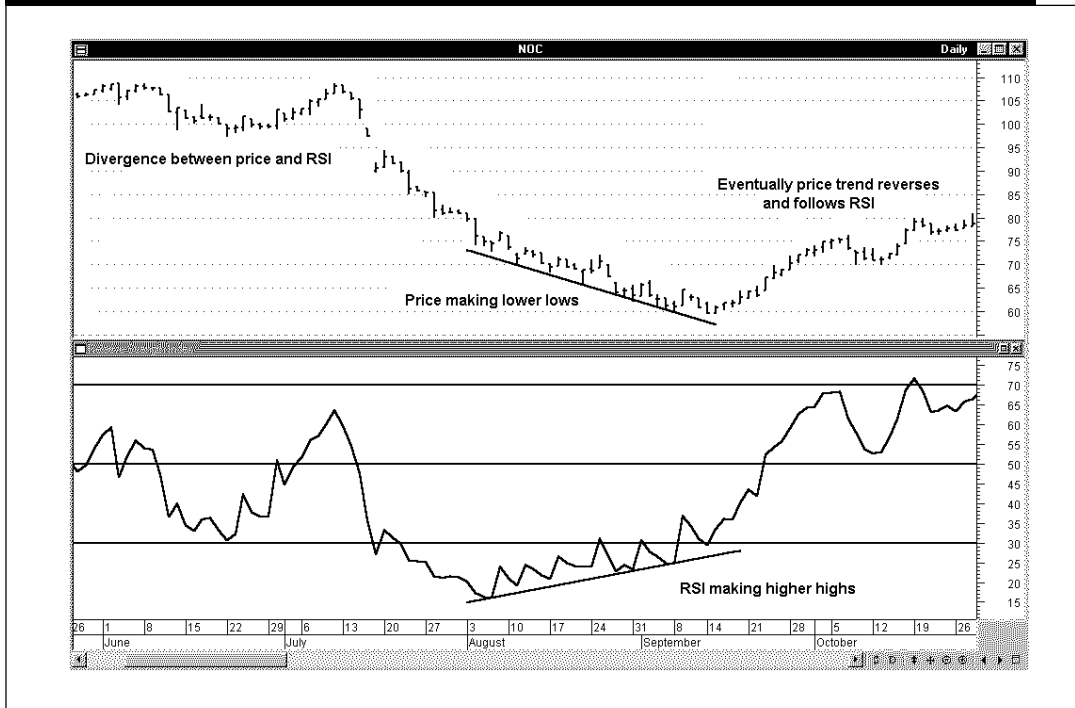
There may be times, however, when there is not sufficient price volatility to move the RSI into these extreme ranges. In this case, you may wish to increase the amplitude (wideness) of the RSI by shortening the time period to the extent that the index moves above 70 or below 30. Shortening the time period increases the sensitivity of the indicator to price

movements, thus increasing its volatility.

Likewise, in a market where there is a lot of volatility, the RSI will tend to make numerous moves outside of these boundaries. Such activity makes the signals that such movement generates less useful. Here it may be necessary to lengthen the time period. Lengthening the time period slows reaction to price changes, thereby making the signals less frequent, and more meaningful.

Figure 3 shows the daily price plots for Netopia as well as two RSI plots—a nine-day and a 14-day. From this chart, you can see that the nine-day RSI is more volatile. There are several times when the 14-day relative strength index does not venture outside of the 70–30 boundaries, while the nine-day does (the circled areas on the chart). Using the nine-day RSI for Netopia, therefore, would yield more buy and sell signals than would the 14-day. By altering the number of periods used in the calculation, you may develop a better sense of what works best, given your particular trading style.

FIGURE 4. NORTHRUP GRUMMAN: TRADING ON RSI DIVERGENCE SIGNALS



that negative divergence is taking place.

On the flip side, divergence takes place when prices are making successively lower lows as the RSI, which is below 30, makes a double-top or a series of higher highs. Again this should serve as an alert that prices may begin an upward track.

This is the case in Figure 4, where Northrop Grumman's price is in a steady downward trend while its 14-day RSI is making a series of higher highs below 30. After several weeks of this diver-

DIVERGENCE

When you compare the pattern of a price chart and the RSI, you would expect that the two for the most part would move in the same direction. There are times, however, when the RSI and price will move in opposite directions—in other words, the two values diverge. Some of the most powerful signals the RSI will generate are when there is a divergence between the indicator and price. When this occurs, the price eventually will reverse and again “follow” the RSI.

One way in which divergence takes place is when the price hits a new high while the RSI is above 70. After a pullback, the price goes to a new high. However, the RSI—while still above 70—

fails to rise above its prior peak. The creation of a double-top by the RSI (two peaks at roughly the same level) or a series of descending peaks while the price is reaching new highs should serve as a warning

the price reverses in an upward direction.

Often when negative divergence is developing, the confirming signal comes in the form of a “failure swing.” After establishing two peaks

FIGURE 5. AMGEN: FAILURE SWING SELL SIGNAL

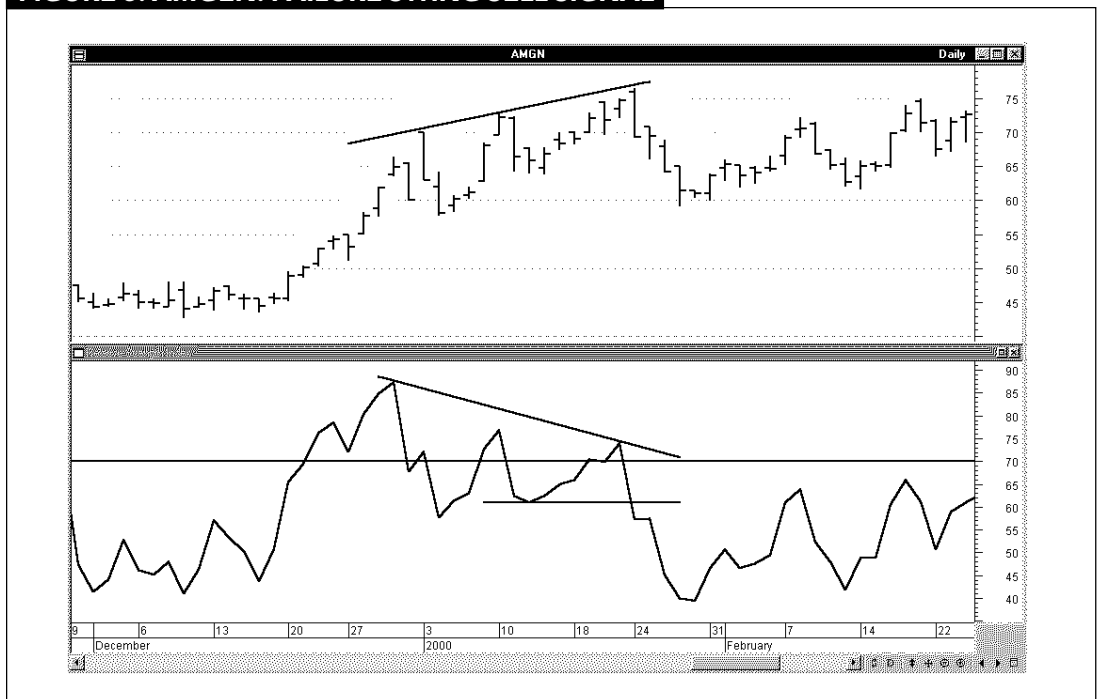
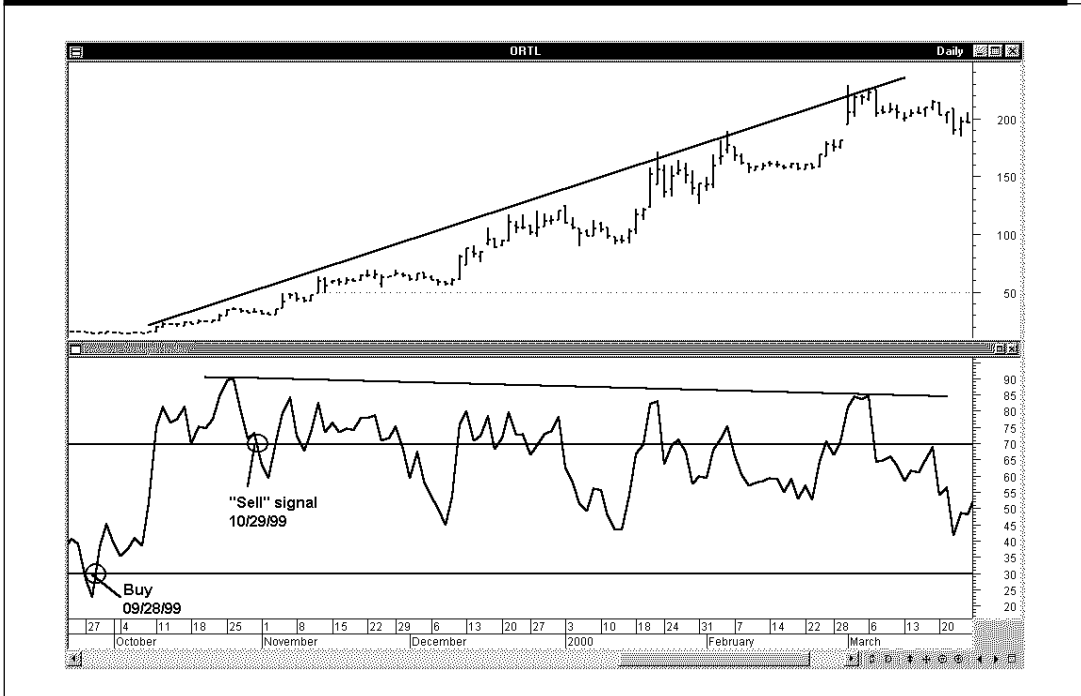


FIGURE 6. ORTEL CORP. PRICE & 14-DAY RSI IN SUSTAINED UPTRENDING MARKET



sell signal. For the next five months the RSI drifted around the 70 level—never generating a buy signal. Meanwhile, Ortel’s price appreciated almost 480% after the sell signal. The most you could take away from the extreme rise in RSI is that the price was probably entering a trending period.

For this reason, the RSI should not be viewed in isolation. Using it in tandem with other indicators such as moving averages may help eliminate such false signals.

above 70 while the price continues to rise, the RSI then falls below the trough formed between these two peaks. When this occurs, a potential sell signal is given—irrespective of the fact that the price may still be rising.

Such is the case in Figure 5. Here we have the daily price plots for Amgen and a nine-day RSI. From the chart, you can see that, over the period January 3, 2000, to January 24, Amgen was in a steady uptrend with three successive higher highs. However, during this same period, the RSI was showing ever lower lows—a distinctive sign of negative divergence. On January 10 and 21, the RSI formed a double-top near 75. After forming the second peak of the double-top, the RSI began to fall and continued down past the level of the trough formed between the two peaks. This failure swing would indicate a signal to sell. Shortly thereafter, Amgen’s price began to fall, from a high of \$76.50 on January 24 to a low of \$59.13 on January 27.

At the bottom, circumstances are reversed. The RSI forms a double

bottom below 30, at which point the RSI goes above the previous peak—generating a buy signal.

LIMITATIONS

As is the case with all types of technical indicators, the RSI does have some limitations. Perhaps the greatest handicap it has is that it is not overly useful in *trending* markets. In other words, its usefulness breaks down when prices are in a sustained up- or downtrend. This is because, during persistent trends, the RSI moves to extreme levels and can remain there for weeks or even months, at which point it cannot be looked upon to generate useable signals.

As an example, Figure 6 shows the price and 14-day RSI for Ortel Corporation. On September 28, 1999, the RSI signalled a buy as it rose above 30. For the next couple of weeks, the RSI rose sharply while the price was all but flat. In mid-October, Ortel began to rise, driving the RSI to a peak of almost 90. While the price continued to rise, the RSI fell below 70 on October 29—a

CONCLUSION

The Wilder RSI may be helpful in identifying potential reversals in an existing trend, assuming you are in a trading market and are a trader. While the signals it generates for such market behavior may be helpful, it is also clear that the RSI breaks down during strong trends.

Like all technical indicators, the RSI is not intended to be *the* indicator. By using it in conjunction with other indicators, you may be able to develop a system that functions in all types of markets. Web sites that offer the RSI in their charting capabilities include BigCharts (www.bigcharts.com) and MetaStock Online (www.metastock.com).

This article has presented several ways in which you can use the RSI as part of a systematic trading approach, but it also serves as an introductory base from which you can begin to formulate your own strategies. Only through time, effort, and trial and error will you find a system that best suits your needs. ♦