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Chart School

Relative Strength Index (RSI)

Overview

Developed by J. Welles Wilder and introduced in his 1978 book, New Concepts in Technical Trading Systems, the Relative Strength Index (RSI) is an extremely useful and popular momentum oscillator. The RSI compares the magnitude of a stock's recent gains to the magnitude of its recent losses and turns that information into a number that ranges from 0 to 100. It takes a single parameter, the number of time periods to use in the calculation. In his book, Wilder recommends using 14 periods.

The RSI's full name is actually rather unfortunate as it is easily confused with other forms of Relative Strength analysis such as John Murphy's "Relative Strength" charts and IBD's "Relative Strength" rankings. Most other kinds of "Relative Strength" stuff involve using more than one stock in the calculation. Like most true indicators, the RSI only needs one stock to be computed. In order to avoid confusion, many people avoid using the RSI's full name and just call it "the RSI."

Formula

$$RSI = 100 - \frac{100}{1 + RS}$$

$$\text{Average Gain} = \frac{\text{(Total Gains/n)}}{\text{(Total Losses/n)}} = \text{Average Loss}$$

$$\text{First RS} = \text{(Average Gain/Average Loss)}$$

$$\text{Smoothed RS} = \frac{\text{[(previous Average Gain) x 13 + Current Gain]/14}}{\text{[(previous Average Loss) x 13 + Current Loss]/14}}$$

$$n = \text{number of RSI periods}$$

To simplify the formula, the RSI has been broken down into its basic components which are the Average Gain, the Average Loss, the First RS, and the subsequent Smoothed RS's.

For a 14-period RSI, the Average Gain equals the sum total all gains divided by 14. Even if there are only 5 gains (losses), the total of those 5 gains (losses) is divided by the total number of RSI periods in the calculation (14 in this case). The Average Loss is computed in a similar manner.

Calculation of the First RS value is straightforward: divide the Average Gain by the Average Loss. All subsequent RS calculations use the previous period's Average Gain and Average Loss for smoothing purposes. See the "Smoothed RS" formula above for details. The table below illustrates the formula in action.

	Close	Chg	Adva	Decl	AvgGain	AvgLoss	RS	RSI
	46.1250							
1	47.1250	1.0000	1.0000					
2	46.4375	-0.6875		0.6875				
3	46.9375	0.5000	0.5000					
4	44.9375	-2.0000		2.0000				
5	44.2500	-0.6875		0.6875				
6	44.6250	0.3750	0.3750					
7	45.7500	1.1250	1.1250					
8	47.8125	2.0625	2.0625					
9	47.5625	-0.2500		0.2500				
10	47.0000	-0.5625		0.5625				
11	44.5625	-2.4375		2.4375				
12	46.3125	1.7500	1.7500					
13	47.6875	1.3750	1.3750					
14	46.6875	-1.0000		1.0000	0.5848	0.5446	1.0738	51.779
15	45.6875	-1.0000		1.0000	0.5430	0.5772	0.9409	48.477
16	43.0625	-2.6250		2.6250	0.5043	0.7234	0.6970	41.073
17	43.5625	0.5000	0.5000		0.5040	0.6718	0.7502	42.863
18	44.8750	1.3125	1.3125		0.5617	0.6238	0.9005	47.382
19	43.6875	-1.1875		1.1875	0.5216	0.6640	0.7855	43.992

(Click here for an Excel spreadsheet with this example in it.)

Here's how lines 14 and 15 were calculated:

$$\text{First RS} = \frac{(.5848)}{(.5446)} = 1.0738$$

$$\text{RSI(period 14)} = 100 - \frac{100}{1 + 1.0738} = 51.779$$

$$\text{Smoothed RS} = \frac{(((.5848 \times 13) + 0.00) / 14)}{(((.5446 \times 13) + 1.00) / 14)} = .9409$$

$$\text{RSI(period 14)} = 100 - \frac{100}{1 + .9409} = 48.477$$

Note: *It is important to remember that the Average Gain and Average Loss are* ***not true averages****! Instead of dividing by the number of gaining (losing) periods, total gains (losses) are always divided by the specified number of time periods - 14 in this case.*

When the Average Gain is greater than the Average Loss, the RSI rises because RS will be greater than 1. Conversely, when the average loss is greater than the average gain, the RSI declines because RS will be less than 1. The last part of the formula ensures that the indicator oscillates between 0 and 100.

Use

Overbought/Oversold

Wilder recommended using 70 and 30 and overbought and oversold levels respectively. Generally, if the RSI rises above 30 it is considered bullish for the underlying stock. Conversely, if the RSI falls below 70, it is a bearish signal. Some traders identify the long-term trend and then use extreme readings for entry points. If the long-term trend is bullish, then oversold readings could mark potential entry points.

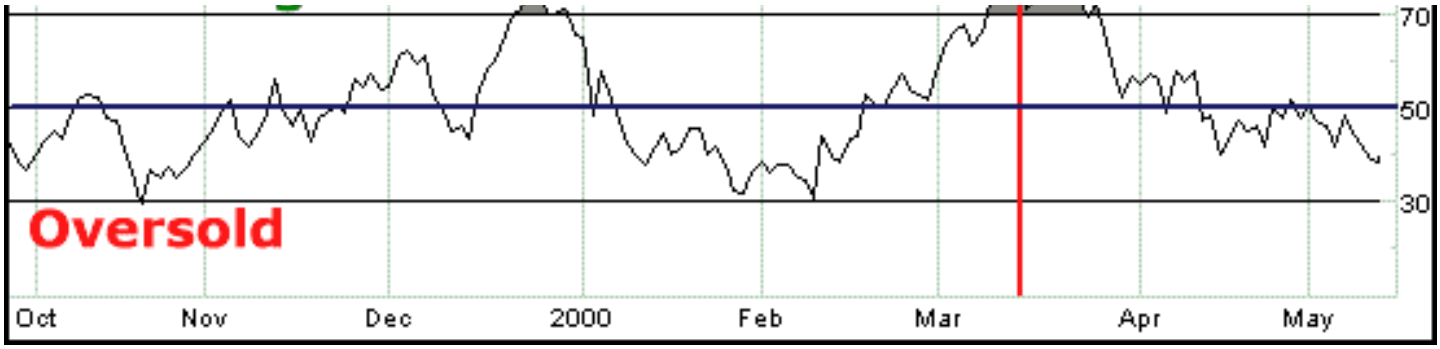
Divergences

Buy and sell signals can also be generated by looking for positive and negative divergences between the RSI and the underlying stock. For example, consider a falling stock whose RSI rises from a low point of (for example) 15 back up to say, 55. Because of how the RSI is constructed, the underlying stock will often reverse its direction soon after such a divergence. As in that example, divergences that occur after an overbought or oversold reading usually provide more reliable signals.

Centerline Crossover

The centerline for RSI is 50. Readings above and below can give the indicator a bullish or bearish tilt. On the whole, a reading above 50 indicates that average gains are higher than average losses and a reading below 50 indicates that losses are winning the battle. Some traders look for a move above 50 to confirm bullish signals or a move below 50 to confirm bearish signals.

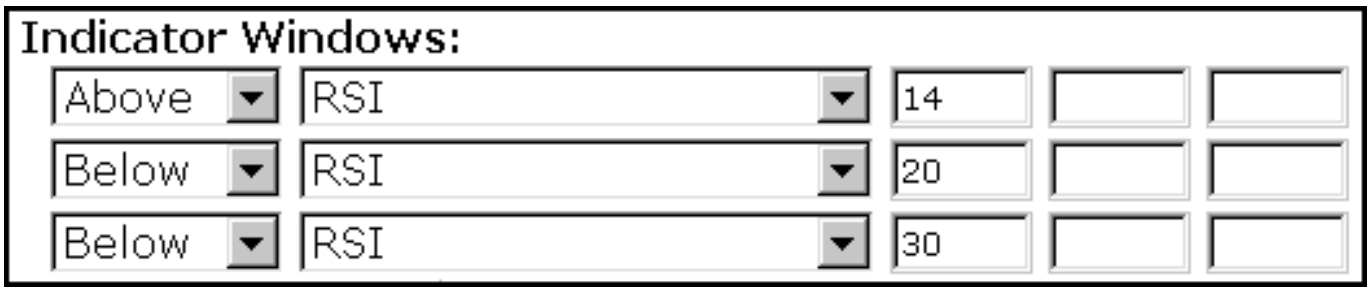
Example



(Click here to see a live example of RSI)

The DELL example shows a number of extreme readings as well as a negative divergence. In Oct-99, RSI reached oversold for a brief moment to mark the low around 38. The next extreme reading (overbought) occurred after a large advance that peaked in Dec-99. RSI reached overbought levels in late Dec-99 and moved below 50 by the second week of Jan-00. The next oversold reading occurred in Feb for another brief moment and marked the low around 35. By the end of Feb-00, RSI moved back above 50 and into overbought territory in March. A negative divergence formed in March and marked the high in the upper fifties.

RSI and SharpCharts



RSI is available on our SharpCharts charting tool. There is one box to choose the number of periods. In the example box, RSI has been assigned 14, 20 and 30 periods. A swing trader might prefer 14-periods, while an investor may prefer 30-periods. Users are encouraged to test different RSI settings and judge for themselves which ones work best and suit their particular trading/investing style.

For more on oscillators, please see our Chart School article on how to use and interpret oscillators.

Send us your Feedback!