

Relative Strength Index (RSI)

Introduction

J. Welles Wilder developed the Relative Strength Index (RSI) and introduced it in the June 1978 article for Commodities magazine, which is now Futures magazine. Wilder provided further detail in his classic book, *New Concepts in Technical Trading Systems*, which was also published in 1978. This book provides details on calculation, usage and signals for RSI and many of Wilder's other indicators including Average True Range, Parabolic SAR and ADX.

Even though the indicator is called the "Relative Strength Index", it does not measure relative strength in the traditional sense. The "relative strength comparative" shows the performance of one security against another with a ratio chart. John Murphy's [relative strength PerfCharts](#) compare the percentage change of 2 or more securities over a specific timeframe. RSI, on the other hand, uses price data from one security to compare its gains and losses over a period of time.

RSI is a momentum oscillator that measures the speed and change of price movements. RSI oscillates between zero and 100. Traditionally, and according to Wilder, RSI is considered overbought when above 70 and oversold when below 30. Signals can also be generated by looking for divergences, failure swings and centerline crossovers. RSI can also be used to identify the general trend.

RSI is an extremely popular [momentum indicator](#) that has been featured in a number of articles, interviews and books over the years. In particular, Constance Brown's book, *Technical Analysis for the Trading Professional*, features the concept of bull market and bear market ranges for RSI. Andrew Cardwell, Brown's RSI mentor, introduced positive and negative reversals for RSI. In addition, Cardwell turned the notion of divergence, literally and figuratively, on its head.

Calculation

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

$$RS = \text{Average Gain} / \text{Average Loss}$$

To simplify the explanation, RSI has been broken down into its basic components: **RS**, **Average Gain** and **Average Loss**. This RSI calculation is based on 14 periods, which is the default suggested by Wilder in his book. Losses are expressed as positive values, not negative values.

The very first calculations for average gain and average loss are simple 14 period averages.

- First Average Gain = Total of Gains during the past 14 periods / 14.

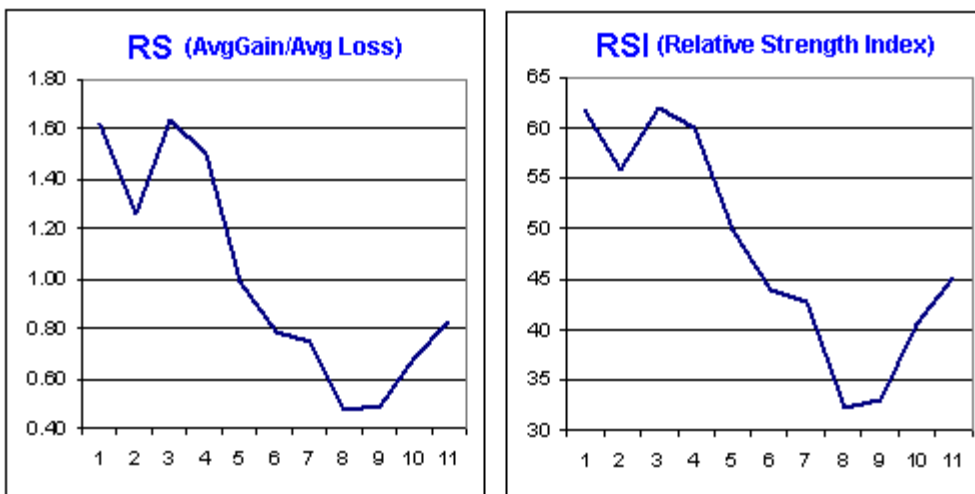
- First Average Loss = Total of Losses during the past 14 periods / 14

The second, and subsequent, calculations are based on the prior averages and the current gain loss:

- Average Gain = [(previous Average Gain) x 13 + current Gain] / 14.
- Average Loss = [(previous Average Loss) x 13 + current Loss] / 14.

Taking the prior value plus the current value is a smoothing technique similar to that used in exponential moving average calculation. This also means that RSI values become more accurate as the total calculation period extends. SharpCharts uses at least 250 data points prior to the starting date of any chart (assuming that much data exists) when calculating its RSI values. To exactly replicate our RSI numbers, a formula will need at least 250 data points.

Wilder simply normalized RS with his formula and turned it into an oscillator that fluctuates between zero and 100. In fact, a plot of RS looks exactly the same as a plot of RSI. This normalization step makes it easier to identify extremes because RSI is range bound. RSI is 0 when the Average Gain equals zero. Assuming a 14-period RSI, this means prices moved lower all 14 periods. There were no gains to measure. RSI is 100 when the Average Loss equals zero. This means prices moved lower all 14 periods. There were no losses to measure.



	Date	Close	Change	Gain	Loss	Average Gain	Average Loss	RS (AvgGain/AvgLoss)	14-period RSI
1	25-Mar-10	49.8							
2	24-Mar-10	49.72	-0.0800		0.0800				
3	23-Mar-10	51.45	1.7300	1.7300					
4	22-Mar-10	51.4	-0.0500		0.0500				
5	19-Mar-10	50.76	-0.6400		0.6400				
6	18-Mar-10	51.27	0.5100	0.5100					
7	17-Mar-10	51.23	-0.0400		0.0400				
8	16-Mar-10	51.34	0.1100	0.1100					
9	15-Mar-10	49.73	-1.6100		1.6100				
10	12-Mar-10	50.04	0.3100	0.3100					
11	11-Mar-10	50.42	0.3800	0.3800					
12	10-Mar-10	50.27	-0.1500		0.1500				
13	9-Mar-10	51.07	0.8000	0.8000					
14	8-Mar-10	50.9602	-0.1098		0.1098			RS	RSI
15	5-Mar-10	51.4493	0.4891	0.4891		0.3092	0.1914	1.6155	61.7658
16	4-Mar-10	50.7606	-0.6887		0.6887	0.2871	0.2269	1.2653	55.8552
17	3-Mar-10	51.8385	1.0779	1.0779		0.3436	0.2107	1.6306	61.9865
18	2-Mar-10	51.599	-0.2395		0.2395	0.3191	0.2128	1.4995	59.9927
19	1-Mar-10	50.1817	-1.4173		1.4173	0.2963	0.2988	0.9915	49.7870
20	26-Feb-10	49.1837	-0.9980		0.9980	0.2751	0.3488	0.7889	44.0982
21	25-Feb-10	48.9242	-0.2595		0.2595	0.2555	0.3424	0.7461	42.7310
22	24-Feb-10	46.3892	-2.5350		2.5350	0.2372	0.4990	0.4754	32.2214
23	23-Feb-10	46.489	0.0998	0.0998		0.2274	0.4634	0.4908	32.9209
24	22-Feb-10	47.6367	1.1477	1.1477		0.2931	0.4303	0.6813	40.5226
25	19-Feb-10	48.4451	0.8084	0.8084		0.3299	0.3995	0.8258	45.2306

Here's [an Excel Spreadsheet](#) that shows the start of an RSI calculation in action.

Parameters

The default look-back period for RSI is 14, but this can be lowered to increase sensitivity or raised to decrease sensitivity. 10-day RSI is more likely to reach overbought or oversold levels than 20-day RSI.