Relative strength index

Abstract:

The relative strength index (RSI) is a technical indicator used in the analysis of financial markets. It is intended to chart the current and historical strength or weakness of a stock or market based on the closing prices of a recent trading period. The indicator should not be confused with relative strength. Unlike other technical indicators which use the concept of relative strength, the Relative Strength Index, commonly referred to as simply RSI, provides a comparison of the performance of a security, relative to itself. It compares the magnitude of a stock's recent gains to the magnitude of its recent losses and turns that information into an oscillator which ranges from 0 to 100. The RSI can be used to; identify overbought and oversold conditions, confirm other technical indicators and warn of potential reversals through divergence with price trends.

Calculating the Relative Strength Index

To calculate the RSI first take the daily movements of a stock and convert them into an upward change (U) and a downward change (D) for each day. If the price closed up on that day then; U=Close Previous Close and D=O. Vice versa for days when prices close down. Then take Exponential Moving Averages of U and D and calculate the ratio;

$$RS = \frac{EMA(U)}{EMA(D)}$$

This is then converted into an oscillator using the following formula;

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

The only parameter in the RSI calculation is the period of the Exponential Moving Averages of U and D. The most commonly used format is the 14 day one, which Wilder originally recommended because it was half the lunar cycle.

Using the Relative Strength Index to inform trading decisions

(i) Overbought/oversold signals:

The principle behind the RSI is that a period of daily price movements which are predominantly in one direction is an extreme case, and likely to be reversed. As the RSI measures the strength of recent upward vs downward movements it can be utilized to identify such extreme events and highlight potential price trend reversal.

Commonly used levels are 70 and 30 that denotes RSI=70 or higher is overbought condition and is a bearish signal while an RSI=30 or lower represents an oversold condition and is a bullish signal.

Trade solely on the basis of these signals is not recommended as false signals are not uncommon. However if confirmed by other technical indicators or a breach of a support/resistance price line, then a signal can be generated.

(ii) Divergence from price:

Because of the way in which the RSI is formed it is expected to confirm price movements. A divergence from this principal can also be used to identify a potential reversal. For example if the RSI of a rising stock falls towards the center line this can signal an upcoming reversal in price.

The same is true of an increase in the RSI for a falling stock. Divergent signals are stronger if the movement is from an overbought or oversold condition.

(iii) Centre line cross-over:

The centerline for RSI is 50. A reading of 50 indicates that the recent strength of up movement and down movement is equal. A reading above 50 (but not overbought) is considered bullish and below 50 (but not oversold) is bearish.

Some traders who use the RSI to confirm other technical signals look for a movement of the RSI from below 50 to above 50 as confirmation of an existing bullish signal. Likewise a movement below 50 from above can be used to confirm bearish signals. The movement described here is not in itself considered a strong signal and should not determine trading. However, it can be used as part of a suite of indicators when looking to confirm an existing signal.

(iv) Trend line violations and price patterns:

As well as using the simple overbought/oversold and center line cross-over signals, it is sometimes possible to construct trend lines and support/resistance lines of the RSI in the same way as would be done for price itself. Violation of these lines, in conjunction with a violation of a trend line in price itself adds weight to the significance of the price movement.

Certain charting patterns such as head and shoulders can also be occasionally observed in the RSI chart and should be interpreted in the same way as for price charts.

Common variations of the RSI

(i) Cutler's RSI:

This is essentially the same as the traditional RSI but uses a simple moving average of U and D instead of the exponential average above. Cutler's RSI can differ from the standard RSI, but the two tend towards the same outcome.

(ii) Chandlers Momentum Oscillator (CMO):

This is a variant oscillator which ranges from -100 to +100 and is not smoothed in the same way as the traditional RSI. This results in more short term volatility and slightly more common overbought and oversold indicators being generated.

(iii) Relative Momentum Indicator (RMI):

This variation includes an additional parameter so that rather than calculating price changes from one day to the next, U and D are based on changes from latest close to close n days ago. Thus strength is replaced by momentum.

Description of the code

Relative strength index (RSI) is a momentum indicator developed by noted technical analyst Welles Wilder that compares the magnitude of recent gains and losses over a specified time period to measure speed and change of price movements of a security.

- Algorithm computes rsi < 30, for a list of symbols.
- Followed by calculation of Sortino ratio for an expected return of 0.05.
- Then returns a list of symbols with rsi < 30 and a positive Sortino ratio.
- Further provides other important statistical figures