TRADE

Relative Strength Index (RSI): What It Is, How It Works, and Formula

Learn how to measure the magnitude of price changes in 11 minutes

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> Part of the Series
> ## Guide to Technical Analysis   ⌄

Relative Strength Index (RSI)

['re-lə-tiv 'streŋ(k)th in-,deks]

A technical indicator, used in momentum trading, that measures the speed and magnitude of a security's recent price changes.

Investopedia

The RSI can be utilized alongside other technical indicators to support trading strategies.
Credit: Investopedia / Julie Bang

> **DEFINITION:**
>
> The RSI is a momentum oscillator that's widely used in technical analysis of stocks and commodities to identify changes in momentum and price

What Is the Relative Strength Index (RSI)?

The relative strength index (RSI) is a momentum indicator used in technical analysis. RSI measures the speed and magnitude of a security's recent price changes to detect overbought or oversold conditions in the price of that security. The RSI is displayed as an oscillator (a line graph) on a scale of 0 to 100.

Traditionally, an RSI reading of 70 or above indicates an overbought condition. A reading of 30 or below indicates an oversold condition. In addition to identifying overbought and oversold securities, the RSI can also indicate securities that may be primed for a trend reversal or a corrective pullback in price.

The indicator was developed by J. Welles Wilder Jr. and introduced in his seminal 1978 book, "New Concepts in Technical Trading Systems." [1] The RSI is one of the most popular technical indicators, and it's generally available on most trading platforms offered by online stock brokers.

KEY TAKEAWAYS

- The relative strength index (RSI) is a popular momentum oscillator introduced in 1978.
- The RSI provides technical traders with signals about bullish and bearish price momentum, and it's often plotted below the graph of an asset's price.
- An asset is usually considered overbought when the RSI is above 70 and oversold when it's below 30.
- In some situations, the RSI line crossing below the overbought line or above the oversold line can be seen by traders as a signal to buy or sell.
- The RSI works best in trading ranges rather than trending markets.

How the RSI Works

prices go down. Relating the result of this comparison to price action can give traders an idea of how a security may perform.[2] The RSI, especially when used in conjunction with other technical indicators, can help traders make better-informed trading decisions.[3]

Calculating RSI

The RSI uses a two-part calculation that starts with the following formula:[2]

$$RSI_{\text{step one}} = 100 - \left[\frac{100}{1 + \frac{\text{Average gain}}{\text{Average loss}}} \right]$$

The average gain or loss used in this calculation is the average percentage gain or loss during a look-back period. The formula uses a positive value for the average loss. Periods with price losses are counted as zero in the calculations of average gain. Periods with price increases are counted as zero in the calculations of average loss.

The standard number of periods used to calculate the initial RSI value is 14.[4] For example, imagine the market closed higher seven out of the past 14 days with an initial average gain of 1%. The remaining seven days all closed lower with an initial average loss of −0.8%.

The first calculation for the RSI would look like the following expanded calculation:
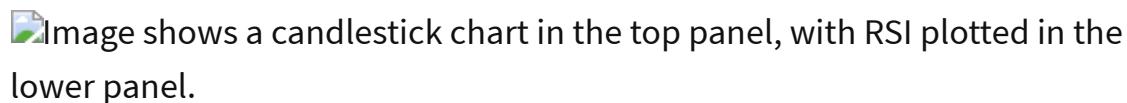
$$\left[1 + \frac{\left(\frac{1\%}{14} \right)}{\left(\frac{0.8\%}{14} \right)} \right]$$

Once there are 14 periods of data available, the second calculation can be done. Its purpose is to smooth the results so that the RSI only nears 100 or zero in a strongly [trending market](#).

$$RSI_{\text{step two}} = 100 - \left[\frac{100}{1 + \frac{(\text{Previous Average Gain} \times 13) + \text{Current Gain}}{((\text{Previous Average Loss} \times 13) + \text{Current Loss})}} \right]$$

Plotting RSI

After the RSI is calculated, the RSI indicator can be plotted, usually beneath an asset's price chart, as shown below. The RSI will rise as the number and size of up days increase. It will fall as the number and size of down days increase.

Image shows a candlestick chart in the top panel, with RSI plotted in the lower panel.

Credit: TradingView

As you can see in the above chart, the RSI indicator can stay in the overbought region for extended periods while the stock is in an [uptrend](#). The indicator may also remain in oversold territory for a long time when the stock is in a [downtrend](#). This can be confusing for new analysts, but learning to use the indicator within the context of the prevailing trend will clarify these issues.

Why Is RSI Important?

- Traders can use RSI to predict the price behavior of a security.
- It can help traders validate trends and trend reversals.
- It can point to overbought and oversold securities.
- It can provide short-term traders with buy and sell signals.
- It's a technical indicator that can be used with others to support trading strategies.

Using RSI With Trends

RSI readings. For example, well-known market technician Constance Brown, CMT, proposed that an oversold reading by the RSI in an uptrend is probably much higher than 30. Likewise, an overbought reading during a downtrend is much lower than 70. [5]

As you can see in the following chart, during a downtrend, the RSI peaks near 50 rather than 70. This could be seen by traders as more reliably signaling bearish conditions.

Many investors create a horizontal trendline between the levels of 30 and 70 when a strong trend is in place to better identify the overall trend and extremes. [6]

On the other hand, modifying overbought or oversold RSI levels when the price of a stock or asset is in a long-term horizontal channel or trading range (rather than a strong upward or downward trend) is usually unnecessary.

The relative strength indicator isn't as reliable in trending markets as it is in trading ranges. In fact, most traders understand that the signals given by the RSI in strong upward or downward trends often can be false.

Use Buy and Sell Signals That Fit Trends

A related concept focuses on trade signals and techniques that conform to the trend. In other words, using bullish signals primarily when the price is in a bullish trend and bearish signals primarily when a stock is in a bearish trend may help traders avoid the false alarms that the RSI can generate in trending markets.

Image shows a candlestick chart in the top panel, with RSI plotted in the lower panel.

Credit: TradingView

What Is a Bullish RSI Number?

A number of RSI levels can be considered bullish, depending on whether the market is trending up or down or is rangebound.

uptrends. In a strong downtrend, the trend can continue well after momentum indicators have hit oversold levels. In addition, any trade entered on this signal may offer limited upside, since you'd likely be trading against a strong, recent trend.

Following a strong uptrend, another bullish RSI signal is a reversal after a decline to around 40–50, an area considered support during an uptrend. This is often confirmation of a positive momentum shift back toward the uptrend after a pullback, signaling potential for continued gains. [7]

What Is a Bearish RSI Number?

Bearish signals from the RSI appear much like bullish ones but in reverse. A basic bearish signal is when the RSI crosses above 70, an overbought level. If this is followed by a move below 70, upward momentum may be weakening, alerting traders to a potential price reversal. [7] But again, bearish RSI signals are best used in downtrends.

During a strong downtrend, one bearish RSI signal is a reversal after a rise to around 50–60. This is often confirmation of a momentum shift back toward the downside after a pullback, signaling potential for continued declines.

Interpretation of RSI and RSI Ranges

During trends, the RSI readings may fall into a band or range. During a strong uptrend, the RSI tends to stay well above 30 and should frequently hit 70. During a strong downtrend, it's rare to see the RSI exceed 70, while it frequently hits 30 or below. [3]

These guidelines can help traders determine trend strength and spot potential reversals. For example, if the RSI can't reach 70 on a number of consecutive price swings during an uptrend, but then drops below 30, the trend is likely breaking down.

The opposite is true for a downtrend. If the downtrend is unable to reach 30 or below and then rallies above 70, that downtrend has broken down and could be reversing to the upside. Trendlines and moving averages are helpful technical tools to include when using the RSI in this way.

Be sure not to confuse RSI and relative strength. The former refers to changes in the price momentum of one security, while the latter compares the price performance of two or more securities. [2]

Example of RSI Divergences

An RSI divergence occurs when the indicator and price begin to reach different levels, indicating a change in momentum that precedes a change in price direction. For example, a bullish [divergence](#) occurs when the security makes a lower low but the indicator forms a higher low. This indicates rising bullish momentum and could be used to trigger a new [long position](#).

A bearish divergence occurs when price makes a higher high but the RSI makes a lower high. [8] This indicates a possible shift to downside momentum.

As you can see in the following chart, a bullish divergence was identified when the RSI formed a series of higher lows as the price formed lower lows. This was a valid signal, but divergences can be misleading when a stock is in a stable long-term trend. In that case, numerous divergences can be seen before a reversal occurs. Using flexible oversold or overbought readings will help identify more potential signals.

Image shows a candlestick chart in the top panel, with RSI plotted in the lower panel.

Credit: TradingView

Example of Positive-Negative RSI Reversals

An additional price-RSI relationship that traders watch for is positive and negative RSI reversals. These are the opposite of bearish and bullish divergences. A positive RSI reversal may take place once the RSI reaches a lower low at the same time a security's price reaches a higher low. Traders would consider this formation a bullish sign and a buy signal.

Conversely, a negative RSI reversal may take place once the RSI reaches a high that's higher that its previous high at the same time that a security's price

Example of RSI Swing Rejections

Another trading technique examines RSI behavior when it's reemerging from overbought or oversold territory. This signal is called a swing rejection. A bullish swing rejection has four parts: [8]

1. The RSI falls into oversold territory.

2. The RSI crosses back above 30.

3. The RSI forms another dip without crossing back into oversold territory.

4. The RSI then breaks its most recent high.

As you can see in the following chart, the RSI indicator was oversold, broke up through 30, and formed the rejection low that triggered the signal when it bounced higher. Using the RSI in this way is very similar to drawing trendlines on a price chart.

Image shows a candlestick chart in the top panel, with RSI plotted in the lower panel.

Credit: TradingView

There is a bearish version of the swing rejection signal that's a mirror image of the bullish version. A bearish swing rejection also has four parts: [8]

1. The RSI rises into overbought territory.

2. The RSI crosses back below 70.

3. The RSI forms another high without reaching overbought territory.

4. The RSI then breaks its most recent low.

The following chart illustrates the bearish swing rejection signal. As with most trading techniques, this signal will be most reliable when it conforms to the prevailing long-term trend. Bearish signals during downward trends are less likely to generate false alarms.

Credit: TradingView

The Difference Between RSI and MACD

The [moving average convergence divergence (MACD)](#) is another trend-following momentum indicator that shows the relationship between two moving averages of a security's price. The MACD is calculated by subtracting the 26-period [exponential moving average (EMA)](#) from the 12-period EMA. The result of that calculation is the MACD line.

A nine-day EMA of the MACD, called the signal line, is then plotted on top of the MACD line. It can function as a trigger for buy and sell signals. [10] Traders may buy the security when the MACD crosses above its signal line and sell, or short, the security when the MACD crosses below the signal line.

The RSI was designed to indicate whether a security is overbought or oversold in relation to recent price levels. It's calculated using average price gains and losses over a given period of time. The default time period is 14 periods, with values bounded from 0 to 100. [11]

The MACD measures the relationship between two EMAs, while the [RSI measures price change momentum](#) in relation to recent price highs and lows. These two indicators are often used together to provide [analysts](#) with a more complete technical picture of a market.

Both [indicators measure the momentum](#) of an asset. However, they measure different factors and may sometimes give contradictory indications.

For example, the RSI may show a reading above 70 for a sustained period of time, indicating a security is [overextended](#) on the buy side. At the same time, the MACD could indicate that buying momentum is still increasing for the security. Either indicator may signal an upcoming trend change by showing divergence from price (the price continues higher while the indicator turns lower, or vice versa).

Limitations of the RSI

signals are most reliable when they conform to the long-term trend.

True reversal signals are rare and can be difficult to separate from false alarms. A false positive, for example, would be a bullish crossover followed by a sudden decline in a stock. A false negative would be a situation where there's a bearish crossover, yet the stock suddenly accelerated upward.

Since the indicator displays momentum, it can stay overbought or oversold for a long time when an asset has significant momentum in either direction. Therefore, the RSI is most useful in an oscillating market (a trading range) where the asset price is alternating between bullish and bearish movements.

What Is a Good RSI Number to Use?

This question could refer to the time frame used in an RSI calculation. Choosing the right RSI period depends on your trading style, time frame, and market conditions. The default is a 14-period time frame, which provides a balanced response to price changes and is well-suited to swing and position trading. Using shorter periods between five and nine makes the RSI more sensitive, appealing to day traders who want to capture quick momentum shifts, though they tend to generate more noise. Meanwhile, using longer periods, such as 21 to 30, suits long-term investors looking to capture major trends.

On the other hand, a "good RSI number" could also refer to RSI levels. When the RSI is below 30, it signals that the security could be oversold or undervalued—meaning it could be a good time to buy. When the RSI is above 70, it signals that the security could be overbought or overvalued—meaning it could be a good time to sell. An RSI of 50 signals a neutral balance between bullish and bearish positions.

Should I Buy When Relative Strength Index (RSI) Is Low?

Some traders consider it a buy signal if a security's relative strength index (RSI) reading moves below 30. This is based on the idea that the security has been oversold and is therefore poised for a rebound. However, the reliability of this signal will depend on the overall context. If the security is caught in a significant downtrend, then it might continue trading at an oversold level for quite some

What Happens When RSI Is High?

As the RSI is mainly used to determine whether a security is overbought or oversold, a high RSI reading can mean that a security is overbought and the price may drop. Therefore, it can be a signal to sell the security.

What Is the Difference Between RSI and Moving Average Convergence Divergence (MACD)?

RSI and moving average convergence divergence (MACD) are both momentum measurements that can help traders understand a security's recent trading activity. However, they accomplish this goal in different ways.

In essence, the MACD works by smoothing out the security's recent price movements and comparing that medium-term trendline to a short-term trendline showing its more recent price changes. Traders can then base their buy and sell decisions on whether the short-term trendline rises above or below the medium-term trendline.

What Is the Difference Between RSI Divergence and RSI Reversal?

RSI divergence occurs when the indicator lags behind price, while RSI reversal signals result from price lagging behind the indicator. Both divergence and reversal signals can be bullish or bearish.

In a bearish divergence, for example, price makes a higher high but the RSI makes a lower high. With a negative reversal, on the other hand, the RSI makes a higher high, while price makes a lower high.

The Bottom Line

All in all, the relative strength index (RSI) is one of the most popular momentum oscillators in technical analysis. It's used to measure the speed and change of price movements, providing traders insights into potential overbought and oversold conditions. Calculated using a function of relative strength, the RSI ranges from 0 to 100. Indeed, the RSI, with its overbought and oversold levels, helps traders spot potential reversals, divergences, and trend continuations.