# Candlestick Charts

Charts used by traders to determine possible price movements based on past patterns. They help traders and investors quickly assess price movements and short-term market sentiment.

* Bullish patterns suggest an upward price trend (buying pressure)
* Bearish patterns indicate a downward price trend (selling pressure).

These patterns are identified through various indicators such as candlestick formations, support and resistance levels, and volume analysis.

Candlestick charting was built on the idea that market prices are influenced by both trader psychology and the balance of power between the bulls and bears.

## Components of a Candlestick

Each candlestick represents a specific period and is made of three components:

1. **Real Body or Body:** This is the rectangular section of the candlestick and shows the range between the opening and closing prices. Long bodies indicate strong buying or selling pressure, while short bodies suggest indecision.
2. **Shadows or Wicks:** These extend above and below the body, marking the highest and lowest prices reached during the period, offering insights into market volatility.
3. **Color:** The colour of the candle provides a quick snapshot of price direction.
   1. A bullish candlestick is typically green or white and means the closing price is higher than the opening price, indicating upward momentum.
   2. Inversely, a bearish candlestick, generally red or black, signals that the closing price was lower than the opening price, reflecting downward pressure.

A graph showing a price chart

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## How to read a Candlestick?

Similar to bar charts, candlestick charts comprise four price points: open, high, low, and close. The high is marked by the top of the upper shadow or the real body if there is no shadow, while the low price is represented by the bottom of the lower shadow or the real body if there is no lower shadow.

Finally, the **closing price's relationship to the open determines whether the candlestick is bullish or bearish**. If the price closes above the open price, the candlestick is bullish. On the other hand, if the price closes below the open price, the candlestick is bearish. With coloured candlesticks, you can recognize bullish or bearish candlesticks instantly.

By analysing these four price points over multiple candlesticks, traders can identify market sentiment and how the bulls and bears are faring against each other, helping to predict potential price changes.

## Common Candlestick Patterns

## Bullish Patterns

### A group of black rectangles and a plus AI-generated content may be incorrect.Bullish Engulfing Pattern

This pattern consists of two candlesticks. The first is a small, bearish candle followed by a larger, bullish candle. As the name implies, the larger candle completely engulfs the previous candle's body. That is, it opens below the lowest point of the smaller candle's body, but the bulls take over and push the price to a close above the highest point of the previous candle's body. This **indicates a shift from bearish to bullish, reflecting strong buying pressure** that may mark a potential reversal.

### A group of black rectangles AI-generated content may be incorrect.Bullish Harami Pattern

Another bullish candlestick pattern is the bullish harami. This is a two-candlestick reversal pattern. It consists of a large bearish candlestick followed by a smaller bullish candlestick that is completely contained within the body of the previous larger candle. This formation **suggests that selling pressure is weakening, and on the second day, buyers are reasserting control**. Confirmation is seen when the harami is followed by a strong bullish candle.

### A group of black rectangles AI-generated content may be incorrect.Bullish Harami Cross

This is a variation of the bullish harami pattern where the second candlestick is a doji, signifying very little difference, if any, between the open and close. Unlike the bullish engulfing pattern, which shows the bulls gaining the upper hand, the doji reflects a stalemate. This often means selling pressure has faded the bulls are about to take over for a while.

### Rising Three Methods

A group of black rectangles

AI-generated content may be incorrect.This bullish continuation pattern signals a temporary consolidation before the prevailing uptrend resumes. The components include a strong bullish candlestick, followed by three or more smaller, bearish candlesticks that remain within the range of the first candle. Finally, another strong bullish candlestick closes above the most recent bullish candle's close.

The smaller bearish candles reflect a brief period of profit-taking or a pause in buying without much selling pressure. The final bullish candle confirms that buyers have regained control and the price is likely to continue moving higher.

### Morning Star Pattern

A graph of candlesticks with different colored rectangles

AI-generated content may be incorrect.Morning star pattern is a bullish three period candlestick formation that consists of…

* a long red candle followed by…
* a small red or green candle (or doji) that gaps below the close of the previous candle followed by…
* a long green candle (stronger signal if gaps up)

## Bearish Patterns

### A group of black and white symbols AI-generated content may be incorrect.Bearish Engulfing Pattern

This pattern consists of two candlesticks. The first is a small, somewhat bullish candle at the top of an uptrend, followed by a larger bearish candle that completely engulfs the previous candle's body. The bearish engulfing pattern indicates a shift in market sentiment from bullish to bearish, suggesting an impending price decline. It typically marks the end of an uptrend.

### Evening Star

A group of black rectangles and squares

AI-generated content may be incorrect.This is a three-candlestick pattern that appears at the top of an uptrend. The first candle is a long bullish candle. It is followed by a small-bodied candle that signals market indecision. Finally, a strong bearish candle confirms the reversal. This pattern suggests buying momentum is weakening and sellers are taking control. It often leads to a downtrend.

### Bearish Harami

A graph of candlesticks and rectangles

AI-generated content may be incorrect.This is a two-candlestick pattern that signals an uptrend's potential reversal. It comprises a large bullish candlestick that is followed by a smaller, bearish candlestick that is completely contained within the body of the previous candle. The bearish harami signals that buying momentum is weakening, and sellers may be starting to take control. A strong bearish candle would confirm the reversal.

### A graph with black lines AI-generated content may be incorrect.Bearish Harami Cross

This is a variation of the bearish harami, where the second candle is a doji, showing near identical opening and closing prices. This signals strong indecision and weakening bullish momentum. A strong bearish candle would confirm the reversal.

### Falling Three Methods

A graph of different sizes and shapes

AI-generated content may be incorrect.The falling three (3) methods is a bearish continuation pattern that indicates a temporary consolidation before the downtrend resumes. It consists of a strong bearish candlestick, followed by three or more smaller bullish candlesticks that stay within the range of the first candle, and finally, another strong bearish candlestick that closes below the first candle's close. The smaller bullish candles represent a brief pause in selling pressure, but their inability to break higher suggests that bears remain in control. The final bearish candle confirms the continuation of the downtrend.

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## Practical Applications of Candlestick Charts

Candlestick charts help traders analyse potential market turning points by more clearly illustrating what's happening in the battle between the bulls and bears than bar charts or line charts. Practical applications include:

* **Trend Identification**: Traders and investors analyse candlestick patterns to determine whether a market is trending, though for this purpose they're best used in conjunction with an indicator such as the Average Directional Index.
* **Confirmation**: Used with other technical analysis indicators as well as support and resistance levels, candlestick formations can flag and confirm short-term market turning points.

## Limitations and Considerations

Candlesticks do have limitations. Their predictive power is limited mostly to the short term, and they are most useful to swing traders. Relying solely on candlestick patterns can lead to misinterpretations and suboptimal decision making. Incorporating additional indicators, volume analysis, support and resistance levels, and even fundamental analysis can help traders and investors make more informed and accurate decisions.

Candlestick charts help traders and investors analyse price movements, market sentiment, and trend reversals. Developed in Japan, they use opening, high, low and closing prices to form predictive patterns. Since patterns can produce false signals, confirming them with support, resistance and other technical tools is essential.

# Simple Moving Average

**What Is a Simple Moving Average (SMA)?**

A simple moving average (SMA) calculates the average price of an asset, usually using closing prices, during a specified period of days.

* A simple moving average is a technical indicator that can aid in determining if an asset price will continue or if it will reverse a bull or bear trend.
* A simple moving average can be enhanced as an exponential moving average (EMA) that is more heavily weighted on recent price action.

Short-term averages respond quickly to changes in the price of the underlying security, while long-term averages are slower to react.

A math formula with numbers and symbols

AI-generated content may be incorrect.

Each day when the stock market closes, there is a new most recent closing price. This replaces the oldest one being used, and a new, up-to-date moving average is calculated. A 50-day moving average would use 50 days’ worth of data to compute the average price on a rolling basis.

A simple moving average smooths out volatility and makes it easier to view the price trend of a security. If the simple moving average points up, this means that the security's price is increasing. If it is pointing down, it means that the security's price is decreasing. The longer the time frame for the moving average, the smoother the simple moving average. A shorter-term moving average is more volatile, but its reading is closer to the source data.

## Special Considerations

### Analytical Significance

 The simplest use of an SMA in technical analysis is using it to quickly determine if an asset is in an uptrend or downtrend.

Another popular, albeit slightly more complex, analytical use is to compare a pair of simple moving averages with each covering different time frames. If a shorter-term simple moving average is above a longer-term average, an uptrend is expected. On the other hand, if the long-term average is above a shorter-term average, then a downtrend might be the expected outcome.

**Popular Trading Patterns**

Two popular trading patterns that use simple moving averages include the death cross and a golden cross. A [death cross](https://www.investopedia.com/terms/d/deathcross.asp) occurs when the 50-day SMA crosses below the 200-day SMA. This is considered a bearish signal, indicating that further losses are in store. The [golden cross](https://www.investopedia.com/terms/g/goldencross.asp) occurs when a short-term SMA breaks above a long-term SMA. Reinforced by high trading volumes, this can signal further gains are in store.

## Simple Moving Average vs. Exponential Moving Average

In contrasting an exponential moving average (EMA) and a simple moving average the major difference is the sensitivity each one shows to changes in the data used in its calculation. More specifically, the EMA gives a higher weighting to recent prices, while the SMA assigns an equal weighting to all values.

Since EMAs place a higher weighting on recent data than on older data, they are more reactive to the latest price changes than SMAs are, which makes the results from EMAs more timely and explains why the EMA is the preferred average among many traders.

## What Is the Difference Between a Simple Moving Average and an Exponential Moving Average?

While a simple moving average gives equal weight to each of the values within a time period, an exponential moving average places greater weight on recent prices. Exponential moving averages are typically seen as a more timely indicator of a price trend, and because of this, many traders prefer using this over a simple moving average. Common short-term exponential moving averages include the 12-day and 26-day. The 50-day and 200-day exponential moving averages are used to indicate long-term trends.

# Exponential Moving Average

**What Is an Exponential Moving Average (EMA)?**

An exponential moving average (EMA) is a type of moving average (MA) that places a greater weight and significance on the most recent data points. The exponential moving average is also referred to as the exponentially weighted moving average.

A math equations on a white background

AI-generated content may be incorrect.While there are many possible choices for the smoothing factor, the most common choice is:

* Smoothing = 2

That gives the most recent observation more weight. If the smoothing factor is increased, more recent observations have more influence on the EMA.

## Calculating the EMA

The formula for calculating the EMA starts with the SMA and uses a multiplier. There are three steps in the calculation (although chart applications can do the math for you):

1. Compute the SMA
2. Calculate the multiplier for weighting the EMA
3. Calculate the current EMA

The calculation for the SMA is the same as computing an average or mean. That is, the SMA for any given number of time periods is the sum of closing prices for that number of time periods, divided by the same number. So, for example, a 10-day SMA is just the sum of the closing prices for the past 10 days, divided by 10.

The formula for calculating the weighting multiplier looks like this:

Weighted multiplier= 2÷ (selected time period+1)

=2÷ (10+1)

=0.1818

=18.18%

In both cases, we’re assuming a 10-day SMA.

So, when it comes to calculating the EMA of a stock:

Where:

t = today

y = yesterday

N = number of days in EMA

k = 2 ÷ (N + 1)

A graph of a stock market

AI-generated content may be incorrect.The weighting given to the most recent price is greater for a shorter-period EMA than for a longer-period EMA. For example, an 18.18% multiplier is applied to the most recent price data for a 10-day EMA, as we did above, whereas for a 20-day EMA, only a 9.52% multiplier weighting is used.

There are also slight variations of the EMA arrived at by using the open, high, low, or median price instead of using the closing price.

## What does the EMA tell you?

The 12- and 26-day exponential moving averages (EMAs) are often the most quoted and analysed short-term averages. The 12- and 26-day are used to create indicators like the [moving average convergence divergence (MACD)](https://www.investopedia.com/terms/m/macd.asp) and the [percentage price oscillator (PPO)](https://www.investopedia.com/terms/p/ppo.asp).

 In general, the 50- and 200-day EMAs are used as indicators for long-term trends. When a stock price crosses its 200-day moving average, it is a technical signal that a [reversal](https://www.investopedia.com/terms/r/reversal.asp) has occurred.

Traders who employ [technical analysis](https://www.investopedia.com/terms/t/technicalanalysis.asp) find moving averages very useful and insightful when applied correctly. However, they also realize that these signals can create havoc when used improperly or misinterpreted. All the moving averages commonly used in technical analysis are [lagging indicators](https://www.investopedia.com/terms/l/laggingindicator.asp).

Consequently, the conclusions drawn from applying a moving average to a particular market chart should be to confirm a market move or indicate its strength. **The optimal time to enter the market often passes before a moving average shows that the trend has changed.**

An EMA does serve to alleviate the negative impact of lags to some extent. Because the EMA calculation places more weight on the latest data, it “hugs” the price action a bit more tightly and reacts more quickly. This is desirable when an EMA is used to derive a trading entry signal.

Like all moving average indicators, EMAs are much better suited for [trending markets](https://www.investopedia.com/terms/t/trending-market.asp). When the market is in a strong and sustained uptrend, the [EMA indicator line](https://www.investopedia.com/ask/answers/122314/what-are-best-technical-indicators-complement-exponential-moving-average-ema.asp) will also show an uptrend and vice-versa for a downtrend. A vigilant trader will pay attention to both the direction of the EMA line and the relation of the [rate of change](https://www.investopedia.com/terms/r/rateofchange.asp) from one bar to the next.

**What Is a Good Exponential Moving Average?**

The longer-day EMAs (i.e. 50 and 200-day) tend to be used more by long-term investors, while short-term investors tend to use 8- and 20-day EMAs.

**Is Exponential Moving Average Better Than Simple Moving Average?**

The EMA focused more on recent price moves, which means it tends to respond more quickly to price changes than the SMA.

**How Do You Read Exponential Moving Averages?**

Investors tend to interpret a rising EMA as a support to price action and a falling EMA as a resistance. With that interpretation, investors look to buy when the price is near the rising EMA and sell when the price is near the falling EMA.

**What Is the RSI?**

* The **Relative Strength Index (RSI)**, developed by J. Welles Wilder Jr. in 1978, is a **momentum oscillator** that measures the speed and magnitude of recent price changes to help detect overbought or oversold conditions.
* It is displayed as a line between **0 and 100**: typically considered **overbought at 70+** and **oversold at 30‑ or below**.

**RSI Formula & Calculation**

* Default **lookback period: 14 periods** (days, hours, etc.).
* Calculate daily **upward change (U)** and **downward change (D)**:
  + If price closes higher: U = change, D = 0; if lower, U = 0, D = positive change.
* Compute **smoothed average gains and losses** using Wilder's method (SMMA).
* **RS** = average gain ÷ average loss;  
  Then **RSI = 100 − [100 / (1 + RS)]**.

**How to Interpret RSI**

* **Overbought (RSI ≥ 70)** may indicate weakening upside momentum or potential pullback.
* **Oversold (RSI ≤ 30)** may signal undervaluation and a possible rebound.
* **Neutral zone (around 50)** suggests a balanced market; readings >50 signal more gains than losses, while <50 suggest more losses than gains.
* In strong trends, RSI can remain in overbought/oversold regions for extended periods, so traders often wait for **crossback** through thresholds—for instance, trading when RSI dips back below 70 after being high.

**Divergence & Failure Swing Signals**

* **Divergence**:
  + **Bearish**: Price makes new highs, RSI fails to confirm (lower highs).
  + **Bullish**: Price makes new lows, RSI shows higher lows. These signal possible reversals.
* **Failure swing**: RSI rises above a threshold, pulls back, then breaches the pullback low or high—indicating trend exhaustion or reversal potential.

**Trend Confirmation & Range‑Shifts**

* Analyst Andrew Cardwell noted:
  + In **uptrends**, RSI often trades between ~40–80.
  + In **downtrends**, between ~20–60.
  + A shift between these bands may signal trend change; **hidden divergences** and **positive/negative reversals** can confirm continuation or reversal.

**Strengths & Limitations**

* **Strengths**:
  + Simple to compute and interpret.
  + Easily available on most charting tools.
  + Effective for spotting overbought/oversold conditions and divergences.
* **Limitations**:
  + May produce false signals in strong trending markets.
  + Adjusting thresholds (e.g. 80/20 during range-bound periods) can improve reliability.

**Comparisons with Related Indicators**

* **MACD vs RSI**:
  + MACD measures trend direction and momentum through exponential moving averages.
  + RSI measures internal momentum based on recent gains/losses.
  + They often yield complementary signals and are frequently used together.
* **MFI (Money Flow Index)** vs RSI:
  + MFI is a **volume‑weighted** version of RSI, using both price and volume.
  + MFI may act as a stronger leading indicator; divergences in MFI are often considered more serious.
  + Many traders use both for confirmation.
* **Stochastic Oscillator vs RSI**:
  + Stochastics compares closing prices to recent high-low range.
  + RSI tracks momentum based on price change velocity.
  + RSI tends to be more widely used, while stochastics can offer faster signals in certain contexts

# MACD

Moving average convergence/divergence (MACD) is a technical indicator to help investors identify entry points for buying or selling.

* The MACD line is calculated by subtracting the 26-period exponential moving average (EMA) from the 12-period EMA.
* The signal line is a nine-period EMA of the MACD line and is plotted on top of the MACD line, this can function as a trigger for buy or sell signals.
* MACD is best used with daily periods, where the traditional settings of 26/12/9 days is the default.

## Using MACD

MACD has a positive value (shown as the blue line on the MACD chart) whenever the 12-period EMA (indicated by the red line on the price chart) is above the 26-period EMA (the blue line in the price chart), and a negative value when the 12-period EMA is below the 26-period EMA. The distance between MACD and its [baseline](https://www.investopedia.com/terms/b/baseline.asp) depends on the distance between the two EMAs. As shown in the chart below, rises and drops in MACD (blue) values correspond to the movements of the two EMA lines.

A graph of stock market

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MACD is often displayed with a [histogram](https://www.investopedia.com/terms/h/histogram.asp) (see the next chart below) that graphs the distance between MACD and its signal line. If MACD is above the signal line, the histogram will be above the MACD’s baseline or zero line. If MACD is below its signal line, the histogram will be below the MACD’s baseline. Traders use the MACD’s histogram to identify peaks of bullish or bearish momentum, and to generate overbought/oversold trade signals.

A graph of stock market

AI-generated content may be incorrect.

## MACD vs. Relative Strength

The [relative strength index (RSI)](https://www.investopedia.com/terms/r/rsi.asp) signals whether an instrument is considered [overbought](https://www.investopedia.com/terms/o/overbought.asp) or [oversold](https://www.investopedia.com/terms/o/oversold.asp) based on its recent price action. The RSI is an [oscillator that calculates the average](https://www.investopedia.com/terms/o/osma.asp) price gains and losses over a given period. The default is 14 periods with values bounded from 0 to 100. A reading above 70 suggests an overbought condition, while a reading below 30 is considered oversold, with both potentially signalling a top or a bottom is forming.

Unlike the RSI or other oscillator studies, the MACD lines do not have concrete overbought/oversold levels. Rather, they function on a relative basis. An investor or trader should focus on the level and direction of the MACD/signal lines compared with preceding price movements in the security at hand, as shown below.

MACD measures the relationship between two EMAs to indicate momentum and potential trade reversals, while the RSI seeks out overbought and oversold conditions by evaluating recent price action. These indicators are often used together to give [analysts](https://www.investopedia.com/terms/a/analyst.asp) a more complete technical picture.

## Limitations of MACD

The **MACD** (Moving Average Convergence Divergence) can signal potential reversals, but it often produces **false positives**, especially during **sideways or slow-trending markets**. These conditions can cause MACD to shift toward zero even without a real trend change.

To reduce false signals, investors should confirm MACD signals with **trend-following indicators** like the **ADX (Average Directional Index)**. An ADX value above 25 suggests a strong trend, while below 20 suggests no trend.

By combining MACD with ADX, investors can better judge the strength of a trend and **avoid acting on misleading MACD signals**, especially during periods of market consolidation.

## Crossovers and Divergence

**MACD Crossovers** occur when the MACD line crosses above (bullish) or below (bearish) the signal line, suggesting potential **buy or sell opportunities**. These crossovers help traders spot changes in momentum.

**MACD Divergence** happens when the MACD line moves in the **opposite direction** of the asset’s price. A **bullish divergence** (price makes lower lows, MACD makes higher lows) may indicate a potential upward reversal, while a **bearish divergence** (price makes higher highs, MACD makes lower highs) may signal a possible downward reversal.

Together, crossovers and divergence are used to **identify trend changes**, though they are more effective when confirmed with other indicators to reduce false signals.

## Is MACD a Leading or a Lagging Indicator?

MACD is a lagging indicator. The data used in MACD calculation is based on the historical price action, therefore MACD readings lag the price. However, some traders use MACD histograms to predict when a change in trend will occur. For these traders, this aspect of MACD might be viewed as a leading indicator of future trend changes.

## What Is a MACD Bullish/Bearish Divergence?

A MACD positive (or bullish) divergence is a situation in which MACD does not reach a new low, despite the price of the stock reaching a new low. This is seen as a bullish trading signal—hence, the term “positive/bullish divergence.” If the opposite scenario occurs—the stock price reaches a new high, but MACD fails to do so—this would be seen as a bearish indicator and termed “negative/bearish divergence.” In both cases, the setups suggest that the move higher/lower will not last, so investors need to look at other technical studies, like the relative strength index (RSI).

## The Bottom Line

MACD is a moving average, [best used with daily data](https://www.investopedia.com/ask/answers/122414/how-reliable-using-moving-average-convergence-divergence-macd-create-or-follow-trading-strategies.asp). Just as a crossover of the nine- and 14-day SMAs may generate a trading signal for some traders, a crossover of the MACD above or below its signal line may also generate a directional signal. MACD is based on EMAs with more weight placed on the most recent data, which means that it can react very quickly to changes of direction in the current price move. Crossovers of MACD lines should be noted, but confirmation should be sought from other technical signals, such as the RSI, or perhaps a few [candlestick](https://www.investopedia.com/terms/c/candlestick.asp) price charts. Because it is a lagging indicator, MACD argues that confirmation in subsequent price action should develop before taking the signal.