Trading Algorithms

INTRODUCTION TO TECHNICAL ANALYSIS

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Introduction

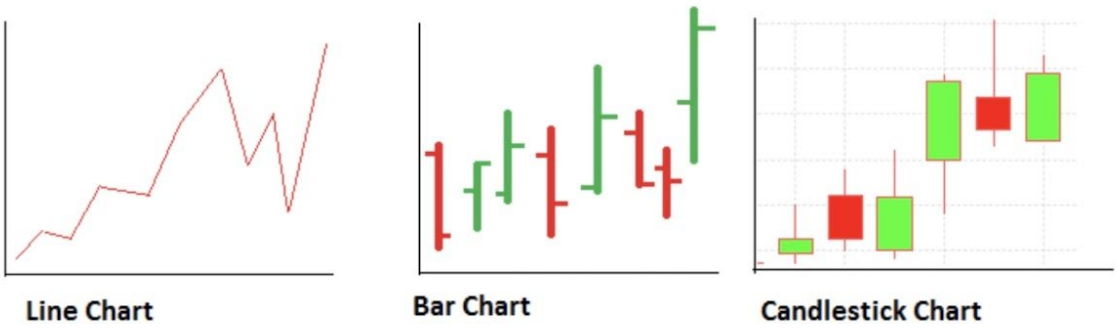
- In finance, technical analysis is an analysis methodology for analyzing and forecasting the **direction of prices** through the study of **past market data**.
- Unlike fundamental analysis, which attempts to evaluate a security's value based on business results such as sales and earnings, technical analysis focuses on the study of price and volume.
- The **theory behind the validity of technical analysis** is the notion that the collective actions – **buying** and **selling** – of all the participants in the market accurately reflect all relevant information pertaining to a traded security, and therefore, continually assign a *fair market value* to the security.
- Technical traders believe that current or past price action in the market is the **most reliable indicator** of future price action.

Introduction …

- A core principle of technical analysis is that a market's price **reflects** all relevant information impacting that market.
- A technical analyst therefore looks at the history of a security or commodity's trading pattern rather than external drivers such as economic, fundamental and news events.
- It is believed that price action tends to **repeat** itself due to the collective, patterned behavior of investors.
- Technical analysis most commonly applies to price changes, but some analysts track numbers other than just price, such as trading volume or open interest figures.
- The two primary variables for technical analysis are the **time frames** considered and the **particular technical indicators** that a trader chooses to utilize.

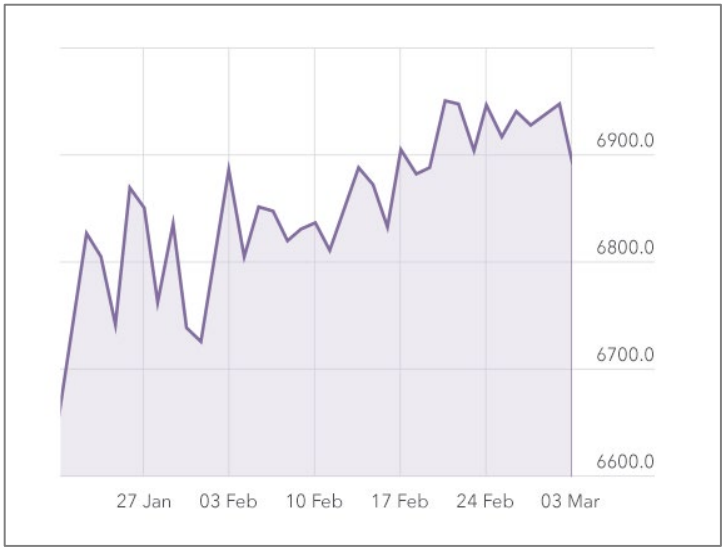
Price charts

- Technical analysts use a variety of charts based on the information they seek. However, there are three types of charts that are most commonly used.
  - Line
  - Bar
  - Candlestick



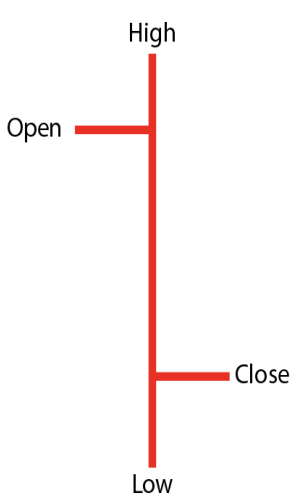
Price charts …

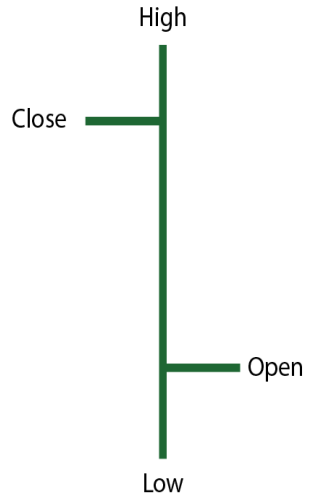
- Line Chart
  - It plots the closing (or **hlc3**) price of a share for each trading day (time frame) over a period.
  - The line formed by joining the dots plotted on the graph shows the movements in stock price during the period.



Price charts …

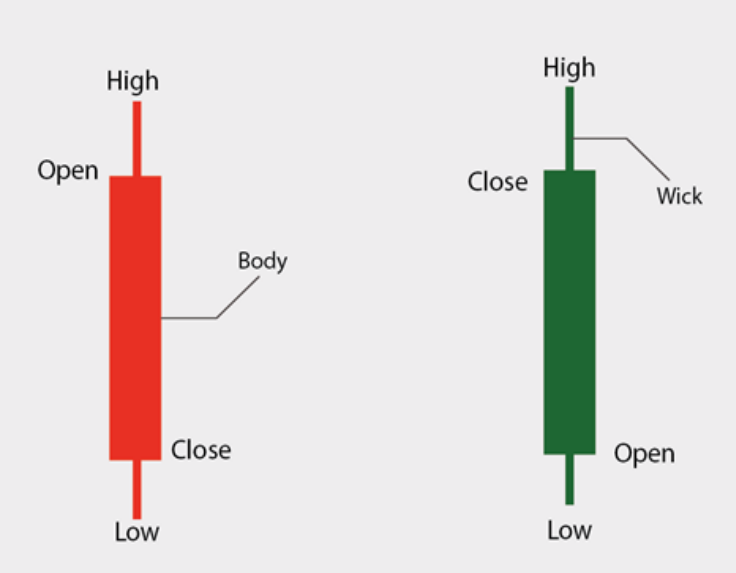
- Bar Chart
  - It plots the high and low prices of a stock using a bar for each trading day for a specified time period.
  - The top of the bar corresponds to the **day's (time frame's)** high and the bottom, day's low.
  - Two additional horizontal lines indicate the opening and closing price. The length of the bar is proportional to the volatility in a stock.
  - Colored coded - If the share price **closes above the open** price it is colored green, and if the **close is below the open** the bar is colored red.





Price charts …

- Candlestick chart
  - It displays the relationship between the high & low and opening & closing prices of a stock.
  - The **body** of the candle represents the opening and closing prices during the period.
  - Above and below the body are vertical lines called **wicks** or **shadows** that show the lows and highs of the traded prices.
  - While an individual candle provides sufficient information, patterns can be determined only by comparing one candle with its preceding and next candles.

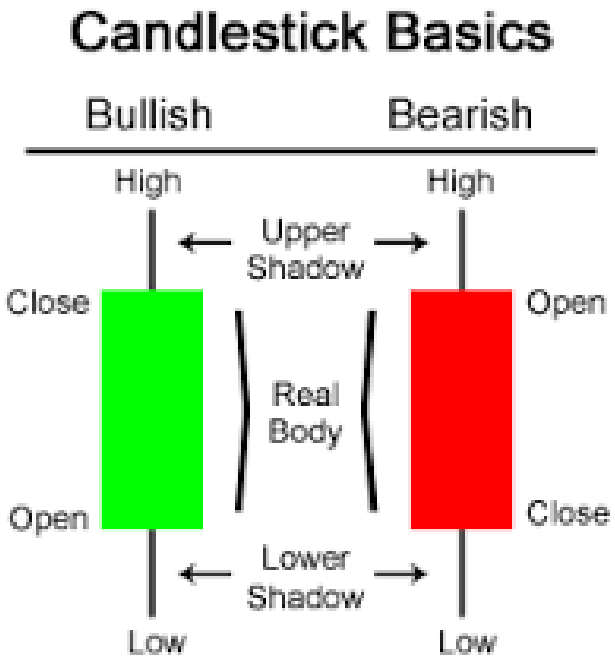


Candlestick patterns

- **Candlestick** charts are a technical tool that packs data for multiple time frames into **single price bars**.
- This makes them more useful than traditional open, high, low, close (OHLC) bars or simple lines that connect the dots of closing prices.
- Candlesticks build patterns that may predict price direction once completed.
- Proper color coding adds depth to this colorful technical tool, which dates back to 18th century **Japanese rice** traders.
- Traditionally, candlesticks are best used on a daily basis, the idea being that each candle captures a full day's worth of news, data, and price action.
- This suggests that candles are more useful to longer-term or **swing traders**.

Candlestick patterns …

- Candlestick charts are an effective way of visualizing price movements.
- There are two basic candlesticks:
  - **Bullish Candle**: When the close is higher than the open (usually green or **white**)
  - **Bearish Candle**: When the close is lower than the open (usually red or **black**)

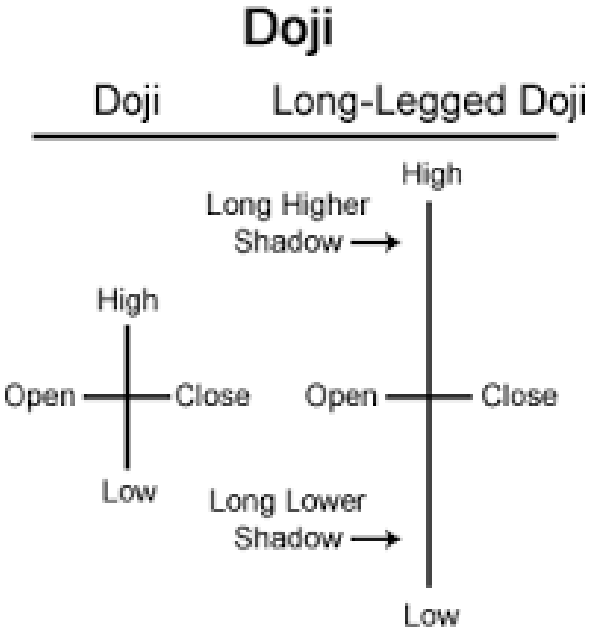


Candlestick patterns …

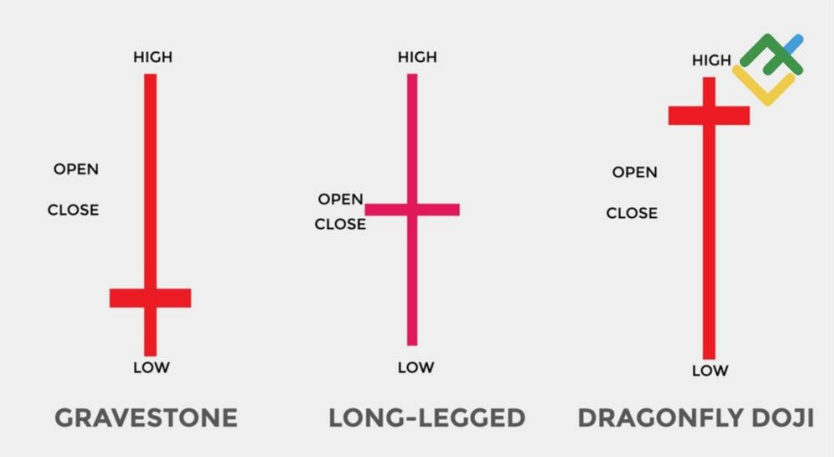
- Candlestick Charts is with multiple candlesticks forming reversal and continuation patterns.
  - Bullish Engulfing
  - Bearish Engulfing
  - Hanging Man
  - Harami
  - Dark Cloud Cover
  - Doji
  - Dragonfly Doji
  - Gravestone Doji
  - Evening Star
  - Morning Star
  - Hammer
  - Inverted Hammer
  - Piercing Line
  - Shooting Star

Doji

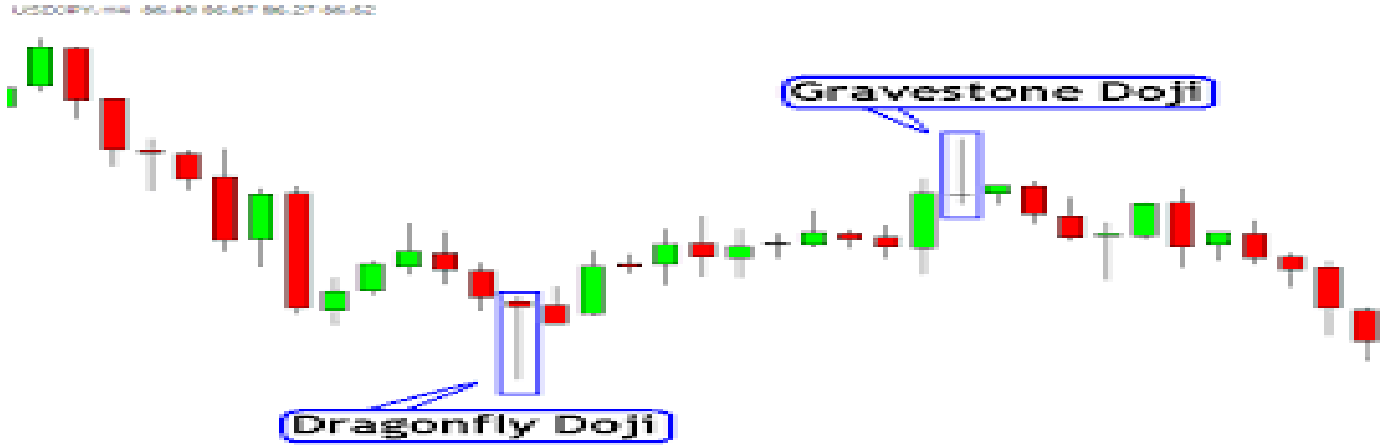
- The open and close are very close together, creating a very small body Doji.
- It represent **indecision** between the bulls and the bears.
- A long-legged Doji is the same as Doji, except the upper and lower shadows shadows are much longer than the regular Doji formation.



Doji …

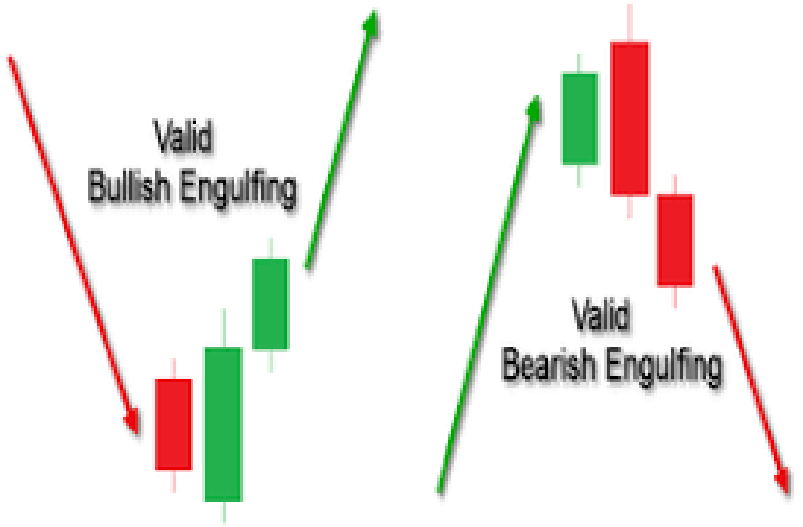

HIGH
OPEN
CLOSE
LOW
GRAVESTONE
HIGH
OPEN
CLOSE
LOW
LONG-LEGGED
HIGH
OPEN
CLOSE
LOW
DRAGONFLY DOJI

long legged Doji(Bearish)
Gap
40%
60%
50%
50%
www.fxpipsgainer.com


Gravestone Doji
Dragonfly Doji

Engulfing

- Engulfing patterns have one bearish and one bullish candle.
- The second candle must fully cover the first candle.
- Bullish or bearish, according to the second candle.



Support and resistance

- Support and resistance are two foundational concepts in technical analysis.
- Understanding what these terms mean and their practical application is essential to correctly reading price charts.
- **Prices move because of supply and demand**. When demand is greater than supply, prices rise. When supply is greater than demand, prices fall.
- Sometimes, prices will move **sideways** as both supply and demand are in equilibrium.

Support and resistance …

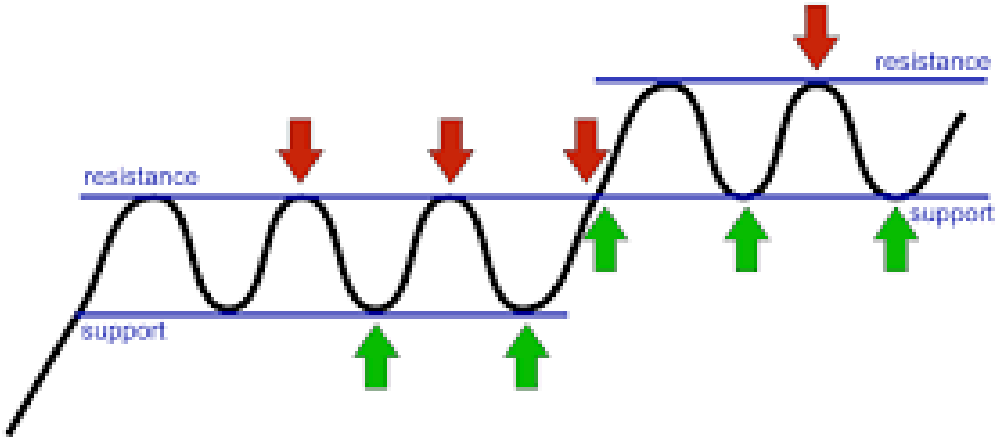
- In a downtrend, prices fall because there is an **excess of supply over demand**.
- The lower prices go, the more attractive prices become to those waiting on the sidelines to buy the shares.
- At some level, demand that would have been slowly increasing will rise to the level where it matches supply. At this point, prices will stop falling. This is support.
- Support can be a **price level** on the chart or a **price zone**.
- In any event, support is an area on a price chart that shows buyers' willingness to buy.

Support and resistance …

- Resistance is the opposite of support. Prices move up because there is more demand than supply.
- As prices move higher, there will come a point when selling will overwhelm the desire to buy.
- This happens for a variety of reasons. It could be that traders have determined that prices are too high or have met their target. It could be the reluctance of buyers to initiate new positions at such rich valuations. It could be for any other number of reasons.
- But a technician will clearly see on a price chart a level at which supply begins to overwhelm demand.
- **This is resistance. Like support, it can be a level or a zone**.

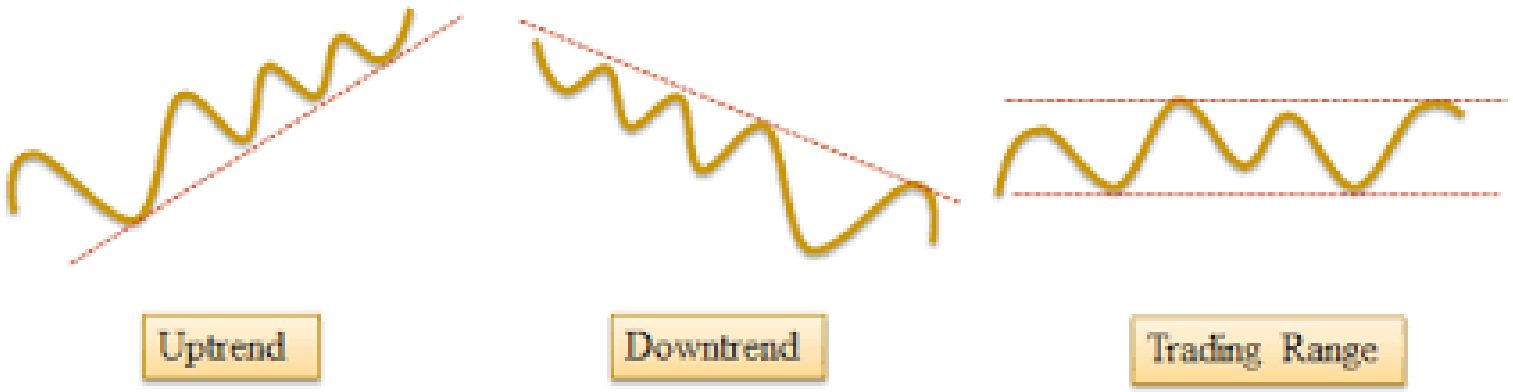
Support and resistance …

- Support and resistance lines indicate likely end of trends.
- Resistance results from the inability to surpass prior high.
- Support results from the inability to break prior low.
- **If support has broken than that level become the resistance, and vice-versa.**



Trend Lines

- There are three basic kinds of trends:
  - An **up trend** where price are generally increasing.
  - A **down trend** where price are generally decreasing.
  - A trading range.



Pivot points

- A pivot point is a technical analysis indicator, or calculations, used to determine the overall trend of the market over different time frames.
- The pivot point itself is simply the average of the intraday high and low, and the closing price from the previous trading day.
- On the subsequent day, trading above the pivot point is thought to indicate ongoing bullish sentiment, while trading below the pivot point indicates bearish sentiment.
- Pivot points are calculated to determine levels in which the sentiment of the market could change from bullish to bearish, and vice-versa.
- Day traders calculate pivot points to determine levels of entry, stops, and profit-taking.

Pivot points …

$$P = \frac{\text{High} + \text{Low} + \text{Close}}{3}$$

$$R1 = (P \times 2) - \text{Low}$$

$$R2 = P + (\text{High} - \text{Low})$$

$$S1 = (P \times 2) - \text{High}$$

$$S2 = P - (\text{High} - \text{Low})$$

where:

P = Pivot point

$R1$ = Resistance 1

$R2$ = Resistance 2

$S1$ = Support 1

$S2$ = Support 2

Moving Average (MA)

- A moving average (MA) is a stock indicator commonly used in technical analysis.
- The reason for calculating the moving average of a stock is to help smooth out the price data by creating a constantly updated average price.
- By calculating the moving average, the impacts of random, short-term fluctuations on the price of a stock over a specified time frame are **mitigated**.
- *Simple moving averages* (**SMAs**) use a simple arithmetic average of prices over some timespan, while *exponential moving averages* (**EMAs**) place greater weight on more recent prices than older ones over the time period.

Moving Average (MA) …

- A simple moving average (**SMA**), is calculated by taking the **arithmetic mean** of a given set of values over a specified period.
- A set of numbers, or prices of stocks, are added together and then divided by the number of prices in the set.
- The formula for calculating the simple moving average of a security is as follows:

$$\text{SMA} = \frac{A_1 + A_2 + \ldots + A_n}{n}$$

where:

A_n = the price of an asset at period n

n = the number of total periods

Moving Average (MA) …

- The exponential moving average (**EMA**) gives more weight to recent prices in an attempt to make them more responsive to new information.
- To calculate an EMA, the simple moving average (SMA) over a particular period is calculated first.
- Then calculate the multiplier for weighting the EMA, known as the "smoothing factor," which typically follows the formula: [2/(selected time period + 1)].

$$EMA_t = \left[V_t \times \left(\frac{s}{1+d}\right)\right] + EMA_y \times \left[1 - \left(\frac{s}{1+d}\right)\right]$$

where:

$EMA_t = \text{EMA today}$

$V_t = \text{Value today}$

$EMA_y = \text{EMA yesterday}$

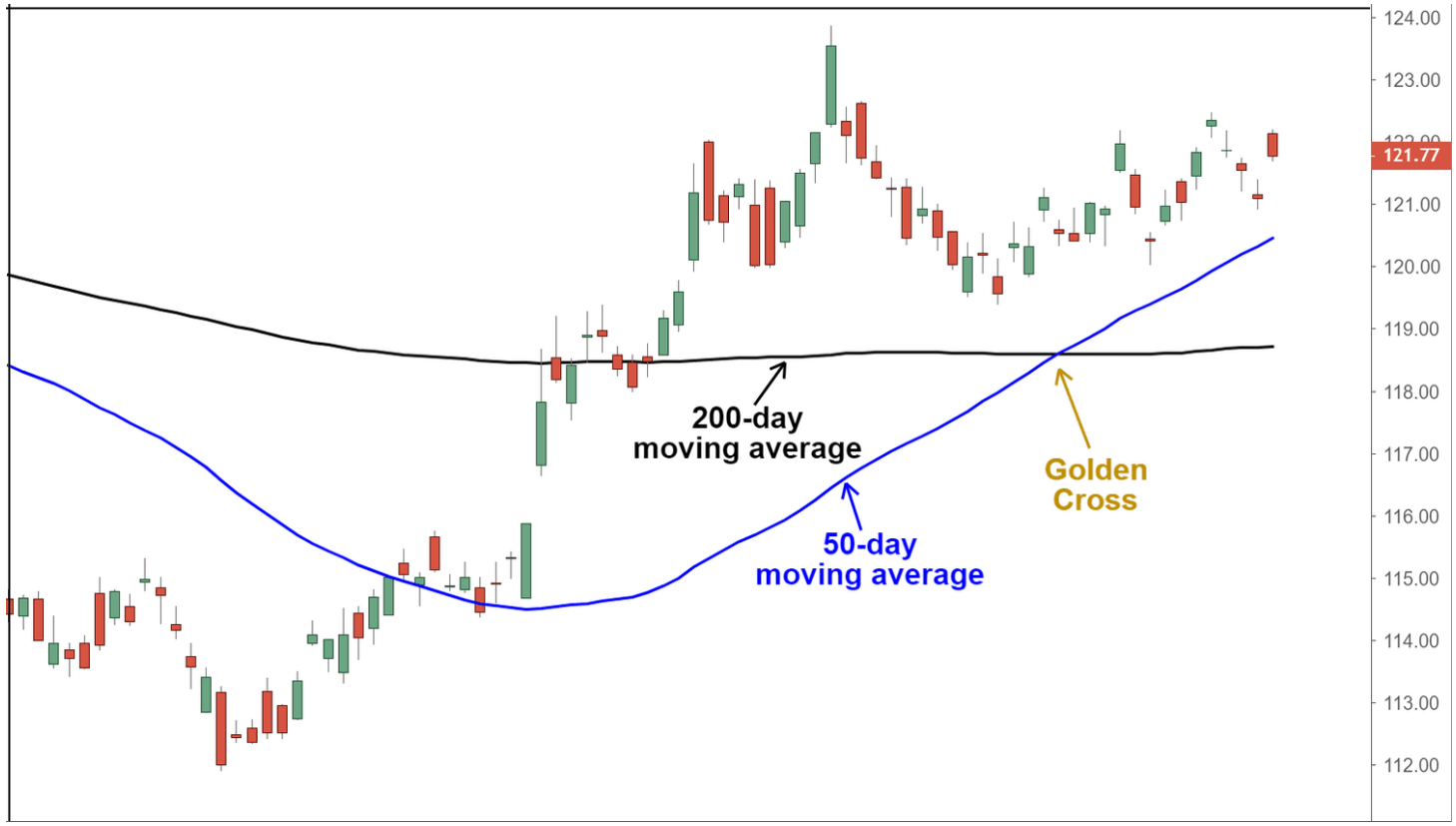
$s = \text{Smoothing}$

$d = \text{Number of days}$

Moving Average (MA) …

- Moving averages are often used by technical analysts to keep track of price trends for specific securities.
- An upward trend in a moving average might signify an upswing in the price or momentum of a security, while a downward trend would be seen as a sign of decline.
- A **golden cross** is a chart pattern in which a short-term moving average crosses above a long-term moving average.
- The golden cross is a bullish breakout pattern formed from a crossover involving a security's short-term moving average such as the 20-day moving average, breaking above its long-term moving average, such as the 50-day moving average.

Moving Average (MA) …



Volume

- Trading volume is a measure of how much a given financial asset has traded in a period of time.
- Traders look to volume to determine **liquidity** and combine changes in volume with technical indicators to make trading decisions.
- Volume can indicate market strength, as rising markets on increasing volume are typically viewed as strong and healthy.
- When prices fall on increasing volume, the trend is gathering strength to the downside.
- When prices reach new highs (or no lows) on decreasing volume, watch out—a **reversal** might be taking shape.

Volume …

- Trend Confirmation
  - A rising market should see rising volume. Buyers require increasing numbers and increasing enthusiasm to keep pushing prices higher.
  - Increasing price and decreasing volume might suggest a lack of interest, and this is a warning of a **potential reversal**.
- Volume and Price Reversals
  - After a long price move higher or lower, if the price begins to range with little price movement and heavy volume, then this might indicate that a **reversal** is underway, and prices will change direction.
- Volume and Breakouts vs. False Breakouts
  - On the initial breakout from a range or other chart pattern, a rise in volume indicates strength in the move.
  - **Little change in volume or declining volume on a breakout indicates a lack of interest** and a higher probability for a false breakout.

Volume …

Moving Average Convergence/Divergence (MACD)

- The moving average convergence/divergence (MACD, or MAC-D) 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.
- MACD is best used with daily periods, where the traditional settings of **26/12/9** days is the norm.
- MACD triggers technical signals when the MACD line crosses above the signal line (to buy) or falls below it (to sell).

MACD Formula

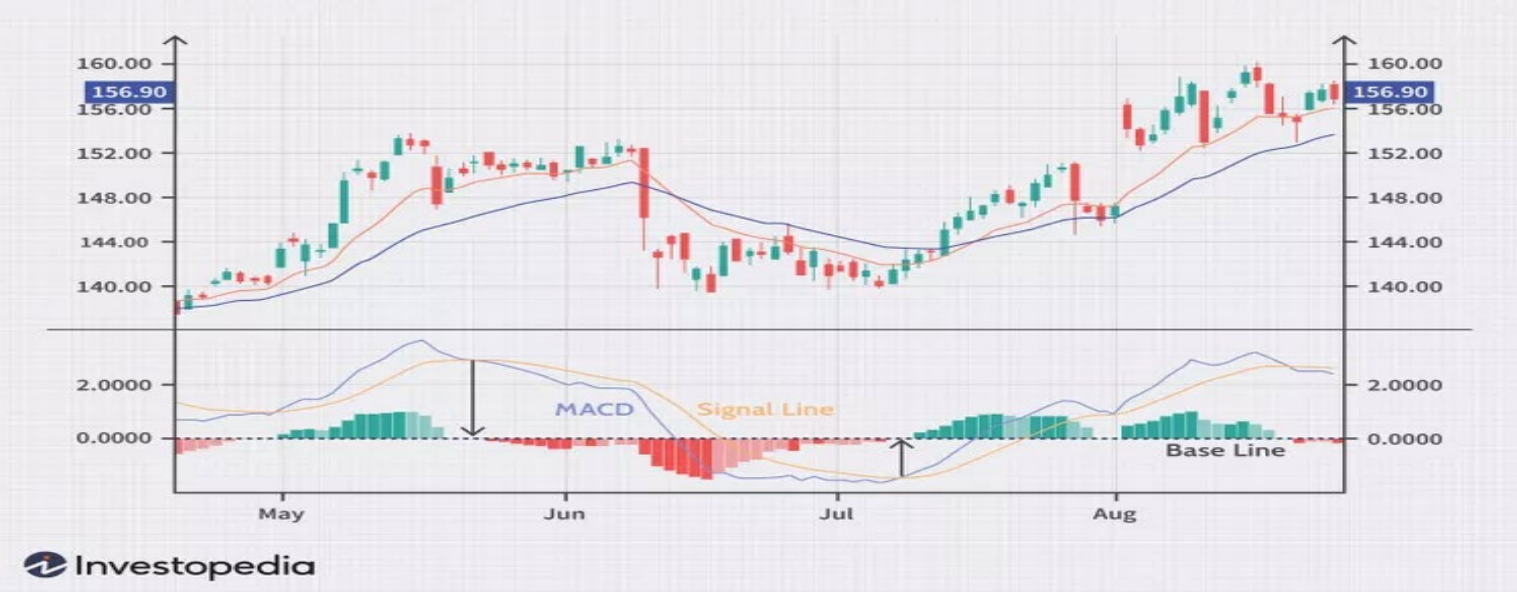
$$\text{MACD} = \text{12-Period EMA} - \text{26-Period EMA}$$

Moving Average Convergence/Divergence (MACD) …

- **MACD** has a positive value whenever the 12-period EMA is above the 26-period EMA and a negative value when the 12-period EMA is below the 26-period EMA.
- The level of distance that MACD is above or below its baseline indicates that the distance between the two EMAs is growing.

Moving Average Convergence/Divergence (MACD) …

- MACD is often displayed with a histogram 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 when **bullish** or **bearish momentum** is high—and possibly overbought/oversold.



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 evaluate overvalued or undervalued conditions in the price of that security.
- As a momentum indicator, the relative strength index compares a security's strength on days when prices go up to its strength on days when prices go down.
- The RSI uses a two-part calculation that starts with the following formula:

$$RS = \frac{average\ gain}{average\ loss}$$

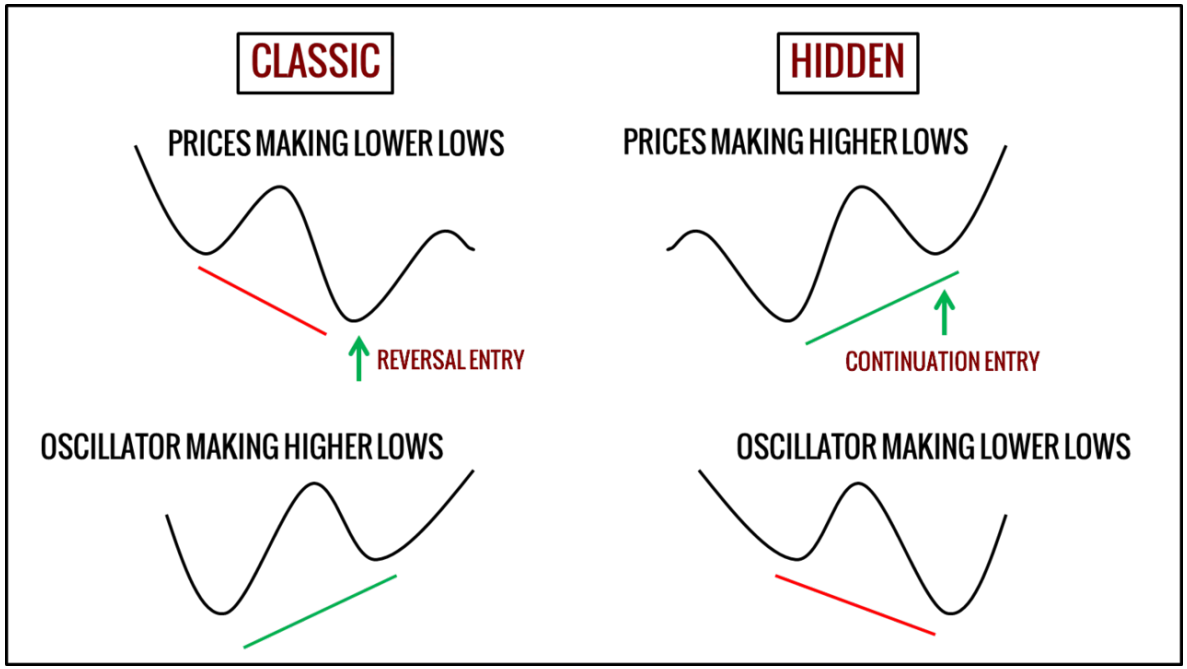
$$RSI = 100 - \frac{100}{1 + RS}$$

Relative Strength Index (RSI)

- The average gain or loss used in this calculation is the average percentage gain or loss during a look-back period.
- The standard number of periods used to calculate the initial RSI value is 14.
- The RSI can do more than point to overbought and oversold securities. It can also indicate securities that may be primed for a trend reversal or corrective pullback in price. It can signal when to buy and sell.
- Traditionally, an RSI reading of 70 or above indicates an overbought situation. A reading of 30 or below indicates an oversold condition.

Regular and Hidden Divergence

- Divergence is a technical analysis pattern spotted on price charts when the price of an asset is moving in the **opposite direction** of a technical indicator or moving contrary to other data.
- **Divergence is a warning that the current trend is weakening and may change**.



Regular and Hidden Divergence …

- Regular or Classic Divergence (Bearish version)

Regular and Hidden Divergence …

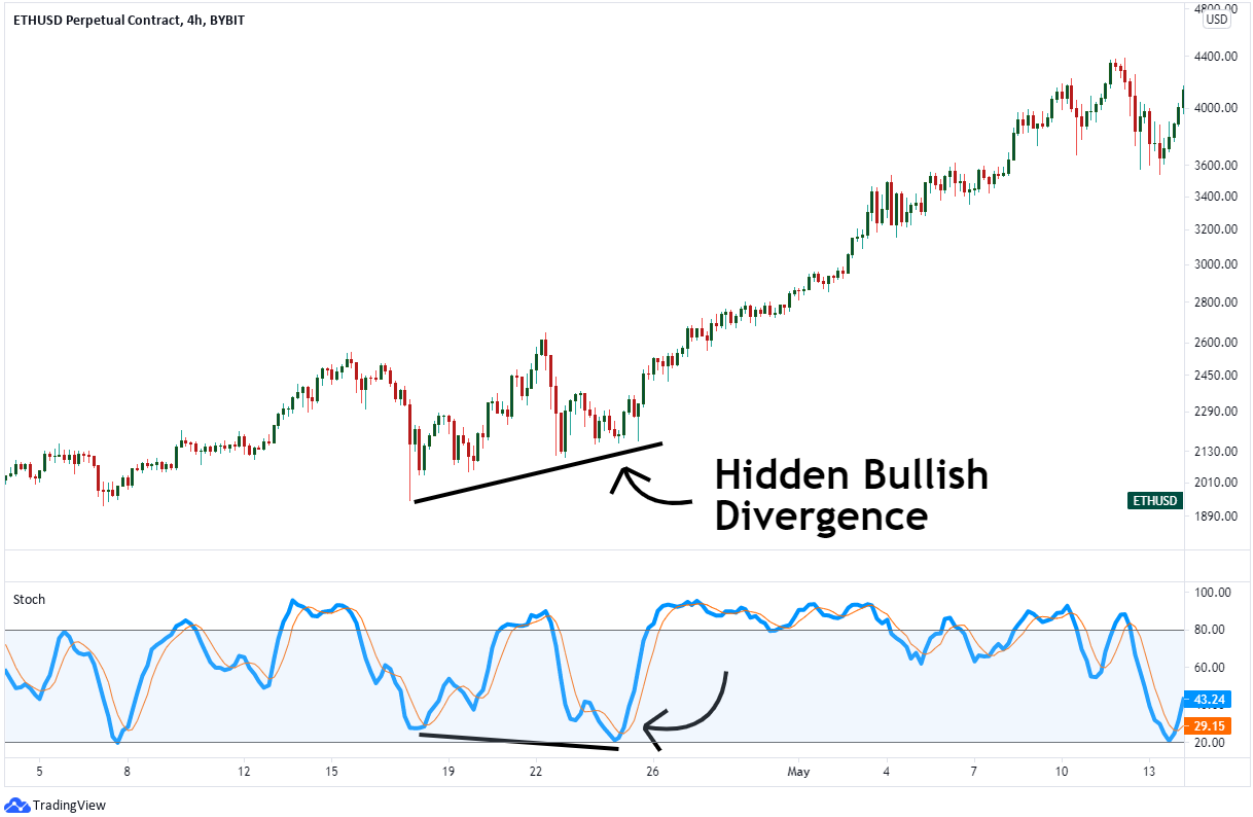
- Regular or Classic Divergence (Bullish version)

Regular and Hidden Divergence …

- Hidden Divergence (Bearish version)

Regular and Hidden Divergence …

- Hidden Divergence (Bullish version)



Ichimoku Cloud

- The Ichimoku Cloud is a collection of technical indicators that show **support and resistance levels**, as well as **momentum** and **trend direction**.
- It does this by taking multiple averages and plotting them on a chart.
- It also uses these figures to compute a *cloud* that attempts to forecast where the price may find support or resistance in the future.
- The Ichimoku Cloud was developed by Goichi Hosoda, a Japanese journalist, and published in the late 1960s.
- It provides more data points than the standard candlestick chart.
- While it seems complicated at first glance, those familiar with how to read the charts often find it easy to understand with well-defined trading signals.

Ichimoku Cloud …

- The Ichimoku Cloud is composed of **five lines** or calculations, two of which comprise a cloud where the difference between the two lines is shaded in.
- The lines include a nine-period average, a 26-period average, an average of those two averages, a 52-period average, and a lagging closing price line.
- **The cloud is a key part of the indicator.** When the price is below the cloud, the trend is down. When the price is above the cloud, the trend is up.
- The above trend signals are strengthened if the cloud is moving in the same direction as the price.
- For example, during an uptrend, the top of the cloud is moving up, or during a downtrend, the bottom of the cloud is moving down.

Ichimoku Cloud …

$$\text{Conversion Line (tenkan sen)} = \frac{\text{9-PH} + \text{9-PL}}{2}$$

$$\text{Base Line (kijun sen)} = \frac{\text{26-PH} + \text{26-PL}}{2}$$

$$\text{Leading Span A (senkou span A)} = \frac{\text{CL} + \text{Base Line}}{2}$$

$$\text{Leading Span B (senkou span B)} = \frac{\text{52-PH} + \text{52-PL}}{2}$$

$$\text{Lagging Span (chikou span)} = \text{Close plotted 26 periods in the past}$$

where:

PH = Period high

PL = Period low

CL = Conversion line

Ichimoku Cloud …

Ichimoku Cloud …

- The overall trend is up when the price is above the cloud, down when the price is below the cloud, and *trendless or transitioning when the price is in the cloud*.
- When Leading Span A is rising and above Leading Span B, this helps to confirm the uptrend and the space between the lines is typically colored green.
- When Leading Span A is falling and below Leading Span B, this helps confirm the downtrend. The space between the lines is typically colored red in this case.
- Traders will often use the Ichimoku Cloud as an area of support and resistance depending on the relative location of the price.
- The cloud provides support/resistance levels that can be projected into the **future**.
- This sets the Ichimoku Cloud apart from many other technical indicators that only provide support and resistance levels for the current date and time.

How to work with TradingView (practical part)

- Charting facilities
- Technical indicators
- Paper trading
- Developing new strategies using Pine script
- Strategy backtesting