

TECHNICAL INDICATORS

The study of Technical analysis is done with the help of Technical Indicators, There are many indicators in the market which can be used to indicate the momentum, the trend, volatility etc. of the market.

Technical indicators are based on mathematical equations that produce a value that is then plotted on your chart. Technical indicators are the interpreters of the market. They look at price information and translate it into simple, easy-to-read signals that can help you determine when to buy and when to sell.

Each technical indicator provides unique information and one can use as many indicators in combination as they can but too many indicators when used in combination can generate ambiguous signals, So we should focus on handful of indicators in combination and keep checking other's as and when one wants to.

Technical indicators look at historical price data, they are not guaranteed to know anything definite about the future.

Technical indicators are divided into the following categories:

- 1. Lagging Indicators:** Lagging Indicators lag the prices and are also known as trend following indicators as they follow the price action. They are designed to keep traders in and keep them in till the trend is intact. They work best in trending markets and are not effective in sideways markets.
- 2. Leading Indicators:** Leading Indicators lead the prices and price follow the movement in such indicators. They generate early entry and exit signals and allow more opportunities to trade.

MOVING AVERAGE

Moving averages are the most basic trending indicator. Moving average show what direction the price is going and where the levels of support and resistance may be. Moving averages themselves can serve as both support and resistance.

Simple Moving averages (SMA) are calculated by finding the average closing price of an asset at any given time and then plotting the points on a price chart. The volatility of a moving average can be adjusted by adjusting the time frame of the indicator.

An N-day Simple Moving Average is calculated by calculating the average of N most recent prices

Calculations:

Simple moving average of N days is calculated as

$$SMA(N) = \frac{\sum_{(Today-N)}^{Today} \text{Closing Price}}{N}$$

When to use...

SMA smoothens the price movements and hence is more helpful to identify trends. Short term SMAs react faster to prices than longer term SMAs. When short-term moving average crosses above the longer term moving average it gives a buying signal and indicates the beginning of an uptrend and vice versa.

EXPONENTIAL MOVING AVERAGE (EMA)

The exponential moving average is very similar to Simple Moving Average. But it assigns more importance to latest data and reduce the lag. Exponential moving average can be calculated by assigning weights to the data points under considerations, such that a more recent data point gets an exponentially higher weight than older data points

Calculations:

Exponential moving average of N days is calculated as

$$EMA(Today) = Closing\ price(Today) \times \alpha + EMA(Previous) \times (1 - \alpha)$$

Where the exponential smoothing factor, α is given by

$$\alpha = 2 \div (N + 1)$$

When to use...

Exponential Moving Average is used in the same way as the Simple Moving Average, but being that EMA reacts faster to recent price values than the simple moving average. Which moving average you use will depend on your trading and investing style. EMA is also used for calculation of many other indicators, like Moving Average Convergence Divergence (MACD) etc.

MOVING AVERAGE CONVERGENCE DIVERGENCE (MACD)

The moving average convergence divergence (MACD) is a trend following momentum indicator and it is a lagging indicator that can show you when trading momentum changes from being bullish to bearish and from being bearish to bullish. The MACD also tells when traders are becoming overextended, which usually results in a trend reversal.

Moving Average Convergence Divergence (MACD) is the difference between a fast and a slow exponential moving average. Typically, 12 and 26 days EMAs are used. MACD is the difference between the values of these two EMAs. A signal line is formed by calculating the EMA (typically 9day) of the MACD. The difference between MACD and the signal line is calculated and plotted as a histogram.

Calculations:

MACD is calculated as -

$$MACD = EMA(12) - EMA(26)$$

The Signal line is plotted as -

$$Signal\ line = EMA(MACD, 9)$$

And the histogram is plotted as -

$$Histogram = MACD - Signal\ Line$$

When to use...

The most common signal is MACD crossing over the signal line. A buy signal is generated when MACD crosses above the signal line, whereas a sell signal is generated when it crosses down through the signal line. Since the histogram is the difference between the MACD and the signal line, it helps you identifying this crossover. Buy/Sell signals are also generated by divergences (A divergence is said to exist if the price and the indicator moves in opposite direction). A positive divergence arises when the price makes a low or moves sideways, but the MACD move in upward direction. You can change the settings of MACD as per the set of moving average combination that you want to use.

RELATIVE STRENGTH INDEX (RSI)

RSI is a price following oscillator, whose value oscillates between 0-100 and calculated based on relative strength. It is a measure of momentum. An N-period relative strength is the ratio of gains in the price in last N days, divided by the losses in last N days.

Calculations:

Relative Strength Index is calculated in the following manner:

1. Gains and losses are calculated as

$$\begin{aligned} &\text{If } \text{Close}(\text{Today}) > \text{Close}(\text{Previous day}) \\ &\text{Gain} = \text{Close}(\text{Today}) - \text{Close}(\text{Previous day}), \text{Loss} = 0 \\ &\text{Otherwise,} \\ &\text{Gain} = 0, \text{Loss} = \text{Close}(\text{Previous day}) - \text{Close}(\text{Today}) \end{aligned}$$

2. Average gain and average loss are calculated as

$$\begin{aligned} \text{Initial average gain (or loss)} &= \frac{\text{Total of gains (or losses) during the last } N \text{ periods}}{N} \\ \text{Average gain (or loss)} &= \frac{\text{Previous average gain (or loss)} \times (N - 1) + \text{current gain (or loss)}}{N} \end{aligned}$$

3. Relative Strength, RS for the last N days is calculated as

$$\text{Relative Strength, } RS(N) = \frac{\text{Average gain in last } N \text{ days}}{\text{Average losses in last } N \text{ days}}$$

4. Finally, Relative Strength Index is calculated as

$$\text{Relative Strength Index, } RSI(N) = 100 - \frac{100}{1 + RS(N)}$$

When to use...

When RSI crosses above the level of 50 it is a bullish signal and vice versa, when RSI crosses above 70 in uptrend it can stay there for extended period and When RSI crosses below 30 negative momentum gets stronger. Higher values of RSI indicate overbought market; whereas low values indicate oversold market. 30 and 70 are usually set as thresholds for a buy and sell signal respectively. Buy/Sell signals are also generated by observing divergence between security and indicator (A divergence is said to exist if the price and the indicator moves in opposite direction). Underlying security usually reverses the direction and follows the direction of the indicator.

STOCHASTIC

The stochastic oscillator is a momentum indicator developed by George Lane that can show you when investor's sentiment changes from being bullish to bearish and from being bearish to bullish. It measures price momentum to identify overbought/oversold conditions, which gives entry or exit decisions. When stochastic forms narrow top, it indicates weakness bulls and when it forms a narrow bottom it indicates a weakness bear.

The stochastic indicator is plotted as two lines, %K and %D. The range of the stochastic oscillator is between 0 and 100. The lower reversal zone is the area of the indicator that is below 20. When %K is above 80, it shows the prices may be overbought and may be reversing trend shortly. When %K is below 20, it shows the prices may be oversold and may be reversing trend shortly. When %K line crosses above %D line, buy signal is generated and When %K line crosses below %D line, a sell signal is generated.

Calculations:

$\% K = 100 \left\{ \frac{C - L(n)}{H(n) - L(n)} \right\}$ where C is the current close,

L (n) is the low of the (n) period, and H (n) is the high of the (n) day period.

% D = a moving average of % K for the specified period.

When to use...

Stochastic can be used with several interpretations: among them are divergences, crossovers, and overbought/oversold. Signals of stochastic are to be used in conjunction with trend following indicator. In a strong trending market stochastic can fail completely. When the %K line rises above the %D line it is considered bullish, and when the %K line falls below the %D line, it is considered bearish. A buy signal is generated when either line dips below and then rises above 20, or a bearish signal is generated when either line rises above and then dips below 80.

You can eliminate some false signals by using only the signals that correspond to the direction of the intermediate- to long-term trends.

FIBONACCI RETRACEMENT (FR)

Fibonacci retracement levels are used as support or resistance levels and they are computed using the Fibonacci ratio. Fibonacci ratios derived from Fibonacci series (0, 1, 1, 2, 3, 5, 8, 13....). The various Fibonacci ratios are 0.236, 0.382, 0.500, 0.618, etc. It Plots percentage retracement lines based upon the mathematical relationship within the Fibonacci sequence. These retracement levels provide multiple support and resistance levels that can be used to target price objectives.

Based upon the number sequence, a set of percentage retracements have been developed that identify important support or resistance areas. These are 23.6%, 38.2%, 50%, 61.8%, 76.4%, and 100%. Applying these percentages to the difference between the high and low price for the period selected generates a set of price objectives with regard to each retracement level. The theory of Fibonacci retracements states that after a period of market movement in one direction (up or down), prices retrace a significant portion of the previous trend before resuming the move in the original direction. These countertrend moves tend to fall into certain predictable parameters, which are often the Fibonacci Retracement levels.

When to use...

Prices tends to stop frequently at Fibonacci Retracement Levels, each of the retracement levels present themselves as possible reversal points. Traditionally 50% was used for retracements, but the 38.2 and 61.8 Fibonacci levels, which many equate to 33% (1/3rd) and 67% (2/3rds), are also the important levels and are seen very often in the markets. These levels can best be used in conjunction with other technical signals. For i.e. selling a bounce in a strong downtrend that rallies up to a Fibonacci Retracement Level at the same time that the market becomes overbought and is also touching its near-term downtrend line.

BOLLINGER BANDS

Bollinger bands is commonly used volume indicator, created by John Bollinger, that can show you not only what direction prices are going but also how volatile the price movement is. Bollinger bands consist of two bands—an upper band and a lower band—and a moving average that are generally plotted on the price movement of a chart.

Bollinger bands are typically based on a 20-period moving average. This moving average runs through the middle of the two bands. The upper band is plotted 2 standard deviations above the 20period moving average. The lower band is plotted 2 standard deviations below the 20period moving average.

The three Bollinger bands for N-day are calculated as -

$$\text{Central Band} = \text{SMA}(N)$$

$$\text{Upper Band} = \text{Central Band} + k \times \sigma(N)$$

$$\text{Lower Band} = \text{Central Band} - k \times \sigma(N)$$

Here, $\sigma(N)$ is the standard deviation of the closing price for last N days.

k is a parameter to be set by the user, which is usually set to 2.

When to use...

- 1) Sharp price changes tend to occur after the bands tighten, as volatility lessens.
- 2) When prices move outside the bands, a continuation of the current trend is implied.
- 3) Bottoms and tops made outside the bands followed by bottoms and tops made inside the bands call for reversals in the trend.

ACCUMULATION / DISTRIBUTION (AD)

It is a momentum indicator that tracks the relationship between price and volume and acts as a leading indicator. It attempts to gauge supply and demand by determining whether investors are generally "accumulating" (buying) or "distributing" (selling) a certain stock by identifying divergences between stock price and volume flow.

Calculations:

"Close Location Value" or CLV is a value based on the location of the close, relative to the range for the period. The CLV ranges from plus one to minus one with the center point at zero.

$$CLV = \frac{(C - L) - (H - C)}{H - L}$$

The CLV is then multiplied by the corresponding period's volume and the cumulative total forms the Accumulation/Distribution Line.

When to use...

A bullish signal is given when the Accumulation/Distribution Line forms a positive divergence and a bearish signal is considered when it forms a negative divergence. Stop loss should be placed below the most recent low or high respective to the trade.

CHAIKIN OSCILLATOR

The Chaikin Oscillator was developed by Marc Chaikin. It is based on the assumption that volume and price normally rise and fall together. When this relationship changes, a possible change in the price trend may result.

The Chaikin Oscillator is calculated as follows:

Chaikin Oscillator = (3 day simple moving average of the ADL) - (10 day simple moving average of the ADL)

ADL = [(close - low) - (high - close)] * Volume) Where ADL = Accumulation/Distribution line (high - low)

When to use...

1. There are two ways in which the Chaikin Oscillator is used. The most important signal is divergence between prices and the oscillator: when prices reach a new high or low in a trend and the oscillator fails to exceed its previous extreme reading and then reverses direction.
2. A second way to use the oscillator is to note changes in direction. BUY signals are given when the price of the security is above its 14-day moving average, the Oscillator turns upward from a negative value. SELL signals are given when the price of the security is below its 14-day moving average, the Oscillator turns downwards and the value of the Oscillator is positive.

PARABOLIC SAR (PSAR)

Parabolic SAR (PSAR) was developed by J. Welles Wilder Jr. and helps in determining the entry and exit points. SAR stands for Stop and Reverse. SAR computes stop loss levels using previous day's data.

Some of the concepts in PSAR computation are:

Extreme price: This is the highest price recorded to date during a long trade or the lowest price recorded to date during a short trade.

Acceleration factor: The acceleration factor is a rate at which the SAR converges with the price. Typically, the minimum acceleration factor is kept at 2% for every new level reached in the existing trend up to a maximum of 20%.

When to use...

1. The Parabolic system is similar to a moving average, but it has the added advantage of a trailing stop/reversal indicator that moves in the direction of the price trend. The SAR points below the price point indicate a long position while the SAR point above the price point indicates a short position. When the market penetrates this "stop and reverse" point, the current position should be liquidated and the opposite position should be taken. If long, liquidate the long position and establish a short position. If short, liquidate the short position and establish a long position.
2. When a trend begins, the SAR points move in small increments and maintain their furthest difference from the price. This allows the trend to develop and prevents positions from being closed out in the event of an early adverse price movement. When the trend becomes established and gains momentum, the gap between SAR's widens and distance from the price narrows. This is due to the Acceleration Factor (AF) in the system.

VOLUME WEIGHTED MOVING AVERAGE (VWMA)

As stated in its name, the volume weighted moving average (VWMA) is similar to the simple moving average; however, the VWMA places more emphasis on the volume recorded for each period.

Therefore, if you place a 20-period simple moving average (SMA) on your chart and at the same time, a 20-period volume weighted moving average, you will see that they pretty much follow the same trajectory. However, on further review, you will notice the averages do not mirror each other exactly.

An N-day volume weighted moving average (VWMA) is the average of the past N days closing prices, each weighted in proportion to the volume on that day.

Calculations:

$$\text{Volume - Weighted Average} = \text{VMA} = \frac{V_1P_1 + V_2P_2 + V_3P_3 + \dots + V_N P_N}{K}$$

$$\text{where } K = V_1 + V_2 + V_3 + \dots + V_N = \sum V_k$$

When to use...

This indicator gives buy and sell signals upon crossovers with price or another MA. Thus a buy signal is generated when a fast-moving volume weighted moving average crosses above a slow-moving simple moving average and a sell signal is generated when it crosses below the slow moving simple moving average.

Average Directional Movement Index (ADX)

ADX indicator used in technical analysis as an objective value for the strength of the trend. ADX is non-directional so it quantifies a trend's strength regardless of whether it is up or down.

Calculations:

+DM = Today's High - Yesterday's High (when price moves upward)

-DM = Yesterday's Low - Today's Low (when price moves downward)

Calculate the true range for the day. True range is the largest of Today's High - Today's Low, Today's High - Yesterday's Close, and Yesterday's Close - Today's Low

+DM14 = (Prev +DM * 13 + Current +DM) / 14

-DM14 = (Prev -DM * 13 + Current -DM) / 14

TR14 = (Prev TR * 13 + Current TR) / 14

Next, calculate the Directional Indicators:

+DI14 = +DM14 divided by TR14

-DI14 = -DM14 divided by TR14

Then, calculate the components of the Average Directional Movement Index (ADX):

Calculate the DI Difference:

Record the difference between +DI14 and -DI14 as a positive number.

Calculate the Directional Index (DX):

DX = DI Difference divided by the sum of +DI14 and -DI14

ADX = (Prev DX * 13 + Current DX) / 14

When to use...

The ADX oscillator fluctuates between 0 and 100. Even though the scale is from 0 to 100, readings above 60 are relatively rare. Low readings, below 20, indicate a weak trend and high readings, above 40, indicate a strong trend. The indicator does not grade the trend as bullish or bearish but merely assesses the strength of the current trend. A reading above 40 indicates a strong downtrend as well as a strong uptrend.

ADX can also be used to identify potential changes in a market from trending to non-trending. When ADX begins to rise from below 20 and moves above 20, it is a sign that the trading range is ending and a trend is developing.

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