

# Lagging Indicators

## Topic 8

# 1. Moving averages

- ▶ One of the most common and familiar trend-following indicators is the moving averages.
- ▶ They smooth a data series and make it easier to spot trends, something that is especially helpful in volatile markets.
- ▶ The two most popular types of moving averages are **the Simple Moving Average (SMA)** and **the Exponential Moving Average (EMA)**.
- ▶ Moving averages are used to determine the direction of trend and are basis of many trend-following systems. Instead of predicting a change in trend, moving averages follow behind the current trend, Therefore, you can use moving averages for trend identification and trend following purposes, not for prediction.

## 1.1. Simple moving average (SMA)

- ▶ A simple moving average is formed by computing the average (mean) price of a security over a specified number of periods.
- ▶ While it is possible to create moving averages from the Open, the High, and the Low data points, most moving averages are created using the closing price.
- ▶ For example: a 5-day simple moving average is calculated by adding the closing prices for the last 5 days and dividing the total by 5.

$$10 + 11 + 12 + 13 + 14 = 60$$

$$60 \div 5 = 12$$

$$11 + 12 + 13 + 14 + 15 = 65$$

$$65 \div 5 = 13$$

- ▶ The averages are then joined to form a smooth curving line - the **moving** average line. Continuing our example, if the next closing price in the average is 15, then this new period would be added and the oldest day, which is 10, would be dropped.

## 1.2.Exponential moving average (EMA)

- ▶ Exponential moving average also called as exponentially weighted moving average is calculated by applying more weight to recent prices relative to older prices.
- ▶ In order to reduce the lag in simple moving averages, technicians often use exponential moving averages.
- ▶ The weighting applied to the most recent price depends on the specified period of the moving average. The shorter the EMA's period, higher weight is applied to the most recent price. For example: a 10-period exponential moving average weighs the most recent price 18.18% while a 20-period EMA weighs the most recent price 9.52%.



# Exponential moving average calculation

- ▶ Exponential Moving Averages can be specified in two ways - as a percent-based EMA or as a period-based EMA.
- ▶ A percent-based EMA has a percentage as its single parameter while a period-based EMA has a parameter that represents the duration of the EMA.
- ▶ The formula for an exponential moving average is:  
**$$\text{EMA (current)} = ((\text{Price (current)} - \text{EMA (prev)}) \times (\text{Multiplier}) + \text{EMA (prev)})$$**
- ▶ For a percentage-based EMA, "Multiplier" is equal to the EMA's specified percentage. For a period-based EMA, "Multiplier" is equal to  $2 / (1 + N)$  where N is the specified number of periods.

- ▶ For example, a 10-period based EMA's Multiplier is calculated like this:

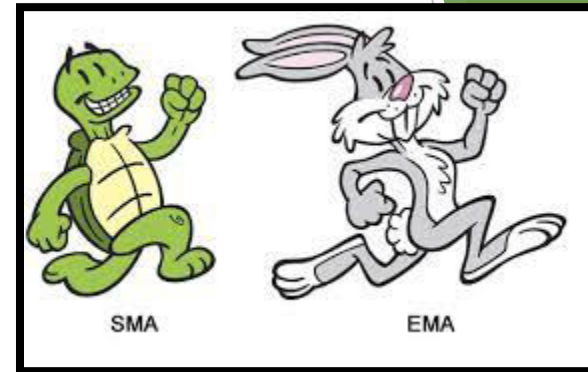
$$\frac{2}{(\text{Time periods} + 1)} = \frac{2}{(10 + 1)} = .1818$$

(18.18%)

- ▶ This means that a 10-period EMA is equivalent to an 18.18% EMA
- ▶ The 10-period simple moving average is used for the first calculation only. After that the previous period's EMA is used.
- ▶ The impact of the older data never disappears though it diminishes over a period of time. The effects of older data diminish rapidly for shorter EMA's than for longer ones but, again, they never completely disappear.

# Simple MA versus Exponential MA

- ▶ Generally you will find very little difference between an exponential moving average and a simple moving average.
- ▶ The exponential moving average is consistently closer to the actual price.
- ▶ On average, the EMA is  $\frac{3}{8}$  of a point closer to the actual price than the SMA.



# Which is better?

- ▶ Regardless of the type you choose, the basic principle is that if there is more buying pressure than selling pressure, prices will move above the average and the market will be in an uptrend. On the other hand heavy selling pressure will make the prices drop below the moving average, indicating a downtrend.
- ▶ The choice of moving average depends on various factors like your trading frequency, investing style and the stock which has been traded by you.
- ▶ The simple moving average obviously has a lag, but the exponential moving average may be prone to quicker breaks.
- ▶ Some traders prefer to use exponential moving averages for shorter time periods to capture changes quicker. Some investors prefer simple moving averages over long time periods to identify long-term trend changes.



- ▶ Whether to select exponential moving average or simple moving average can be solved only by obtaining an optimum trade off between sensitivity and reliability.
- ▶ The more sensitive an indicator is the more signals that will be given. Although these signals may prove timely, but they are highly sensitive and may generate false signals.
- ▶ The less sensitive an indicator is the fewer signals that will be given by it. However, less sensitivity leads to fewer and more reliable signals. Sometimes these signals can be late as well.
- ▶ Shorter moving averages are very sensitive and generate more signals. Longer moving averages will move slower and generate fewer signals. These signals will likely prove more reliable, but they also may come late.
- ▶ Thus it requires every investor to experiment on different moving averages lengths and their types.

# Trend identification/ Confirmation

- ▶ There are three ways to identify the trend with moving averages: direction, location and crossovers.
- ▶ **Direction of the moving average:** The trend is considered up when moving average is continuously rising. If the moving average is declining, the trend is considered down.
- ▶ **Price location:** The basic trend can be determined through location of the price relative to the moving average. If the price is located below the moving average then there is a downward trend in place and visa versa for the price being located above the moving average.
- ▶ **Location of the shorter moving average relative to the longer moving average:** The trend will go up is going up if the shorter moving average is above the longer moving average. If the shorter moving average is below the longer moving average, the trend is considered down.



# Interpretation

- ▶ Signals to buy or sell are generated when the price crosses the MA or when one MA crosses another, MAs.
- ▶ Buy when prices move above the moving average line on the chart and sell when prices drop below the moving average line.
- ▶ Another method used by technical analysts is using the two moving averages on the same chart with different time periods. For example, the crossover of a 100 or 200-day MA.

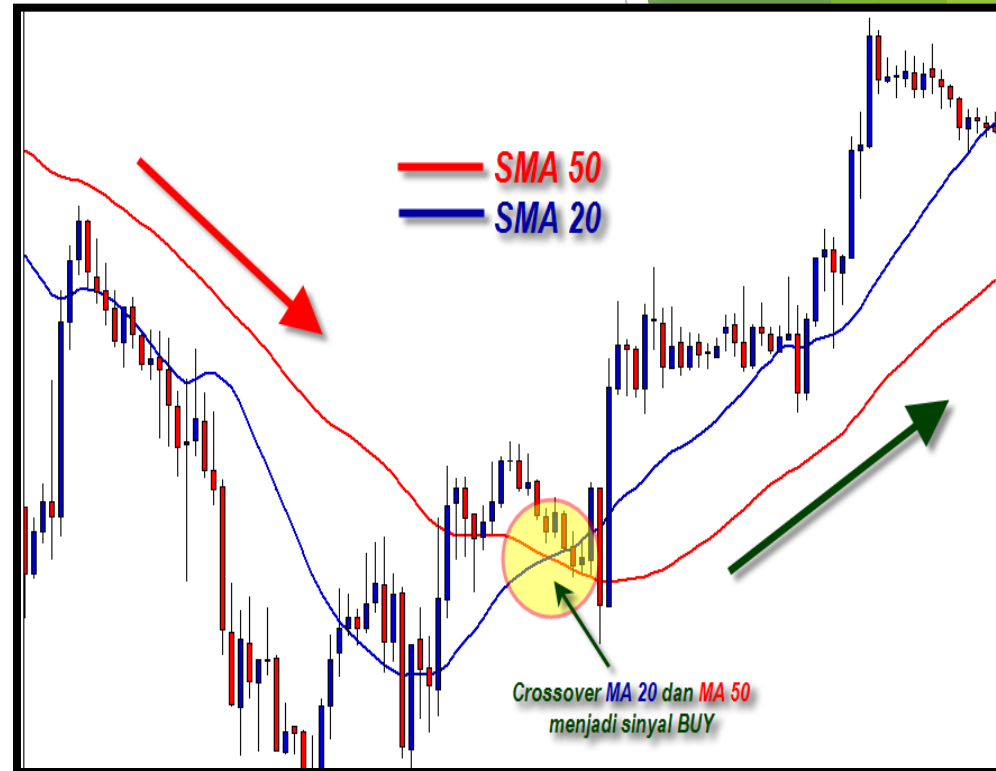


# Signals - Moving Average Price Crossover

- ▶ A price break upwards through an MA is generally a buy signal, and a price break downwards through an MA is generally a sell signal.
- ▶ As we have seen, the longer the time span or period covered by an MA, the greater the significance of a crossover signal.
- ▶ Many traders, for example, recommend waiting for one period - that is one day for daily data and one week for weekly data.
- ▶ Whenever possible try to use a combination of signals. MA crossovers that take place at the **same time** as trend line violations or price pattern signals often provide strong confirmation.

# Signals - Multiple Moving Averages

- ▶ It is usually advantageous to employ more than one moving average. Double and triple MAs often provide useful signals.
- ▶ With two MAs the **double crossover** is used. When the short term moving average crosses the long term moving average to the downside, then a sell signal would be triggered and visa versa. For example, two popular combinations are the 5 and 20-day averages and the 20 and 100-day averages.



- Many investors use the **triple moving average crossover** system to buy and sell stock. The most widely used triple crossover system is the popular 4-9-18-day MA combination. A buy signal is generated when the shortest (and most sensitive) average - the 4 day - crosses first the 9-day and then the 18-day averages, each crossover confirming the change in trend.



# **Moving Average Convergence/Divergence (MACD)**

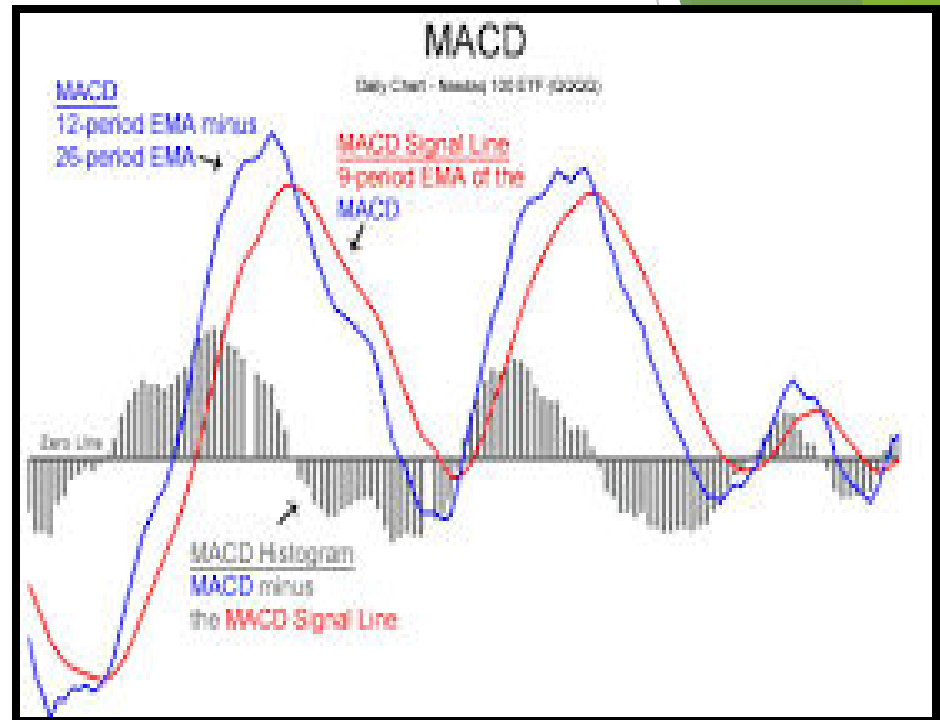


# Introduction

- ▶ MACD stands for Moving Average Convergence / Divergence.
- ▶ It is a technical analysis indicator created by Gerald Appel in the late 1970s.
- ▶ The MACD indicator is basically a refinement of the two moving averages system and .
- ▶ The MACD does not completely fall into either the trend-leading indicator or trend following indicator; it is in fact a hybrid with elements of both.
- ▶ The MACD comprises two lines, the fast line and the slow or signal line. These are easy to identify as the slow line will be the smoother of the two.

# The procedure for calculating the MACD lines

- **Step1:** Calculate a 12 period exponential moving average of the close price.
- **Step2:** Calculate a 26 period exponential moving average of the close price.
- **Step3:** Subtract the 26 period moving average from the 12 period moving average. This is the fast MACD line.
- **Step4:** Calculate a 9 period exponential moving average of the fast MACD line calculated above. This is the slow or signal MACD line.



## MACD benefits

- ▶ The importance of MACD lies in the fact that it takes into account the aspects of both momentum and trend in one indicator. As a trend-following indicator, it will not be wrong for very long. The use of moving averages ensures that the indicator will eventually follow the movements of the underlying security. By using exponential moving averages, as opposed to simple moving averages, some of the lag has been taken out.
- ▶ MACD divergences can be key factors in predicting a trend change. A negative divergence signals that bullish momentum is going to end and there could be a potential change in trend from bullish to bearish. This can serve as an alert for traders to take some profits in long positions, or for aggressive traders to consider initiating a short position.
- ▶ MACD can be applied to daily, weekly or monthly charts.
- ▶ The MACD indicator is basically a refinement of the two moving averages system and measures the distance between the two moving average. The standard setting for MACD is the difference between the 12 and 26-period EMA.

# Use of MACD lines

**MACD generates signals from three main sources:**

- ▶ Moving average crossover
- ▶ Centerline crossover
- ▶ Divergence

# 1. Crossover of fast and slow lines

► The MACD proves most effective in wide-swinging trading markets. We will first consider the use of the two MACD lines. The signals to go long or short are provided by a crossing of the fast and slow lines. The basic MACD trading rules are as follows:

► Go long when the fast line crosses above the slow line.

► Go short when the fast line crosses below the slow line.

► These signals are best when they occur some distance above or below the reference line. If the lines remain near the reference line for an extended period as usually occurs in a sideways market, then the signals should be ignored.



## 2.Center line crossover

- ▶ A bullish centerline crossover occurs when MACD moves above the zero line and into positive territory. This is a clear indication that momentum has changed from negative to positive or from bearish to bullish. After a positive divergence and bullish moving average crossover, the centerline crossover can act as a confirmation signal.
- ▶ A bearish centerline crossover occurs when MACD moves below zero and into negative territory. This is a clear indication that momentum has changed from positive to negative or from bullish to bearish. Once MACD crosses into negative territory, momentum, at least for the short term, has turned bearish.



### 3.Divergence

- ▶ An indication that an end to the current trend may be near occurs when the MACD diverges from the security. A positive divergence occurs when MACD begins to advance and the security is still in a downtrend and makes a lower reaction low. MACD can either form as a series of higher lows or a second low that is higher than the previous low. Positive divergences are probably the least common of the three signals, but are usually the most reliable and lead to the biggest moves.
- ▶ A negative divergence forms when the security advances or moves sideways and MACD declines. The negative divergence in MACD can take the form of either a lower high or a straight decline. Negative divergences are probably the least common of the three signals, but are usually the most reliable and can warn of an impending peak.



# THANK YOU