R54 Technical Analysis

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1. Introduction

Technical analysis has long been used by traders, analysts, and investors and has received broad acceptance from regulators and the academic community, particularly with regard to its behavioral finance aspects. Although certain aspects of technical analysis, such as the calculation of indicators, have specific rules, the interpretation of findings is often subjective. This reading covers some of the main tools used in technical analysis.

2. Technical Analysis: Principles, Assumptions, and Links to Investment Analysis

Technical analysis is a form of security analysis that uses price and volume data in decision making. The data is often graphically displayed in the form of charts. These charts are analyzed using various indicators to identify investment opportunities. Technical analysis allows us to see a battle between buyers and sellers, and predict which side may win.

Technical analysis is based on the following logic:

- Supply and demand determine prices.
- Changes in supply and demand – both in price level and volume - can cause changes in prices.
- Past price action can be used to project potential future prices with charts and other technical tools.

Technical analysis of any financial instrument does not require detailed knowledge of that instrument. Technical analysis can be applied to any time frame – short term and long term. Although technical analysis is commonly used for short-term trading or tactical asset allocation decisions, analyzing long-term charts can assist in making long-term investment decisions or strategic asset allocation decisions.

2.1. Principles and Assumptions

The three main principles of technical analysis are:

- The market discounts everything.
- Prices move in trends and countertrends.
- Price action creates certain patterns that tend to reoccur and may be cyclical.

The market discounts everything: A core assumption of technical analysis is that the price already reflects all known factors impacting a financial instrument. i.e. at any point in time, a stock's price already reflects its fundamentals – balance sheet, income statement, cash flow statement, as well as broad economic factors and market psychology.

Prices move in trends and countertrends: Technical analysis assumes that prices follow trends – upward, downward, sideways or a combination of these. Once a trend is identified, we can expect future price movements to follow the trend rather than go against it. A common saying among technical analysts is – "The trend is your friend".

Price action is repetitive, and certain patterns tend to reoccur: Technical analysis assumes that due to market psychology, price movements repeat. These repetitions in price movements can be charted, and patterns that are likely to repeat can be identified.

2.2 Technical Analysis and Behavioral Finance

Behavioral finance deals with the influence of psychology on the behavior of investors. Technical analysis can be thought of as the study of collective investment psychology or sentiment and is thus directly related to behavioral finance. It assumes that the market reflects the collective knowledge and sentiment of many participants such as investors, hedgers, insiders, and other stakeholders. The greater the volume of a participant's trades, the more impact the participant will have on price. By studying market technical data (price and volume trends), technicians seek to understand investor sentiment.

Fundamental theorists believe that markets are rational and efficient. On the other hand, technicians believe that human behavior is often erratic and driven by emotion. Therefore, they believe that market trends and patterns reflect this irrational human behavior. They rely on recognition of such trends and patterns in the past to project future patterns of security prices.

Chart patterns are a graphic representation of human trading activity. Chart patterns have predictive power because human behavior is often repeated, for example, fear during market sell-offs or greed during market bubbles.

Some financial instruments have an associated income stream that adds to the security's intrinsic value such as coupon payments for bonds and dividends for equity shares. A fundamental analyst can use these cash flows to arrive at a present value of the security. However, for other assets such as commodities, which do not have underlying income streams or financial statements, technical analysis is commonly used.

2.3. Technical Analysis and Fundamental Analysis

Technical and fundamental analyses approach the market in different ways, but are both useful. Key differences between the two are listed below:

- Technicians focus solely on analyzing markets and the trading of financial instruments. Fundamental analysis, on the other hand, focuses on financial and economic analysis as well as societal and political trends analysis.
- Technical analysis is based on price and volume data (i.e. trading data), while fundamental analysts incorporate external market data, with company's financial statements, to predict security price movements. It is important to note that the company's financial statements are often subjective, while price and volume data are objective.
- Fundamental analysis is considered a more theoretical approach, while technical analysis is considered a more practical approach.

Drawbacks of technical analysis are:

- Technicians are limited to studying market movements and do not use other predictive analytical methods.
- Market movements and trends may take some time to become evident. Therefore, technicians may be late in identifying changes in trends and patterns.
- Sometimes the markets can change without warning.

Although the two approaches seem opposing, in practice, many investors combine technical analysis and fundamental analysis to make better investment decisions.

2.4 The Differences in Conducting/Interpreting Technical Analysis in Various Types of Markets

Technical analysis works best in liquid and deep markets. In illiquid markets and markets that are subject to large outside manipulation (such as actions of central banks), the application of technical analysis is limited.

Technical analysis can be applied to different asset classes such as: equities, commodities and currencies.

Market participation (retail vs. institutional) can also have an impact on technical analysis. Retail investors tend to have less in-dept information and may depend on technical analysis and momentum trading more than institutional investors. Institutional investors have limited interest in small and micro-cap stocks that do not offer enough liquidity.

Market inefficiencies can result in strong trend periods, and inefficiencies can be more easily exploited in emerging and frontier markets.

3. Chart Types

The primary tools used in technical analysis are charts and indicators. Charts are graphical displays of price and volume data. Indicators are approaches to analyzing the charts. These tools may be used on an individual basis, but the best results are obtained by combining different techniques.

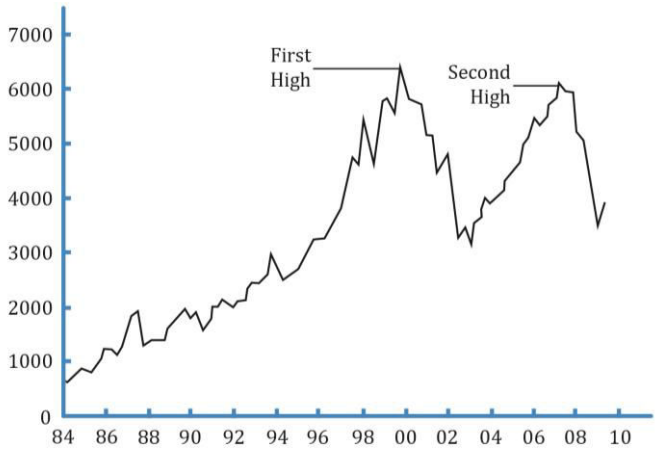
3.1. Types of Technical Analysis Charts

The various types of charts used in technical analysis are:

Line chart

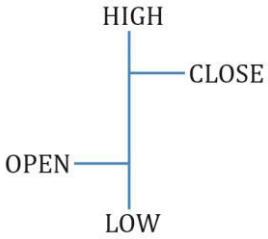
Line charts are a simple graphic display of price trends over time. Line charts are usually drawn with closing prices as the data points. Many traders consider the closing price as the most important data point, because it reflects the final decision for that period's transactions.

An example of a line chart is shown below. The vertical axis (y axis) represents price level and the horizontal axis (x axis) is time. The line chart shows that the price of the stock during the first upward movement of the price is higher than the second high.



Bar chart

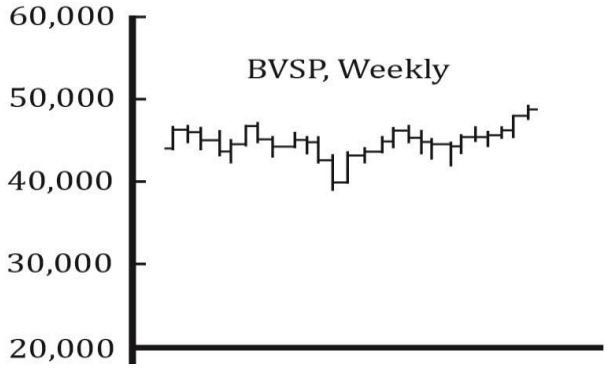
A line chart has only one data point per time interval. A bar chart, in contrast, has four bits of data in each entry - the opening and closing prices, and the high and low prices during the period.



Bar chart notation

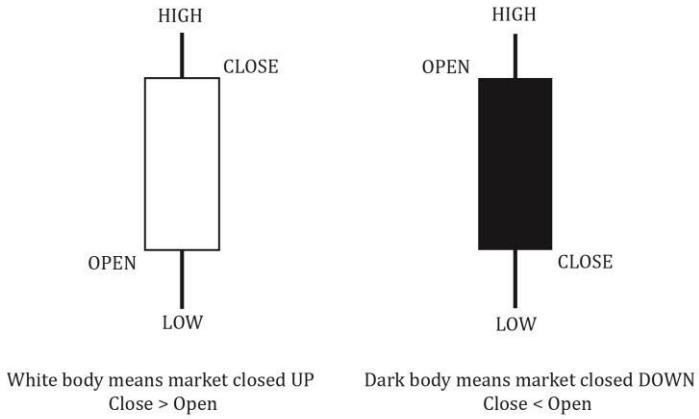
The figure on the left shows how the data point for each interval is constructed. A vertical line connects the high and low price for the day. A cross-hatch to the right indicates the closing price, and a cross-hatch to the left indicates the opening price.

A short bar indicates little price movement while a long bar indicates a wide divergence between the high and the low for the day. An example of a bar chart is shown in the figure below:

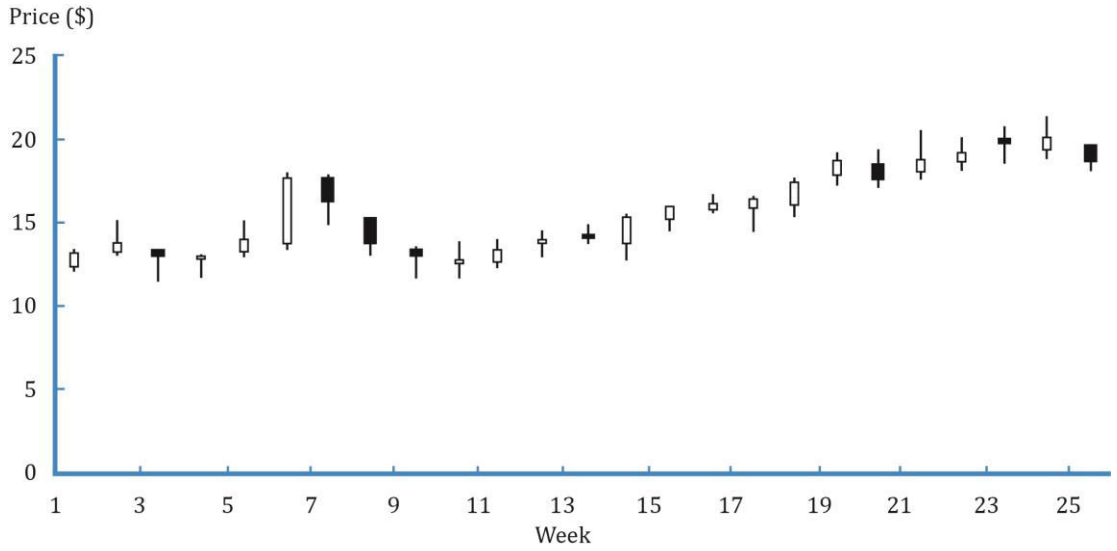


Candlestick chart

A candlestick chart also provides four prices per data entry point: the opening and closing prices, and the high and low prices during the period.



The body of the candle is either white or shaded. A white body means that the market closed up. A shaded body means that the market closed down. An example of a candlestick chart is shown below:



An advantage of the candlestick chart over the bar chart is that price moves are much more visible, which allows for faster analysis.

Scale

The vertical axis can be constructed with either:

- Linear/Arithmetic scale: Suitable for narrower ranges, for example, prices from $20 to $35
- Logarithmic scale: Suitable for range of values representing several orders of magnitude, for example, $10 to $10,000.

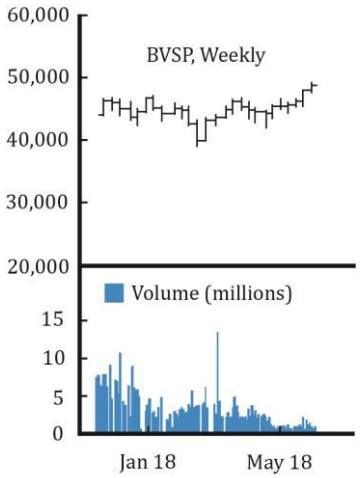
A logarithmic scale is suitable for longer time frames, whereas a linear scale is suitable for shorter time frames.

The horizontal axis usually shows the passage of time. The appropriate time interval

depends on the nature of the underlying data. We can have 5-min, 30-min, 1-hour, daily, weekly or even monthly charts. It is important to note that the shorter the time frame, the less meaningful the analysis tends to become. Many analysts start with a longer time frame and then come down to shorter time frames.

Volume charts

They are often displayed below a line, bar or candlestick chart. The number of units of the security traded is plotted on the Y-axis and time on the X-axis.



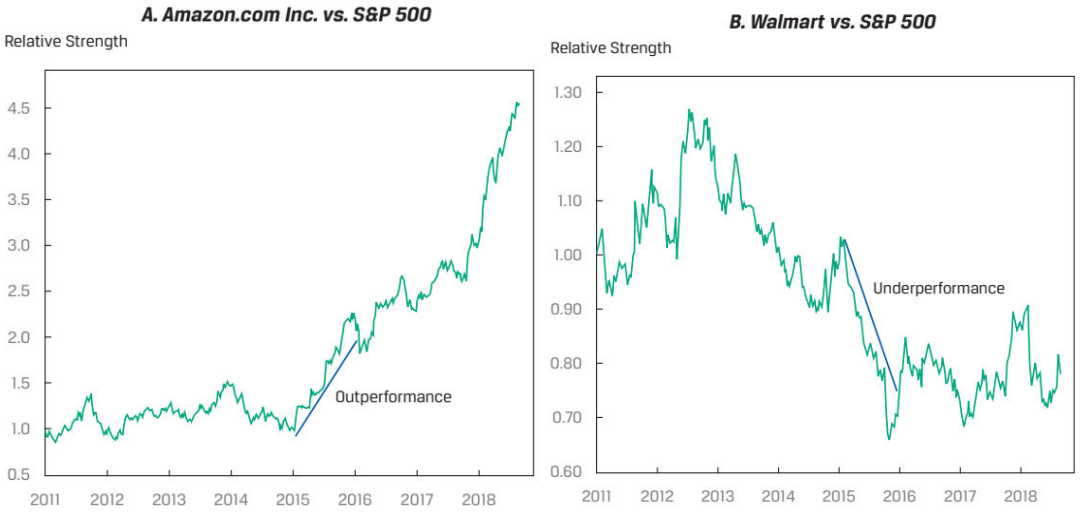
Volume is an important element in technical analysis and is generally used to confirm a trend, as it indicates the strength of the buyers and sellers.

- If volume increases when prices are increasing, then it implies that more and more investors are buying the asset at higher and higher prices. This is considered positive and the two indicators confirm each other.
- On the other hand, if volume and prices move in opposite directions, then it implies that fewer and fewer investors are willing to buy the asset at the higher prices and price rally may soon end.

Relative strength analysis

Relative strength analysis is used to compare the performance of a particular asset, such as a stock, with that of some benchmark index or the performance of another stock. Typically, the analyst prepares a line chart of the ratio of the two prices, with the asset under analysis as the numerator and the benchmark or other security as the denominator. A rising line shows that the asset is performing better than the benchmark; a declining line shows that the asset is underperforming. A flat line shows neutral performance.

In the figures below, the performances of two stocks — Amazon and Walmart are compared to the S&P 500 index using relative strength analysis. Amazon has generally outperformed the benchmark. Whereas, Walmart has generally underperformed the benchmark.



4. Trend, Support, and Resistance

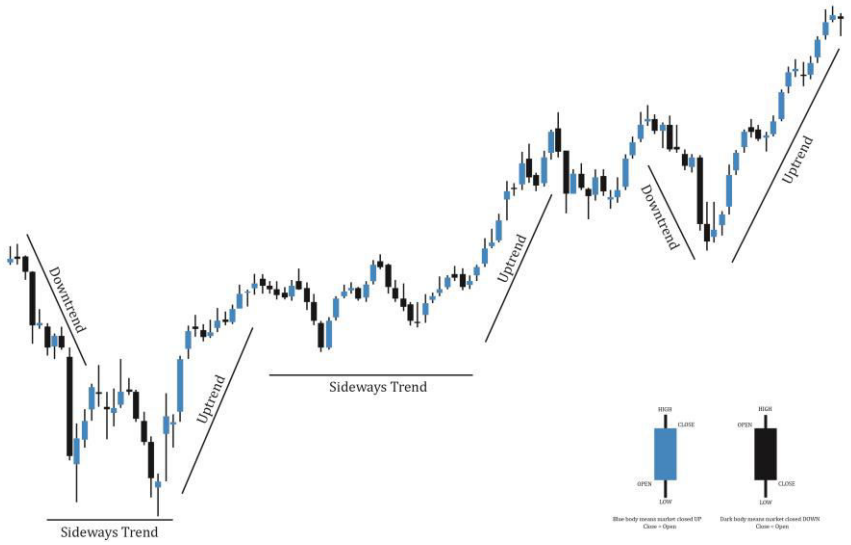
A trend is a long-term pattern of price movements in a particular direction. When a security is not trending, it is said to be in consolidation. Trend analysis is based on the observation that market participants tend to act in herds and that trends tend to stay in place for some time.

Uptrend

A security is said to be in an uptrend if prices are reaching higher highs and higher lows. An upward trendline can be drawn by connecting the increasing low points with a straight line. An uptrend indicates that the demand is more than supply.

Downtrend

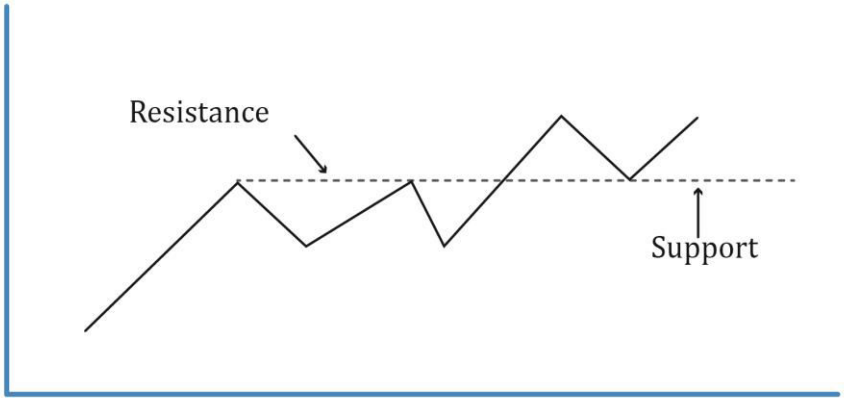
A security is said to be in a downtrend if prices are reaching lower highs and lower lows. A downward trendline can be drawn by connecting the decreasing high points with a straight line. A downtrend indicates that the supply is more than demand.



Support
It is the price level at which there is sufficient buying pressure to stop a further decline in prices.

Resistance
It is the price level at which there is sufficient selling pressure to stop a further increase in prices.

Change in polarity
Once a support level is breached, it often becomes a new resistance level. Similarly, once a resistance level is breached; it often becomes a new support level.



5. Common Chart Patterns

Chart patterns are formations that create a recognizable shape; common patterns appear repeatedly and lead to similar subsequent price movements. Chart patterns can be divided into two categories: reversal patterns and continuation patterns.

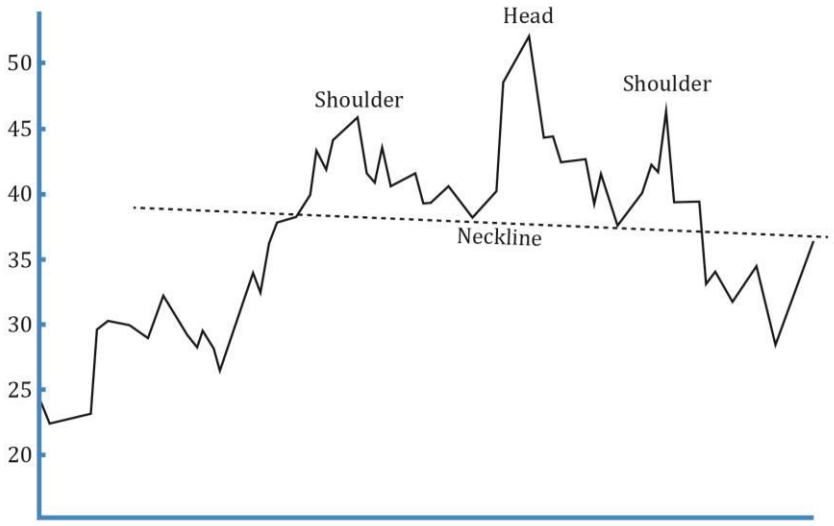
5.1 Reversal patterns

They signal the end of a trend. The four kinds of reversal patterns are:

Head and shoulders pattern:

It consists of the left shoulder, the head, and the right shoulder. This pattern indicates the end of an uptrend especially if the second shoulder has the lowest volume. We can profit by going short on the security, the price target is:

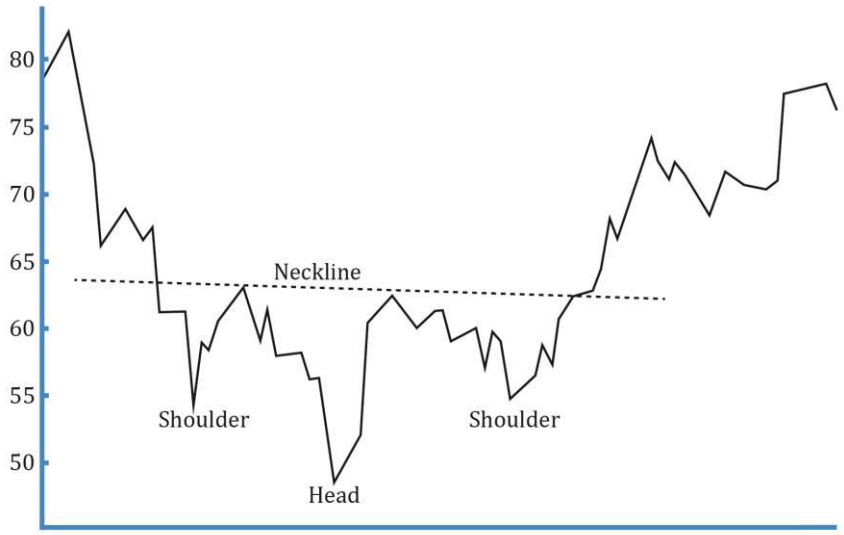
Price target = neckline – (head – neckline)



Inverse head and shoulders pattern:

It is a mirror image of the head and shoulders pattern. This pattern indicates the end of a downtrend. We can profit by going long on the security, the price target is:

Price target = neckline + (neckline – head)



Example

In an inverted head and shoulders pattern, if the neckline is at €125, the shoulders at €80, and the head at €95, the price target is closest to which of the following?

A. €155.
B. €110.
C. €95.

Solution:

Inverted Head and shoulder patter target price = Neckline + (Neckline – Head)

Target Price = 125 + (125 – 95)

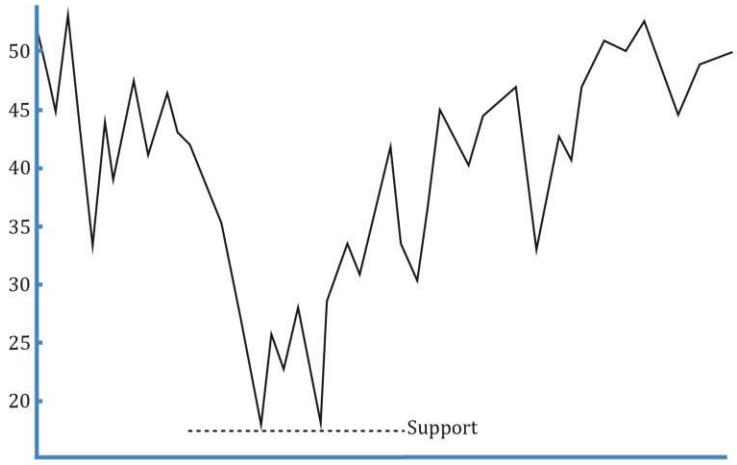
Target Price = 155

Double tops and bottoms:

A double top is formed when prices hit the same resistance level twice and fall down. It indicates the end of an uptrend. Typically, the second high will have lower volumes than the first high.

A double bottom is formed when prices bounce back from the same support level twice. It indicates the end of a down-trend.

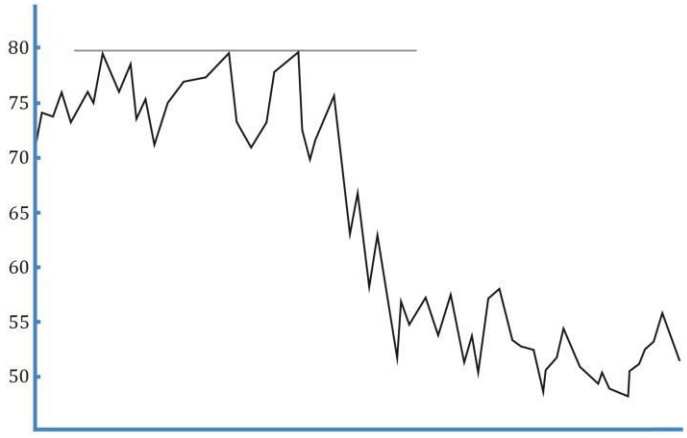
As with the head and shoulders pattern, the size of the double top or double bottom is used to set price targets.



Triple tops and bottoms:

Triple tops are formed when prices hit the same resistance level thrice.

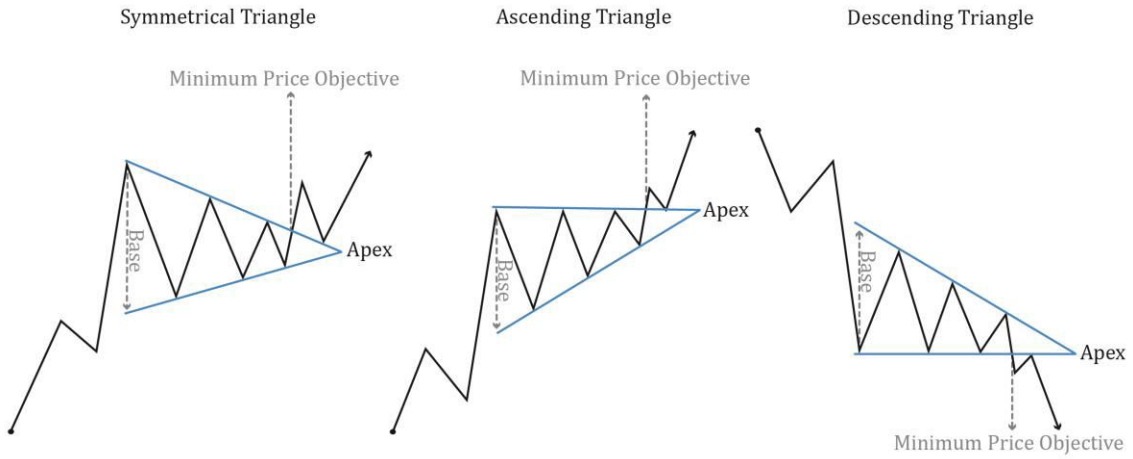
Triple bottoms are formed when prices bounce back from the same support level thrice.



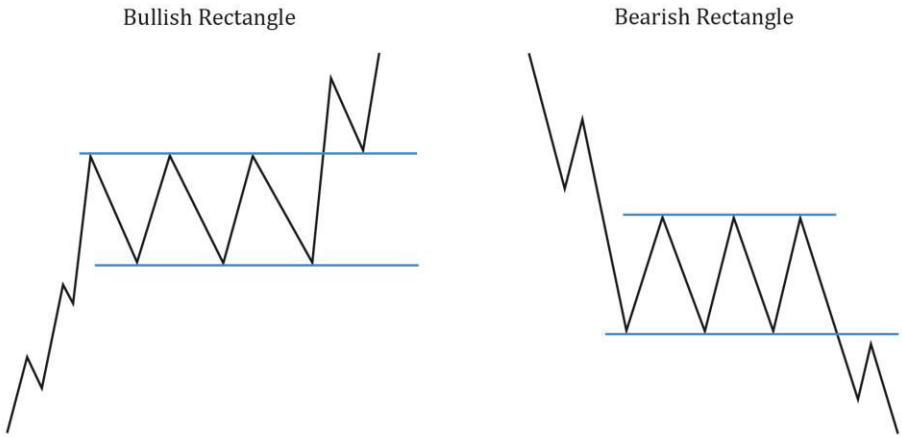
5.2 Continuation patterns

They signal a temporary pause in the trend, and that the trend will continue in the same direction as before. The four kinds of continuation patterns are:

Triangles:
One trendline connects the highs and a second trendline connects the lows. As the distance between the highs and lows narrows, the trendlines converge, forming a triangle. There are three forms - ascending triangles, descending triangles, and symmetric triangles. Triangles indicate that buying and selling pressure has become roughly equal. If price breaks out of the triangle and the previous trend continues, then the size of the triangles can be used to set price targets.



Rectangles:
One trendline connects the highs and a second trendline connects the lows. As the distance between the highs and lows is constant, the trendlines are parallel to each other and form a rectangle. As with triangles, rectangles also indicate that when prices break out of the rectangle, the previous trend will continue and the size of the rectangle can be used to set price targets.



Flags:
They are similar to a rectangle and are formed by two parallel trendlines. However, they form over a much shorter time interval.

Pennants:
They are similar to a triangle and are formed by two converging trend lines. However, they form over a much shorter time interval.

6. Technical Indicators: Moving Averages and Bollinger Bands

6.1 Technical Indicators

Technical indicators are used to derive additional information from basic chart patterns. There are three kinds of technical indicators that we will discuss; price-based indicators, momentum oscillators, and sentiment indicators.

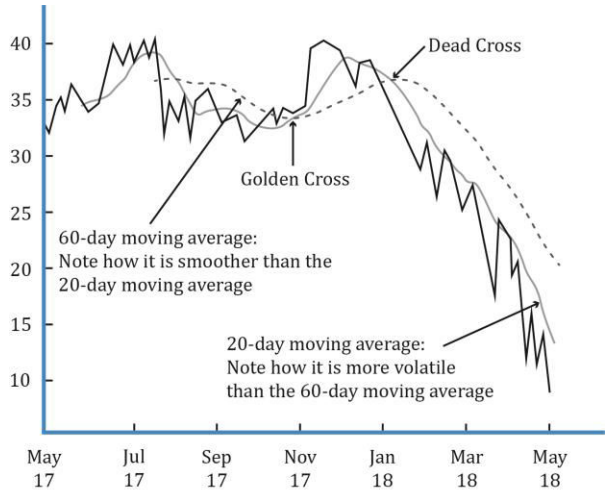
Price-based indicators

They incorporate the information contained in the current and past market prices. The common types are:

Moving average:

It is the average of the closing prices over a specified number of periods (n) . They are used to smooth out short-term price fluctuations and help identify the trend. The larger the selected value of n, the smoother the moving average. Moving average lines are often considered support or resistance levels. In an uptrend, the current prices are above the moving average. In a downtrend, the current prices are below the moving average.

Moving averages for different time periods, such as 20-day and 60-day averages, can be used together. When a short-term moving average crosses from underneath a longer-term average, this movement is considered bullish and is known as a golden cross. When a short-term moving average crosses from above a longer-term average, this movement is considered bearish and is known as a dead cross.



Bollinger bands:

Bollinger bands consist of a moving average plus a higher line representing a set number of standard deviations and a lower line representing a set number of standard deviations. Typically, the higher and lower lines are drawn two standard deviations away from the n-period moving average. The figure below shows a Bollinger band and a moving average.

A common use of a Bollinger band is to create trading strategies such as a contrarian strategy. In this strategy, an investor sells when a security's price reaches the upper band and buys when it reaches the lower band. The contrarian strategy assumes that the security's price will stay within the bands.

If the security becomes more volatile the Bollinger bands become wider. If the security becomes less volatile the Bollinger bands become narrower. Bollinger band width is an indicator derived from Bollinger Bands. It is calculated as:

Bollinger Band width = [(Upper band – Lower band)/Middle band] × 100

This indicator is generally used to identify a 'squeeze' – when volatility falls to very low

levels and prices are expected to break out.

7. Technical Indicators: Oscillators, Relative Strength, and Sentiment

Momentum oscillators

It is difficult to identify unusual changes in price movements with price-based indicators. Momentum oscillators help overcome this problem. They are based on rate of change in price data, but are scaled to make them 'oscillate' around a value, such as '0', or between two values, such as '0' and '100'. Extremely high and extremely low oscillator values indicate overbought or oversold market conditions.

Technical analysts also look for convergence or divergence between oscillators and price. 'Convergence' occurs when the oscillator and prices move together (for example, both making higher highs). 'Divergence' occurs when oscillator and prices move in different directions. Convergence indicates that the price trend is likely to continue. Whereas, divergence indicates that the price trend is likely to reverse.

Three main uses of oscillators are:

- Determining the strength of a trend.
- Determining reversal points. When an oscillator reaches a historically high or low level it indicates that a reversal is likely.
- Making short-term trading decisions.

The commonly used momentum oscillators are:

- Rate of Change Oscillator (ROC)
- Relative Strength Index (RSI)
- Stochastic Oscillator
- Moving-Average Convergence/Divergence Oscillator (MACD)

7.1 Rate of Change Oscillator

The rate of change (ROC) oscillator is calculated as:

100 x (Most recent closing price – Closing price n days ago).

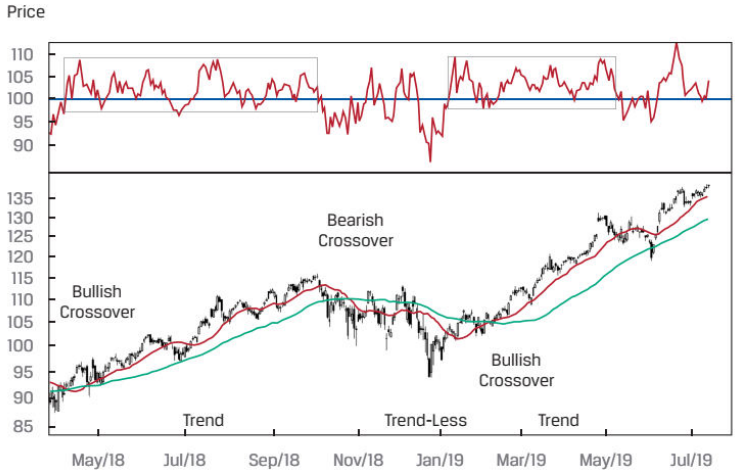
Calculated this way, it oscillates around zero. When the ROC oscillator crosses zero into the positive territory, during an uptrend, it is considered bullish. When the ROC oscillator crosses zero into the negative territory, during a downtrend, it is considered bearish.

Sometimes, the ROC oscillator is set to oscillate around 100 instead of 0, by calculating it as:

100 x (Most recent closing price/Closing price n days ago)

The figure below shows a ROC oscillator with 100 as the midpoint. Short-term and long-term moving averages are also plotted. During trend periods, the ROC oscillator moves in a narrow range between 100 and 110. So once the uptrend is confirmed with a bullish crossover, we can use the ROC oscillator to time the minor peaks and troughs in the uptrend.

During trendless periods, the ROC oscillator moves in a wide range between 80 and 110. Timing entry and exit is difficult during such periods.



7.2 Relative strength index

Relative strength index (RSI) is used to measure the inner momentum of a security. It is calculated as the ratio of the magnitude of 'up days' to the magnitude of 'down days' of that security across a given time period. A popular time period used is 14 days.

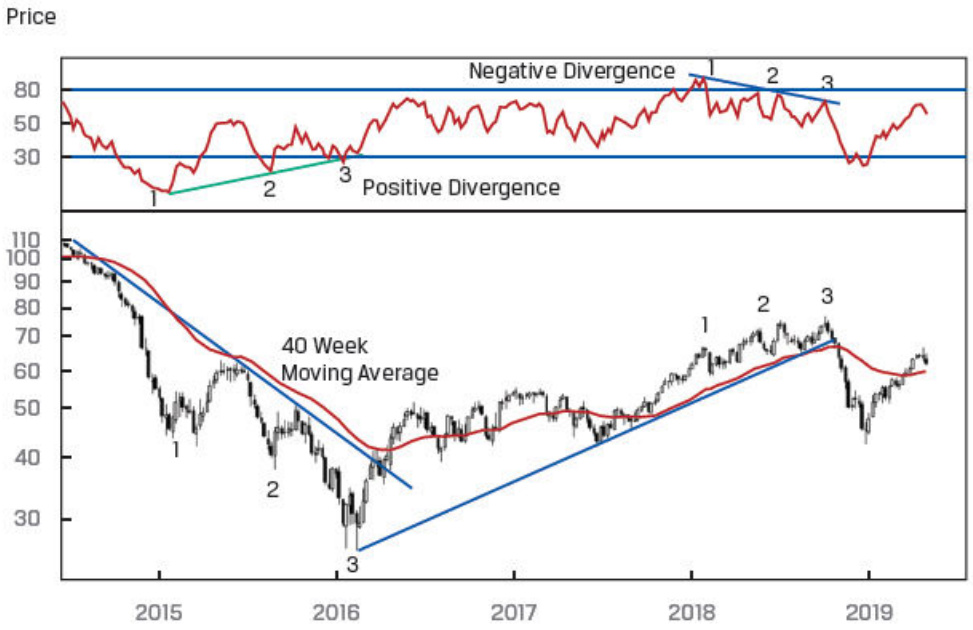
$$\text{RSI} = 100 - \frac{100}{1 + \text{RS}}$$

where:

$$\text{RS} = \frac{\text{Up changes for the period under consideration}}{\text{Down changes for the period under consideration}}$$

The value of the RSI is always between 0 and 100. A value above 70 represents an overbought situation while a value below 30 suggests that an asset is oversold.

The figure below shows a sample chart with RSI.



A positive divergence occurs when the security price reaches a new low but the RSI reaches a higher low. This scenario indicates that while the price is reaching a new low, the inner momentum is improving; in other words, the selling pressure is decreasing.

A negative divergence occurs when the security price reaches a new high but the RSI fails to reach a new high. This scenario indicates that while the price is reaching a new high, the inner momentum is fading; in other words, buying pressure is decreasing.

Instructor's Note: The RSI should not be confused with 'relative strength analysis'. RSI is used to measure the internal strength of a single asset. Whereas, relative strength analysis compares the relative performance of two assets.

7.3 Stochastic Oscillator

It is based on the observation that in uptrends, prices tend to close at or near the high end of their recent range. Similarly, in downtrends, they tend to close near the low end. It is composed of two lines, called %K and %D that are calculated as follows:

$$\%K = 100\left(\frac{C - L14}{H14 - L14}\right)$$

where:
C = latest closing price
L14 = lowest price in past 14 days
H14 = highest price in past 14 days

%D = average of the last three %K values calculated daily.

The stochastic oscillator has a default setting of 14-days.

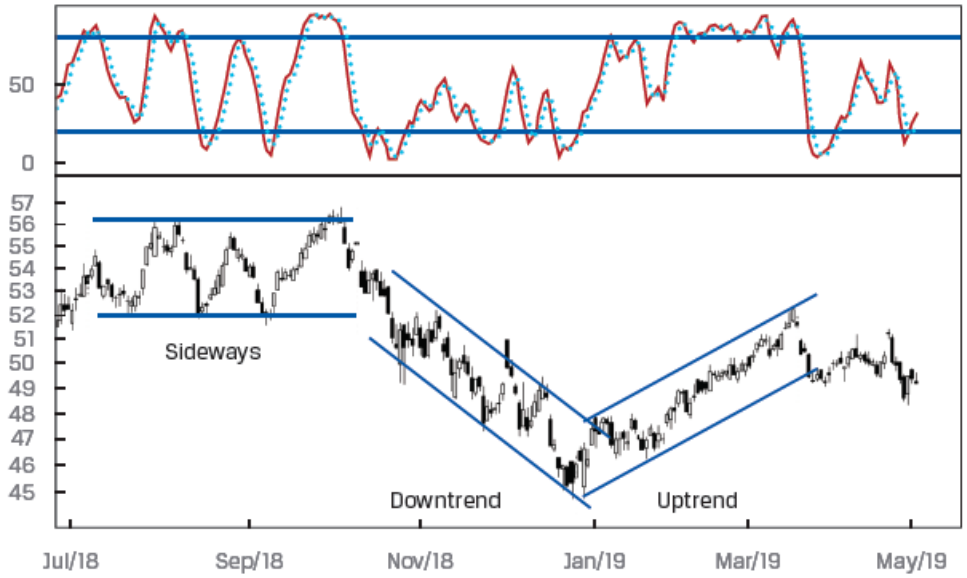
%D is like a long-term moving average and is also called the signal line. It oscillates between

0 and 100. Generally, values between 20 and 80 are considered short term noise. Values above 80 are considered bearish as they indicate overbought conditions. Similarly, values below 20 are considered bullish as they indicate oversold conditions.

When the %K moves from below the %D line to above it, this move is considered a bullish signal. On the other hand, when %K moves from above the %D line to below it, this pattern is considered bearish.

Stochastic oscillator should be used with other technical tools such as trend analysis, pattern analysis and RSI analysis. If multiple tools give us the same signal, then we can consider it to be a strong signal.

A sample chart with a stochastic oscillator is shown below.

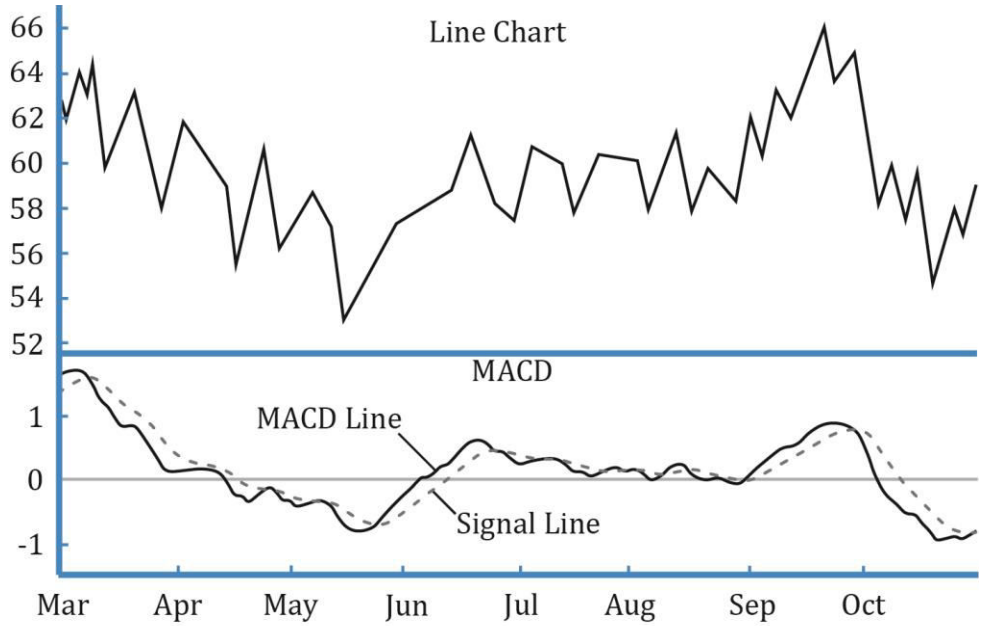


7.4 Moving-average convergence/divergence oscillator (MACD)

It is the difference between a short-term and a long-term moving average of the security's price. It is composed of two lines - MACD line and signal line.

- MACD line: difference between two exponentially smoothed moving averages, usually 12 and 26 days.
- Signal line: exponentially smoothed average of MACD line, usually 9 days.

The indicator oscillates around 0 and has no upper or lower limit.



MACD is used in technical analysis in three ways.

- Crossovers of the MACD line and signal line may indicate a change in trend.
- If the MACD is outside its normal range for a given security, then this may indicate a reversal.
- If the MACD is trending in the same direction as price, then this indicates a convergence pattern. On the other hand, when the two are trending in opposite directions, then this indicates a divergence pattern.

Instructor's Note:
The most known use of momentum oscillators is to indicate the overbought or oversold position of a security. Thus, they help in providing signal for buying or selling security but do not help to set the target price.

7.5 Sentiment indicators

They gauge investor activity for signs of bullishness or bearishness. The two types of sentiment indicators are investor polls and calculated statistical indexes:

Calculated statistical indices: They are calculated from market data, such as security prices. The common types are:

- The ***put/call ratio*** is the volume of put options traded, divided by the volume of call options traded. Generally, investors who buy put options have a bearish view and investors who buy call options have a bullish view. Therefore, a high put/call ratio indicates that the market is bearish. Whereas, a low ratio indicates that the market is bullish.
  The ratio is often viewed as a contrarian indicator. An extremely high value indicates an oversold market. Whereas, an extremely low value indicates an overbought

market.

- The ***CBOE volatility index (VIX)*** is a measure of near-term market volatility calculated from option prices of S&P 500 stocks. The VIX rises when market participants become fearful of a market decline.

  VIX is generally interpreted from a contrarian perspective and used with other trend, pattern, and oscillator tools. When other tools indicate an oversold condition and the VIX is at an extreme high, this combination is considered bullish.

- ***Margin debt*** is loans taken by individual traders to fund their stock purchases. When stock margin debt is increasing, traders are aggressively buying and the stock prices will rise because of increased demand. Eventually, margin traders use up all of their available credit. The demand tapers off and prices start declining. Falling prices may trigger margin calls, traders will be forced to close their positions, which can push prices even lower.

8. Intermarket Analysis

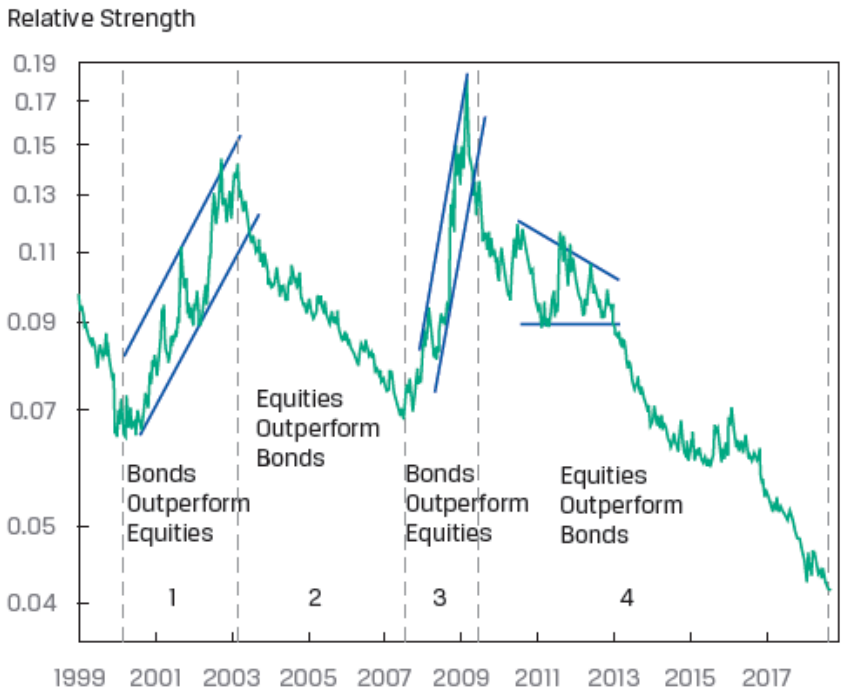
8.1 Principles of Intermarket Analysis

Inter-market analysis is based on the principle that all markets (namely equities, bonds, currencies and commodities) are interrelated and influence each other. Here, technicians look for inflection points in one market as a warning sign to start looking for a change in another related market. To identify these inter-market relationships, a commonly used tool is the relative strength analysis (covered earlier).

Relative strength analysis can be used in many ways such as:

- Evaluating the relative performance of different asset classes
- Evaluating the performance of particular security relative to overall asset class
- Evaluating the relative performance of different sectors within an asset class

The following chart compares the relative strength of 10-year treasury bonds with S&P 500.



The chart shows clear periods of both outperformance and underperformance of T-bonds relative to the S&P 500. Inflection points in this chart occur in 2000, 2003, 2007, and 2009. These points could have been used as signals to move funds between these asset classes.

Relative strength analysis can be used to further identify the strongest performing sectors within an asset class; and the strongest performing securities within that sector.

Inter-market analysis can also help measure the relative performance of major equity benchmarks from different countries. These observations can help decide how much funds to allocate across different countries.

8.2 Technical Analysis Applications to Portfolio Management

Technical analysis can use either a top-down approach or a bottom-up approach to analyze securities.

Top-down approach: The top-down approach focuses on how the overall economy affects different sectors or industries. Intermarket analysis and relative strength analysis help identify outperforming asset classes, countries, or sectors. Technicians try to identify major inflection points or changes in trends. This approach can help make tactical asset allocation decisions. Tactical asset allocation (TAA) refers to a portfolio strategy that changes the allocations to different categories in the short term to take advantage of market opportunities.

For example, consider the below chart which shows the relative strength for the Emerging Markets Index and the All Country World Index.

The two major inflection points are:

- 2003 - the breakout from the double bottom chart pattern with the breach of the long-term average
- 2012 - the breakdown of the trendline and long-term average.

These inflections points could have been used to temporarily increase allocation to emerging market equity.

Bottom-up approach: The bottom-up approach uses rules and conditions to identify investment opportunities. It is useful for identifying individual stocks, commodities, or currencies that are outperforming, irrespective of market, industry, or macro trends.

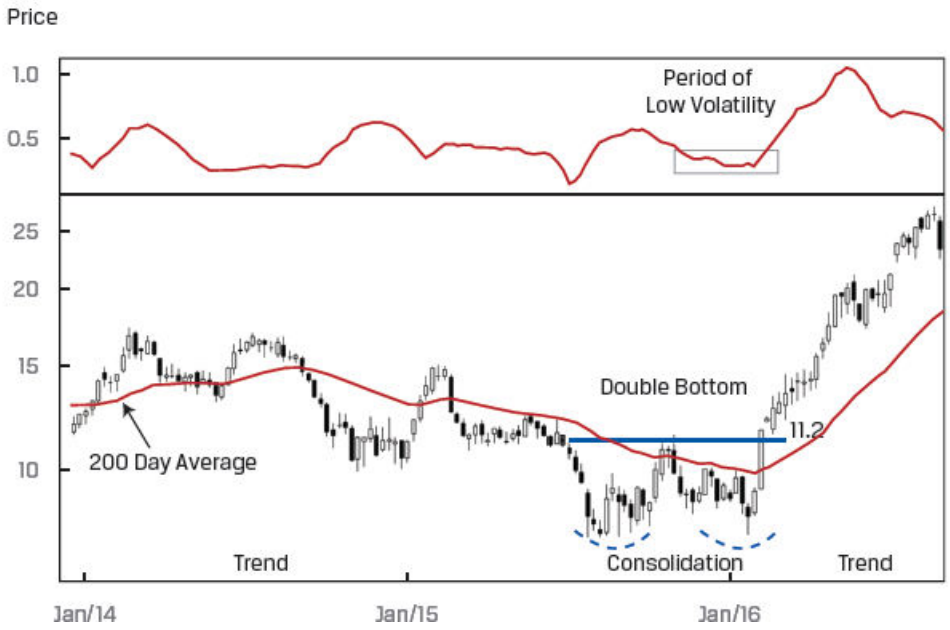
A typical bottom-up approach consists of the following steps:

Step 1: Identify the investment universe, for example developed market equity

Step 2: Define the selection criteria, for example:

- The breakout should take place above the 200-day exponential moving average
- Price should be in a low-volatility condition prior to the breakout
- The breakout should take place from a well-defined classical chart pattern between 3 and 24 months in duration
- Breakout confirmation should be a weekly close above the chart pattern boundary

A computer program will help identify stocks that meet all four criteria. An example is shown below:



8.3 The Role of the Technical Analyst in Fundamental Portfolio Management

A technical analyst can serve a supporting role in a team of investors. The technician can add value by identifying investment opportunities through either top-down or bottom-up analysis, depending on the nature of the investment firm or fund. The technician should follow a purist approach, and should not be influenced by other inputs such as the fundamentals of the company.

A technician's main contribution would be providing input on the timing of the purchase or sale of a security. The technician can also provide a rationale for the expected move, price targets and the price level at which the analysis would be invalidated.

A technical analyst will typically not be directly involved in position sizing decisions.

Summary

LO.a: Explain principles and assumptions of technical analysis.

Technical analysis is a form of security analysis that involves examination of past price and volume data to predict future behavior of the market or individual security.

The three main principles of technical analysis are:

- The market discounts everything.
- Prices move in trends and countertrends.
- Price action creates certain patterns that tend to reoccur and may be cyclical.

LO.b Describe potential links between technical analysis and behavioral finance.

Technical analysis can be thought of as the study of collective investment psychology or sentiment and is thus directly related to behavioral finance.

Fundamental theorists believe that markets are rational and efficient. On the other hand, technicians believe that human behavior is often erratic and driven by emotion. Therefore, they believe that market trends and patterns reflect this irrational human behavior. They rely on recognition of such trends and patterns in the past to project future patterns of security prices.

LO.c: Compare principles of technical analysis and fundamental analysis.

Technical and fundamental analyses approach the market in different ways, but are both useful. Key differences between the two are listed below:

- Technicians focus solely on analyzing markets and the trading of financial instruments. Fundamental analysis, on the other hand, focuses on financial and economic analysis as well as societal and political trends analysis.
- Technical analysis is based on price and volume data (i.e. trading data), while fundamental analysts incorporate external market data, with company's financial statements, to predict security price movements. It is important to note that the company's financial statements are often subjective, while price and volume data are objective.
- Fundamental analysis is considered a more theoretical approach, while technical analysis is considered a more practical approach.

LO.d: Describe and interpret different types of technical analysis charts.

Line charts

- Graphic display of prices over time.
- It has only one data point per time interval – the closing price.
- Price is plotted on the Y-axis and time on the X-axis.
- The closing prices for each trading period are connected by a line.

Bar charts

- It has four data points per time interval – opening price, highest and lowest price, and closing price.
- Price is plotted on the Y-axis and time on the X-axis
- They give a better sense of the trend in the market.
- A short bar indicates low volatility, a long bar indicates high volatility

Candlestick charts

- It has the same four data points per time interval as a bar chart– opening price, highest and lowest prices, and closing price.
- Price is plotted on the Y-axis and time on the X-axis.
- If the market closed up, the body of the candle is clear.
- If the market closed down, the body of the candle is shaded.

Volume charts

- Often displayed below a line, bar or candlestick chart.
- Number of units of the security traded is plotted on the Y-axis and time on the X-axis.
- Generally used to confirm a trend.

LO.e: Explain uses of trend, support, and resistance lines.

Uptrend: A security is said to be in an uptrend if prices are reaching higher highs and higher lows. An upward trendline can be drawn by connecting the increasing low points with a straight line.

Downtrend: A security is said to be in a downtrend if prices are reaching lower highs and lower lows. A downward trendline can be drawn by connecting the decreasing high points with a straight line.

Support: It is the price level at which there is sufficient buying pressure to stop a further decline in prices.

Resistance: It is the price level at which there is sufficient selling pressure to stop the further increase in prices.

Change in polarity: Once a support level is breached, it often becomes a new resistance level.

Similarly, once a resistance level is breached; it often becomes a new support level.

LO.f: Explain common chart patterns.

Reversal patterns: They signal the end of a trend. The four kinds of reversal patterns are:

- Head and shoulders pattern
- Inverse head and shoulders pattern
- Double tops and bottoms
- Triple tops and bottoms

Continuation patterns: They signal a temporary pause in the trend, and that the trend will continue in the same direction as before. The four kinds of continuation patterns are:

- Triangles
- Rectangles
- Flags
- Pennants

LO.g: Explain common technical indicators.

Price-based indicators: They incorporate the information contained in the current and past market prices. The common types are:

- Moving averages
- Bollinger bands

Momentum oscillators: They are constructed from price data, but are calculated such that they fluctuate between a high and low value (typically between 0 and 100). They help to identify changes in the market sentiment. The common types are:

- Rate of change (ROC) oscillator
- Relative strength index (RSI)
- Stochastic oscillator
- Moving-average convergence/divergence oscillator (MACD)

Sentiment indicators: They gauge investor activity for signs of bullishness or bearishness. The common types of calculated statistical indices:

- put/call ratio
- Volatility index (VIX)
- Margin debt

LO.h: Describe principles of intermarket analysis.

Intermarket analysis is based on the principle that different markets such as stocks, bonds, commodities, currencies etc. are interrelated and influence each other. Technicians often use relative strength analysis to look for the inflection point in one market as a warning sign to start looking for a change in another related market. The relative strength analysis can also be used to identify attractive asset classes and attractive sectors within these classes to invest in.

LO.i: Explain technical analysis applications to portfolio management.

Technical analysis can use either a top-down approach or a bottom-up approach to analyze securities.

The top-down approach focuses on how the overall economy affects different sectors or industries. It is useful for identifying outperforming asset classes, countries, or sectors. This approach can add value to asset allocation decisions.

The bottom-up approach uses rules and conditions to identify investment opportunities. It is useful for identifying individual stocks, commodities, or currencies that are outperforming,

irrespective of market, industry, or macro trends.

