# **Section 1: Theoretical Knowledge**

Stock Market Basics:

1. What is a stock and how is it traded?: A stock is a security that represents ownership in a company. When you buy a stock/share, you essentially own a small part of the company. A stock is traded at an Exchange, such as NSE(National Stock Exchange) or BSE(Bombay Stock Exchange). When you want to carry out a trade(buy/sell), the broker places the order for you at the exchange. At the exchange, it matches your order with many other orders given in the market. Ex: If you place a buy order for 50 shares at 1000/- each, at the exchange, you may get all the shares from 1 individual only, or maybe 10 from one person, 25 from a second and 15 from another person. This is done by the exchange’s matching algorithm.
2. When a market order is issued, your stock will be traded at the best possible price available in the market. Ex: If you issue a buy order, it will look for the lowest price to buy, but when you sell the same stock, it will look for the highest available price to maximise your profit. These orders are executed quickly.  
     
   When a limit order is issued, the user enters a limit price (the maximum price he will buy or the minimum price at which he will sell). The order will be executed only if the limit price or better is met. These orders aren’t executed as fast as market orders as a limit criteria must be met.
3. In the market, “bid” price is the maximum price at which a buyer is willing to buy and the “ask” price is the minimum price at which a seller is willing to sell. The difference between the bid and ask prices is called bid-ask spread.   
   When the bid-ask spread is small, it is termed “tight spread” but if it is big, it is termed “wide spread”. By small and large we mean taking it relative to the stock price. One should trade in a tight bid-ask spread as this means high demand(since buyers are willing to pay high enough to match asking prices of sellers). Trading in wide bid-ask spreads is risky as it shows uncertainty.
4. The price of a stock is the last traded price in the market. Hence, the price is basically decided by the traders in the market. There is no direct link between the company working and its stock price. When a company does its business well, it shows a promising future to the retail investors, hence demand increases so stock price increases. Vice-versa, if a company is performing poorly, the price decreases. On a day-to-day basis it does not affect the stock price directly
5. A symbol is series of characters(letters) that are used to represent the publicly-traded security on the exchange
6. Dividends is an amount of money paid by the company to its shareholders out of the profits it made during the year. A company is not obliged to give dividends each year even though they might have made a profit. The company can choose not to distribute dividends if management feels that it is better to use the funds for the growth of the company. In cases where there isn’t much further scope of growth for the company, dividends are likely to be distributed. In some cases, even if the company is incurring a loss, if it has healthy cash reserves, it can choose to distribute dividends.

Technical Analysis:

*Moving averages(MA):* They are trend indicators and one of the simplest of the lot. Moving averages calculates the average of the prices of a particular stock over a time duration. As time is dynamic, it has the term “moving”. Any time period can be taken for a moving average, say 5-day, 14-day, etc. So MA is basically the sum of closing prices of a stock over a specific number of time periods, divided by total no. of time periods. By using a MA indicator and comparing it with the candlesticks of the real-time market(i.e if it is above of below the MA plot), we can take a decision of whether to place a buy/sell order.

*RSI(Relative Strength Index):* It is a popular momentum indicator used to predict a trend reversal. The indicator oscillates between 0 and 100. RSI compares the internal strength of the stock and does not compare 2 different securities. Formula for RSI is:

RSI = 100 - 100/(1 + RS), where RS = average gain/average loss.

--> If RSI is more than 80, the stock is considered as “*overbought*” and there is a high chance of reversal (down trend), similarly, if the RSI is between 0 and 30, there is a high chance of reversal (up trend).

*MACD:* MACD(Moving Average Convergence Divergence) is one of the most reliable indicators in history. As the name suggests, it is an analysis based on the crossover of two averages.

A standard MACD is calculated by subtracting 26-day EMA from 12-day EMA. If the MACD is +ve, one should look for buying opportunities, else if it is -ve, one should look for selling opportunities.

If you're comparing the MA’s on a graph, the short term MA should cross-over and above the long term MA, in such a case buy order shall be placed. Else, sell order.

*Bollinger Bands(BB):* They are used to determine overbought and oversold levels. A trader will try to sell when the price reaches the top of the band and will execute a buy when the price reaches the bottom of the band. The BB’s upper and lower band together forms an envelope. The envelope expands, whenever the price drifts in a particular direction indicating a strong momentum. The BB signal fails when there is an envelope expansion. Hence, BB works well in sideways markets, and not a trending one.

Risk Management:

1. *Drawdown*: A drawdown can be defined as the percentage of capital a trader loses before bouncing back up. More technically it is the percentage of the difference between the *peak* and *trough* of your portfolio value. Peak is the point, just before losses were made, and trough is the point in the loss-making phase just before a turnaround was made.  
   Possible reasons for this are: (i)Making a big loss on a single trade or a few trades, due to incorrect decisions taken, (ii) Experimenting new strategies, (iii)Different market conditions.
2. Risk management in trading refers to the process of identifying, analysing, and taking steps to mitigate or control exposure to financial losses in trading activities. It is a crucial aspect of a trading strategy, as it helps traders protect their capital and ensure long-term profitability.
3. A stop loss is an order placed to buy or sell a certain stock once it reaches a specific price. This is done to minimise the loss. When you open a position, and if it starts making a loss, you would want to exit the trade before making a big loss. To prevent this from happening, you set a stop-loss price, which may be a small % lower/higher (depending if it was a buy/sell order) than your open price. Thus, when the stock price reaches the specified value, your position will be squared off, preventing any further loss.
4. Position sizing is the process of determining how much capital to be allotted in each trade, depending upon the risk of the trade. Risk is inversely proportional to the size of the trade. This helps in properly managing funds and I believe this is by far the most important step, as even if you have a profitable strategy, but place a large size on a risky trade, you might incur a big loss in the process.

Algorithmic Trading:

1. Algorithmic trading is the trading of securities through buy/sell orders initiated by computer algorithms. These algorithms are trained by a trader, using tools such as technical analysis indicators, cash flow statements, revenue, etc. and make their decisions accordingly. In fact, such algorithms can also track the news for updates and make decisions accordingly too. The operational part (actual trading) is fully automated, the traders job is to create new strategies, and ensure current strategies are working properly.  
   On the other hand, manual trading requires you to analyse all the signals of the market and then make an informed trade.
2. Advantages of algo-trading are:

* It is much faster than humans, executing orders within milliseconds
* It carries out emotion-less trading unlike humans, so more efficient
* It is highly scalable, as algorithms can be used for different time-zones, or markets.
* It can handle large volumes efficiently

However, the disadvantages are:

* Algorithmic trading requires fast software and hardware, so malfunction in either can lead to missed opportunities or losses.
* Developing and maintaining sophisticated algorithms requires a significant investment of time and expertise.
* By back-testing a strategy on historical market data, one must be cautious that it does not overfit to the data so much that it is unable to adapt to current market conditions.
* Algorithms need liquidity to function well. If the market is not as liquid, orders might work against the trader’s position.

1. Backtesting is important in quant to analyse how the algorithm would have performed in the past. It also serves to prove that you have understood the strategy completely and have reproduced the algorithm for its exact implementation.  
   By tallying with historical data and replicating the result, one can confirm that the algorithm hasn’t made any common errors. Also, while backtesting, one can try out new changes in the algorithm, thereby refining and improving the strategy.