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Implementation of Correlation Techniques for the Equity Market in India

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Abstract: The equity market is the place where shares of listed companies can be managed by public and can be traded through exchanges. The shareholders can enjoy the financial benefits of the companies whose shares they hold. While the traditional theory tells that the factors that move stock prices are due to earnings per share, valuation multiple etc, technical factors like inflation, economic strength, substitutes etc. can also affect the rise and fall in stock market. This paper suggests three main parameters which is responsible for the up down trends in market and verifies the dependency of these three parameters by the means of correlation method in statistical analysis. Parameters like open interest, last traded price in derivatives and delivery volume in cash market are taken into account for the same. By the means of correlation function, the dependency of these three parameters with each other have been studied and observed to be correlated.

Keywords: Financial Market, Derivatives, Earnings per Share, open interest, Last Traded Price, Exchange-Traded Funds.

I. INTRODUCTION

A financial market is a place where buyers and sellers join in the trade of assets such as bonds, commodities, derivatives, currencies and equities. These markets are used to raise finance and they exist in nearly every nation in the world. Some financial markets are very small, with less number of participants and investors while others carries huge transactions daily.

Based on market levels, financial markets are divided into primary market and secondary market. Primary market, also called new issue market deals with those securities which are issued to the public for the first time, where secondary market deals with the securities which have already passed through the new issue market.

Another category of financial market is based on security types. Money market, capital market, derivative market, financial service market depository market and non-depository market come under this category. Money market is a market for dealing with financial instruments and securities that have a short term of maturity, from several days to just under a year. Any organization or government requires funds (capital) to finance its operations; they can raise money through the sale of stocks and bonds in the name of company. These are bought and sold in the capital markets. So capital market is the one which deals with assets that have a long term of maturity. Stock market, also known as equity market and bond market are the two subdivisions of capital market. Equity market [3] is the market where securities' ownership is issued and endorsed and the market in which an investor loans money to a corporate or governmental entity that hires the funds for a specified period of time at a rate of interest is called debt market.

Another category of financial market is derivative market [1] where its value is derived from its underlying securities like stocks or commodities. Futures, options, forwards are some of the examples of common derivatives. Firms and individuals use financial services markets such as ATM, credit cards, credit rating etc… to purchase services that help the working of equity and debt markets.

II. RELATED WORKS

Lots of works have been done in the field of financial market to study the factors affecting the up down trends in stock prices [2] and all. Traditional theory tells that the deciding parameters that control this trend are earnings per share, valuation multiple, book value etc… EPS (Earnings per share) is the portion of a company/institution's profit assigned to each outstanding share of common stock and is calculated as ratio of net profit to the number of shares. EPS is a marker of a company/institution's financial achievement. It is generally considered as the unique element in determining a share's price. Valuation multiple is the ratio of price of the share to EPS. Book value is the total value of the company's securities that investors would theoretically receive if a company were liquidated. It can indicate whether a stock is underpriced or overpriced.

Market sentiment is the overall attitude of investors toward a particular asset or larger financial market. Rising prices would indicate a bullish market sentiment, while falling prices would indicate a bearish market sentiment. This is used by traders and technical analysts, who use technical indicators to try to analyse and profit from the short term price variations often caused by attitude of investors towards an asset/ security. Technical factors [9] like inflation, economic strength, substitutes etc… also claim to be the factors which cause the rise and fall in stock market. Inflation is the rate at which general level of prices of services and commodities is rising, and falling.

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III.PROPOSED WORK

By analyzing the huge data set provided by national stock exchange, this work proposes three parameters as the deciding factors for the trend change in stock market. They are open interest, last traded price in derivatives and delivery volume in cash market.

A. Futures and Options

It's a variation in derivative products [1] based on exchange- traded funds (ETF). ETF futures are the contracts that represent an agreement to buy or to sell, the underlying ETF shares at an agreed-upon price on or before a specified date in the future, i.e., the contract which is based on quantity, quality, delivery time and place for the settlement at a future date. Both parties engaging into such an agreement are enforced to finish the contract at the end of the contract time with the delivery of cash or stock.

To participate and avail the benefits of such contract, stock holders have to put up an initial deposit of cash in their accounts called as the margin. When the contract is closed, the initial margin is credited with any gains or losses that add to over the contract period. If there is any change in future price from the pre agreed price, the difference is also settle daily and the transaction of such differences is watched by the exchange which uses the margin money from either party to assure appropriate daily profit or loss. If the minimum maintenance margin or the lowest amount required is insufficient, then a margin call is made and the concerned party must immediately replenish the shortfall. This process of ensuring daily profit or loss is known as mark to market.

ETF options, on the other hand, are contracts that give the holder the right, but not the obligation, to call(buy) or to put(sell) the underlying exchange traded funds' shares at an agreed upon price on or before a specified date in the future. It is a financial derivative that represents a contract sold by one party (option writer) to another party (option holder). Options are highly skilled securities that can be used in many different ways. Call options give the option to buy at a certain price, so the buyer would need the stock to go up. Put options give the option to sell at a reasonable price, so the buyer would need the stock to go down. Traders use this option to speculate, which is a relatively risky way, while hedgers use options to mitigate the risk of holding an asset.

B. Open Interest

It is the total number of options and or futures contracts that are not delivered or closed on a particular day. The number of buy market orders before the stock market opens. In short it's the total number of open contracts on a commodity, applies mainly to the futures market.

A contract has both a seller and a buyer, so the two market players join together to make one contract. The position of open interest that is reported each day indicates the rise or fall in the number of contracts for that day and it is indicated either by a positive number or a negative number. A rise in open interest along with the rise in price is said to indicate an upward trend and the rise in open interest along with a decrease in price points a downward trend. A rise or fall in prices while open interest remains same or declining may indicate a change [2] in the possible trend. This paper suggests, along with the open interest, the parameters like last traded price and delivery volume can be taken into account to predict the trend analysis of equity market.

- If open interest is increasing and prices are rising at a faster rate than its five year seasonal average, this is a positive sign. More investors are entering the market, involving additional buying, and any purchases are aggressive in nature.
- If the open interest falls following an increasing trend in both price and open interest, this is considered as a warning sign to decline.
- High open interest at market tops is a bearish signal if the price drop is sudden.
- When an increasing trend of open interest begins to reverse, expect a bear trend to get underway.
- Decline in open interest and rising prices at a rate greater than the seasonal norm is bearish.
- If prices are declining and the open interest rises more than the seasonal average, this shows that short positions are being opened.
  A decline in both price and open interest indicates liquidation by discouraged traders with long positions. This is also a bearish sign.

C. Last Traded Price(LTP)

The price of stock throughout a day is always fluctuating. The last traded price or LTP is the price at which the most recent trade performed. It shows the latest buy value or sell value and is called as a current market price. Open price is the price at which particular scrip opened while capital market opens with a price difference from yesterdays close price. The price at which one particular scrip buys or sells transaction executed at very low price on that day is called high price. Close price is the price at which particular scrip traded last at closing time of equity market on previous day.

D. Deliverable Quantity

Every stock on a daily basis will have a total traded volume and deliverable volume. Deliverable volume or deliverable quantity is the quantity of shares which actually pass from one group of people, who had those shares in their demat account before today and are selling today, to another group of people, who have purchased those shares.

It is those portions of total traded which actually leads into a person taking delivery into demat or selling from demat account. The rest of the volume will be intraday trades, where no delivery is given or taken. Trend says that if the stock is going up or down with high deliverable volume, the move is supposed to be stronger as long term investors are getting in or out respectively.

Deliverable quantity data needs to be analysed along with the share price. When the share price of the stock rises along with the higher percentage of deliverable quantity to traded quantity, it shows bullishness in the share. When the share price of the stock is moving down with higher percentage of deliverable quantity to traded quantity.

E. Correlation

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Correlation is a statistical technique, which is used to measure the strength of association between two variables, that is, how strongly the pairs of parameters are related. The value of correlation coefficient (r) varies from -1.0 to +1.0. If the value of r is close to 0, it means there is no relationship between the variables. If it's positive, it means that as one variable becomes larger, the other becomes larger and if the value of r is negative, it means that as one gets larger, the other variable gets smaller. This is often called inverse correlation [4].Dependence is a statistical relationship between two random variables or two sets of data [5]. So correlation means any of a broad class of statistical relationships involving dependence. Dependence refers to any situation in which random variables do not satisfy a mathematical condition of probabilistic independence. There are different types of correlation coefficients, for measuring the degree of correlation [6]. Among them the most common is Pearson correlation coefficient, which is sensitive only to a linear relationship between two variables. It is obtained by dividing the covariance of the two variables by the product of their standard deviations. Rank correlation coefficients [7], such as Spearman's rank correlation coefficient and Kendall's rank correlation coefficient measure the extent to which, as one variable increases, the other variable tends to increase, without requiring that increase to be represented by a linear relationship.

IV. ANALYSIS WITH R SOFTWARE

R is an open-source statistical environment modeled after S and it is a powerful statistical program. This work considers the values of companies like Sbi, Tata Motors, Hindalco, Axis bank etc… And by analyzing parameters like open interest and last traded price in futures and deliverable quantity in cash market, we have noticed that out of 445 rows, only 22 rows show an increase of these parameters from its previous day. Following steps are done for the analysis of these values.

- Extract the selected rows with four columns like name of the company as V1, Last traded price(LTP) is denoted by V2, Open Interest is denoted by V3 and Deliverable quantity is denoted as V4 and saved it in a .txt file.
- This txt file is read from R, using the command read. table ( ) function, as shown in the Fig 1.
- After importing the table, dependency between the variable V2 and V3 are tested, where V2 indicates Last traded price and V3 indicated open interest.
- Correlation function cor (variable_1, variab -le_2, method="method") is used for the same.
- The same function is used to calculate the correlation between V2 and V3, V3 and V4 and V2 and V4 and the values are -0.15, -0.44 and -0.33 respectively.
  Since they are negative values, there exists an inverse correlation [8] between these three parameters, i.e., when one variable gets larger, then the other variable gets smaller. This proves there is a dependency between the parameters open interest, LTP and delivery volume.

V. CONCLUSIONAND FUTURE SCOPE

Derivative market is the place where its value is derived from its underlying securities like stocks or commodities. Futures, options, forwards are some of the examples of common derivatives. Lots of research works are going on in this field of equity market. National Stock exchange even promotes such works. While traditional theory tells that the factors affecting the fluctuation in price in stock market are earnings per ratio, valuation multiple etc, this work suggests three new parameters like last traded price, open interest and deliverable quantity as the reasons for up-down trend in the derivatives.

There exist various functions to calculate the statistical difference between different samples. Using correlation function the dependency between the variables has been proved. The statistical difference between these parameters can be calculated in future.

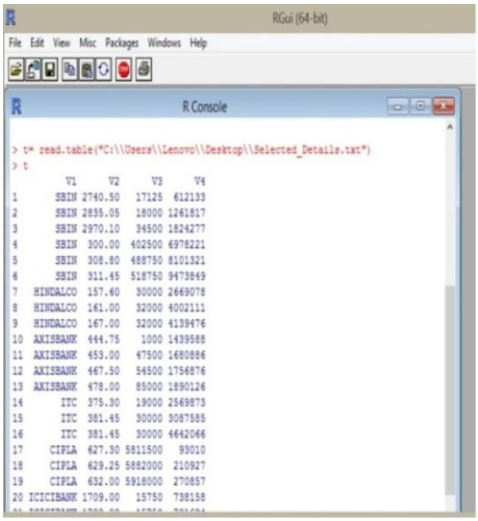

Fig. 1.read.table ( ) in R software

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