Descriptive Analysis on Products/Services demand and Market conspectus: A quantitative approach

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Abstract. The research conducted in this paper consists of finding out the shortcomings of Efficient Market Hypothesis as it is purely based on if information is immediately priced in the Trading markets. Efficient market hypothesis(EMH) also suggests that it is not possible for someone to give more returns than the market in long term. Which has been disproven in this research using multiple criteria decision making and taking the companies with Good Debt to Market cap ratio and check their aggregated outcome over a long period of time and the rate of return came out to be significantly higher than the growth in the market. One of the main assumptions of EMH also happens to be that fundamental analysis does not affect stock market or stock indexes but its proven to be false as in long term if indexes are selected based on good criterias. Efficient market hypothesis says that stock prices depend on news and the news of the next day is by default unpredictable, but it doesn't take into account the fact that not everyone interprets the news in the same way and even if they do they don't process the information on the same intensity.

Keywords: Prediction Analysis, Stock Market, Multiple-criteria decision analysis, Weights for parameters, Back Tracking, Correlation, PROMETHEE, AHP, technical analysis, stocks ranking.

1. Introduction

PROMETHEE is one of the latest MCDM strategies that was proposed by Brans et al. [7] and has progressively been applied in numerous fields [8], particularly in the speculation investigation and execution assessment. Mareschal and Brans, Vranegl et al., Babic and Plazibat[9], Bouri et al. what's more, Albadvi et al.[10] all applied PROMETHEE as a dynamic apparatus to take care of the various issues in the field of account. In this paper, we apply PROMETHEE II to choose firms with extraordinary execution in the choice cycle of significant worth contributing.

The proposed model is organized around two columns: Industry assessment and Company assessment. The inclination positioning association technique for enhancement assessment (PROMETHEE) has been utilized for tackling the issue [6]. As a genuine case and an overview from the specialists so as to decide the viable measures for industry assessment and friends assessment has been directed.[3] Nevertheless, it has long been criticized by academic researchers and users. [4] This criticism has been established based on two facts: the first fact which is the theory of labor markets argues that "prices always fully reflect available information" [5]. The second fact is that technical analysis is based on weak fundamentals[6]. It appears that technical analysis can be a

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compromising tool since it offers a relative composition of human, political and economic events. Like the companies before 9/11 and after 9/11 had the same fundamentals, but the prices dropped 50%.

2. The Efficient Market Hypothesis

2.1 Weak Form of Efficient market Hypothesis
On the off chance that a market is regarded to be 'frail structure proficient', it would imply that no relationship exists between chronicled costs and progressive costs.

2.2 Semi Strong Form of Efficient market Hypothesis
This would imply that principal examination may assist dealers with gathering data and produce better than expected returns. Chance that a market is regarded to be 'frail structure proficient', it would imply that no relationship exists between chronicled costs and progressive costs [11].

2.3 Strong form of Efficient market Hypothesis
Solid structure EMH states that all accessible data, both open and private, is valued into the cost of a security [12]. Strong Market Hypothesis expects that the market is great, thus the main way an individual could make an extreme return is by utilizing insider data [13]. Both specialized and central examinations would be rendered disputable, as neither could give profitable Information. Table 1 shows the six type of generalized criteria.

| Table 1. Mathematical Model of PROMETHEE |
|------------------------------------------|
| Types of generalized criteria | Parameters |
| I. Normal criterion | $H(0)$ |
| II. Quasi-criterion | $H(0)$ |
| III. Criterion with linear preference | $H(0)$ |
| IV. Level criterion | $H(0)$ |
| V. Criterion with linear preference and indifference area | $H(0)$ |
| VI. Gaussian criterion | $H(0)$ |

3. Technical Analysis
Stock price data for all the stocks is taken and totals about to be more than a Million rows, and many many stock symbols [7]. Then another dataset is taken with all the fundamental values of the companies, then newer columns are created requiring the values like P/E ratio, normal ratio from Debt to Equity of the given company and taking all the companies of good Market cap, Ratio, Profit %, dividend. Through filtering using pandas Dataframe and after filtering the final names of the companies who fulfill all the criterias are kept in a separate Data Frame and all the names of the company values are extracted from the dataframe by using Unique Ticker, store them in a dataframe the 10 year stock prices for all the stocks [11]. After storing the stock prices of good stocks in the
variable then group all the values by Date column then sum it up, then plot it in line plot as an index, so this will not be weight adjusted Weight or prices adjusted [6].

This is the Aggregate of all the stocks with the Assets to Liability Ratio above 10.

As seen in the figure above the rate of return for Aggregated Index is around 1000% for a period of approx. 10 years.

**Figure 1.** Correlation for the Created Index
Figure 2. Correlation for the Aggregated Stock Market

Figure 1 is a Scatter Plot showing Positive correlation for the selected Stock Index using PROMETHEE and Figure 2 is the Scatter plot which gives the correlation which is not ideal i.e. it shows less Correlation. Hence the Scatter Plot shows more Positive Correlation for Aggregated market’s Index. As observed in Figures the Scattered matrix for Figure 2 is much more scattered and for the Selected index S&P 500.

Figure 3. Mean Deviation for the Selected Index
Fig 3 gives the Percentage change in daily values which gives a wide variation in percentage changes for the index which indicated high volatility on Daily Bases which proves the hypothesis that the market is Volatile and can change Positive 10 to Negative 10 percentage on daily basis but as we see over the long term it follows a uptrend and the Figure 4 gives the a double bell curve for the our selected Index of stocks using PROMETHEE indicates Bimodal Distribution also indicating percentage change is spread out into Two different group.

3.1 Comparing the Method by Traditional methods

Figure 5. Time Series Aggregate for 23 Stocks
Figure 6. Time series aggregate of the Entire Stock List

Figure 5 contains Cumulative Index of stocks above Asset to Debt Ratio above 10 and Figure 6 Contains Cumulative return of the stocks Randomised stock collective rates of return for the aggregate for 23 stocks randomly picked in the market from 2009 to 2019 the return for the 10 year period is merely 200% , Fig.5 Looking at the Graph and taking the returns from 2008-2019 the average return is around 1000% but considering the return for S&P 500 or the market it comes out to be around 350% . Therefore using actual good parameters and ranking criterias it is possible to have a high rate of return compared to the market in the long run , Stated otherwise by the Efficient market Hypothesis[8] .

3.2 Increasing Gains Using Leverage

At that point finance dependent on the specific boundaries are entered and dependent on those boundaries (like greatest market top, enchantment equation, all stocks with the most reduced P/E ) TOP 100/500 STOCKS are chosen and dependent on those boundaries they are totaled and afterward contributed similarly [4]. The outcomes fluctuate enormously dependent on the measure of time you took for backtesting like the blend of those 3-4 models boundaries may really be acceptable however they probably won't function admirably for 2-3 years, for the others expectation may be high for a very long time. in any case, in some other mix of boundaries it can give a totally unique outcome dependent on the time span we pick. At that point the following is absolutely specialized dependent on that utilizing the past model we can plot the future stock cost in and afterward contribute it daily or two, yet the minutes after the specific episodes are not so much so we use influence to expand the benefit [9]. So assume we get a model right 80% of h time and we influence 1:1000 on a 1% sure increment what can happen is the multiple times you cash will go to zero however the rest times it will build multiple times. So even 1 time win can recoup your whole portfolio.

4. Fundamentals

1. In the securities exchange the measure of rate increment diminishes, not an issue the extent that it is certain we can use and get the necessary outcomes.

2. Discover the connection between's two distinct boundaries and discover what befalls this when this is taken [7]. As per Joel Greenblatt there is no relationship between's the past presentation of a chief and his exhibition in the following 3-4 years.

3. In the momentary the market runs on news and feelings in the drawn out it runs on basics.

Pick the stocks positioning savvy or make the total of the chose boundaries like the main 500 organizations or distinction between similarly weighted files. lists which gauge the boundaries considered similarly [8]. Like to pick the stocks positioning savvy (in view of 2-3 unique boundaries).

Let gj(a) be the estimation of a measure j for a choice a. We note dj (a, b), the distinction of estimation of a rule j for two choices an and b.

\[ d_j(a, b) = g_j(a) - g_j(b) \] (1)
\( P_j(a, b) \) \( a,b \) is the estimation of the inclination level of a standard \( j \) for two choices \( a \) and \( b \). The inclination capacities used to figure these inclination degrees are characterized, for example

\[
P_j(a, b) = F(d_j(a, b)) \quad \text{with} \quad \forall x \in [-\infty, \infty], \ 0 \leq F(x) \leq 1
\]

(2)

Leave C alone the arrangement of thought about standards and \( w_j \) the weight related to the basis \( j \). The worldwide inclination record for a couple of conceivable choice \( a \) and \( b \) is registered as follows:

\[
\pi(a, b) = \sum_{j \in C} w_j \times P_j(a, b)
\]

(3)

For each possible decision \( a \), we compute the positive outranking flow \( \phi^+(a) \) and the negative outranking flow \( \phi^-(a) \) \([7]\). Leave \( A_n \) alone the arrangement of potential choices and \( n \) the quantity of potential choices. The positive outclassing stream of a potential choice \( a \) is processed by the accompanying formulae:

\[
\phi^+(a) = \frac{i}{n-1} = \sum_{x \in A} \pi(a, x)
\]

(4)

The negative outranking flow of a possible decision computed by the following formulae:

\[
\phi^-(a) = \frac{i}{n-1} = \sum_{x \in A} \pi(x, a)
\]

(5)

The PROMETHEE I partial preorder \( (P^\sim, \Pi, R) \) is then obtained by considering the intersection of these two preorders:

\[
\begin{cases}
  aP_1 b & \text{(a outranks b)} \\
  aP_2 b & \text{(a is indifferent to b)} \\
  aP_3 b & \text{(a and b are incomparable)}
\end{cases}
\]

(6)

5. **Industries and Companies Ranking (Fundamental Analysis)**

The required data in the PROMETHEE method are: Effective criteria in evaluation: these criteria are the foundation of ranking and have been extracted through the study of literature and surveying decision-making process in one of the Tehran investment and stock exchange companies \([5]\). Then, using a questionnaire, the necessity of using expert views is asked. Weight or relative importance of criteria: this weight will be provided with the help of the information obtained from the questionnaire where weights of criteria are calculated using the effects of their interaction on each other.

Type of criterion (max / min): other required information about the criteria, is its type which was considered using questionnaire and integrating experts views for each criterion. Preference function for each criterion: preference function in The PROMETHEE method depends much on the nature of the criterion and on the view of the decision maker \([8]\). For this purpose there are six standard preference functions that take into consideration most applications.

6. **Methodology**

- A dataset containing all the fundamental analysis like the dept of the company and the market capitalization, the long term assets, cash and cash equivalents are taken out from that Dataset all the company names which fit the criterias are filtered using the if else statement or the criterias set in place in multiple steps\([15]\) . And each step filtering for a new criterias and storing into the same table.
- We want to extract the dataset out of all this for all the criterias one by one and the final dataset to meet all the criterias above like for example all the stocks where the market capitalization is more than 10 Billion, the P/E ratio is less than 5 , is only in industry with a lot of stability.
- It is only a famous name and last one if it has to be included (This wasn't included for the thought), it has huge protection in its industry (referred to as moat) and a good balance sheet.
But what happens sometimes is a stock when its price is 1000 and another stock with equal market cap but with a price of 10 and kept in an index a 10% rise in stock A will give a total of 1110 or almost a 10% return but when Stock B rises in the index for 10 percent it becomes 1011 or a total rise of almost 0.001%.

7. Proposed system and proposed algorithm

In the event that leaders were dubious of standards loads and/or foresee a danger factor of high seriousness that could influence rules loads. On the off chance that chiefs were questionable of execution measures and/or foresee a danger factor of high seriousness that could influence execution measures. In the event that chiefs were unsure and/or foresee a danger factor of high seriousness that could influence the two standards loads and execution measures [9]. At whatever point two choices were imperative from one another in the ultimate result, they had distinctive execution measures as for standards. In the event that an elective scores most noteworthy on the most significant measure or rules and didn't have horrible showings on others. For a choice to be positioned first in an equivalent rules weight decisional issue [12].

The proposed model is organized around two columns: Industry assessment and Company assessment. The inclination positioning association technique for enhancement assessment (PROMETHEE) has been utilized for tackling the issue [6]. As a genuine case and an overview from the specialists so as to decide the viable measures for industry assessment and friends assessment has been directed. Theoretically, technical analysis tries to predict the trend of stock price using data on prices and trading volume over the last. The main problem with this approach is that it highly relies on empirical regularities based on price and volume movements [3].

There are many other ways in which higher returns can be achieved rather than just risking everything. Stock market also doesn't need Any news Good or bad to affect its price as suggested because there has been countless cases where company prices have crashed despite showing high rates of return , because there was negative sentiment in market , and pump and dump schemes do exist where good news has nothing to do with good news but with the volume . As observed in the recent Covid-19 Pandemic the Stock market rose 44 % from the period of march to june 2020 when all businesses were going bankrupt, Travel was banned, consumer spending was the least and the unemployment rate was the highest it has ever been. [5].The proposed system suggests that investing in a stock market can be done on fundamental analysis and altho the market is Volatile in the short term, in the long term it returns to the fundamentals as the Stocks with the best fundamentals seem to return higher percentage gain overtime than the Standard benchmark S&P 500 . Hence, Disproving the Efficient Market Hypothesis according to which stocks can return a higher percentage over the market in the long term and are dependent on pure chance of luck as the market depends on News and News by definition is Unpredictable. Filtering out stocks by selecting the good fundamentals and ranking them using Multiple Criteria Decision making methods like PROMETHEE returns a higher percentage return over the Market in long term. Various types for Multiple-criteria decision analysis are shown in ‘Fig 7’.

Types of MCDM

![Figure 7. Proposed Working of the Model](image-url)
8. Result and analysis

The Model gave following result after Testing:

Testing Mean Squared Error: 1.278
Symmetric mean absolute percentage error: 10.110

The Higher Percentage return over 10 years for the Stock Index chosen by observing the Fundamentals of the stocks and aggregating them to find index (i.e around 1000% rise over 10 Years ) being 2-3 times higher than the Market proves our Hypothesis that EMH is faulty by negating its clause that One can’t outperform the market over a long period of time unless provided with some sort of Insider information and also Fundamentals of Stocks are not of much use as the price of stocks depend on the new news with by definition can’t be predicted.

9. Conclusion

Decision-making process involves setting goals, gathering relevant information and reviewing and evaluating information related to alternatives. After performing factor analysis on the first questionnaire (evaluating industries criteria) weights of the remaining criteria should be calculated based on their mutual influence on each other [14].

There are many things which are assumed as EMH says there is no way to outperform the market but as we know for a fact using the given index that the indexes with good filtering criteria can outperform the market in long term. According to the theory everything is efficient then bubbles shouldn’t exist, but as we know there have been many many cases when the stock market crashed and recessions have hit, and it also has been proven that undervalued stocks can be picked.

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