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Techniques in Analyzing Stock Market

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Abstract
The stock market forecast includes forecasting the future value of the company's shares or other financial instruments traded on the stock exchange. Different types of trading can be performed on the stock exchange. It can be a short-term trade or even a long-term trade, but if someone can predict the value or valuation of this company it can bring a very good return on investment. Before the development of the digital world, predictors continued to use paper-based working methods such as fundamental and technical analysis. Various useful technical indicators such as SMA, EMA, and MACD have proven to be very useful; however, with the advent of computer technology and prediction algorithms, they have moved into the technological field. Analysts began by building a prediction system with a neural network, a tracking vector machine, decision trees, and a hidden Markov model. Prediction accuracy is improved by using an algorithmic approach and evolutionary data mining techniques used to predict the stock market.
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1. Introduction

Stock market forecasts have always attracted researchers. Although many scientific experiments have been conducted, no method has been found that can accurately predict movements in stock price. The objective of any financial investment is to achieve an above-average return on investment while maintaining a certain level of risk [1], but the difficult prediction lies in the complexity of modeling market dynamics. Despite the lack of the latest forecasting methods, some modest successes have been achieved. Exchange research encompasses two basic business philosophies as basic and technical approaches. The basic analysis assumes that the price movement in the stock market is based on the relative data of the security. Fundamentalists use numerical data such as income, trade, and management efficiency to determine future projections. In technical analysis, time to market is considered critical. Technicians use graphical and technical models to identify prices and quantitative trends. These latter individuals rely on historical data to predict future outcomes [2]. One area of limited success in market forecasting comes from text data. Data from quarterly reports or breaking news can drastically affect the entire equity portfolio. The most interesting literature on financial text extraction is based on the identification of a predefined set of keywords and machine learning techniques. These methods typically weigh keywords concerning stock price movements. This type of analysis has shown a clear but weak ability to predict stock prices.

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2. Fundamental Analysis

The basic business-level analysis includes financial data analysis, management reporting, business concepts, and competition. In addition, the relationship between the data in accounting and important characteristics such as revenue growth and the relationship between price and book value is examined [3], [4]. At the industrial level, it is possible to study the forces in supply and demand of the products offered. At the economic level, a basic analysis can refer to economic data to assess current and future economic growth. To predict future stock prices, a basic analysis combines economic, industrial, and business analysis [5], [6], [7] and subtracts the actual value and estimated value of the stock. If the fair value does not match the current share price, basic analysts assume that the stock is overvalued or undervalued and that the market price will eventually move towards fair value. Fundamentalists ignore arbitrary opinions and believe that markets are weak in terms of efficiency. Basic analysts, who believe that prices do not accurately reflect all available information, try to take advantage of perceived price differences. Different aspects of basic analysis is business plan management, management, and financial analysis. The advantage of fundamental analysis is the identification of a long-term trend. It also helps to discover companies with valuable assets, strong balances, and stable income.

Technical Analysis

A large number of technical indicators are available for technical analysis. They use various statistics generated on the market such as B. Closing prices from the history, amount traded. In the early 1960s and 1970s, several researchers examined TI-based business rules. Although they are very useful [8], [9], recent studies [10], [11] show that they are very useful. Frequently used TIs are Simple Moving Averages (SMA), Exponential Moving Averages (EMA), Moving Average Convergence (MACD), Exponential Moving Averages (EMA), and Relative Strength Indices (RSI). This estimator, which relies on the principle of maximum likelihood, is primarily the

common method for obtaining a practical estimator. It has the clear advantage of being a crank turning procedure, which allows you to implement it for complicated estimation problems [15].

3. Opinion Mining

With the growth of the web over the past decade, opinions can be found almost everywhere: on blogs, social networks like Facebook and Twitter, news portals, and e-commerce sites. While opinions should help, when there is just too much to handle, the availability of such opinions to users becomes overwhelming. The easiest way to summarize an opinion is the result of emotional predictions. The task of predicting votes or ratings has been studied for many years. In addition to such summaries, newer generations of opinion summaries also contain structured summaries breakdown by aspects, various formats of textual summaries, and temporal visualization.

3. Machine Learning Methods

Artificial Neural Network (ANN): It has several benefits, but one of the most popular is the fact that you can learn by looking at datasets. In this way, KNN is known as the access limit of random functions. These types of tools will help you find the ideal and most convenient methods for finding solutions for defining arithmetic functions or distributions. ANN uses data samples rather than complete data sets to find a solution, saving time and money. ANNs are considered relatively simple mathematical models to improve the efficiency of available data analysis technologies. KNN consists of three layers. These layers are connected. The first layer consists of input neurons. These neurons send data to the second layer, which in turn sends the output neurons to the third layer. Artificial neural network training involves choosing acceptable models containing multiple algorithms.

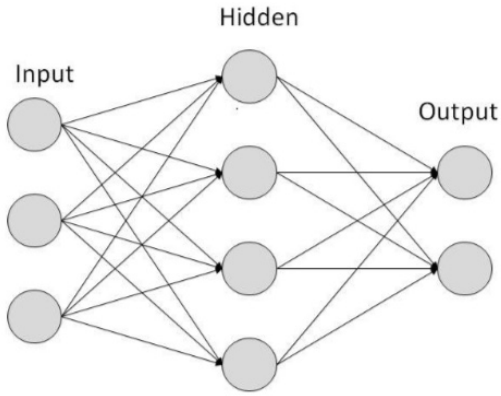

Figure 1: Artificial Neural Network

Phua [12] used a neural network for financial forecasts. The effect of volume data on the stock price forecast was tested. Khan [13] used a neural network with different numbers of hidden layers to analyze stock price prediction. Supports vector machine (SVM). Although SVM can be used for various optimizations, such as Typical data Classification problems, such as regression, are common problems. The basic idea is shown in Figure 2. Data points are identified as positive or negative and the problem is finding and hyper planing. This plane separates the data from the maximum edge point. SVM falls into the category of supervised machine learning algorithms that can be used for classification and regression challenges. However, scientists use it mainly for classification problems. In this algorithm, we draw each data element as a point in n-dimensional space, where the values of each function are values and certain coordinates. Then we perform the classification by finding the hyperplane, which divides it very well into classes.

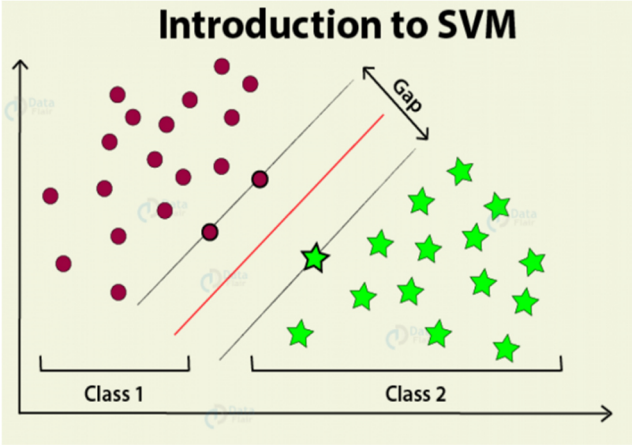

Figure 2: Support Vector Machine

The figure above shows a two-dimensional case in which data points can be separated linearly. The SVM approaches linear regression, which means it minimizes unresponsive losses and is minimal with normalized linear parameters. It is possible to formally request an extension of the access road to the access road from the zone to the access road. The hidden model Mark machine is conditioned by the completion. It has a fixed number of states. This is a series of solutions that change a wide range of possibilities. Markov's hidden models were introduced in the early 1970s. I use it as a speech recognition tool. This model based on statistical methods is one of the most popular and used languages for building mathematical structures, such as the application of the latest methods.

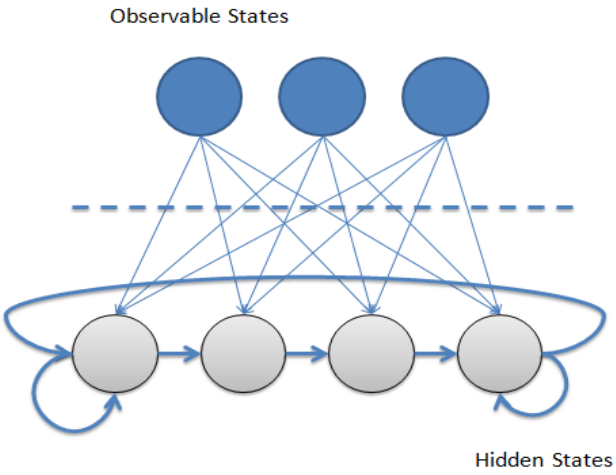

Figure 3: Hidden Markov Model

Recently, researchers have proposed HMM as a classifier or predictor for speech signal recognition, DNA sequence analysis, manual character recognition, and natural language domains. It proves that HMM is a very effective tool for various uses. The advantages of HMM can be summarized as follows:

• HMM has a solid statistical basis
• Can process new data reliably
• Efficient computer for development and evaluation
• Can predict similar patterns effectively

Decision trees form classification or regression models in the form of a tree structure. Divide the data set into smaller and then smaller subsets and gradually develop a cohesive decision tree. The end result is a tree with decision nodes and leaf nodes. The decision node has two or more branches. A list node represents a classification or decision. The highest decision node in the tree that corresponds to the best prediction is called the root node. Decision trees can handle categories and numeric data.

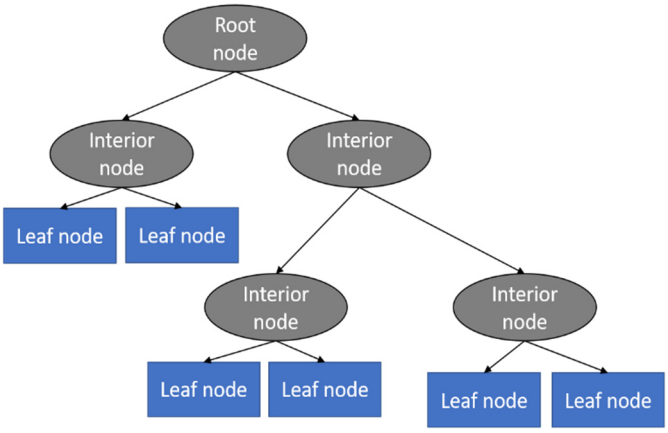

Figure 4: Decision Tree

A decision tree is built top-down from a root node and involves partitioning the data into subsets that contain instances with similar values. ID3 algorithm uses entropy to calculate the homogeneity of the sample. If the sample is completely homogeneous the entropy is zero and if the sample is equally divided it has an entropy of one. The information gain is based on the decrease in entropy when a dataset is split on an attribute. The construction of a decision tree is all about finding attribute that returns the highest information gain.

4. Conclusion

This article concludes that although several approaches and techniques are available to increase the return on investment in the stock market, each method has its advantages and limitations. Fundamental analysis helps to find the intrinsic value of a stock, but after a long time, it is not profitable for the trade. Indicators close to prevention technology and future price levels by observation and past patterns, and therefore are used for long-term trading and short-term trading. SMA smooths out price movements by removing most counterfeits, which also delays buy and sell signals. EMA ridicules delays by favoring recent precedents, so it is better than SMA in terms of recent market movements. The advantage of using RSI is that it immediately indicates overbought and oversold levels to traders, but because the indicator shows momentum as long as momentum remains strong, the indicator can remain in the overbought or oversold territory for a long time. Therefore, a price analysis or other confirmation is still required for the investment. The MACD indicator is a trend indicator. With mobile media it is possible to find a trend using MACD, it is possible to determine the strength of the trend and the possibility of solar energy, but it is difficult to find investment in the market using MACD. Thanks to the usefulness and nature of man, the tradition of opinion have become an area of active research. As the volume of the data manager increases, it is always important to analyze and summarize the responsible data. That's why I came to offer you many types of opinion synthesis techniques. Machine learning methods also have the advantages and limitations of parrots. The neural network is indeed an adaptive teaching method with a well-organized structure, but sometimes it approaches the local minima in the optimization problem. Congestion is another neural network problem. Over-fit also occurs in complex decision trees. Learning difficult concepts can be difficult in decision trees. The learning model parameter is another limitation in decision trees. HMM uses a large number of parameters, which leads to a large amount of data needed for its training. Although SVMs have good generalization performance, they can be slow in the testing phase. Although with limitations for all non-algorithmic techniques, when properly applied, we can predict stock market prices to some extent, the use of a machine learning algorithm has shown better results. We can effectively predict value and trends.

References

1. Yu-Feng Lin, Chien-Feng Huang, Vincent S. Tseng. (2012). A Novel Methodology for Stock Investment using Episode Mining and Technical Indicators. Conference on Technologies and Application of Artificial Intelligence.
2. Vivek Rajput, Sarika Bobde. (2016). Stock Market Forecasting Techniques: Literature Survey. International Journal of Computer Science and Mobile Computing. Vol 5, Issue. 6, pp. 500-506.
3. John Sneed “Estimating earning forecasting model using fundamental analysis: Controlling for different across industries”, American business review, pp. 17-24, 1999.
4. Vanstone B., Finnie G., and Tan. C., “Applying fundamental analysis and neural network in the Australian stock market”, Proceeding of the international conference on Artificial intelligence in Science and Technology, Hobart, Tasmania, pp. 21-25, November 2004.
5. E.I. Altman, “Financial ratios, discriminate analysis and the prediction of corporate bankruptcy”, Journal of Finance, vol. 23, 1968, pp. 589-609.

6. S.P. Kothari., "Capital markets research in accounting ", Journal of Accounting and Economics, vol. 31, 2001, pp.105-231.
7. D. Nissim and S.H. Penman., "Ratio analysis and equity valuation: from research to practice", Review of Accounting Studies, vol. 6, pp. 109-154.
8. Alexander S. (1961), "Price movements in speculative markets: trends or random walks, Industrial Management Review, pp. 7-26.
9. Fama E.F. and Blume M.E., (1966), "Filter Rules and Stock-Market Trading", Journal of Business, 39, Part 2: Supplement on Security Pricing, pp 226-241.
10. Fernandez-Blanco, P., Bodas-Sagi, D. J., Soltero, F. J., and Hidalgo, J.I., 2008, "Technical market indicators optimization using an evolutionary algorithm.
11. Bodas-Sagi, D. J., Fernandez, P., Hidalgo, J.I., Soltero. F.J., (2009), "Multi-objective optimization of technical market indicators.
12. X. Wang, P.K.H. Phua and W. Lin., "Stock market prediction using neural networks: does trading volume help in short-term prediction", in Neural Networks, 2003. Proceedings of the International Joint Conference on, vol.4 IEEE, 2003, pp. 2438-2442.
13. A.U. Khan, "Stock rate prediction using backpropagation algorithm: Analyzing the prediction accuracy with a different number of hidden layers", Glow gift, 2005.
14. Luigi Troiano, Pravesh Kriplani, "Predict Trend in the Next-Day Market by Hierarchical Hidden Markov Model".
15. Agordzo, G.K., Ammah, A.H., Derrick, Y., & Israel, A. (2020). An Alternative to the MVU Estimator to Estimate the Level of DC in AWGN. Innovative Systems Design and Engineering, 11, 42-45.