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Research Paper

Evaluation of the Accuracy of Support Vector Machine based on Genetic Algorithm Compared to Common Linear Methods in Forecasting Earnings Per Share[1]

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INTRODUCTION

Information about earnings and projected earnings per share is considered crucial from the perspective of many users. Therefore, to attract investors, companies strive to predict the profit of each share with the greatest accuracy. However, accurately forecasting the profit of each share is a challenging task in the financial field despite the numerous methods available. Most researchers aim to determine the best method for profit forecasting. Consequently, the primary goal of this research is to investigate the accuracy of the support vector machine based on the genetic algorithm compared to common linear methods in predicting the profit of each share. The research seeks to answer the following questions: What is the ability of the support vector machine based on the kernel function in predicting the profit of each share? What is the ability of the combined method, predicting the support vector machine based on the genetic algorithm, in predicting the profit of each share? What is the ability of the panel

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regression method to predict the profit per share? Is the combined ability and performance of the support vector machine prediction method based on the genetic algorithm better than the support vector machine method based on the kernel function and the conventional prediction method (panel regression method)?

MATERIALS AND METHODS

In terms of its purpose, the current research is classified as applied research. The statistical sample comprises companies listed on the Tehran Stock Exchange. After gathering the information, 100 companies remained from the target population, constituting a total of 1,200 company-years between 1387 and 1398.

In this research, three methods—combined support vector machine model based on the genetic algorithm, support vector machine, and linear regression—have been employed to predict profit. Subsequently, after designing the models, predicting the results, and calculating the error rates for all three models, their prediction accuracies have been compared. MATLAB and Molder software were utilized for designing artificial intelligence models and estimating them.

To achieve the research goals, a review of previous studies in the field of profit forecasting led to the selection of 14 financial ratios influencing profit forecasting. Subsequently, to devise a model for predicting company profitability, a comparison was made among the combined model of support vector machine based on the genetic algorithm, support vector machine, and linear regression.

RESULTS AND DISCUSSION

Research findings related to the first hypothesis indicate that, in investigating the ability of the support vector machine based on the kernel function to predict the profit of each share, the linear, polynomial, RBF, and circular kernel support vector machine models revealed that the most influential variable in profit prediction is the dividend per share, while company size, financial leverage, and asset growth have the least impact on profit prediction. This result suggests that the dividend of each share contains valuable information. Additionally, among the four support vector machine functions (RBF function, polynomial, cyclic, and linear), the support vector machine based on the RBF kernel function demonstrated the best performance with a prediction accuracy of 82%.

Research findings pertaining to the second hypothesis, which examined the ability of the combined method of support vector machine prediction based on the genetic algorithm in profit prediction, showed that the accuracy of the combined model in profit prediction is 84%, indicating good performance. Furthermore, the results revealed that in the combined support vector machine model based on the genetic algorithm, the most influential variables in predicting profit are the dividend per share, profit per share, and rate of return.

Regarding the third hypothesis, which evaluated the accuracy of common panel linear regression methods in predicting profit per share, the findings showed that the F statistic of the research regression model has a probability less than 0.05 at a significant level, confirming with 95% confidence that the model is significant. The results indicated a significant and direct relationship between the variables of dividend, gross profit, average profit per share, current profit per share, operating cash flow, company size, asset growth, stock return, asset return rate, residual profit, and the economic added value with profit per share. The regression model explained 65% of the changes in the dependent variable.

Concerning the fourth hypothesis, which assessed the reliability and ability of the combined support vector machine prediction method based on the genetic algorithm compared to the support vector machine methods based on the kernel function and panel regression, the findings revealed that the ability of the combined model of the support vector machine based on the algorithm surpasses other methods. Following the combined method are support vector machine models based on the RBF kernel function, polynomial, and circular, with panel regression at the end, based on the percentage of correctly predicted profits for each share.

CONCLUSION

The research results demonstrated that the combined support vector machine model based on the genetic algorithm exhibited superior performance in predicting the movement trend of profit per share compared to the support vector machine model based on kernel functions and the linear regression method, achieving higher accuracy.

This outcome suggests that the combined support vector machine model based on the algorithm significantly enhances the predictive power of profit, as evidenced by its better performance criteria. Essentially, the integration of the genetic algorithm with

support vector machine proves effective in selecting influential input variables and minimizing the impact of ineffective ones.

Keywords: Earnings Per Share, Support Vector Machine, Genetic Algorithm, Linear Models.

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