ISSN 2616-5775 Vol. 5, Issue 4: 41-45, DOI: 10.25236/AJCIS.2022.050407

Optimization Model for Gold and Bitcoin Value Based on Neural Network and Greedy Algorithm

Yage Ren, Jiangxue Li

Xuchang University, Xuchang, Henan, 461000, China

Abstract: *Trading strategies based on the technical analysis are widely employed in the fifinancial markets in order to maximize the total return of market traders. This paper proposes an optimization model for gold and bitcoin investment that gives the best daily trading strategy by analyzing the price data. We employed time series ARIMA model, and BP neural network to forecast the closing price. With the help of MATLAB and SPSS software, the respective forecast values and model evaluation indexes are calculated. The errors of the corresponding models are analyzed, and the predicted value of BP neural network is the closest to the true value through comprehensive analysis.*

Keywords: *BP neural network; Greedy algorithm; Control variable method; Optimization model of gold and bitcoin investment*

1. Introduction

Market trading cannot operate without the analysis and prediction of data. It is certainly an icing on the cake for the development of the market economy to dig out more meaningful values for trading through known data. More precisely, to get the most out of it, it is necessary to know the daily transactions that need to be transferred in and out of gold and bitcoin, and the daily prices of gold and bitcoin are floating, and gold can only be traded when the market is open, and bitcoin can be traded every day, so a very reasonable and specific trading strategy is often needed to further increase the returns. In order to obtain the optimal daily transaction, we need to predict the closing price of gold and bitcoin tomorrow. In this paper, exponential smoothing method, time series ARIMA and BP neural network are used to predict the closing price of gold and bitcoin tomorrow.

2. Data preprocessing

Before establishing the model, we should consider the accuracy of the data. First, we use jupyter to test the data by repeated value, missing value and predicted value. After inspection, there are no duplicate and abnormal values in the data.

Because the exponential smoothing method can quickly reflect the changes of the actual value of the market, the exponential smoothing method can predict the closing prices of bitcoin and gold in the short term in the future. In this forecast, the primary index smoothing method, the secondary index smoothing method and the tertiary index smoothing method are selected. Taking gold as an example, the gold closing price up to that day is analyzed. Because the fluctuation of the gold closing price is relatively stable, the value of α is 0.2, and the gold closing price of tomorrow is predicted.

The above three exponential smoothing methods are completed by Excel. The prediction effects of the three exponential smoothing methods are compared, as shown in Figure 1.

ISSN 2616-5775 Vol. 5, Issue 4: 41-45, DOI: 10.25236/AJCIS.2022.050407

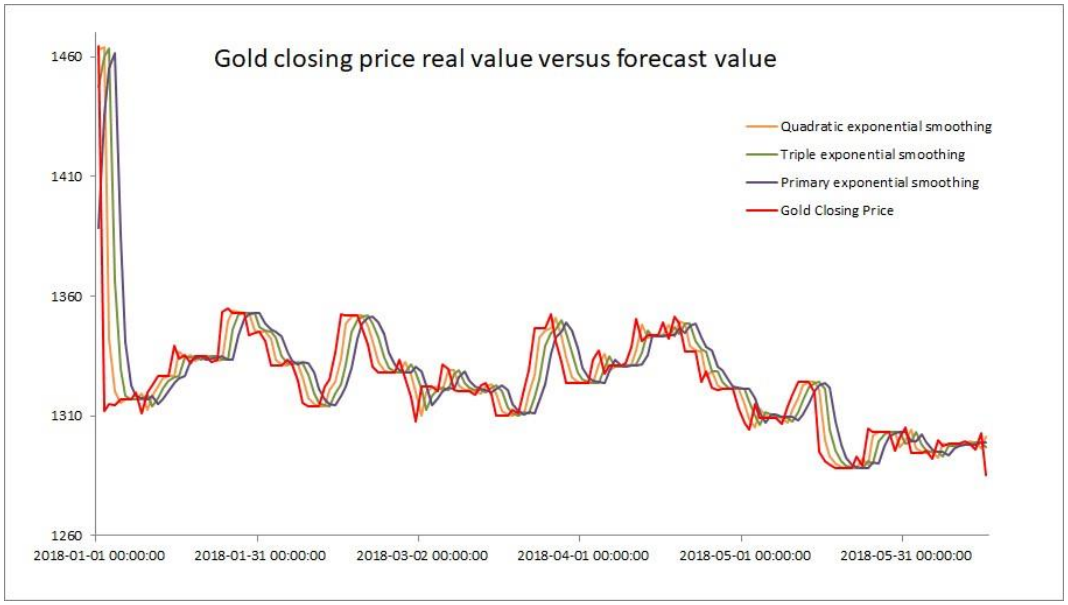

Figure 1: Gold closing price real value versus forecast calue

From the graph, we can see that when α is the same, under the comparison of three exponential smoothing methods, the predicted value of the quadratic exponential smoothing method is the closest to the true value with the smallest standard deviation, the predicted value of the primary exponential smoothing is the least close to the true value with the largest error, and the predicted value of the tertiary exponential smoothing is average, thus we choose the predicted value of the quadratic exponential smoothing method to compare with the predicted value of the time series and the predicted value of the BP neural network to select the optimal predicted value.

3. Time series

Since the closing prices of bitcoin and gold are arranged according to time, it can form a time series. The change trend and change law of the closing prices of bitcoin and gold can be inferred from the change law of the composition sequence. This paper uses the ARIMA model of time series to predict the closing prices of bitcoin and gold in the future.

This question uses matle, spss to do prediction, first need to observe the past closing price of bitcoin and gold trends, to predict the closing price of bitcoin and gold on November 13, 2020 as an example, there are Figure 2 can be seen, the closing trend of bitcoin and gold is unstable.

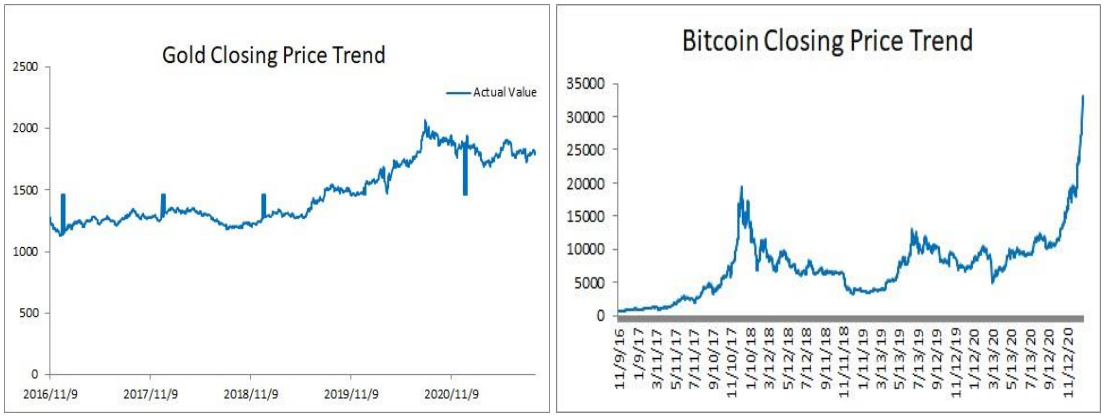

Figure 2: Gold and Bitcoin Closing Price Trends

In the first step, the closing prices of bitcoin and gold are fixed order, and the data are differenced to the twelfth order and tested for smoothness. The series can be roughly judged stable by the difference and autocorrelation plots, and the series is found to be smooth after using the adftest-function test. In the second step, white noise test is performed. Use spss to make the residual plot of gold closing price, by Figure 3 can be seen that the residual of gold is white noise, the lag order of bitcoin's correlation

ISSN 2616-5775 Vol. 5, Issue 4: 41-45, DOI: 10.25236/AJCIS.2022.050407

coefficient and partial autocorrelation coefficient and 0 have a significant difference, that the residual of bitcoin is not white noise, can not predict the future closing price of bitcoin very well.

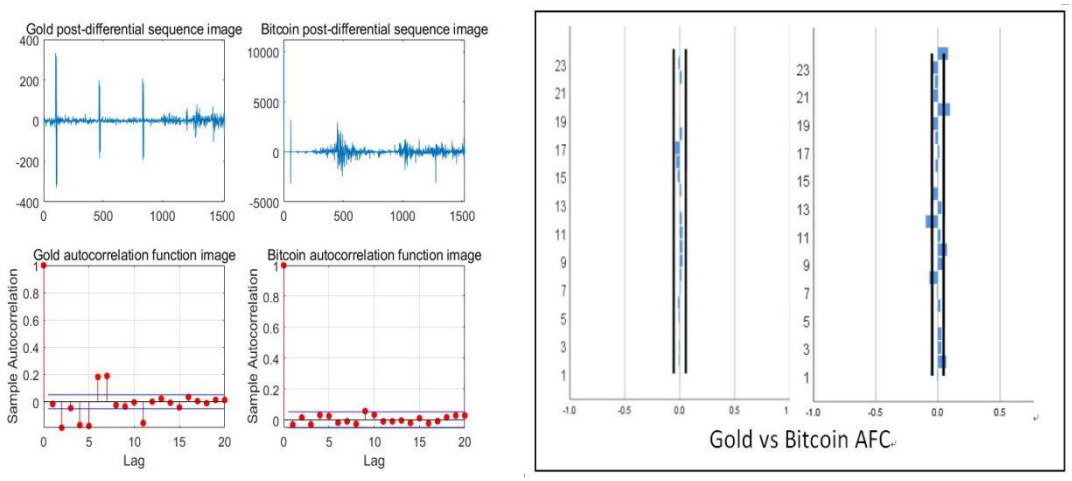

Figure 3: Indicator Charts for Gold and Bitcoin

We can see that the accuracy of time series prediction is not high, and the bitcoin model cannot predict the future closing price of bitcoin well, so BP neural network is used to predict the future closing price of gold and bitcoin and compare it with the predicted value of quadratic exponential smoothing method.

4. PB Neural Network

BP neural network is a mathematical model that simulates a way of human thinking so that it has a certain predictive function, due to its self-learning ability adaptive ability and better fault tolerance, etc. According to the requirements of the topic, this paper uses this method to analyze and predict the future closing price of the stock. Using MATLAB neural network toolbox, a network is created and trained and its performance is evaluated using mean square error and regression analysis.

The BP (Back Propagation) network, proposed by a group of scientists led by Rumelhart and McCelland in 1986, is a multilayer feedforward network trained by an error back propagation algorithm and is one of the most widely used neural network models. The BP network learns and stores a large number of input-output pattern mapping relations without revealing the mathematical equations describing such mapping relations beforehand. The topology of the BP neural network model consists of an input layer, a hidden layer and an output layer. The network structure of the stock closing price prediction model developed in this paper is shown in Figure 5 below.

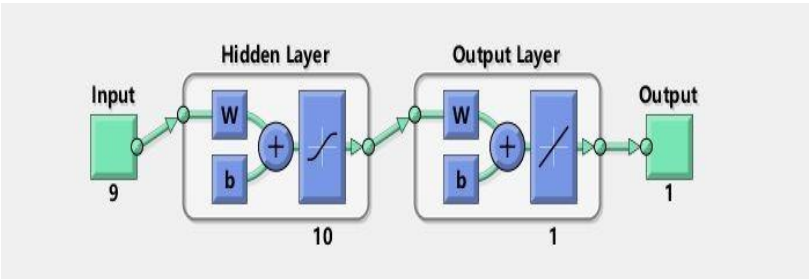

Figure 4: Neural network model structure diagram

The input layer of the neural network is constructed by selecting multiple indicators. Since the data contain only the closing prices of gold and bitcoin on that day, it is necessary to construct indicators in order to construct the input layer of the neural network and construct the exponential average (EMA), Calculate the smoothing factor:$\alpha N = N2+1$Immature Stochastic Value (RSV), KDJ Stochastics, etc.

Based on the nine indicators constructed as the input layer, Figure 5 illustrates the relationship between the input and output of the neural network. The closing price is used as the output layer to divide 70% of the number of samples as training data, 15% as validation data, and 15% as test data, and the number of hidden neurons is set to 10, and the Levenberg-Marquardt algorithm method is used for training. Finally, Mean Squared Error plot and regression plot are obtained. Taking gold as an example.

ISSN 2616-5775 Vol. 5, Issue 4: 41-45, DOI: 10.25236/AJCIS.2022.050407

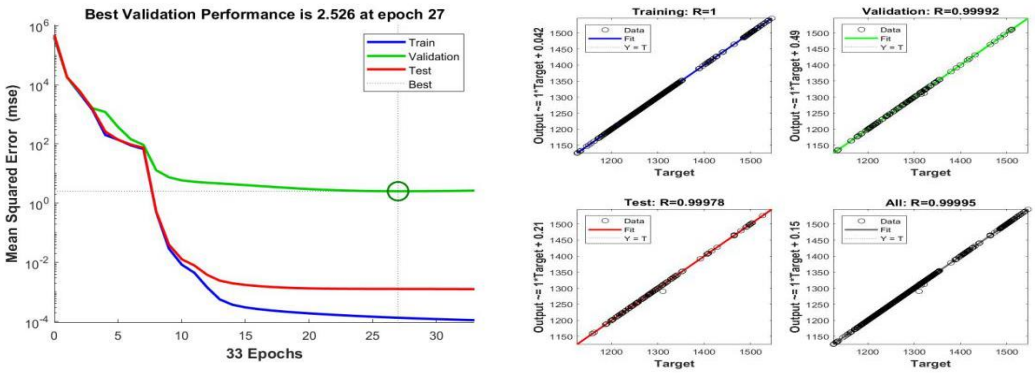

Figure 5: Neural Network Metrics Chart

The graph on the left shows the best models for the minimum MSE corresponding to gold and bitcoin. The graph on the right regresses the fitted values on the true values, and the better the fit is close to 1 means the better the fit is. The corresponding visualization of the forecast results based on the gold and bitcoin price forecasts versus the daily closing prices can be plotted as shown in Figure 6 below.

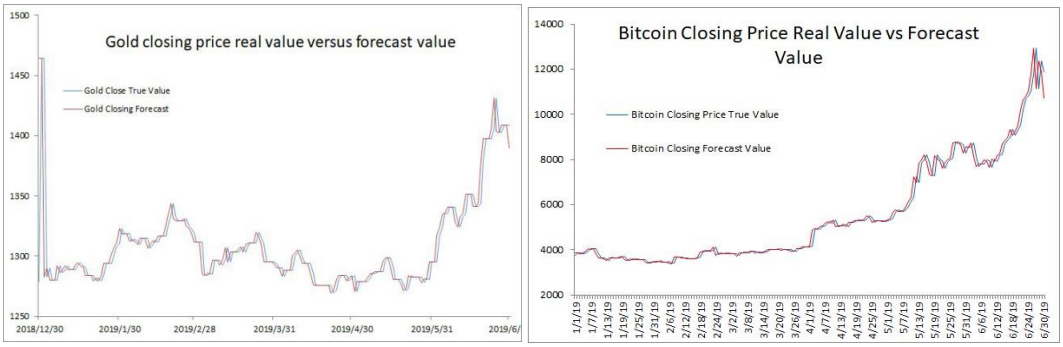

Figure 6: BP neural network actual value versus predicted value trend

There is no specific effective software and method for predicting quotes for gold and bitcoin, and multiple methods can be used to predict them.

In predicting the market, it relies on personal experience and skills, technical analysis software only provides some reference for analysts and has a limited role. Therefore, you will see that for the same market, different companies give sometimes very different trend forecasts. Gold and bitcoin forecasts have a lot of data to be counted and analyzed all the time. Even though forecasting trends is a comprehensive art, the comprehensive art is a combination of various studies.

In this paper, the future outgoing prices are predicted by exponential smoothing, time series and BP neural network, respectively. Due to the excessive error of time series prediction and the non-white noise residuals of bitcoin, the predicted values of the secondary exponential smoothing and BP neural network are considered first.

Taking gold as an example, since the RMSE derived from the quadratic exponential method = 1.627097 and the RMSE of the BP neural network = 1.263, it shows that the predicted value of the BP neural network is more accurate. And from the comparison of each trend line in Figure 12, it is found that the predicted value of BP neural network is closer to the real value, so the predicted value of BP neural network is chosen for the subsequent model data.

5. Sensitivity Analysis

Because of the limitations of the given data, the parameters are often based on estimates or forecasts and therefore subject to errors. In order to analyze the impact of these subjective factors, we chose to vary the ratio of the commission for investing in gold and bitcoin slightly, setting the interval of variation of the commission to [0.01,0.05], varying it with a frequency of 0.01 and observing the resulting consequences. The overall return on the 0.01-0.05 bitcoin (gold) fee ratio is obtained by fixing the gold (bitcoin) fee ratio separately and plotting a line graph based on the data for easy analysis, as follows.

ISSN 2616-5775 Vol. 5, Issue 4: 41-45, DOI: 10.25236/AJCIS.2022.050407

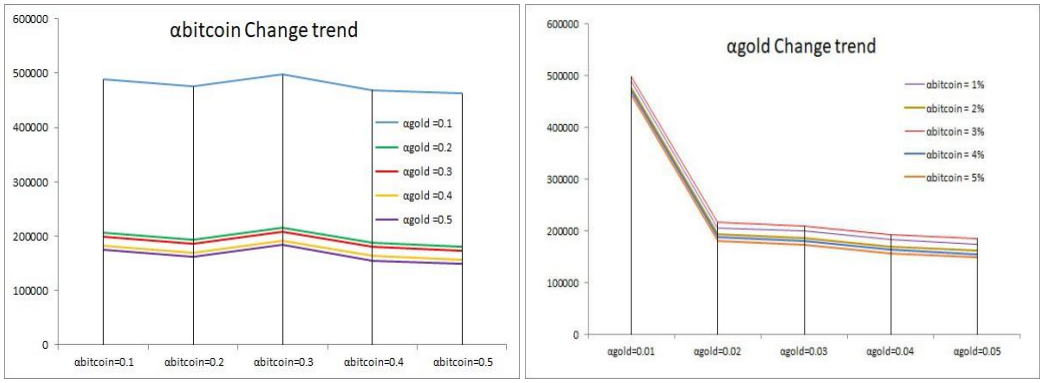

Figure 7: Gold and bitcoin commission ratio change chart

As shown in Figure 7 the meaning of the lines in the graph is that each line is the trend of the fixed commission percentage of bitcoin as the commission percentage of gold increases, there are graphs can be seen in the fixed commission percentage of bitcoin as the commission percentage of gold increases on the overall return is not significant, in the same bitcoin commission conditions, αgold = 0.03 when the final return is higher, in αbitcoin=0.01, αgold=0.03 when the final return is the highest.

As shown in Figure 10 under the commission ratio of fixed gold, the overall return tends to decrease as αbitcoin increases, and decreases faster in the interval of [0.01,0.02], indicating that when the commission of bitcoin is in that range has a greater impact on the overall return. Above 0.02 it tends to plateau. Under the same commission condition for gold, the final return is higher at αbitcoin=0.01 and the final return is highest at αbitcoin=0.01 and αgold=0.03.

6. Further Discussion

And for the moment, although the retail hall of each securities business department is popular, most people are still keen to discuss old banker stocks, ST stocks and other topics, investment thinking to be converted.

For the current market, the extreme volume of volume indicates that the market is more divergent. Short-term shocks will inevitably continue. Investors can adjust their positions appropriately, reduce the previous increase of too much stock, intervention in some of the stocks that have not yet started. For the medium-term trend of the general market, you can still remain optimistic.

The development and existence of trends in the markets for gold and bitcoin are constantly changing. By the chart of gold and bitcoin in five years, it can be seen that the closing price of gold can basically tend to stabilize, and the closing price of bitcoin is significantly more floating.

The current hot account opening situation is undoubtedly closely related to the active trading market sentiment. However, it is important to note that the closing price changes of gold and bitcoin, although up pleasingly, are unevenly cold, with almost half the number of bulls and half the number of bears. Without a professional investment vision, accurate grasp of individual stocks and certain investment skills, even in such a hot market, earning the index without making money, there are many people. The newcomer, while aiming for the benefits, must not leave the investment risk aside.

References

[1] Cha Bo, A study on the optimization problem of venture capital contracts under the behavior of changing capital use of startups [J]. Systems Engineering, 2021: 1-13.
[2] Xu Rui, Han Feng Xia. Research progress and application of BP neural network for predicting property prices along subway lines [J]. Sichuan building materials, 2021, 47(12): 172-175+177.
[3] Liu Zhiqian. Markov chain-based stock price volatility prediction [J]. Cooperative Economics and Technology, 2021, (24): 64-67.
[4] Zeng Ni, Chen Junhao, Fu Qingxin. A dynamic planning strategy based on greedy algorithm [J]. Computer Knowledge and Technology, 2021, 17(20): 141-143+152.
[5] Guo Qiansheng, Li Dong, Zhang Lei, Wei Chuyuan. A time series prediction model based on point-in-time process [J]. Computer Engineering and Science, 2021, 43(07): 1299-1307.