

Research on the Trading Strategies for Maximizing the Value of Assets in Quantitative Trading

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Abstract: This study focuses on trading strategies for maximizing the value of assets, when traders buy, sell and hold bitcoin and gold daily. We have built a price forecasting model using Multiple Linear Regression (MLR) theory, and an executable trading model to provide daily trading orders. First, a 5-year data of daily prices were checked and few of missing values in gold price were filled with the value of the day before. Second, the MLR model was adopted using today's price, today's 5-day moving average (MA5) and today's 20-day moving average (MA20) to forecast prices in future days. The first 8% of the data was used as training set, and the goodness of fit is up to 99.64% on the remaining data. Third, we determined the overall trading strategy, the buying/selling point judgment strategy and the combination trading strategy for bitcoin and gold, based on the forecasting model. Finally, a trading model was built to solve daily trading orders (sell, buy or hold on) and the corresponding values for the three currencies (cash, bitcoin and gold), for a 5-year trading period. We have calculated that the value of assets increased from the initial \$1,000 to \$38.34 million, after 5 years of investment.

Keywords: Multiple Linear Regression, Price Forecasting, Trading Strategies, Daily Trading Orders

1. Introduction

In financial markets, the formulation and implementation of reasonable trading strategies^[1] is a necessary path to increase profits. This study focuses on trading strategies for maximizing the value of assets, when traders buy, sell, and hold bitcoin and gold daily. We have built a MLR price forecasting model^[2], and based on this forecasting model, an executable trading model has been built. Total value after a period of assets has been calculated as well.

2. Price Forecasting Model

2.1. Data analysis and preprocessing

Gold cannot be traded on holidays and weekends while bitcoin can be. In order to unify the data format, the gold price on holidays and weekends is filled with the price of the last day before the market closed. And also, a true-or-false-flag is added to the daily price data to mark whether gold can be traded on that day. Other individual missing prices are filled with the values of the previous day.

2.2. Model establishment

We adopt the MLR model to forecast the price of bitcoin or gold. Daily prices in the past are used to construct new attributes. The common moving average^[3] in the stock market can intuitively show the ups and downs in the past, objectively reflect the state of the market, and provide reference information for market traders to identify trends and make decisions. Therefore, we take the daily price, the 5-day moving average (MA5) and the 20-day moving average (MA20) as the explanatory variables X_1 , X_2 , X_3 . Y is the predicted price value of a day, which is a random variable. The following model is obtained:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + c \quad (1)$$

The specific calculation process of the above model is shown in Table 1 below:

Table 1: Introduction to price forecasting model and algorithm.

Algorithm 1: Multiple linear regression model to predict daily bitcoin price
Input: 8% of the data set in table Bchan-MACD with independent variables are: X_1, X_2, X_3 ;
Output: Unknown parameters $\beta_1, \beta_2, \beta_3, C$; Decision coefficient R^2 ;
1: Import the first 8% of the data set as the training set for building the model;
2: Parsing method to determine model parameters;
3: Import 92% of the data set as the test set for model testing;
4: Return model test set predictions;
5: Calculate the goodness-of-fit of the multiple linear regression model.

2.3. Model solution

Taking the prediction of one day as an example, the following conclusions can be obtained:

For bitcoin, the price forecast model of one day after a certain day is trained as follows:

$$Y = 0.92080X_1 + 0.04152X_2 + 0.039544X_3 + 2.44910 \quad (2)$$

And for gold, the price forecast model of the next day is showed as follows:

$$Y = 1.00019X_1 + 0.01232X_2 - 0.034494X_3 + 26.44189 \quad (3)$$

The prediction performance of the above model on a part of the test set is shown in Figure 1 below, the solid red line means the actual daily prices, and the blue dotted line means the predicted prices. It is intuitively observed that the trend between the prediction curve and the actual value curve on the test set is consistent, and the values have a good degree of consistency. Taking formula (2) as an example, the goodness of fit (determination coefficient R^2) is 99.64%, The average relative error is 2.709%. It can be seen that the prediction model can well explain the price change and achieve a good prediction effect.

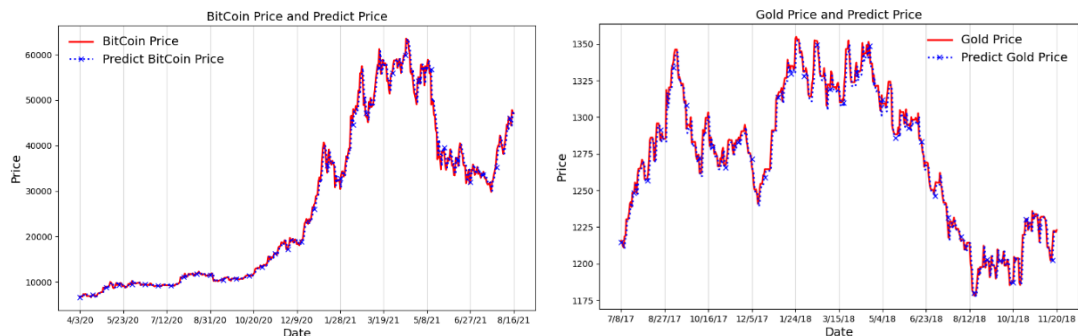


Figure 1: Price prediction performance of Bitcoin (left) and Gold (right).

3. Trading Model

3.1. Model establishment

3.1.1. Basic trading strategies

The followings are the overall trading strategies^[4] for bitcoin and gold:

(1) About risk appetite: in order to achieve the goal of maximizing the value of assets, we adopt a more radical full position operation. On the premise of reliable price forecasting, this is the most efficient way to make money. Considering that the whole position operation is greatly affected by the risk of misprediction, this trading strategy is based on the more accurate prediction model in the previous section.

(2) About trading objects: since the overall increase of bitcoin will be much greater than that of gold, bitcoin is the main trading partner for investment. As a secondary and auxiliary transaction, gold trading is used to hedge risks and supplement bitcoin trading when it is difficult to make profits. When bitcoin and gold both rise, give priority to buying bitcoin; When bitcoin falls, if the increase of gold meets the investment requirements (such as transaction cost requirements, the increase is greater than 2% of the cost of selling bitcoin and 1% of the cost of buying gold), then we buy gold.

3.1.2. Buying and selling point judgment strategies

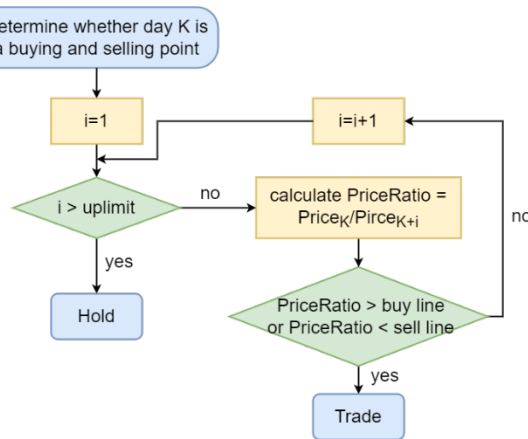


Figure 2: Bitcoin or gold trading point judgment process.

As shown in Figure 2, t_1 represents the initial date of judging whether it is the trading point; t_{1+i} represents a date after the initial date; subscript “i” indicates the number of the interval days between t_1 and t_{1+i} . The subscript “i” also represents the holding period (wait-and-see period) of bitcoin or gold, that is, the duration in the state of buying or selling. To judge if t_1 is the buying point or the selling point, we need to observe a day in future, which can for the first time has a variation of price more than the transaction cost. If this variation is a rising variation, t_1 is the buying point, and if this variation is a falling variation, t_1 is the selling point. We need to choose whether the day is the buying and selling point based on the fact that the price variation from t_1 to t_{1+i} can cover the transaction cost.

If t_1 is a buying or selling point, it indicates that the holding period (wait-and-see period) is between t_1 and t_{1+i} , then take t_{1+i} time as the new initial time “ t_1 ”. Cycle the above steps, and judge whether the time is a buying or selling point by predicting the data after t_{1+i} time.

3.1.3. Two currency combination trading strategies

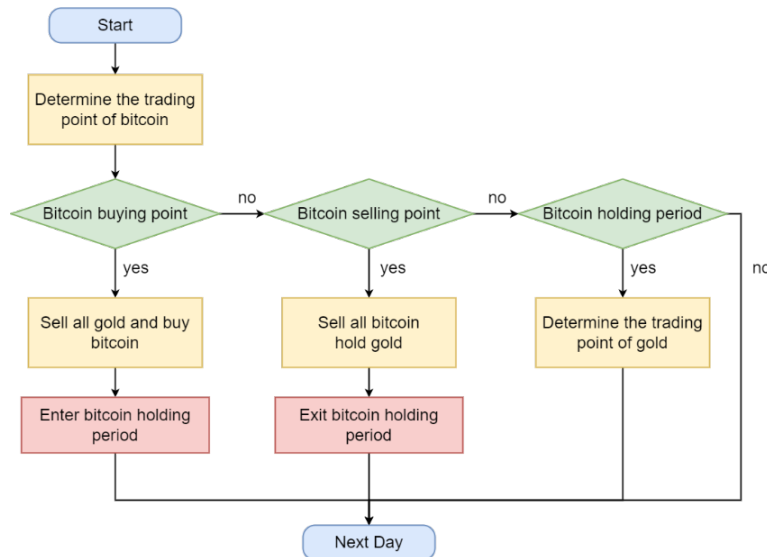


Figure 3: Combined trading strategy of bitcoin and gold.

In Figure 3, for the combined transaction of bitcoin and gold^[5], we need to judge the respective trading points of bitcoin and gold first.

Since bitcoin is the main object of transaction, we give priority to the status of bitcoin. If a day is judged as the buying point of bitcoin, in order to obtain the maximum value, we sell all gold and buy bitcoin in full position. If a day is judged as the selling point of bitcoin, the bitcoin will be all sold, and the gold will remain in its state. If it is judged that the day is in a bitcoin’s wait-and-see period, you can conduct appropriate trading operations on gold, so as to improve and expand benefits.

3.2. Calculation results of model

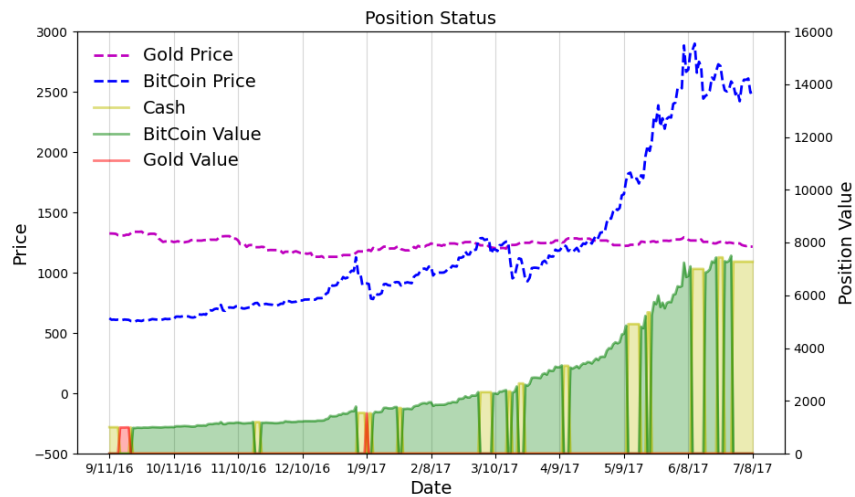


Figure 4: Trading position chart from 9/11/2016 to 7/8/2017.

Figure 4 depicts the cash, bitcoin, and gold positions between 9/11/2016 (September 11th, 2016) and 7/8/2017, a 300-day period. In the lower part of the figure, the solid red line, solid light green line and the solid dark green line separately indicates the daily position value of gold holdings, cash holdings and bitcoin holdings. From the fewer red areas and more dark green areas in the figure, we can know that the bitcoin was traded much more often than gold. The total value of assets has increased from \$1000 on 9/11/2016 to \$7272.96 on 7/8/2017, which indicates that the trading model can ensure the effective growth of the value of assets. As an example, Table 2 detailly describes the specific operations (sell, buy, hold) and corresponding values for the three currencies, between the 9 days of 1/8/2017 and 1/16/2017.

Table 2: Detailed position and operation list from 1/8/2017 to 1/16/2017.

Date	CASH	GOLD	BITCOIN	Buying and selling point of Gold	Buying and selling point of Bitcoin
1/8/2017	1544.12	0	0	HOLD	SELL
1/9/2017	0	1528.67	0	BUY	HOLD
1/10/2017	1527.51	0	0	SELL	HOLD
1/11/2017	1527.51	0	0	HOLD	HOLD
1/12/2017	0	0	1496.96	HOLD	BUY
1/13/2017	0	0	1583.93	HOLD	HOLD
1/14/2017	0	0	1567.87	HOLD	BUY
1/15/2017	0	0	1571.01	HOLD	HOLD
1/16/2017	0	0	1592.00	HOLD	HOLD

Similarly, the daily trading orders, positions, and the final value of assets in the 5-year trading can also be calculated. After calculation by days, we draw the conclusion that \$1000 on 9/11/2016 can grow to 38.34 million (\$38344990) on 9/10/2021.

We also calculated the theoretical maximum value of money for 9/10/2021 in the most ideal state based on the above decision model by using all days of real data: up to \$400 million. The reason why the actual estimate of 38 million is lower than the maximum money value is that the predicted price deviates somewhat from the real price.

4. Conclusion

(1) Advantages of this trading model: At the end of the transaction, the final income cap is high. The trading strategy is simple and easy to implement. The utilization rate of transaction funds is improved.

(2) Disadvantages of this trading model: The model requires high accuracy of prediction. When the whole position operation is carried out, the anti-risk ability of the model is poor.

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