

The Feasibility of Grid Trading Approach for Bitcoin Based on Backtesting

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Abstract. Contemporarily, cryptocurrency represented by Bitcoin has attracted extensive attention from investors. The nature of Bitcoin is different from fiat currency or traditional financial assets, and the high volatility of bitcoin leads to greater potential financial risks in the bitcoin trading market. Therefore, the research on the volatility of the bitcoin market is increasing of practical significance. This paper investigates the feasibility and effectiveness of applying grid transactions for the high volatility trend like Bitcoin. Based on analyzing the daily transaction data of Bitcoin from July 2019 to July 2021, we conclude that grid transaction is feasible in the bitcoin exchange market. On this basis, this paper discusses the impact of initial position price, grid price upper limit, grid price lower limit, the number of the upper grid, the number of the lower grid, and other factors on the yield of bitcoin grid transactions based on backtesting. According to the result, when the parameters: initial position price is 35000, grid price upper limit is 0000, grid price lower limit is 6000, the number of upper grids is 20, and the number of lower grids is 1 or 2, grid trading has the maximum yield. These results shed light for further study of the investment strategy of grid transactions in the cryptocurrency market.

Keywords: cryptocurrency, grid trading, Bitcoin

1. INTRODUCTION

As one of the world's youngest and most popular emerging exchange markets, cryptocurrency markets, including the Bitcoin market, have been booming nowadays. In 2010, the establishment of the Bitcoin Market, the world's first digital currency exchange, triggered many investors' enthusiasm for digital currency investment in the following years.

Taking Bitcoin as an example, its market value soared from \$1.5 billion to \$130 billion in the six years from 2013 to the end of 2019. During this period, the market value reaches a peak at more than \$300 billion. The hot investment made the market price rise and fluctuation frequently. The difficulty in valuing Bitcoin has made it difficult for investors to determine a

reasonable price range for digital currencies. At the same time, the peculiar trading system of digital currencies has also led to high volatility. Since the trading mechanism of the bitcoin market is based on traditional financial markets, they are highly correlated. This study takes the frequent fluctuation characteristics of the value of bitcoin as the entry point.

Contemporarily, grid transaction has developed rapidly, which is widely used in the global financial market. Investors need to analyze price movements before making financial investments. Even if prices show a trend in the medium to long term, they may fluctuate in the short term. In financial market transactions under high volatility trends, most traders choose to adopt a short-term trading strategy, i.e., the grid trading method is suitable for the volatile bitcoin market.

Firstly, this study discusses the theoretical basis of the grid trading method, analyzes the characteristics of the grid trading method, and designs the model of the grid trading method. Subsequently, this study crawls the historical transaction data of Bitcoin and then selects the historical data of a period to obtain and optimize the transaction parameters. Finally, the data backtesting is carried out to draw conclusions and prospects.

2. LITERATURE REVIEW

So far, some scholars have begun to use China's A-share market data to conduct empirical studies on the trading behavior and the ability to price behind the trend of high volatility in value. Li [1] discussed the relationship between price volatility and stock market valuation level based on the Shanghai Stock Exchange transaction data. Their results indicate that there was a positive relationship between the two. Zheng [2] introduced margin trading into the study of a-share price formation, verified the long-term impact on the return rate of stock prices, and established a theoretical model according to the difference in differences for analysis.

2.1 Existing research in other fields

Rapid progress has also been made in the study of commodity price fluctuations. Xie and Han [3] found that the long-term equilibrium relationship of commodity futures prices was caused by demand, and the speculative trading of funds mainly caused the short-term price changes. Liu and Xu [4] believed that the trading behavior of short-term institutional investors increased the price volatility of the market. Other scholars also pointed out that money supply and speculative capital enhanced the price discovery function of products [5]. At the same time, the dollar index weakened the price discovery function of products in the futures market. According to Zhang and He [6], the price changes in China's commodity futures market are influenced by the prices of similar futures varieties in the world, and they have a leaping nature, in which the leaping nature of prices precisely causes the short-term fluctuations of futures prices. Wang [7] stated that the trading of individual investors and speculators increased the short-term price fluctuation of commodity futures. In contrast, hedges and institutional investors alleviated the price fluctuation of commodity futures.

2.2 Existing research on the digital currency market

In terms of the digital currency market, most academic research focuses on digital currency's legal status and regulatory measures. In contrast, some researches focus on the returns of the

bitcoin market [8]. From the perspective of previous researches, domestic and foreign scholars have conducted a series of comprehensive studies on the investment theories and management strategies of securities investment fund companies [9]. In terms of basic theories, there are both studies on the methods of reasonably determining the intrinsic value of assets and the causes of abnormal phenomena in the financial market [10], presenting the contradiction of whether the financial market is effective. In terms of management strategy, both active investments pursue excess return and passive investment, which focuses on long-term average return.

2.3 Summary

Domestic and foreign scholars have done a lot of empirical research on the theory and strategy of grid trading. Through the comparison and summary of the relevant theoretical basis and the analysis of the specific application have laid a good foundation for future research on grid trading. The previous research is mainly for the securities investment fund companies to the stock market basic research or trend forecast technical analysis. However, grid trading is a trading method based on market fluctuations, which is unnecessary to predict market price trends. The theory of grid trading assumes that changes in stock market prices are unpredictable. Although grid transactions are widely used in practice, there is little research on applying grid transactions to digital currency markets.

3. DATA AND RESEARCH METHOD

Due to the frequent waves of the price of Bitcoin, a passive transaction that does not require so much management cost is needed. Meanwhile, the transaction strategy must have the advantages of lower risk and high return. In fact, the grid transaction system fully meets all the requirements. As mentioned above, the grid transaction system assumes that the change of future prices is unpredictable. In other words, there is no such strategy, which can predict the change of the market price and increase return. As a result, the grid transaction system does not focus on one single transaction but puts all efforts to divide risks into every transaction within the grid. The investment risk can be low in this way, as all the returns happened within a period will increase. The final purpose of grid transactions is to decrease the investment risk. From a long-term perspective, in an unstable market, the grid transaction strategy remains stable, as well as the relative lower total return.

The grid transaction system has three remarkable advantages. First, the grid transaction strategy is simple and concise. It does not require excessive calculations and interpretation of indicators to decide the buy point or sell point. Second, grid transaction achieves automagical trade. It can avoid mental pressure with a lower management cost. Third, the grid transaction does not need to predict the short-term price trend. The larger the fluctuation is, the higher return the strategy can earn. In summary, a grid transaction system can decrease the risk. On the opposite, it also has some disadvantages. First, it only applies in the situation of high fluctuation. Otherwise, the high loss can be discovered. Second, it is relatively conservative, and low returns can be found in the process of trade. Take Bitcoin as the research object, the pattern of applying grid transaction can be discovered. Here are the specific steps: First, we take the Bitcoin price data from 2019 to 2021 as samples. Second, we use Python as the primary computer language to exercise the grid transaction system and adjust all the parameters based on the final result,

including the return ratio, the max drawdown, and the net values. Third, the data samples are utilized to carry out data back testing. The final results verify that grid transactions can be used in the trade of Bitcoin. Finally, we analyze and discuss the conclusion and adjust parameters based on different principles and other indicators.

3.1 Data

This research takes the everyday opening price from 2019 to 2021 as the data samples from Investing.com.

3.2 Grid trading module

Grid trading module is a conventional trading strategy, which is based on fluctuations in the cryptocurrency market. To make sure every market price move contributes to maximizing the return, a "grid" is applied at the market quotation. The grid consists of many different horizontal price lines, and no vertical lines are allowed at the grid trading module. To form a grid at the cryptocurrency market, first, a general prediction is required to ensure the market price wave will not be strong enough to break the lower limit and the upper limit, as know as the anticipated price corresponding to the position of 0% and the anticipated price corresponding to the position of 100%. Once the available price range is set, the central price level is where the position is opened, and half position will be bought in, i.e., the price is also named the anticipated price corresponding to the position of 50%. After the settlements of limits, the trading threshold quantities higher than the selected price and the trading threshold quantities lower than the selected price should be defined. In a word, they are defined by the lines between the upper and lower limits of the price, and they decide when the position should change. Once the price surge and cuts one of the lines, the sell-out action should be done to the position. Once the price slip and cuts one of the lines, the buy-in action should be done to the position. However, if the price is too high and breaks the upper limit, all of the positions should be sold, while if the price is too low, all of the positions should be held. In this way, high and stability can be found since sales at high prices and purchase at low prices.

3.3 Descriptive Analysis

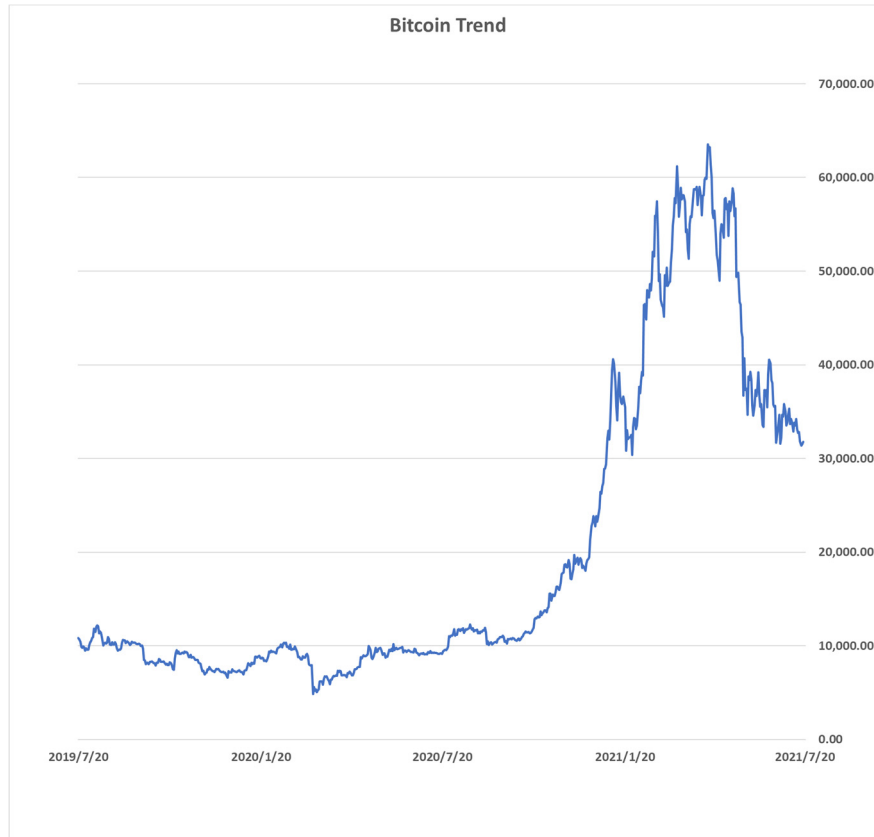


Figure 1. The net value diagram of Bitcoin

To analyze Bitcoin, it is important to visualize the closing price of the Bitcoin from July 2019 to July 2021. As shown in Fig. 1, Bitcoin skyrockets in the period from September to December in 2020, the highest price has been reached 60000 RMB, and the price continued increasing. Later that year, Bitcoin fluctuated frequently, and the most obvious fluctuations appeared from January to May in 2021. Bitcoin had more waves since the COVID-19 began to influence the world. Under the background of COVID-19, the interest rate in the U.S is around 0, so most investors put their money in the venture capital, as an example, in the Bitcoin market.

4. DATA RETURN

4.1 Backtesting Indicators

Backtesting refers to the test performed to see whether the final strategy works well in the situation or whether the final outcome is the best option. It is usually performed after the research is done. Two indicators are involved in this backtesting, the return ratio (net return)

and max drawdown. Return ratio is a significant parameter used to how much money has been earned in an investment. The larger the return ratio is, the more money has been gained in the investment. Max Drawdown is an indicator that is used to evaluate the risk of a specific investment. It compares the lowest net value of an investment with the net value when the investment is made and forms a ratio. The higher the max drawdown rate, the higher the risk an investment is taken.

4.2 Backtesting Results

Given the above two indicators, Python is taken as the major computer language to form this backtesting. Five parameters are set in the grid transaction system, involving the anticipated price corresponding to the position of 50%, the anticipated price corresponding to the position of 0%, the anticipated price corresponding to the position of 100%, the trading threshold quantities higher than the selected price and the trading threshold quantities lower than the selected price. Based on the available strategy, our final purpose is to adjust five parameters to achieve the highest return ratio and reduce the max drawdown as much as possible.

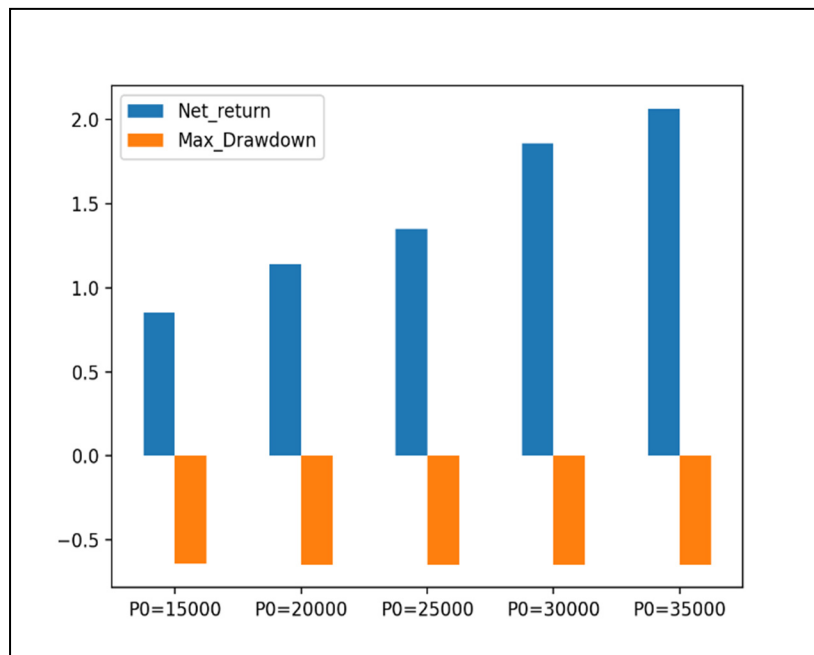


Figure 2. Return ratio and max drawdown based on the variable of the anticipated price corresponding to the position of 0%

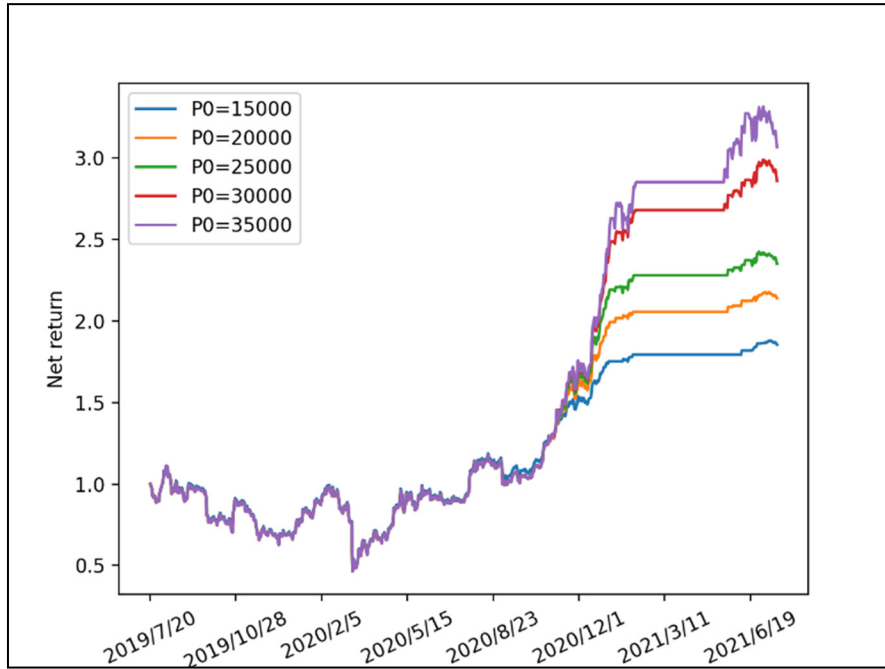


Figure 3. net value based on the variable of the anticipated price corresponding

The trend of the anticipated price corresponding to the position of 50% is easy to observe. As shown in Fig. 2, with the increase of the anticipated price corresponding to the position of 50%, the return ratio has been increased. Meanwhile, the anticipated price corresponding to the position of 50% does not have a clear relationship with the max drawdown. As presented in Fig.3, when the data quantities have been reached the maximum, grid transaction gain maximum net return with the anticipated price corresponding to the position of 50% of 35000. In a word, 35000 is the best taken position price option.

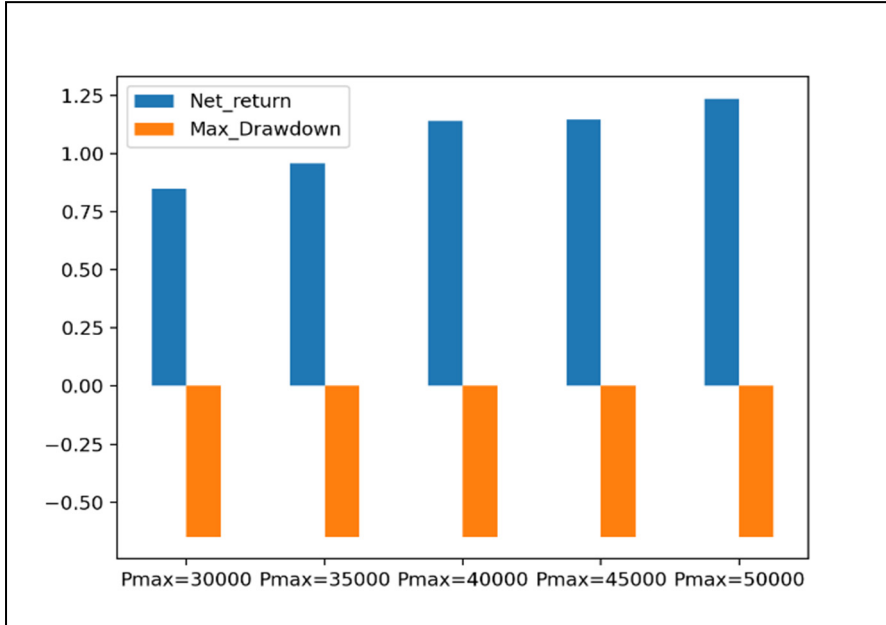


Figure 4. The grid transaction price limit is the yield and maximum pullback rate of variables

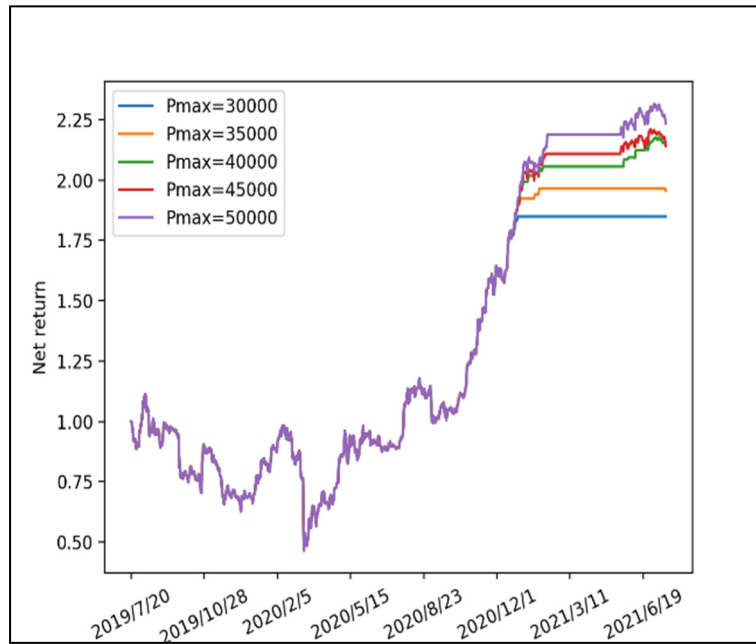


Figure 5. The grid transaction price cap is the net value diagram of the variable

The anticipated price corresponding to the position of 0% is complicated. 30000 has been set as the beginning price. As the anticipated price corresponds to the position of 0% increase, a positive correlation has been found between the anticipated price corresponding to the position of 0% and return ratio. When the anticipated price corresponding to the position of 0% reaches 50000, as depicted in Fig.4, the return ratio reaches the maximum value. In the meantime, as presented in Fig.5, when the data quantities have been reached the maximum, grid transaction gain maximum net return with a maximum price of 50000. In summary, 50000 is the best the anticipated price corresponding to the position of 0%.

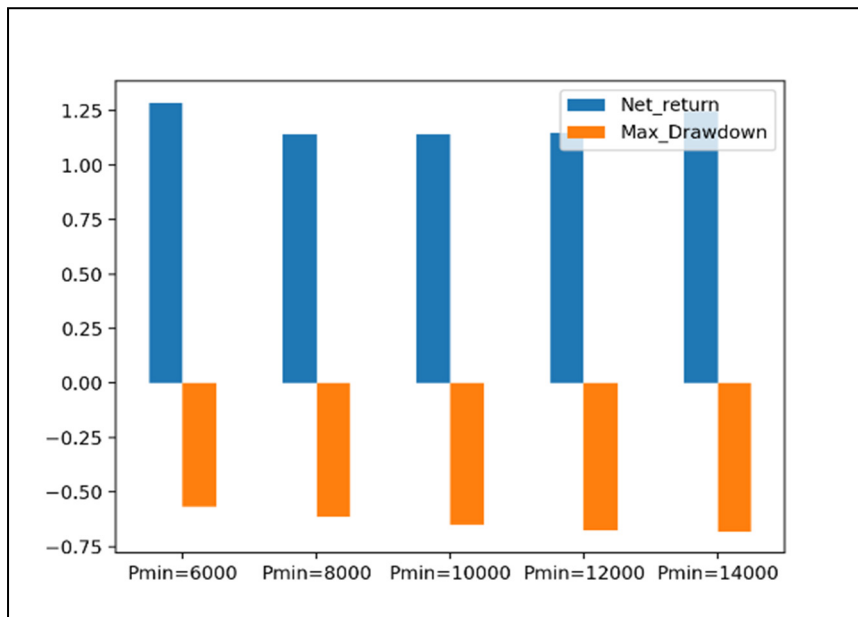


Figure 6. The grid transaction price limit is the yield and maximum pullback rate of variables

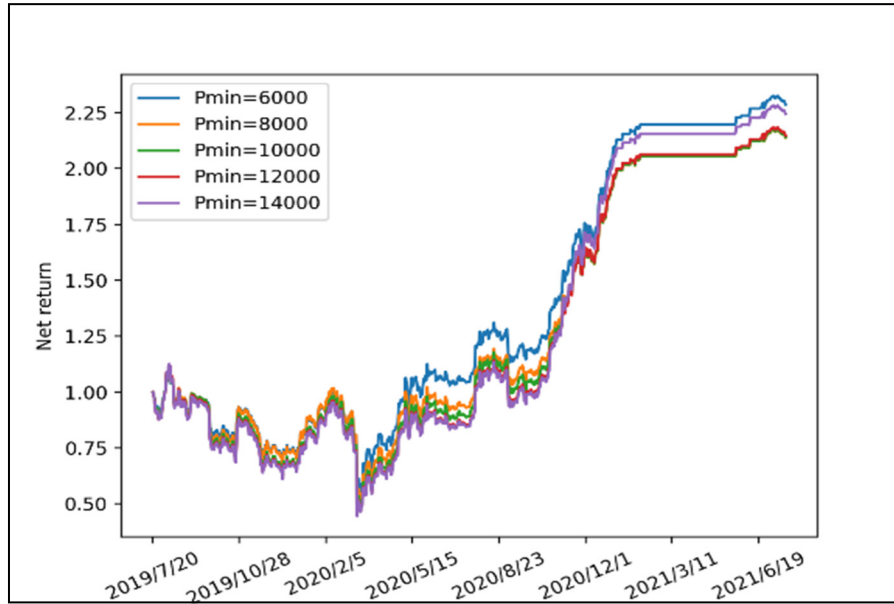


Figure 7. The grid transaction price lower limit is the net value diagram of the variable

The anticipated price corresponding to the position of 100% trend is not easy to infer. First, as shown in Fig. 6, when the anticipated price corresponding to the position of 100% keeps increasing, the return ratio decrease and then goes up. When the anticipated price corresponding to the position of 100% is 14000 and 6000, the return ratio has been reached 1.25, which is the maximum level. Subsequently, the anticipated price corresponding to the position of 100% has a positive correlation with max drawdown. The higher the anticipated price corresponding to the position of 100%, the higher the max drawdown. At the same time, when the data quantities have been reached maximum, grid transactions gain maximum net return with a minimum price of 6000. In conclusion, 6000 is the best the anticipated price corresponding to the position of 100%.

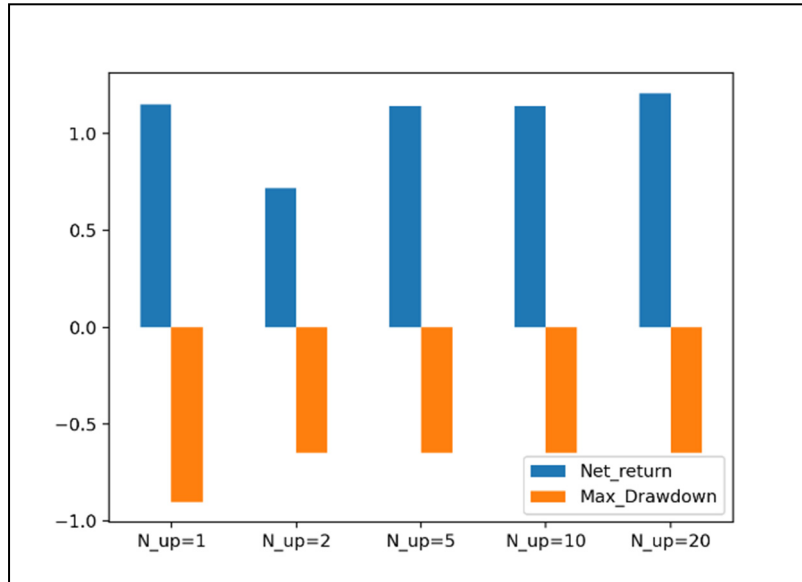


Figure 8. The number of grids above is the rate of return and the maximum pullback rate of the variables

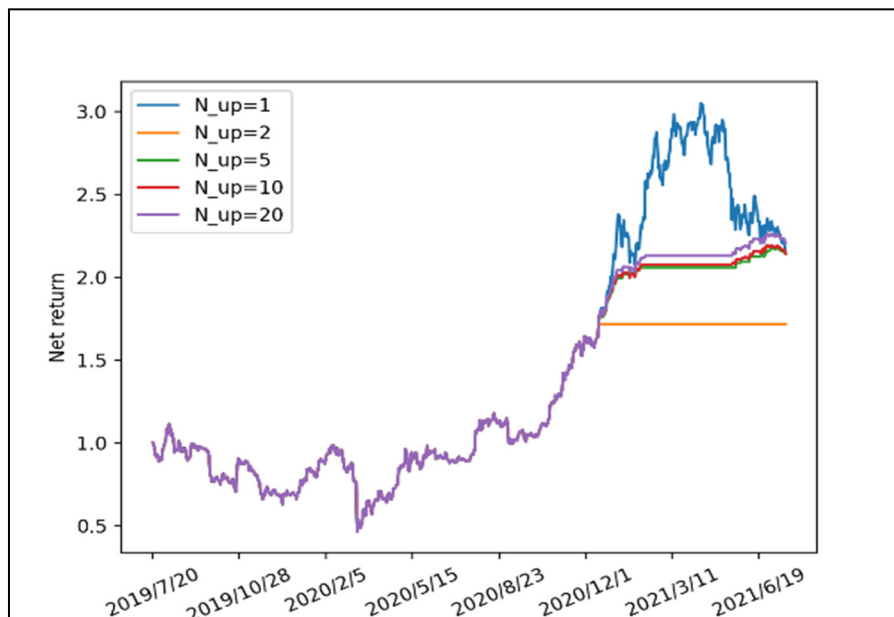


Figure 9. Net value diagram of the number of grids above are variables

For the trading threshold quantities higher than the selected price, as illustrated in Fig. 8, the return ratio has been reached the maximum level when the trading threshold quantities higher than the selected price is 20. Simultaneously, when the number is 20, the max drawdown is relatively small. As shown in Fig.9, when the data quantities have been reached the maximum,

grid transaction gain maximum net return with trading threshold quantities higher than the selected price of 20. In the end, the best option of trading threshold quantities higher than the selected price is 20.

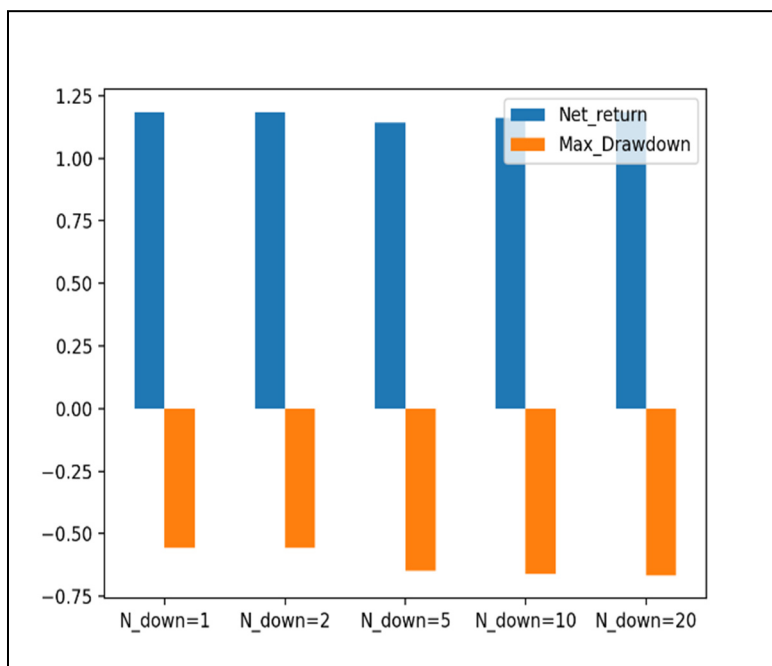


Figure 10. The number of grids below is the yield and maximum pullback rate of the variables

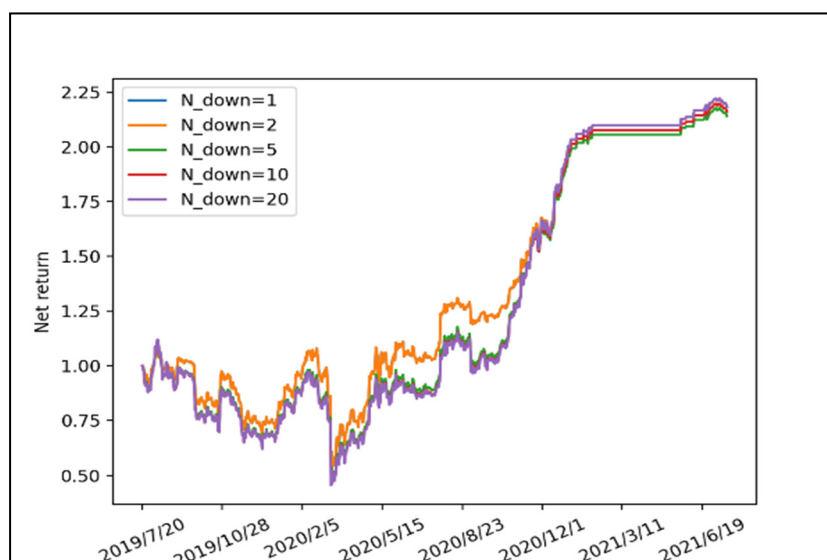


Figure 11. The net value diagram of the number of grids below are variables

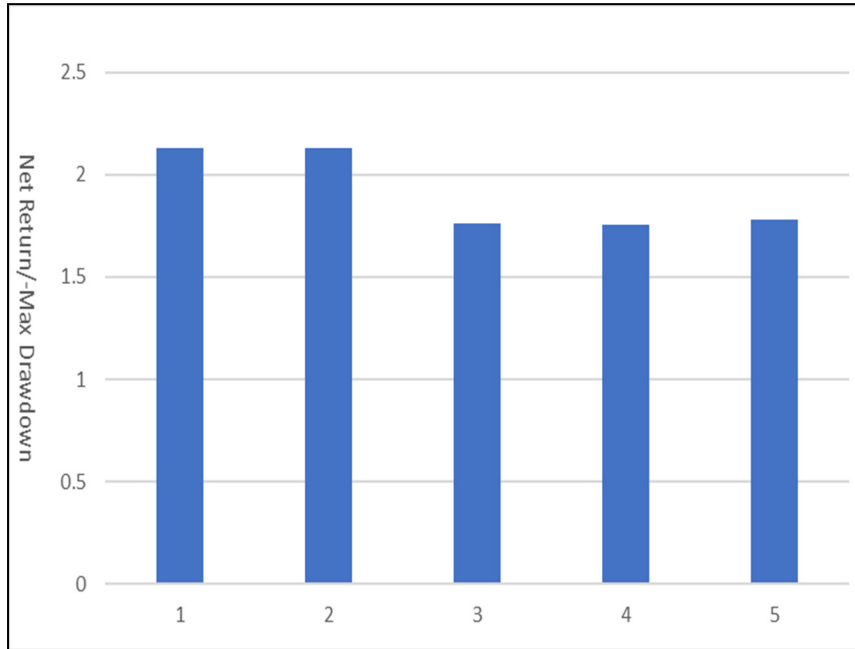


Figure 12. Ratio diagram of the maximum pullback rate to the yield

For the trading threshold quantities lower than the selected price, as given in Fig. 10, the trading threshold quantities lower than the selected price has a positive correlation with max drawdown. Still, it does not have a clear relationship with the return ratio. Two indicators were compared with a ratio that consists of max drawdown and returns ratio. As displayed in Fig. 12, when the trading threshold quantities are lower than the selected price is 1 and 2, the new ratio reaches the largest value, which means the return is maximum and the risk is smallest. At the same time, as shown in Fig. 11, when the trading threshold quantities lower than the selected price is 1 and 2, the net return has been reached the maximum level. Finally, the best option of trading threshold quantities lower than the selected price is 1 or 2.

In general, the grid transaction system can be used as a major trade strategy in the Bitcoin market. According to backtesting, the most useful parameters should be: 35000 for the taken position price option, 50000 for the anticipated price corresponding to the position of 0%, 6000 for the anticipated price corresponding to the position of 100%, 20 for the trading threshold quantities higher than the selected price is 20, and the 1 or 2 for the trading threshold quantities lower than the selected price is 1 or 2.

5. CONCLUSION

In summary, aiming at the trend of high fluctuation of bitcoin value, this paper selects the transaction data of bitcoin value in the past two years. It carries out backtesting by setting parameter variables. The optimal backtesting results are finally obtained based on the comparisons of the impacts for different parameter changes on bitcoin grid transactions. When

the take position price is taken as the only independent variable, the grid trading strategy has the maximum return and the minimum risk when the take position price is 35,000. In this case, the anticipated price corresponding to the position of 0% is the only independent variable. 50000 is the best-anticipated price corresponding to the position of 0%. With the anticipated price corresponding to the position of 100% as the only independent variable, the optimal anticipated price corresponding to the position of 100% is 6000. When the trading threshold quantities higher than the selected price is the only independent variable, the optimal choice is 20. When the trading threshold quantities lower than the selected price are the only independent variable, the optimal solution is 1 or 2. To sum up, this study determines the optimal backtesting results as follows: 35000 for the taken position price option, 50000 for the anticipated price corresponding to the position of 0%, 6000 for the anticipated price corresponding to the position of 100%, 20 for the trading threshold quantities higher than the selected price is 20, and the 1 or 2 for the trading threshold quantities lower than the selected price is 1 or 2.

The empirical results of this paper indicate that grid trading can improve the performance of the quantitative investment in Bitcoin under the trend of high volatility, and the conversion of trading strategy can further improve the return of investment. As applied research, the quantitative investment strategy based on the high volatility trend of Bitcoin proposed in this paper makes full use of the information in the market, enriching the research on the linkage between grid trading strategy and bitcoin, which provides a reference with rich economic value for investors.

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