

# Research on Quantitative Trading Strategy Based on Five-day Average Manipulation Method and Diversification Strategy

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**Abstract:** Quantitative trading is an emerging financial investment strategy that uses computer technology as a carrier to replace traditional human subjective judgment with advanced mathematical models for two financial products with typical characteristics, bitcoin and gold. The trading strategy utilizes multiple factors such as diversification strategy and five-day average manipulation method, combined with analysis of professional indicators in finance, to provide optimal decision guidance. The final result is a total value of \$45,123 after five years of investment of \$1000.

**Keywords:** Quantitative trading; Diversification strategy; Five-day average manipulation method

## 1. Introduction

Gold, as a precious metal and general equivalent, has a price that fluctuates around its value. Bitcoin, on the other hand, is a digital virtual currency and its price is an outward expression of people's confidence in it. Further, by the law of value in political economy, it can be argued that gold is more stable in the long run compared to bitcoin. [1]

Mathematical modeling is used to predict two typical financial products, bitcoin and gold, and to determine the optimal investment portfolio. In today's situation where retail investors have seven losses, two draws and one win, it is expected to effectively increase the return of retail investors. [2] At the same time, this quantitative trading idea can be extended to other financial products with similar characteristics and become one of the foundations for quantitative trading of various financial products.[3]

## 2. Trading Decision Model Based on Five-day Average Manipulation Method and Divergence Strategy

Based on a diversification strategy to combat risk, with three options: cash, gold, and bitcoin, an investor should invest one-third of each of the three options, i.e., keep \$333 in cash. However, one of the important properties of cash is that it is a medium of exchange that can be put into circulation immediately. In this case, since cash is not considered for functions other than purchasing financial products, its nature reverts to a general equivalent, no different from gold, and based on the previous assumptions, cash does not increase in value, taking into account real-life inflation. Therefore, we decided to invest the retained \$333 in gold.

According to the five-day average manipulation method [4] of the short-term stock market watch strategy, the comparison of today's price, tomorrow's forecast price and the past five days' price averages can guide today's buying and selling strategies. Combined with the scenario, the initial capital is only \$1000, which is a typical retail investment, and should focus more on the balance of risk and return, combined with the book *The Future for Investors* by Professor Jeremy J. Siegel on fast-growth investments and avoiding bubbles caused by market mania [5]. In summary we believe that trading strategies have at least the following characteristics:

- (1) Diversify your capital and use diversification to resist risk.
- (2) Consider fully the impact of the commission on the operation and operate with caution. Limit the

number of operations based on the commission rate to avoid losing commission for multiple operations in pursuit of small profits.

(3) Mainly focus on medium and long-term transactions, reduce speculation to obtain long-term value.

(4) Consider buying when tomorrow's estimated price is higher than the five-day line, and do not consider filling positions below the five-day line. If the estimated price tomorrow is lower than the five-day line, consider selling in time to avoid losses if the selling fee is lower than the loss of continuing to hold.

(5) Assuming that the investor is risk averse, based on the utility function, when the forecast price is too high, in order to avoid losses caused by forecast errors, then give up buying to seek stability.

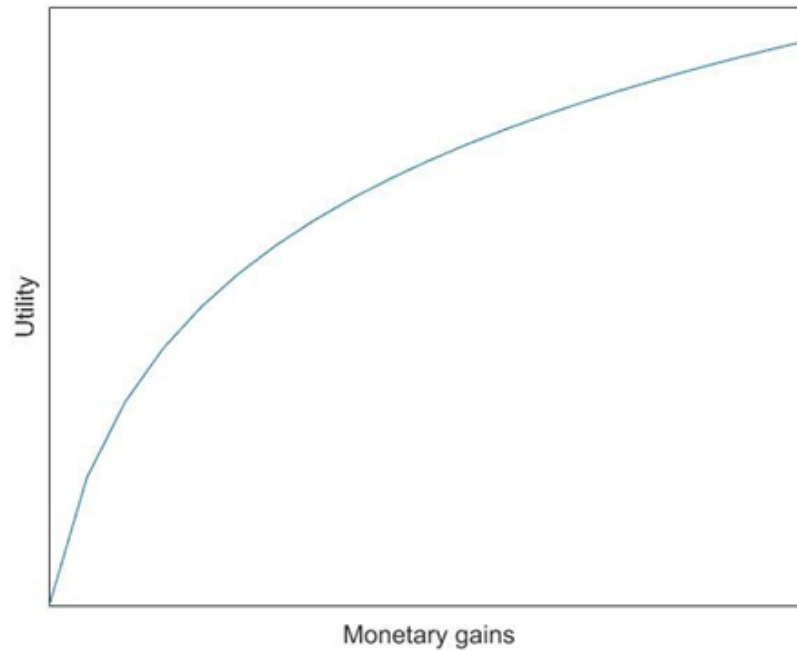


Figure 1: Utility function

(6) When considering an investment, the investor will refer to financial parameters related to the investment object, such as Sharpe ratio, PE, PB, ROE, etc. PE and PB require more data for representative percentile calculations, while investment products are futures and virtual currencies, which do not have corporate net profits. Sharpe ratio is a more appropriate investment reference indicator for these two investment assets, so Sharpe ratio is used as a judgment condition. It is stipulated that the Sharpe ratio is higher than 1.5 before considering buying.

The Sharpe ratio is one of the three classical indicators that can simultaneously consider both return and risk. The idea of not operating below a certain Sharpe ratio threshold further reflects the parallelism between risk and return of our strategy.

$$\text{Sharp ratio} = \frac{\text{excess return}}{\text{standard deviation of excess return}} \quad (1)$$

Analyzing from the perspective of strategy, we do not just adopt a high yield strategy in the modeling process, but fully consider the optimal balance of risk and return to develop relevant investment disciplines and strategies.

Research in modern investment theory shows that the magnitude of risk plays a fundamental role in determining the performance of a portfolio. With more accurate computerized big data simulation forecasting results we can operate in larger confidence intervals, simulations with risk assessment, investment limits, and in risk-based analysis provide sufficient guarantees.

In building the trading model, by the short- and medium-term operation theory, and the utility function, the number of operations has been limited based on the trading commission, and in this question, the number of operations varies with the operating rate.

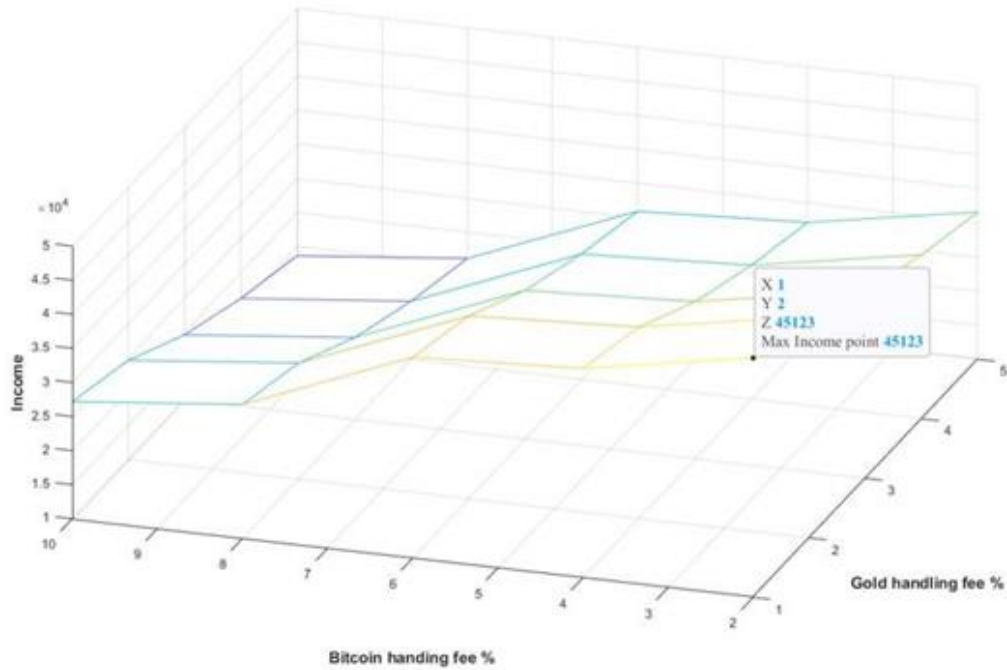


Figure 2: Final return graph for different commission cases

The final results are as follows.

Table 1: Total revenue under different handling fees

		Different Gold Handling Fee				
		1%	2%	3%	4%	5%
Different Bitcoin Handling Fee	2%	45123	42463	37462	34065	31606
	4%	40708	38048	33047	29650	27191
	6%	39456	36798	31797	28400	25941
	8%	29658	26998	21997	18600	16141
	10%	27175	24515	19513	16117	13658

Gold Operating Rate, Bitcoin Operating Rate and Final Value Table According to the above table, we can find that the final return decreases with higher operating rates for both gold and bitcoin, sensitive to both binary variables.

Since the "double pool limit" has been planned at the beginning of the calculation, we can plot the image of the revenue and fees for each of the two pools at different commission rates separately. After fitting the MATLAB function, we can get the following images.

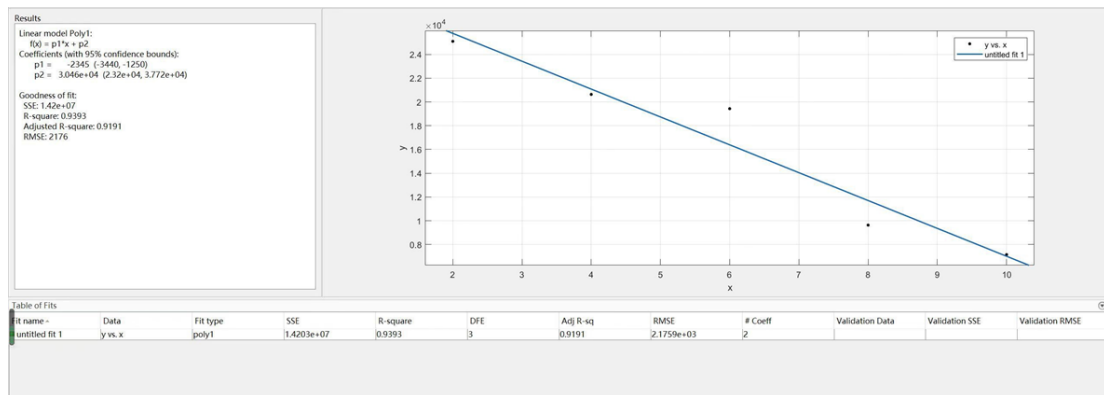


Figure 3: Bitcoin purchase curve

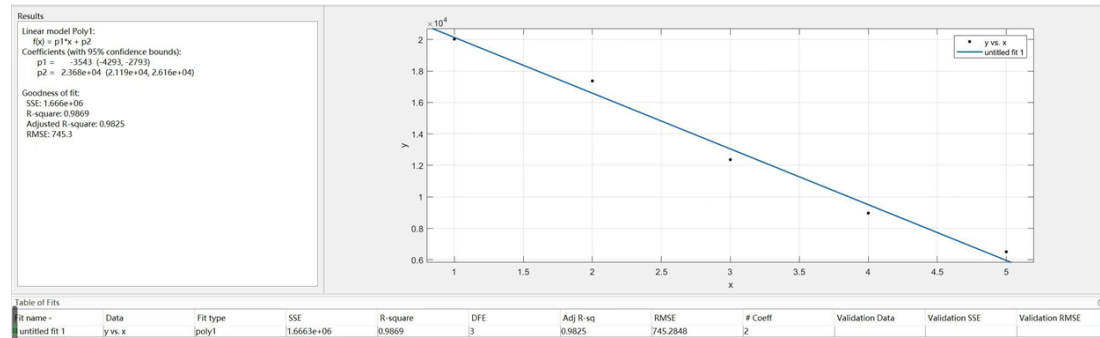


Figure 4: Gold purchase curve

For the bitcoin purchase curve, the slope of its fitted curve is -2345, then its sensitivity

$$S(V, \alpha_{\text{bitcoin}}) = -2345 \frac{V}{\alpha_{\text{bitcoin}} \% * 100} \tag{2}$$

For the gold purchase curve, the slope of the fitted curve is -3543, then its sensitivity

$$S(V, \alpha_{\text{gold}}) = -3543 \frac{V}{\alpha_{\text{gold}} \% * 100} \tag{3}$$

Therefore, it can be shown that the model is sensitive to changes in trading rates and can be run correctly to create profit in the case of different trading rates.

### 3. Conclusion

Diversified allocation strategy is well known that allocation plays a considerable role in the investment process and can even, in turn, influence investors' decisions. In the investor's asset allocation, it can be divided into risky investments, stable investments and cash flows, with the specific allocation depending mainly on the investor's own financial situation and risk tolerance. For this reason, our code is designed with 3 simple self-adjustable, set data representing the proportion of each of these three investment amounts. Since a person's status does not change in a short period of time, we do not set these three sets of data to circulate among each other due to fluctuations in the investment value of different investment products, fully reflecting the control of risk and facilitating the management of related decisions.

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