

# Research on Quantitative Investment Strategy Based on Multifactor and Double Average Model

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**Abstract:** In recent years, with the gradual maturity of China's capital market, the number of rational investors is also increasing, and the demand and application for quantitative stock selection is becoming increasingly widespread. Among many quantitative stock selection theories, the multi factor stock selection model and the double moving average stock selection model are favored by institutional investors due to their inherent characteristics such as discipline, systematicness, and accuracy. This article conducts quantitative stock selection analysis for listed companies based on a quantitative investment research model based on multiple factor and double average line models, and studies whether the model can help investment and obtain additional benefits, providing some ideas for future quantitative analysis.

**Keywords:** Quantitative investment, Multi factor stock selection, Double moving average trading strategy, Timing strategy, Technical analysis.

## 1. Introduction

### 1.1. Research Background

Quantitative investment products refer to automated investment and financial management models that use quantitative methods and programming to complete operations in the trading market, based on certain models, calculation methods, and theoretical systems, and achieve the goal of obtaining relatively stable returns. With the increasing number of listed companies in China, it is difficult to select stocks with high value based on traditional industry analysis methods, so it is necessary to conduct quantitative stock selection[1]. In this context, quantitative analysis has many advantages over traditional fundamental analysis, such as systematicness, discipline, decentralization, and efficiency. In terms of stock selection, common models include the plate rotation model, consistency expectation model, and capital flow model. Compared to other models, the multi factor stock selection model is a quantitative investment stock selection strategy. The biggest advantage is that the results are based on objective data and complete models, which can avoid the interference of personal subjective ideas and have objectivity. In terms of timing, common models include trend tracking and horizontal market breakthrough. Compared to other models, the dual moving average strategy has better practical guidance for investment timing and stock selection, and can better grasp the timing of trading. Therefore, this article selects a quantitative investment research model based on multiple factors and double average line models to conduct quantitative stock selection analysis for listed companies. Through massive statistical testing and data processing, it ensures the effectiveness of stock selection. At the same time, it proposes clear stock selection strategies, and selects some stocks with higher cumulative returns for research to explore the return rate of the model.

### 1.2. Research significance

The situation in the stock market is rapidly changing and full of uncertainty. Traditional investment strategies have

been impacted due to their technological lag. In addition, the improvement of algorithms has made the computational efficiency of massive data more efficient, and quantitative investment is increasingly valued by investors. The stock market has the characteristics of high risk and high yield. If investors want to obtain benefits from the stock market, they must have a certain degree of investment thinking. Generally speaking, quantitative timing and stock selection strategies can be divided into two categories: timing and stock selection behavior[2]. The significance of this study is to explore whether quantitative investment strategies based on multi factor and double average model can provide effective quantitative stock selection strategies after conducting quantitative data processing statistics and stock selection analysis on listed companies. The main value of this model is whether it can expand its advantages in bull markets and avoid declines in bear markets after combining overselection with stock selection. The model needs to focus on how stock selection factors bring excess returns to investments, and how moving average timing can be used as a risk management tool to avoid losses. An excellent quantitative stock selection model can adapt to the objective conditions where the market is not fully efficient and investors are not fully rational, overcome perceptual psychology to the maximum extent, rationally and quickly accept market information and respond, thereby obtaining excess returns for investors[3]. From the perspective of existing domestic quantitative investment funds, quantitative investment strategies have great prospects for market application. Quantitative timing stock selection strategies can maximize returns by analyzing historical information to predict future prices.

### 1.3. Research content

The concept of multi factor strategy: Compared to single factor models, multi factor quantitative stock selection models do not only consider the impact of one factor on the stock price trend, but also select as many candidate factors as possible. After effectiveness testing and redundancy proposed, the effective factors are finally obtained. The final factors are used to construct the model, and after repeated trial and error,

the best model is fitted.

**Multi factor model:** Compared with arbitrage pricing model and capital asset pricing model, the three factor model (Fama French) explains some issues that cannot be explained in the arbitrage pricing model and capital asset pricing model, and concretizes some unknown factors. In order to study more comprehensively, accurately, and scientifically how investment returns affect factors, scholars have added candidate factors as much as possible on the basis of the three-factor model (Fama French), and studied all possible influencing factors, so as to consider them more comprehensively, making the model fitting effect better, and the stock selection and analysis results more accurate and scientific, which is more conducive to investors' analysis and operation.

**Double moving average strategy concept:** Double moving average refers to short-term moving average and long-term moving average. Buy when the short-term moving average crosses the long-term moving average, and sell when the short-term moving average crosses the long-term moving average.

**Double moving average model:** The simple moving average (SMA) is used as the basis, because the CSI 500 rarely presents trendy quotes and has more volatile quotes. The simple moving average (SMA) is not sensitive to changing prices, helping to improve yields.

#### 1.4. Research methods

**Double moving average strategy method:** buy stocks when the short-term moving average crosses the long-term moving average from bottom to top; Sell stocks when the short-term moving average crosses the long-term moving average from top to bottom.

**Multi factor stock selection method:** Firstly, identify candidate factors. There are various factors in the market, and in different market environments, how much will affect the stock price trend; Next, determine the effective factors, conduct a back test among the candidate factors, and use scoring and regression methods to screen the factors to determine the effective factors that have a significant impact on stock returns; Finally, eliminate redundant factors. Among the effective factors, if there are multiple factors that have a consistent impact on stock returns and have a common effect on stock returns, it indicates that they have a high correlation.

#### 1.5. Research difficulties

The goal of this article is to develop a construction scheme for an investment analysis system based on multi factor and double moving average quantitative strategies. This type of model has its particularity, complexity, and variability. At the same time, due to the domestic research on quantitative investment focusing on the field of quantitative trading, there has been less involvement in stock selection strategies that combine multiple factors and double moving average models. Therefore, it is difficult to provide a comprehensive theoretical reference and reference for the proposed scheme in such a segmented field. At the same time, how to ensure that the strategy construction becomes an effective combination while meeting the basic usage needs of the system is an important reason for exploring new technological solutions in this article, and also a difficulty in constructing this system solution. Based on previous related papers, this article uses the JoinQuant website to simulate model combinations to test the best simulation strategy.

### 1.6. Innovation

This article focuses on the combination of multi factor and double average model stock selection strategies, which are rarely studied in the field of domestic quantitative investment. The multi factor stock selection strategy collects multiple information from the market, effectively avoiding losses, and obtaining excess returns from potential risks in the market; The double average trading strategy calculates the average value of the return between the buying and selling ranges, and obtains that the difference between the average value of the return between the buying and selling ranges is positive. If we combine the two models together, whether the stock returns can have excess returns is the main innovation of this article.

## 2. Literature Review

Multi factor model is one of the most widely used quantitative investment strategies. It comprehensively considers many factors and adjusts the weight and combination of these factors to achieve the goal of optimal investment portfolio. Hou, Xue, and Zhang (2015) proposed a multi factor investment model. They used ten years of data to backtest the model, and the results showed that it can provide higher returns and lower risks compared to traditional CAPM models[4]. The double moving average model is another commonly used quantitative investment strategy. This model is based on changes in market trends and uses the intersection of short-term and long-term averages to make buying and selling decisions. Gong et al. (2019) conducted a study using data from China's stock market, proving that the model can provide relatively stable returns[5]. The combined application of multi factor and double moving average models has also been widely discussed. Ji et al. (2019) proposed an investment strategy based on multiple factors and double moving average models, which achieved significant excess returns in the backtesting. Liu et al. (2021) used a deep reinforcement learning algorithm to optimize this strategy, and the results show that the optimized strategy can further improve the yield compared to the unoptimized strategy[2].

Combining the advantages of multi factor and double moving average models, quantitative investment strategies based on these two models have shown good results in practical applications. In future research, it is possible to further explore how to optimize this strategy and improve its stability and reliability.

## 3. Quantitative Investment Strategies

This article takes the China Securities 500 market from January 4, 2022 to December 30, 2022 as the research object, adopts a multi factor model and a double moving average model for analysis, and simulates data such as strategic returns, excess returns, and maximum pullbacks through the JoinQuant website. At the same time, this chapter will explain the research methods for conducting tests, including data selection, how to build tests, and how to evaluate test results.

### 3.1. Data selection

This chapter will use historical data to conduct backtesting tests on the multi factor model and the double average model, and obtain excess returns based on the multi factor and double average model. The data used in this article are all from the JoinQuant website. This empirical study covers the period from January 4, 2022 to December 30, 2022 in the China Securities 500 market, with an initial total of 770 stocks

selected. The reason for choosing the year range from January 4, 2022 to December 30, 2022 is because A-shares have experienced a complete annual economic cycle within this time range and are time-sensitive, which can see the sustained performance of factors in different market environments. The measurement of stock gains and losses is more comprehensive and objective, and provides more comprehensive information for constructing multiple factor stock selection models and guiding actual investment.

### 3.2. Factor Selection

First, identify candidate factors that should be available,

**Table 1.** Candidate Factors

Value factor	Growth factor	Quality factor	Technical factor
P/E ratio	net return on assets change	asset liability ratio	3 month momentum
Price to book ratio	Total return on assets Change	Fixed assets proportion	6 month momentum
Earnings yield	Reinvestment yield	Inventory cycle rate	9 month momentum
Book value ratio	Growth rate of main business	Accounts receivable turnover rate	12 month momentum
Cash yield		Total Asset turnover	Turnover rate
			Transaction rate

Next, determine the effective factors. This article mainly uses the candidate factor ranking method to test the effectiveness of the candidate factors. The specific structure is as follows: This article uses the constituent stocks of the China Securities 500 Index as the stock pool, and first arranges all stocks in a certain order based on a certain factor. Then, each sample stock within the scope of the study is scored, with the first ranked stock being scored 1 point and the second ranked stock being scored 2 points, and the last ranked stock being scored 500 points by analogy. Then rank the sample stocks according to different factors and divide them into 10 groups on average, with 50 stocks in each group, to construct an extreme stock portfolio. Calculate the average of the weighted annual composite returns of each group of portfolio stocks at each time point.

Finally, eliminate redundant factors and calculate the correlation matrix of effective factors. Through calculation, the correlation coefficient between the total asset change rate and the net asset change rate is greater than the threshold value. Therefore, the return on equity is eliminated. The P/E ratio is similar to the earnings yield, so exclude the earnings

universal, and highly distinguishable. "Only with the availability of data that is more consistent with the characteristics of quantitative investment data, and with universality can we better examine stocks. In addition, only with differentiation can candidate factors be selected to select high-quality stocks.". This article selects effective factors from four perspectives: value factor, growth factor, quality factor, technology factor, and growth factor, and conducts factor analysis. The specific candidate factors are as follows:

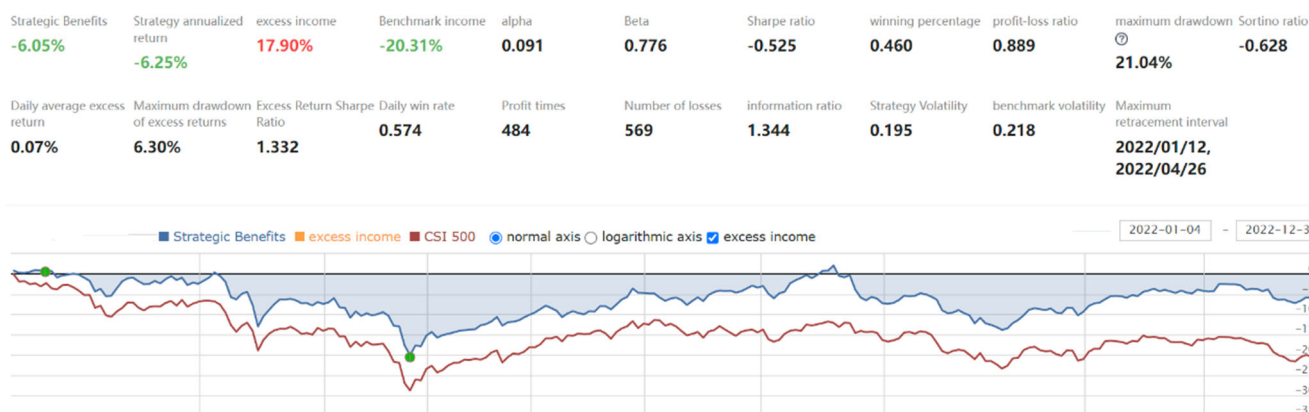
yield. The remaining seven factors, namely, P/B ratio, P/E ratio, cash yield, asset liability ratio, total asset yield change, total asset turnover rate, and trading volume, are the effective factors we have selected.

**Table 2.** Effective Factor

Value factor	Growth factor	Quality factor	Technical factor
P/E ratio	total return on assets change	asset liability ratio	transaction rate
P/B ratio		Total Asset turnover	
Cash yield			

### 3.3. Test method

This article mainly uses the data from JoinQuant website from January 4, 2022 to December 30, 2022, to study the effectiveness of the multi factor model. The simulation results are shown in the following figure:



**Figure 1.** Details of the multi factor strategy backtesting

Strategic Benefits	Strategy annualized return	excess income	Benchmark income	alpha	Beta	Sharpe ratio	winning percentage	profit-loss ratio	maximum drawdown	Sortino ratio
40.33%	41.91%	79.06%	-21.63%	0.455	0.290	1.249	0.250	1.558	19.26%	1.994
Daily average excess return	Maximum drawdown of excess returns	Excess Return Sharpe Ratio	Daily win rate	Profit times	Number of losses	information ratio	Strategy Volatility	benchmark volatility	Maximum retracement interval	
0.26%	18.95%	2.370	0.521	11	33	1.939	0.304	0.203	2022/04/06, 2022/05/24	

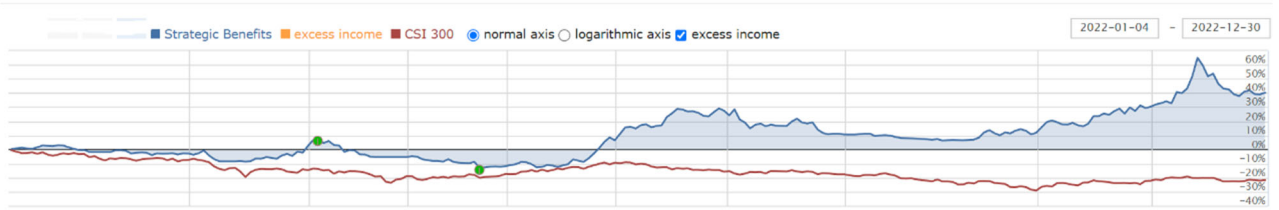


Figure 2. Double moving average model strategy backtesting details

The conclusion that the model returns are positive verifies the effectiveness of quantitative investment strategy research based on multi factor and double moving average models.

### 3.4. Empirical Results

Using quantitative investment strategies based on multiple factor and double moving average models for backtesting,

and comparing the CSI 500 index over the same period, we can obtain the results of multiple factor testing and double moving average testing within the selected time range. By understanding the drivers behind a strategy, we will recognize certain characteristics of companies and stocks that can help improve investment returns. The following figure shows some revenue details of the strategy:



Figure 3. Cumulative Revenue

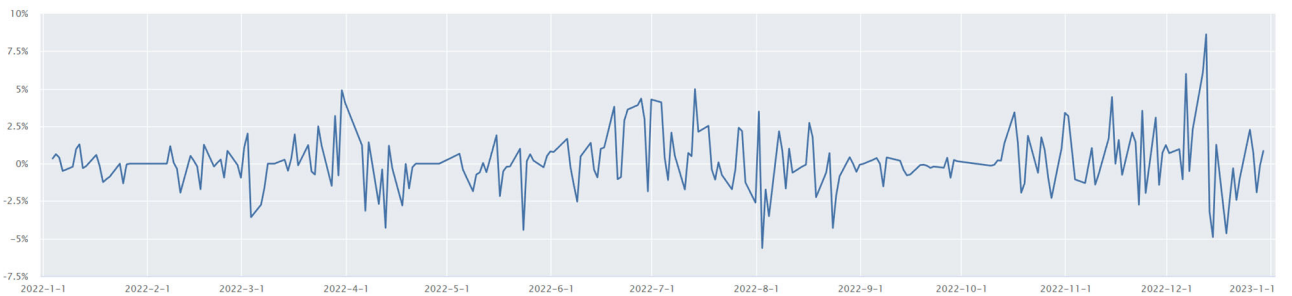


Figure 4. Intraday Revenue

Although the model returns well, there is still room for improvement. From the model, it can be concluded that most stock returns are positive and comprehensive returns are positive, which verifies the effectiveness of quantitative investment strategy research based on multiple factor and double average line models.

## 4. Conclusion

### 4.1. Research conclusion

This article selects the stocks of the China Securities 500 Index as the research object, and on this basis, carries out targeted optimization on the drawbacks of quantitative investment strategies based on multiple factors and double average line models. The research interval is selected from January 4, 2022 to December 30, 2022. Using the JoinQuant quantitative platform to conduct backtesting of multiple

factor and double average model strategies before and after optimization, capture performance evaluation indicators such as backtesting returns, Sharp ratio, alpha, maximum pullback, and excess returns from the backtesting platform, and test some of the better performing strategies. The following results are obtained: First, the combination of multiple factor and double average trading strategies has a significant guiding effect on the CSI 500 total return index. Secondly, the combination of multi factor and double moving average trading strategies has wide applicability. The optimization effect of the strategy is generally good, and most parameters can improve the strategy income. Thirdly, the research has shown various specific data of some stocks after applying the double average strategy on the basis of multi factor stock selection, which has greatly helped the application of the model in real life.

## 4.2. Future outlook

Although this article has conducted a lot of exploration on the dual moving average and multi factor stock selection strategies, there are still some areas that need to be further improved. You can start from the following aspects: First, increase the factors in the factor pool. Consider introducing some other weighting methods in the future modeling process, and compare which weighting method is most suitable. Secondly, we can try to apply it to other moving average strategies and study their effectiveness. Finally, the number of optional bid picks for the CSI 500 index is still small. In the future, you can try CSI 800 for a back test to test the effectiveness of the trading strategy for any new changes.

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