

Quantitative Trading Strategy Based on Multifactor Index Enhancement

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Abstract. Excellent stock selection strategy can not only spread risks for people, but also bring considerable benefits to people. With the development of China stock market and the continuous improvement of quantitative level, using artificial intelligence for financial investment has gradually become an industry craze. Quantitative investment is a method based on data, with model as the core and with the help of computer programs, among which multi-factor stock selection model is the most widely used. Quantitative investment refers to the process of transforming investors' thoughts or ideas into mathematical models, or simulating real-world situations by using models, so as to judge market behavior or trends, and making specific investment decisions and implementation by computers. This paper constructs a quantitative trading model based on multi-factor index enhancement, verifies the effectiveness of quantitative stock selection strategy, and provides research data and stock selection strategy for investors at different levels; At the same time, it also provides corresponding reference ideas, policy suggestions and theoretical basis for investors to obtain reasonable income, the government to improve and open financial markets, and the whole society to improve the efficiency of resource allocation.

Key words: Stock selection strategy, Quantitative investment, Multi-factor model

1. Introduction

With the increasing complexity and scale of China's capital market, the variety and quantity of investment are increasing day by day, and the investment channels and methods owned by both individual and institutional investors are also increasing. Nowadays, the financial market is complicated, the influencing factors of financial product prices are often not limited to the linear relationship under the traditional mathematical model, and it is difficult to achieve the optimal integration of theoretical model and practical operation, resulting in the low investment efficiency of traditional finance in today's financial market [1]. Quantitative investment refers to the investment in which people look for laws in the market through statistical methods, compile quantitative strategies on computers, and then issue programmed orders for buying and selling, in which they get certain guaranteed returns [2]. This method transforms the investors' thoughts or ideas into mathematical models, or simulates the real world situation by using the models, so as to judge the market behavior or trends, and hand them over to the computer for specific investment decision-making and implementation [3]. Timeliness means that quantitative trading strategy can closely follow the trend of the market, capture the investment opportunities that change in a blink of an eye, and finally get the return beyond the market index [4]. Decentralization means that quantitative trading strategy can reduce the influence of unsystematic risk factors on strategic return through decentralized investment portfolio, and obtain higher strategic return to the greatest extent [5].

Different from the traditional investment methods of fundamental analysis and technical analysis, quantitative investment seeks to minimize human factors, while adopting a fully computer-controlled trading system and following strict discipline reduces the deviation from the established trading strategy caused by the psychological role of traders [6]. Excellent stock selection strategy can not only spread risks for people, but also bring considerable benefits to people. Investing through quantitative trading strategy not only hopes to keep up with the development of investment methods, but also hopes to get a return that exceeds the market index and ordinary personal investment in stocks and other markets [7]. In the process of operation, the computer system can show absolute discipline, and the trading system can operate according to the pre-set trading strategy, which greatly reduces the influence of subjective emotions such as greed and fear of investors [8]. The timing method in

quantification also has certain reference significance to the stock selection model. Adding the timing method to the original model can enhance the timeliness of the model and consider the influence of different time points on stock selection [9]. This paper constructs a quantitative trading model based on multi-factor index enhancement, verifies the effectiveness of quantitative stock selection strategy, and provides research data and stock selection strategy for investors at different levels.

2. Multi-factor exponential enhancement model for stock selection

Multi-factor model is the most widely used stock selection model. The basic principle is to adopt a series of factors as the stock selection criteria, and the stocks that meet these factors are bought, while those that do not are sold. Multi-factor model is relatively stable, because there are always some factors that will play a role in different market conditions. Profit is a relative concept, which refers to the income obtained after investing a considerable amount of resources in all aspects. If the profit rate is larger, the higher the profit level is; The smaller the profit rate, the lower the level of profit [10]. Index is widely used in various fields, and it is an important reference index. It is to synthesize a large number of individual indicators through some rules to reflect the overall situation. Take the stock index as an example. In fact, the stock index selects a basket of stocks through certain stock selection rules, calculates the total market value of the stock portfolio, and normalizes it into the number of stocks to represent the changes of the value of a certain style of stock portfolio over time.

From the selected candidate factors, the effective factors that can explain the stock return rate are screened out, and a multi-factor stock selection model is established. The connotation of effective factor is that it can effectively explain the source of risk asset return rate and provide reference value for predicting future stock return rate. After selecting effective factors, effective but redundant factors need to be synthesized or eliminated. This step is mainly to test the correlation and multicollinearity of the selected significant factors. For the multi-factor model, the traditional multi-factor stock selection model is a linear regression model. If there is a strong correlation between factors and multiple collinearity, the estimation of the model will often be distorted and inaccurate [11]. As far as the company is concerned, the initial driving force of the company's operation is to get the maximum benefit in the future and the company can continue to operate and develop continuously. For different types of investors, the model has good applicability and stability. Multi-factor stock selection model selects many types of factors to test and screen out effective factors. Many investors believe that the level of profitability of a company is more important than the financial situation and the level of operation. Investors' pursuit is to get the most income, so when comparing several companies with comparable reputation, they are more inclined to invest their capital in companies with high profitability.

The idea of index enhancement can be divided into three aspects: position control, industry rotation and stock selection. The goal of this strategy is to obtain excess returns while tracking the benchmark index, that is, to obtain enhanced returns under the premise of controlling the tracking error. Tracking error is the standard deviation of tracking deviation, and its formula is as follows:

$$TD_{it} = R_{it} - R_{tb} \quad (1)$$

$$TE = \frac{1}{n-1} \sum_{t=1}^n \left[TD_{it} - \frac{1}{n} \left(\sum_{t=1}^n TD_{it} \right) \right]^2 \quad (2)$$

Where TD_{it} is the deviation of fund tracking, which is the difference between the change rate of fund net value R_{it} and the performance benchmark return rate R_{tb} of the fund in the same period.

In the validity test of single factor grouping, considering the relationship between factor value and time, the portfolio is constructed once a month according to factor value, and the effect of portfolio yield is checked. In this way, the portfolio constructed by monthly position adjustment can better explain the effectiveness of the factors. The determination of portfolio size is an important step in the construction of multi-factor model. In portfolio, we often adopt decentralized investment strategies

to reduce risks. Profitability is a very important ability of a company, and investors in the market underestimate the prediction effect of current earnings information on future profitability, and earnings momentum is the most powerful evidence. In other words, after the company's financial statements are published, there will always be a stage of adjustment of the company's share price, which will bring investment opportunities to market investors.

In an efficient market, investors are mostly rational, and everyone will make an effective judgment on the rise and fall of securities prices through rational judgment and the quality of the information obtained. The final development of any market will develop towards a state with sound legal mechanism, transparent information transmission path, open market data and no market manipulation. Multi-factor stock selection model relies on computer technology, and through a large number of data processing and analysis, effective factors are selected from a wide range of factor types, which has strong reference value. When the market reaches the second stage-semi-strong efficiency, the fundamental analysis that is effective in the weak market also loses its function, and various financial indicators of the company can quickly reflect in the changes of securities prices. When the market develops to the third stage-strong efficient market, even inside information can't help investors get excess returns. Using quantitative stock selection strategy and advanced computer technology can effectively process a large number of data, and can deeply mine and analyze the data, greatly improving the efficiency of investment research, which is an advantage that manual stock selection does not have.

3. Implementation of stratified sampling exponential enhancement

Market value and industry are very important risk factors. The core of stratified sampling strategy is to make the portfolio consistent with the benchmark index in these two risk dimensions, and then select the one with the highest expected return among several stocks with similar market value and industry attributes to invest in order to obtain excess returns. If in a securities market, with the fluctuation of individual stock price, the market value of the company corresponding to the stock changes accordingly, at the same time, the company may also have behaviors that affect the stock price without affecting the market value, that is, the phenomenon that the stock price and market value change asynchronously. This synchronous and asynchronous phenomenon and the size and frequency of market value changes will in turn have a certain impact on the fluctuation of stock prices.

The demand for products of enterprises in the market is large, and the outstanding expansion ability of business operation is often reflected in the high growth rate of main business income. If the income growth rate of an enterprise's main business can be kept at about one third, the enterprise can be judged as having good growth. In order to analyze the validity of the test factor data, the factors without orthogonal treatment and the factors without market value and industry neutralization treatment were back-tested. Because orthogonalizing the factors may reduce the influence of important factors on the results, so that the final scoring result is inclined to the side with more weight, try to use non-orthogonal factors. The portfolio x sought by rational investors makes the risk get optimal control when the expected income level R_0 is given;

$$\begin{cases} \min & x^T \Sigma x \\ s.t. & r^T x \geq R_0 \\ & \sum_{i=1}^n x_i = 1, \quad x \geq 0 \end{cases} \quad (3)$$

Or maximize the expected return under the condition of a given risk level V_0 :

$$\begin{cases} \max & r^T x \\ \text{s.t.} & x^T \Sigma x \leq V_0 \\ & \sum_{i=1}^n x_i = 1, \quad x \geq 0 \end{cases} \quad (4)$$

Among them:

$$x = (x_1, x_2, \dots, x_n)^T \quad (5)$$

$$r = (r_1, r_2, \dots, r_n)^T \quad (6)$$

r_i represents the proportion coefficient of i securities investment in the total investment; n is the number of selected securities; $r^T x$ represents the yield of securities portfolio; $x^T \Sigma x$ represents the risk of securities portfolio; $\Sigma = (\sigma_{ij})_{n \times n}$ stands for covariance matrix of yield.

When analyzing the growth rate of enterprises, the growth ratio is a frequently used index. During the period of expansion, enterprises show the expansion of asset scale. This performance is due to two reasons: one is the increase of owners' equity, and stock investors need to pay attention to the specific situation of funds being used; The second is often due to the operation of loans, but considering the factors of capital structure, when the asset-liability ratio of enterprises reaches a certain level, the debt scale is limited. Generally, companies with low asset-liability ratio have strong solvency, mature and stable business strategy and low investment risk, which are easily sought after by capital preservation and risk-averse investors. However, many enterprises with high asset-liability ratio are innovative enterprises with great development potential in the initial stage, which need a lot of financing to expand production, improve production capacity and obtain optimal profits.

4. Conclusion

Quantitative investment relies on a large amount of data and scientific mathematical statistics, which can provide an effective strategy to seek excess returns, and also proves that quantitative investment has strong feasibility and market potential in China stock market. Based on the existing quantitative investment research, this paper analyzes the thinking and practice of multi-factor exponential enhancement strategy. Quantitative stock selection based on multi-factor model can fully tap the value information of listed companies and screen out stocks with growth potential. Quantitative investment is based on the premise that the market is ineffective or weakly efficient. With the passage of time, the number of investors using multi-factor quantitative stock selection model is increasing, which will make some factors no longer suitable. The addition of other factors will make the model more effective, so the selection of factors should be more comprehensive. In the quantitative investment model, the holding period, transaction cost and risk management of the stock portfolio will all affect the rate of return of the model, and more research on this issue in the future will make the model more applicable and flexible.

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