



Quantitative Investment Portfolios Building Using Historical Data of Securities

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Abstract. In recent years, with the emergence of innovative financial instruments, arbitrage and trend operation are brought to the market. Quantitative trading uses a variety of computer technology to analyze these huge market data, which is more efficient and accurate than manual analysis, and at the same time, it can better grasp some potential profit opportunities. Although the quantitative trading market started late, several decades ago, it has developed rapidly in recent years, and many quantitative trading platforms have emerged in the market. Firstly, this article provides an overview and analysis of the background of the quantitative trading and basic portfolio. Secondly, based on this theory, this paper defines the concept of quantitative portfolio in accordance with the basic portfolio. Thirdly, this article mainly discusses the comparison of the two portfolio methods, such as the scope of use, application. After that, the article also gives the corresponding success or failure cases, and also tries to find out the reason behind these cases. This paper conducts market research through Internet data collection, analyzes the current situation and the existing problems of both quantitative trading and basic portfolio. Finally, the article puts forward several suggestions which aim to help people who work in the industry to improve their portfolios, and also has a summary of the results of the previous chapters. The article concluded that with the rapid development of computer technology, quantitative investment will become more and more popular, and its yield will be higher and higher.

Keywords: Quantitative Investment Portfolio · Fundamental Portfolio · Comparison · Historical Data

1 Introduction

With the rapid development of quantitative investment, it has become a professional field that cannot be ignored in the financial market. Quantitative investment can bring investors more diversified and characteristic investment products, and enrich the product types of institutional investors [6]. Based on modern computer technologies, analyzing huge market data can help to get accurate market results and formulate optimal strategies. In terms of forecasting, there are different investment portfolio methods. This article mainly compares the fundamental portfolio and the quantitative portfolio. The focus of this research is the similarities and differences between the application of the two

methods. Furthermore, by analyzing the corresponding cases, the reasons for the success or failure of different methods will be discussed. Finally, the author will put forward suggestions based on the current problems found in this research to help people improve their investment portfolios.

2 General Review of the Topic

Quantitative investment refers to the trading mode that sends out the order of sale through the quantitative method and computer program to obtain stable income. Quantitative investment is the process of using computer technology and adopting certain mathematical models to realize the investment concept and investment strategy. According to the mathematical model and the transaction rules, the transaction signal is generated, and the system automatically executes the transaction process of the instruction [8]. Interestingly, the investment industry generally calls quantitative investment “black box”. Quantitative investment refers to the trading mode that sends out the order of sale through the quantitative method and computer program to obtain stable income. Quantitative investment is the process of using computer technology and adopting certain mathematical models to realize the investment concept and investment strategy. According to the mathematical model and the transaction rules, the transaction signal is generated, and the system automatically executes the transaction process of the instruction [4]. Interestingly, the investment industry generally calls quantitative investment “black box”. The advantage of quantitative investment is that this method not depends on the feeling, experience and intuition of the investors, but on data and formula. Therefore, the influence of subjective factors can be avoided. Furthermore, through quantitative investment, investors can be freed from various daily trivial information analysis and form a once and for all mode. There are two important parts to quantitative investing which are research and implementation. On the contrary, fundamental strategies focus on a relatively small group of stocks and emphasizes forecasting future prospects, including the future earnings and cash flows of a company.

3 The Development of Quantitative Investment

Quantitative investment originated in the early 1970s. The first passively managed index fund in the world was released by the international investment management company of Barclays. Later, it was called the originator of quantitative investment. American quantitative economics professor Barr Rosenberg, as a pioneer of quantitative investment, created the portfolio performance management model, and established Rosenberg institutional equity management company with three partners to manage the stock investment portfolio by computer. Since then, he has developed a variety of quantitative analysis models, and created the famous “comprehensive alpha” model. By 1990, the asset management scale of Rosenberg institutional equity management company had exceeded 10 billion US dollars.

Since the 1980s, with the rapid development of information technology such as computer and Internet, all kinds of securities and options products have been continuously enriched, and the volume of financial transactions has increased greatly. Great changes

have taken place in Wall Street. If investors only use manual analysis and trading mode, it is likely to be abandoned by Wall Street. Without the use of computers, analytical models and Internet, investors will fall into high-risk investment dilemma in the face of huge financial data. In this way, the quantitative investment method using computer for mathematical statistical analysis began to be gradually accepted by investors.

In the Asian financial crisis from 1997 to 1998, the algorithmic trading of quantitative investment played a bad role. At the same time, the failure of long-term capital management companies has also made quantitative investment worse, and the field of quantitative investment has been questioned and rejected unprecedented. Since then, quantitative investment has not been spared by the financial crisis that began in 2007. However, these cannot completely negate quantitative investment. James Harris Simmons, a legendary fund manager, has created an amazing myth with an average annual return rate of 60% in 20 years by using the method of quantitative investment, which has left the traditional value investment far behind. Simmons's success makes the majority of quantitative investors hope again. Facts have proved that the use of quantitative investment method needs to be deepened and created constantly. The invariable quantitative model and strategy cannot always defeat the market. Quantitative investment managers must constantly improve the model and create more rigorous models to defeat the ever-changing market. Failure and financial crisis after failure have not broken the confidence of quantitative investors, on the contrary, they have tempered the quantitative investment model of investors. In the financial storm of 2007, some quantitative investment funds optimized and improved the investment model, achieved timely stop loss, so that the majority of investors saw the hope of quantitative investment, and from then on, quantitative investment ushered in a broad space for development [4].

4 Comparison Between Qualitative Portfolio and Fundamental Portfolio

Traditional investment is to use basic analysis or technical analysis in the process of investment. The stock transaction price and market operation depend on the analysis method of human. Through the experience and judgment of human, the asset allocation, stock selection and timing are determined, and the transaction is completed by professionals.

Fundamental portfolio relies on human analysis and judgment and is executed by professionals. Therefore, in the traditional investment model, the results are easily disturbed by the analyst's subjective judgment and emotions, which will affect the accuracy of the results [7]; while quantitative investment is the use of procedures to analyze existing data. The entire process, from stock selection, timing to position selection, is controlled by a computer, which can avoid the interference of human subjective factors. Therefore, compared with traditional investment, quantitative investment can be more objective, stable and reliable.

In terms of the scope of decision-making objects, due to the manual operation of the basic investment model, the number of stocks or futures products tracked in real time is limited. At the same time, at the analytical level, technical indicators that can be analyzed manually are limited. Therefore, the scope of investment decision-making is

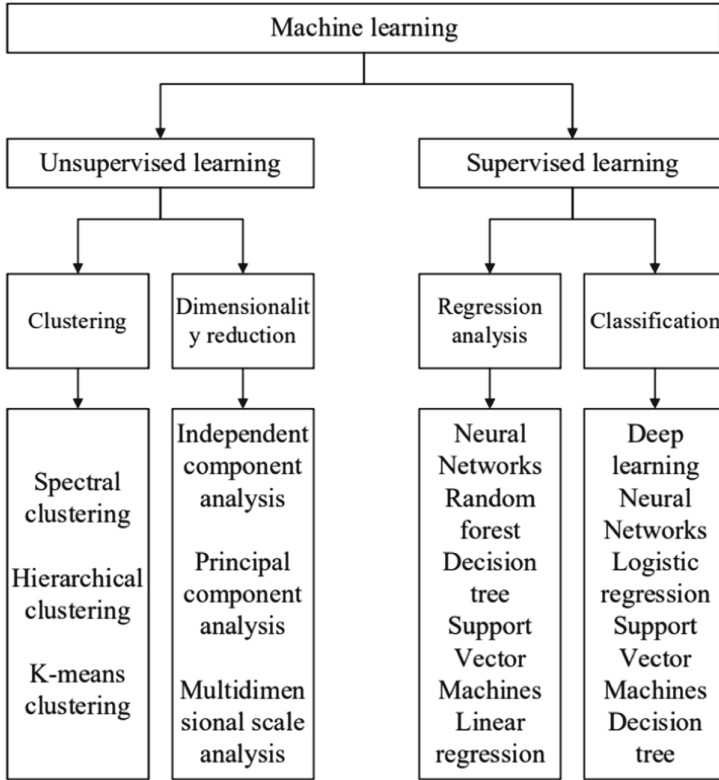


Fig. 1. Process of quantitative analysis.

narrow. However, quantitative investment is the use of computer programs for quantitative analysis and judgment, the investment products tracked can be unlimited, and the analysis indicators can also be increased and expanded, as shown in Fig. 1 [2].

In terms of the depth of decision-making, since the market is changing rapidly, when using computers for analysis, the analytical system cannot be updated. Therefore, quantitative investment methods can only maintain the depth of decision-making in existing strategies, and it is difficult to keep up with market changes. In contrast, under the fundamental investment model analysis, researchers can conduct more in-depth investment analysis according to changes in market conditions, and update the analysis indicators and data.

In terms of income and risk control, the fundamental investment model emphasizes investment income rather than risk control; quantitative investment takes risk control as an important link and pursues a balance between risk and return. Quantitative investment can be quickly assessed through computer programs. Therefore, compared with the fundamental investment model, quantitative investment can effectively prevent investment managers from deviating from potential performance benchmarks, excessive pursuit of profits and ignoring risks.

The advantages of quantitative investment lie in discipline, system, timeliness, accuracy and decentralization. For investors, it is very hard for them to make choices between the quantitative investment fund and the fundamental investment fund as they have very different styles. Quantitative portfolio is more like a systematic way to operate the fund which rely on the statistical and mathematical methodologies. The investment decision is a result calculated by the model systematically. For the fundamental portfolio, the investment selection is based on judgemental decisions made by the investment managers. The common method used by fundamental analysis is top-down analysis and this method allows investors to analyze the market from the big picture all the way down to individual stocks.

One significant drawback of the quantitative strategy is that other managers are able to follow its strategy. If the majority of market participants follow the similar investment strategy, it would be difficult to turn around the positions as the market liquidity is limited at that time. For example, quantitative equity fund managers experienced a liquidity shock in August 2007 due to managers, having herded into similar trades, attempting to liquidate at the same time. Even in normal market times, volatility and liquidity will be dynamically changing, and traders need to reflect this in their expectations. Lower liquidity suggests longer trading horizons; however, higher volatility might cause investors to speed up trades and incur higher costs to avoid execution risk of adverse price movements.

The drawback of fundamental analysis is that this method is relatively subjective and too many assumptions and sources are used. The fundamental analysis needs to take into considerations those factors like company operations, sales and productions, financial statements, ratio analysis and government policies. The analysis needs a lot of efforts and time. The advantage of it lies in the deep-seated decision-making to choose investment strategy [5]. The process is shown in Fig. 2.

The advantages of quantitative investment compared with traditional investment are that it can avoid the human negative impact, manage the emotion and cognition of the person through computer implementation strategy, judge and analyze the investment

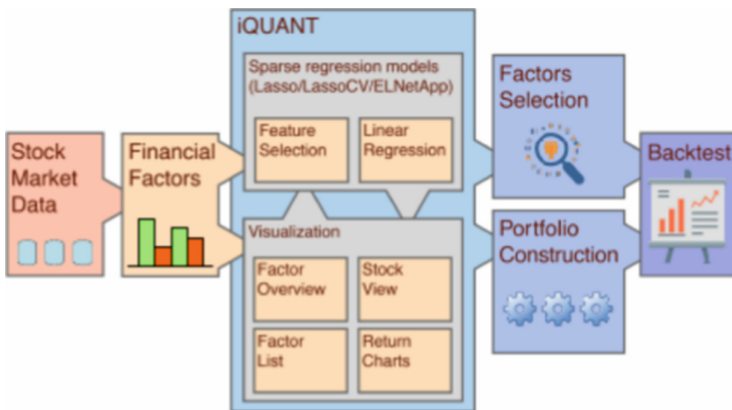


Fig. 2. Process of fundamental analysis. (original by the author)

object more quickly and accurately, and balance the risk and return. However, when there is dramatic changes in the market, the results of quantitative analysis should be updated.

5 Analysis on the Performance Fund for Quantitative Style in China During the Past Decade

With the gradual maturity of the domestic market mechanism, quantitative trading also began to develop in China. Automated trading developed earlier in the futures market and has begun to take shape; With the return of Wall Street Chinese in the financial crisis, quantitative investment is becoming a hot spot in the stock market; Some institutional investors began to use algorithmic trading to reduce transaction execution costs; And arbitrage in ETF, warrant and other products.

Automated trading started in the domestic securities market at first, and has been accepted by more and more investors in the futures market in recent two years. Especially in April 2010, the launch of CSI 300 stock index futures provides investors with short investment means. At the same time, all kinds of software suppliers have launched the futures automatic trading software function, which provides short-term traders with a quick underground order mode. In addition, the automated trading model of futures market is gradually developed by investors for their own use, and has evolved into a professional team composed of investment consultants of a certain scale. According to China International Futures Corporation, the number of investors allowed to use programmed trading now accounts for 10% of the company's total customers, with an increase of more than 10 times in the past year [3].

The research question to address is to find out the best performance fund for quantitative style in China during the past decade. Despite the prolonged trade war with the United States, China has been one of the top-performing stock markets globally. It is meaningful to understand how the best quantitative fund manager form the portfolio and which stock the manger picks to outperform the market.

To address the question, we could collect the quarterly holdings of the portfolio if it is disclosed and analyse the style of the fund. It is also important to study the fund manager past style and strategy. We should also do the attribution analysis and compare the fund performance with the benchmark funds. The attribution analysis would find out the reason behind the fund superior performance.

Domestic quantitative investment funds have also developed rapidly. The main funds include Everbright quantitative fund, Zhonghai quantitative fund, Shangtou Morgan alpha, Huashang dynamic, Fuguo Hushen 300 enhancement, harvest quantitative alpha fund, Nanfang strategy optimization, Changsheng quantitative fund, AIA berry quantitative fund, Huafu quantum vitality fund, Damo Huaxin multi factor selection strategy fund Shenwanlingxin quantitative Small Cap Fund. The 13 quantitative investment funds were launched in 2012, as shown in the Fig. 3. The annual return is more than 12%, more than 4% points higher than that of actively managed partial equity funds. After a short period of more than one year of establishment and development, quantitative investment fund has emerged [1].

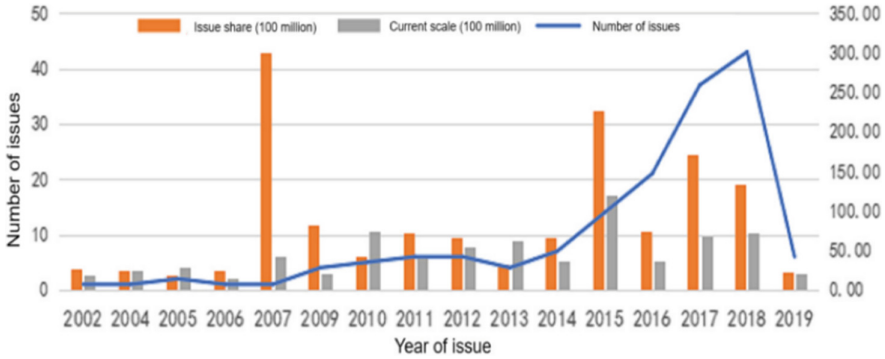


Fig. 3. The 13 quantitative investment funds. (original by the author)

6 Conclusion

In a word, quantitative strategy determines the general direction of investment, investment trading strategy determines the return of investment, asset allocation determines the balance of investment, transaction execution determines the real-time of investment, and risk management determines the safety of investment. These parts are indispensable and promote each other. In the field of quantitative investment, this study is just the beginning, constantly improve the efficiency of the platform, enrich the quantitative investment trading strategy, optimize the portfolio of investment strategy, research new investment model, real transaction test, etc., will become the main goal of the next stage of quantitative investment platform optimization work. With the maturity of computer and big data technology, quantitative investment has played a role in enriching and optimizing the market. At the same time, quantitative investment methods also provide investors with new decision-making perspectives and opportunities. Domestic institutional investors are increasing their investment in quantitative investment to speed up the process of quantitative investment. Quantitative investment has very promising prospects in China.

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