

Research on Localization Status and Investment Strategy of Quantitative Fund in China

Jun Chu*

School of Business, University of Dundee, Dundee, Scotland, UK

*Corresponding author: 2520344@dundee.ac.uk

Abstract. In this paper, Quant funds in China based on the market as a starting point for research, at the current mainstream of modern portfolio theory, the factor model and the theoretical basis of dynamic DEA, mainly analyze the modern portfolio theory in the application of funds of funds, not a single security analysis, especially since 2014, when the domestic market emerged a lot of "FOF" and "FOHF." Most of these portfolio funds do not carry out in-depth analysis of the underlying funds or even understand the trading methods and essence of various strategies, but focus on the combination of various strategies of hedge funds. In this paper, combined with their own learning experiences, the analysis of the various domestic trading strategies, combined with the quantitative funds in China, local firm performance, and portfolio of related theory, the study of portfolio theory in the domestic application of portfolio management, and the practice of funds allow us to put forward some useful suggestions and thinking.

Keywords: Quantitative investment; quantitative strategy; dynamic DEA model; performance analysis.

1. Introduction

Although quantitative investment is essentially the same as traditional qualitative investment, it can be said to be the "quantitative application of qualitative ideas," which places more emphasis on data. All decisions are made according to the model, with strict discipline. Thus, quantitative investment excludes people's emotions and ensures the objectivity of investment. On the other hand, the human brain's ability to process information is limited after all. When there are few stocks in the market, it may not be a problem, but now the A-share market has more than 4500 stocks. Looking back just in the past 2021, the CSRC issued a total of 524 companies' IPO applications, according to the recent weekly issuance rate. The benefits of quantitative investment information processing will be evident in 2022, when the volume of new issues is likely to exceed that of 2021.

China's fund industry has been developing for nearly 20 years. From an initial scale of 10 billion yuan to 25 trillion yuan by the end of 2021, with 174 public fund companies, China's securities investment fund industry has made remarkable achievements. It has been 15 years since the first public offering of a quantitative fund was established in 2002. The early quantitative funds were mainly index-enhanced quantitative funds, and none were issued in the two years since 2006. With the start of the rebound in 2009, quantitative investment recovered [1]. In the same year, in addition to issuing three index-enhanced funds, four active quantitative funds were also issued, leading a wave of quantitative investment. In the following years, the issuance of quantitative funds has never been interrupted, showing an overall upward trend. In 2011, the number of funds established exceeded 10 [2]. From 2013 to 2015, a large number of neutral strategy funds were issued in the market to cope with the volatile market during that period. In 2015, the number of quant funds issued reached a record high, with a total of 32 quant funds issued. Active quant funds replaced index-enhanced quant funds and became the main new funds. The year 2021 can be called the first year of quantitative funds. China's 10 billion quantitative private equity institutions have increased from 10 in 2020 to 28 in 2021.

Wind data shows that as of April 15, Richina quantitative hedge strategy, Huatai Pary quantitative hedge strategy, Invesco Great Wall quantitative hedge strategy, Shenwanlingxin quantitative hedge strategy, Everbright Sunshine quantitative hedge strategy B, and other 6 funds have gone against the market since this year, like "a little red in the green." With a return rate of 30.45%, the Wanjia Macro

Timing Multi-Strategy Fund became the "champion" of public offering fund returns in the first quarter of 2022. The imagination space of the quantitative fund is gradually unfolding.

From the perspective of quant funds, the mainstream quantitative strategies in the market mainly include three categories. The first type is an active quantitative strategy. Active quantitative strategy is the quantitative way to select stocks, combined with active fundamental screening, to construct this kind of active combined with quantitative strategy. The second type is the exponential enhancement strategy. Index enhancement refers to tracking a certain index first, which is generally the mainstream broad-base index in the market, such as the CSI 300, CSI 500, or even CSI 1000 index. On the basis of this index, long-term stable excess returns will be pursued, i.e., the enhanced alpha part. The third type is quantitative hedging with an alpha strategy. The core of the alpha strategy of quantitative hedging is the combination of index enhancement to obtain excess returns relative to the index, but at the same time, stock index futures will be introduced to hedge to remove the volatility of the market or what is called the index and obtain relatively stable alpha returns. These kinds of strategies have also grown in the last five years, especially in the last two to three years. It is also a very mainstream strategy for using public funds. From the latest section, the number of active quantitative fund products accounted for the largest proportion, 59.64%. By the end of the first quarter of 2022, the total shares of active, incremental, and hedge quant funds were 54.901 billion, 77.480 billion, and 21.488 billion, respectively. There are 229 active quant funds, 130 incremental quant funds, and 25 hedge quant funds in the stock market. Index-enhanced fund products accounted for the largest share of 50.35%.

Mainly referring to multiple models, this paper analyses the quantitative fund situation and strategy in China, not a single securities analysis, but paying attention to the combination of hedge fund strategies. Since 2014, when the implementation of the private fund law marked the formal establishment of the legal status of domestic private equity funds, as hedge fund tools were put into use, domestic hedge funds began a rapid growth [3]. A large number of professionally trained on Wall Street home business, the foreign strategy combining the actual situation of the domestic application of localization, thus in China also appeared a variety of investment strategies, these strategies including active quantitative strategy, exponential enhancement strategy, quantitative hedging alpha strategy, etc., with mature application of these policies on private equity funds, domestic quantitative funds have a real sense of the optional bid.

2. Research on Quantitative Fund Performance based on the Modern Portfolio Theory

Modern portfolio theory was first put forward by American economist Markowitz in 1952, which laid the foundation for portfolio theory. Before Markowitz, people's understanding of risk and return was separate. Markowitz first linked risk and return to measure and define investment. Since then, risk and return, like two sides of the same coin, have become important indicators of investment activity [4]. Both a limited and a broad understanding of portfolio theory exist. Portfolio theory in its strictest sense refers to Markowitz portfolio theory. The capital market theory, which is made up of the capital asset pricing model and the efficient theory of the security market, is included in the generalised portfolio theory in addition to the classical portfolio theory and its various alternative portfolio theories. This essay mostly uses portfolio theory in its restricted sense. Markowitz portfolio theory mainly includes two aspects, as follows.

(1) Dispersion of investment targets: Generally speaking, the relationship between the risk and return of the investment target is the issue that investors pay the most attention to. Through the establishment of a portfolio, investors' requirements for risk and return can be met. The effective portfolio is generally the portfolio with the greatest return under expected risk or the portfolio with the least risk under expected return.

(2) Correlation between investment targets: The correlation coefficient is a representation of the number of correlations reflecting the degree of common variation between two random variables. For

portfolios, the correlation coefficient can reflect the degree to which the expected returns of each group of investment targets move in the same direction or in the opposite direction.

Through the analysis of the model results, several findings can be derived as follows. The first finding is that the volatility of a portfolio is significantly lower than that of any single strategy. It can be found that the optimal combination of variance is significantly lower than the variance of a single policy, which has an apparent effect on the volatile combination from lower, suggesting that the modern portfolio theory is effective in the application of portfolios. In line with the expectations, the modern portfolio theory can be used to get the optimal combination of the hedge fund portfolio. Another finding is that the portfolios of hedge funds can achieve absolute returns. Absolute return is the vocabulary that domestic has been using recently. Absolute return is to point to the income that can be obtained, and the market has nothing to do with it. In a statistical sense, this absolute return means that the correlation between the portfolio and the market is low. Through calculation, it can be found that the correlation between the constructed portfolio and the market is 0.16, which proves that the pool of funds can obtain an absolute return.

Theoretically, Markowitz contends that the claim that the majority of captive investors are risk-averse is dubious. For instance, if a security has a return range of 7%–23% and another has a return range of 9%–21%, it would be foolish for the investor to choose the former over the latter because both securities have an average return of 15%. The estimation of anticipated returns and hazards is the appropriate gauge for the actual returns and risks of a portfolio and the securities it contains, in accordance with Markowitz's theory. The relationship between the end of the security and the end of the market is represented by the correlation coefficient. It is implausible to claim that variance is one of the best indicators of risk. First, it is unlikely that historical data will be repeated. Second, the link between securities cannot be fixed because a security's factors vary often throughout time. Third, in theory, Markowitz's theory states that short-term price movements with a large or low anticipated variance should determine the expected return of a security. However, in reality, short-term price fluctuations do not actually pose a risk to investors who are restricted by a lack of liquidity or who are in fact the custodians of some securities.

3. Research on Quantitative Fund Performance based on the DEA Model

DEA, the full name of "Data Envelopment Analysis," is a non-parametric estimation method, an integrated application of management, mathematics, economics, and operations research that was proposed by Chares A., Cooper W., and Rhodes E. in 1978 [5]. Data envelopment analysis is used by scholars to evaluate the relative effectiveness of similar production units, also known as DEA effectiveness. DEA replaces the traditional production function in economics with the concept of the envelope, which represents the set of optimal solutions. By making up the effective front surface and the decision-making unit, the closer the decision-making unit is to the effective front surface, the higher the effectiveness is. The efficiency index commonly used in the DEA model is divided into three categories: total technical efficiency index, scale efficiency index, and pure technical efficiency index. When the output of a securities investment fund is the largest, the smallest input factor represents the total technical efficiency. Under the condition that the scale of the securities investment fund is unchanged, the input factor is the smallest, which represents pure technical efficiency. Scale efficiency is the quotient of total technical efficiency and pure technical efficiency.

The DEA model is widely used to evaluate relative performance between production units of the same type. The basis of making a decision is based on the input and output elements of the decision-making units. For example, when evaluating the performance of a garment factory's production, the inputs are the cost of capital investment, site cost, and manpower cost, while the output element is the number and relative quality of the product. Compared to the same, it can be seen that the securities investment fund as a production unit; the securities investment fund in the process of operating costs and the risk of investment would have to pay the cost as inputs, and fund income can be thought of

as output elements, and the DEA model will be good to apply to the securities investment fund performance evaluation. The advantages of the DEA model in the application is specified as follows.

(1) The DEA model can comprehensively apply multiple evaluation indexes and data, including the selection of input indexes, output indexes, and data period.

(2) The DEA model is convenient to apply. It only needs to input the data of each input index and output index to get a comprehensive performance ranking without listing each index one by one and comparing and analyzing a large number of data points as traditional fund performance evaluation does.

(3) The application of the software can calculate the relative invalidity of various target-specific adjustment quantities of decision-making units to achieve the aim of optimizing decision-making unit performance, and its application in the securities investment fund performance evaluation is effective for the securities investment fund performance optimization scheme.

Although the DEA model is applied to performance research, it has many advantages. However, in practical application, it has many limitations.

(1) The input and output indicators of the DEA model are human choices; the choices of different people may not be consistent, which leads to the possibility that the research conclusion is inconsistent and has certain subjectivity.

(2) The data envelopment analysis method is a non-parametric analysis method, so there is no random perturbation term in research, so the requirement for data accuracy is also unusually high.

(3) The input index data and output index data of some DEA models are required to be greater than or equal to 0. When the data is less than 0, the application software cannot produce results, so it is necessary to conduct standardized processing on the data.

4. Research on the Attribution of Fund Performance

Attributable research on fund performance mainly refers to the analysis of the sources of fund returns, especially the study of timing ability and stock selection ability. In 1966, Telillo and Mazer innovatively proposed the T-M model for the study of timing ability and stock selection ability. They believed that if future returns could be predicted, then the investment portfolio could be adjusted accordingly and prospectively to achieve the purpose of optimizing income [6]. In 1981, Henrikson and Robert B. Henrikson Merton made some improvements based on the T-M model to get the H-M model, which is simpler than the T-M model in terms of analytical thinking. In fact, the T-M model is very similar to the H-M model in terms of timing and stock selection, but the difference is that the nonlinear treatment of the SML curve is different. In 1984, Chang and Llewellyn proposed the C-L model based on the arbitrage pricing theory of the H-M model. This model has strong applicability and can be used to obtain the beta value of a securities investment fund in a bull or bear market, respectively, to analyze the characteristics of the fund. In 1972, Fama and French introduced the scale factors and value factors, thus creating the Fama-French three-factor model, which was used to explain stock returns. Fama and French believe that portfolio returns come from the book-to-market ratio factor, market asset portfolio factor, and market value factor, which can be well applied to the research of fund performance attribution if certain adjustments are made. In 1997, Carhartt explained the market trend effect by adding the momentum factor since the Fama-French three-factor model was created by Fama and French. In 2012, Hou, Xue, and Zhang found that if the value factor in the Fama-French three-factor model was replaced by the investment factor and the return on equity factor, the results could be more superior than the Fama-French three-factor model. In 2013, Fama and French are the two people who created the Fama-French three-factor model to make the improvement on the original model, which added profitability and investment mode as two factors to better explain stock returns [7]. The defect of the model is that when the investment portfolio contains a high proportion of low-profit small-cap stocks, The explanation of returns is not ideal, and the introduction of two new factors makes the original value factor redundant.

5. Research on the Persistence of Fund Performance

Whether the fund's performance is sustainable or not depends more on whether the market is efficient. In the process of launching the Jensen index, Jensen conducted research on the fund's performance from 1945 to 1964, and the results denied that the performance of security investment funds was sustainable. The early academic studies all believed that the performance of security investment funds was not sustainable [8]. After 1990, financial scholars found that fund performance was sustainable after a certain period of investigation. Especially in 2004, Tonks studied the investment performance of the British pension from 1983 to 1997 and found that the investment performance of the British pension was sustainable in one-year data. In 1995, Malkiel conducted an in-depth study on the performance persistence of one-day stock investment securities investment funds from 1971 to 1991 and found that between 1970 and 1980, stock investment: The performance of funds has a relatively significant persistence, but since 1980, the phenomenon of fund performance persistence is not obvious, and there are often reversals. Over the same period, and brown, in the research of securities investment fund performance persistence, also found in some years, the fund performance persistence shows some years of securities investment fund performance that is not continuous, and even reverse [9]. Even under the different performance indicators, the securities investment fund performance persistence will show different, It can be seen that the research on the performance persistence of securities investment funds is not only related to the time period but also related to the selection of performance indicators.

6. Discussion

In China, because the operation time of the quantitative fund is not long and the development of financial derivatives and hedge funds is limited, domestic academic research on the quantitative fund involved in this article is not much, and industrial newspapers and magazines feature it mainly in the form of an introduction or an interview, but there is a lot of research on traditional arbitrage, which belongs to the scope of quantitative investment. Domestic research on fund performance is much older than that on quantitative funds and is more mature at present [10]. Because the comparison of fund performance is not the focus of this paper, this paper introduces the reference of fund performance research literature. Shi Daimin (2000) and Xu Hanjiang (2000) evaluated the operation performance of the earliest 10 securities investment funds by using the Sharpe index, Treynor index, and Jensen > average return index without considering risks. All found that the overall operating performance of fund income in China is better than the market average [11]. Shen Wei Tao et al. (2001) applied the risk-adjusted index approach to conduct an empirical study on the performance of securities investment funds, both the T-M and H-M models, discovered that following risk adjustment, the performance of the fund was generally superior to that of the benchmark portfolio, and the fund manager's successful performance was made possible by careful stock selection: However, there is insufficient proof that fund managers possess market timing abilities [12]. Shoufa wang (2005) analyzed the fund's income and risk, manager's stock selection ability, performance persistence, and risk-adjusted returns from four aspects, such as establishing an index system, and adopted principal component analysis of multivariate statistical analysis to determine the index weight of the above four aspects, then got a measure of the comprehensive index fund's performance and carried on the comparison to the fund's performance. Chen Zhanhui and Yang (2006) studied the profit patterns of inertia and contrarian investment strategies in China's stock market. Zhenxiang, Chen Min (2007) used the statistical arbitrage test for the revenue-based weak validity of the Chinese stock market. Han Guangzhe and Chen Shoudong (2007) conducted a study on the statistical arbitrage model based on the constituent stocks of the Shanghai 50 Index. Huang (2009) compared and introduced quantitative investment and qualitative investment. Yang Yong (2009) introduced the statistical arbitrage strategy of hedge funds. Qu Yunxiang and Huang Qi (2011) studied quantitative investment by constructing a quantitative investment portfolio to obtain AIA returns, and the paper verified that quantitative investment was indeed feasible and effective from an empirical perspective. Jiang Hao

and Xue Chen (2011) studied quantitative investment models from the perspective of the negative correlation between volatility and return rate. Based on the review of various classical quantitative models in the past, this paper took a new approach and focused on the problem of "the relationship between time-varying volatility and time-varying return rate of the same stock at different times." After the empirical test, it is found that the volatility of the same subject is negatively correlated with the rate of return [13].

Asset managers, including fund companies and investors, are advised to use quantitative investment strategies while managing their investments. According to an empirical analysis of the Shanghai 50 index using the single factor regression model, better outcomes can be obtained. This paper suggests that fund companies actually verify the validity of the classical model and, on the basis of the development of quantitative investment strategies, develop new models that more closely match the real stock returns. For instance, 64% of the members of the regression results are significantly under the 5% significance level, and R square is generally higher. The empirical analysis shows that the momentum strategy-based model can outperform the index in terms of returns [14]. Since the stock selection method is successful, it is advised that fund companies submit an application. Stock selection tactics It is discovered that the winning group can significantly outperform the losing group by comparing the yield differences between the winner group with a high alpha and the loser group with a low alpha. P has a mean value of 0.12 throughout all testing and holding periods. Therefore, it is advised that fund companies employ a selection strategy based on momentum. In summary, it is advised that fund companies actively implement quantitative investment strategies in order to increase fund returns and boost the effectiveness of the securities market. This is due to the effectiveness of quantitative investment. However, it is important to avoid the "fat tail," similarity, and trend change when applying a quantitative investment strategy. For instance, the model shouldn't make all of the investment decisions; artificial judgement should be added as necessary.

7. Conclusion

In this paper, efficiency analysis, comparative analysis, and relaxation variable analysis of three types of funds are conducted based on modern portfolio theory and the dynamic DEA model, and then the attribution research of fund performance is conducted, mainly focusing on the analysis of fund income sources, timing ability, and stock selection ability. However, there are defects in this model. When the portfolio is heavily invested in low-earning small-cap stocks, the return explanation is not ideal, and the two newly introduced factors make the original value factor redundant. Through the analysis of the model results, this paper has several findings: (1) Different strategies correspond to different market performances. According to the data, different strategies correspond to different market performances. It can be seen that macro-hedging strategies versus Shanghai Deep 300 basically kept the synchronization; the market rose when the macro hedging strategy also had a good performance; the market fell when the macro hedging strategy also had the possibility of falling. The relationship between CTA and arbitrage strategies and the rise and fall of the market is not obvious. At the same time, it can also be seen that Alpha strategy is inevitably related to the rise and fall of the market, and the advantages of Alpha strategy are more obvious when the market shocks or falls. (2) The performance of a strategy is related to the volatility of the market. Through statistical data, it found that the CTA strategy and the arbitrage strategy are basically not related to the trend of the market, and these two strategies are closely related to the market volatility. When the market volatility increases, they have good returns, and when the volatility is stable, the returns narrow. (3) The judgment of the market is conducive to the timing ability of the strategy. Through the analysis, this paper finds that an understanding of strategy style and market style is conducive to our strategy timing. The understanding of market fluctuations will be of great help to our strategy and timing.

References

- [1] Xu Jianjun. "Overseas development and practise of FOF [J]." China Finance, 2014 (4): 88–89.
- [2] Wang Lingyan, "Research on the Development of Private Equity in China," Economics and Management, 2007, 21(3): 47–50.
- [3] Risk control of private equity in China [D]. Southwest University of Finance and Economics, 2008.
- [4] Markowitz H.M., Portfolio selection [J] Journal of Finance, 1952(5):77-91
- [5] Charnes A. WW Cooper, E. Rhodes. 1981. Data envelopment anal-ysis as an approach for evaluating program and managerial efficiency with an illustrative application to the program follow through experiment in US public school education[J]. Management Science, 27: 668-697.
- [6] Sharpe W. F., "Mutual fund performance" [J]. The Journal of Business, 1966, 39(1): 119–138.
- [7] Lee C., Rahman S., "Market timing, selectivity, and mutual fund performance: an empirical investigation" [J]. Journal of Business, 1990: 261-278.
- [8] Treynor J. L., Black F. How to use security analysis to improve portfolio selection [J]. The Journal of Business, 1973, 46(1): 66–86.
- [9] Modigliani F, Modigliani L. Risk-adjusted performance [J]. Journal of portfolio management, 1997, 23(2): 45–54.
- [10] Fama E F, French K R. Common risk factors in the returns on stocks and bonds [J]. Journal of Financial Economics, 1993, 33(1): 3-56
- [11] Chen Zhuo, "Research on China's Quantitative Fund Performance Based on the DEA Model" [D]. Guangxi University, 2017.
- [12] Fan Zhigang, ZHAO Xin-jie. The development trend of global private equity and its prospect in China [J]. Financial Forum, 2007, 12(10): 3-8.
- [13] Xie Yun. Research on Problems and Countermeasures of Essence Securities Aggregate Asset Management Business [D]. Inner Mongolia University, 2016.
- [14] Measurement and Attribution of Practical Portfolio Performance [M]. John Wiley & Sons, 2008.