



The Performances of Different Strategies Based on Time Series Analysis for Chinese Markets

Jiayi Zhu*

Department of International Trade University of Sanya Shanghai, China

* 18409142@masu.edu.cn

Abstract

Margin trading and stock index futures were introduced in China since 2010, and investment institutions began to add shorting mechanism into their portfolios or new products. The development of margin trading provides a hedging strategy, the statistical arbitrage strategy. Before and after margin trading started, major securities brokers have intensified their research on margin trading and launched a series of research reports on statistical arbitrage. It can be seen that with the advent of "shorting era", statistical arbitrage strategy will occupy an increasingly important position. This paper focuses on market neutral strategy and global macro strategy in statistical arbitrage. Specifically, the procedure of picking stocks in Chinese market is explained and the application status of the two strategies are shown. Besides, the application effects of the strategies through actual trading data are investigated and tested. The trading results shed light on good returns and profits for both strategies.

Keywords-*statistical arbitrage strategy; market neutral strategy; global macro strategy.*

1. INTRODUCTION

Statistical arbitrage, which originated at Morgan Stanley in 1985, is an investment strategy that uses a matching portfolio to buy and sell stocks. From 1985 to 2000, statistical arbitrage strategies made huge gains. Pairs-trading, which is a statistical arbitrage strategy, was pioneered by Nunzio Tartaglias quant group at Morgan Stanley in the 1980s, and it remains an important statistical arbitrage technique used by hedge funds [1]. It works by taking two stocks that are highly correlated, evaluating their relative values, going long on the undervalued stocks and shorting the overvalued ones. More sophisticated statistical arbitrage takes into account the relative values of multiple stocks (i.e., an appropriate pool of stocks) and calculates whether to go long or short a particular share. These stocks belong to different sectors and can hedge against non-systemic risk [2].

Statistical arbitrage strategy is an important tool to apply statistical methods to securities market, especially for foreign institutional investors (e.g., hedge funds), which has been successfully used for many years. Its implementation has brought huge low-risk returns to foreign institutional investors. Due to the lack of shorting mechanism and stock index futures and other derivatives in China's securities market for a long time, there is no

implementation platform for statistical arbitrage strategy. Therefore, there is little research and application of statistical arbitrage strategy in China [3]. Margin trading and short selling were officially launched in China on March 31, 2010, and CSI 300 stock index futures were officially listed and traded on April 16, 2010, providing a good platform for the implementation of statistical arbitrage strategy in China's securities market [4].

In Chinese markets, statistical arbitrage is relatively scarce and, in its infancy according to previous literatures. Sun used GARCH model to simulate the change trend of the return series of Shenzhen Composite Index. According to the results, the returns of China's stock market had obvious long-term memory, and the stock market did not reach weak form efficiency [5]. Dou found that neither the Shanghai stock market nor the Shenzhen stock market has reached weak form efficiency, but the Shanghai stock market is developing towards weak form efficiency [6]. Fang used statistical arbitrage strategy in closed-end fund market, pointing out that statistical arbitrage is a model-driven investment method adopted by institutional investors. Qiu and Cheng applied the statistical arbitrage strategy based on co-integration to the simulation trading of CSI 300 stock index futures [7]. The data adopts the one-minute data of IF0806 and IT0807 contracts from May 19, 2008 to May 21, 2008. The simulation trading market of stock index futures has some space of

intertemporal arbitrage, and the statistical arbitrage strategy is effective [7].

The rest part of the paper will focus on market neutral strategy and global macro strategy in statistical arbitrage under the condition that previous studies have proved that statistical arbitrage strategy is effective. On the premise of theoretical basis, stock and futures trading data are selected to test the application effect of the strategy and whether the strategy can hedge risks and gain profits, so as to serve as a reference for future investors.

2. METHODOLOGY

2.1. Data

This paper selects three stocks and three futures. The three stocks are Guangzhou restaurant group Co. Ltd (603043), New Hope Co. Ltd (000876) and Jiangsu Heng Rui Pharmaceuticals Co. Ltd (600276), and three futures are crude oil (BRN0Y, sc2205) and gold (AU9999). All

of these data come from the straight flush. The specific time range is given as follows:

- Guangzhou restaurant group Co. Ltd (603043) starts from January 28 and end from March 2;
- New Hope Co. Ltd (000876) starts from February 10 and end from February 28;
- BRN0Y began on February 23 and ended on March 4;
- sc2205 began on February 25 and ended on March 8;
- AU9999 began on February 25 and ended on March 8;

Jiangsu Heng Rui Pharmaceuticals Co. Ltd (600276) began on February 10 and ended on March 9.

The price trends for the selection companies are shown in Figs. 1-4, respectively.



Figure 1. The price trends of Guangzhou restaurant group Co. Ltd (red-green candlestick) and New Hope Co. Ltd (blue-purple candlestick).



Figure 2. The price trend of BRN0Y.



Figure 3. The price trend of sc2205.



Figure 4. The price trend of AU9999.



Figure 5. The price trend of Jiangsu Hengrui Co.Ltd.

2.2. Model & Strategy

This paper uses market neutral strategy and global macro strategy to hedge risks and obtain low risk returns. Market-Neutral Strategy refers to the strategy that can make portfolio returns and volatility completely free from

the influence of market systemic risk, so as to achieve the market neutral goal [8].

Conceptually, market neutrality means that only those returns that are irrelevant to the market are obtained and those returns that need to bear market risks are discarded. The income source of assets can be explained by capital asset pricing model. Therefore, capital asset pricing

theory is the theoretical basis of market neutral strategy [9].

In retrospect, Sharp made a specific description of the relationship between return and risk of assets for the first time [10]. It is believed that the expected return of stocks or portfolios consists of risk-free interest rate and market premium return, namely:

$$R_i = R_f + \beta_i (R_m - R_f) \quad (1)$$

where R_i is the return on stock i , R_f is the risk-free interest rate, R_m denotes for expected return on the stock market, β_i means beta for firm i , every firm has its own Beta. Beta represents the market risk sensitivity of firm i .

The strategic goal of market neutral strategy is to reduce the risks borne by the product by reducing the beta coefficient, and to abandon the market risk premium return and only pursue the Alpha return. According to CAPM model, beta coefficient describes the sensitivity of portfolio return rate to market fluctuation. Beta value can be positive or negative or zero. Positive beta value indicates that portfolio return rate will increase due to market fluctuation, while negative Beta value indicates that portfolio return rate will decrease due to market fluctuation. If Beta is zero, the yield of the portfolio is not affected by market factors. In order to avoid the adverse impact of the Beta is negative earnings of product. Especially in the bear market or the market volatility in the market, investors can use market neutral strategy, using the shorting mechanism, build investment portfolio Beta value of 0, to eliminate or reduce the effect of market factors, and based on asset choice ability to obtain an absolute positive return.

Theoretically, the market neutral strategy should make the Beta coefficient of the portfolio be 0, but in practice, the Beta coefficient cannot be completely 0, because the identified arbitrage opportunities tend to disappear gradually with the gradual increase of investors. Therefore, neutral participants in the stock market do not aim for absolute market risk neutrality, but to keep β within a certain range. Foreign practical experience shows that if the Beta of the product portfolio is between -0.2 and 0.3, it can be considered as basically market neutral.

Global macro strategy hedge funds were born in the 1980s. At present, there are great differences in global macro investment strategies, each with its own characteristics. In terms of their commonality, they mainly use leverage to capture the trading opportunities brought by trends, market deviations and structural changes in different countries and regions, and pay attention to the imbalance of macro economy. When markets deviate too far from equilibrium, they trade in the opposite direction. The specific investment targets of global macro hedge funds will involve bonds, stocks, foreign exchange, commodity futures and so on.

The difference of global macro strategy is that the investment horizon is broader, or the investment area is larger. The investment object it focuses on is closely related to the macroeconomic situation of different countries, and it usually takes a long position in a certain asset class in one country or region. Shorting an asset in another country or region, thereby hedging the risk of an asset globally [10].

3. RESULTS & DISCUSSION

3.1. Market neutral strategy

The strategy performances are summarized in Table. 1. To give a description and explanation of the performances, following analysis is carried out. As for Guangzhou restaurant, it has strong profitability. Specifically, its net profit margin is 14.99%, gross profit margin is 38.26% and ROE is 16.08%. The company with strong profitability means that its management level and financial data are leading industry. The ROE is higher than 5%, and that the shareholders in the high utilization efficiency of the capital and strong bargaining power. Meanwhile, the net profit margin are above 10%, operation and management level are high, and gross profit margin top in the industry, products are still in the blue ocean, the future can continue to maintain good profits.

Besides, it also has fast inventory turnover. To be specific inventory turnover days were 37.36 days, with an average of 42.52 days in the past three years. The inventory turnover rate is 7.23 times and the industry average is 4.62, higher than the industry average. The company has relatively strong inventory management ability, which is beneficial to the company's operation.

Additionally, its monetary capital increases greatly. The monetary capital was 2.348 billion yuan, increase 89.68% from the previous month. The ratio of monetary capital to market value is 0.18, higher than the current median value of 0.08 in the industry. Compared with other enterprises in the same industry, the state of operation is relatively good, and the probability of risk in financial situation is small.

Moreover, this stock has a good development prospect in the semi-finished prepared dishes. This kind of food refers to the finished or semi-finished products that are made of agricultural, livestock, poultry and aquatic products and are combined with various auxiliary materials. They are produced in modern standards, processed through cutting, mixing, curing, forming and seasoning, and then preserved by rapid freezing technology or other preservation technologies. Prepared dishes can be eaten only after simple cooking treatment and shorten the time of cooking, which is in line with the current requirements of fast pace of life and high efficiency. Contemporarily, on account of the impact of the epidemic and the continuous improvement of cold

chain technology, the prepared dish industry has ushered in greater development opportunities driven by catering and household consumption. On this basis, prepared dishes have a large market in China.

Regarding to New Hope Co. Ltd, it has weak solvency. In detail, the asset-liability ratio is 64.83%, and the current ratio is 0.84. The company's debt paying ability is weak, and the asset-liability ratio is higher than 60%, which is regarded as too high risk and may lead to a debt paying crisis. Moreover, the current ratio is lower than 1, indicating that the company's current assets are greater than its current liabilities, and it is difficult to repay short-term debts when they are due.

Besides, the profitability is pretty low for the company. Net profit margin is -6.41%, gross profit margin is 2.24% and ROE is -18.14%. The company's profitability is weak, which is typically characterized by performance losses, or even substantial losses, which may be caused by the company's own operating problems or the recession of the industry. This stock has a high risk.

In addition, the company released the annual report performance forecast shows that the net profit in 2021 is expected to lose 8.6 billion to 9.6 billion, mainly in the pig sector, annual loss is expected to be 10.3 billion to 11.3 billion. This is the company's first serious loss in more than ten years. In 2021, pork prices entered a downward cycle in China, bottoming out at 10.78 yuan/kg, down 70.34%. On this occasion, New Hope's pig sector in 2021 almost lost the profits of the past three years. In 2021, New Hope would market 9.9781 million pigs, an increase of 20% over the same period. However, due to the gradual recovery and even surplus of domestic pig production capacity in China, pig prices have fallen significantly from the same period last year, the average sales price of the company's commercial pig is down about 42% year on year. At the same time, the conflict between Russia and Ukraine has affected wheat and other grain exports, leading to record high corn price in China and raise the price of soybean meal spot. The feed raw material price rises and the cost of pig breeding increased significantly year-on-year, the company's pig breeding business suffered a substantial loss.

TABLE 1. TRADING DATA BASED ON MARKET-NEUTRAL STRATEGY

Symbol	Long/short	Qty	Curr	Price Paid	Price Sold	Profit	Return	Beta
603043	long	100	CNY	22.42	23.31	89	3.97%	1
000876	short	-100	CNY	17.58	15.42	216	12.29%	1
Total						305	7.625%	

TABLE 2. TRADING DATA BASED ON GLOBAL MACRO STRATEGY

Symbol	Long/short	Qty	Curr	Price Paid	Price Sold	Profit	Return
600276	short	-200	CNY	¥ 41.95	¥ 40.08	¥ 374	4.46%
BRN0Y	long	100	USD	\$96.71	\$118.31	\$2160(¥ 13749)	22.33%
sc2205	long	100	CNY	¥ 612.5	¥ 735.9	¥ 12340	20.15%
AU9999	long	100	CNY	¥ 379.6	¥ 405.3	¥ 2570	6.77%
Total						¥ 29033	17.20%

3.2. Global macro strategy

The strategy performances are summarized in Table. 2. To give a description and explanation of the performances, following analysis is carried out. As for crude oil price, the pandemic has sent its prices to their lowest levels in 20 years. Since then, crude prices have recovered and climbed rapidly, topping \$91 a barrel in February, the highest level since 2014. The Russia-Ukraine conflict is one of the reasons for the rise in international oil prices, but the more critical factor is the tight balance between oil supply and demand: the impact of the COVID-19 pandemic on the world economy is gradually decreasing, and countries' demand for oil is recovering, but oil supply is not increasing as expected. In addition, the limited options for oil price suppression also contributed to higher prices.

Besides, the current geopolitical events affect the short-term price of crude oil, the risk of conflict between

Russia and Ukraine in the short term escalates, and Russia faces a high probability of subsequent European and American sanctions. If Russia's crude oil export or produce is affected by sanctions, the price is more likely to rise.

In addition, tight balance ought to be taken into consideration. It means that supply and demand are roughly in balance in the short term, but the surplus is not large enough to guarantee sufficient supply at all times. The United States is the largest crude oil consumer in the world, and 50% of the downstream demand for crude oil is travel demand. The recovery of travel demand from overseas countries, mainly the United States, due to the easing of the epidemic is the main reason for this round of oil price rise. In the meantime, the tightness of the supply side has accelerated the rise of crude oil prices. On the one hand, OPEC countries did not increase their oil production as expected and some OPEC countries did not meet their targets, resulting in a tight balance between supply and

demand for crude oil. On the other hand, the conflict between Russia and Ukraine has further raised concerns about the supply side of crude oil. A combination of factors pushed the price of crude oil up rapidly.

However, there are limited options for oil price suppression. At present, the United States to inhibit the continuous rise in oil prices involves the release of more national oil strategic reserves, exerting pressure requirements 'OPEC' member states full load production crude oil, relaxing sanctions on Iran crude oil as part of the resumption of negotiations on the Iranian nuclear agreement. However, the nuclear non-proliferation treatment has made it difficult to reach agreement on the Iranian nuclear agreement. Efforts to persuade 'OPEC' members to increase more oil production will have only a limited impact. At present, only Saudi Arabia, the United Arab Emirates and Kuwait have some rich crude oil production capacity, but the effect of increasing global oil production and supply is limited.

As for gold, similar to oil, gold prices rose in Russia-Ukraine conflict. Regarding to Jiangsu Heng Rui Pharmaceuticals Co. Ltd. This stock shows a downward trend and find some reasons for that. First, the market has been divided on whether Heng Rui pharmaceutical is a generic drug company or an original drug company, resulting in large fluctuations in its valuation. The pullback in both valuations and share prices is the result of such volatility in market perception. Besides, the core competitiveness of its original drugs and innovative drugs is also controversial. Second, centralized procurement has a significant impact on the suppression of its generic drug revenue and profit, valuations have also been hit. Some people estimate that at least 3.5 billion sales revenue losses, accounting for about 15% of its revenue. Third, the scandal of false invoice and fictitious business broke out and the company was punished. Last but not least, Heng Rui as a pharmaceutical enterprise, although it has research and development and innovation, the early valuation is too high, far beyond the average level of pharmaceutical stocks. With the occurrence of negative events in the industry and its own, valuation killed is a normal phenomenon. So far, Heng Rui's valuation is still above the industry average.

3.3. Limitation

Nevertheless, this paper has some limitations and drawbacks. This paper does not conduct in-depth research and optimization on market neutral strategy and global macro strategy. Instead, it only focuses on the analysis of the application status of the two strategies and the application effect of the test strategy. The depth of the research is insufficient, which can only make a fundamental contribution to the future analysis and research. Furthermore, the data adopted are few and the time of each transaction is short. Only the earnings results of stocks and futures in a short period of time are analyzed,

which cannot explain the long-term trend of stocks and futures.

4. CONCLUSION

In summary, this paper investigates market neutral strategy and global macro strategy in statistical arbitrage based on Chinese market. According to the analysis, market neutral and global macro strategy all have good application effect. Market neutral strategy strategic objective is to reduce the risks by reducing the Beta coefficient, and abandon the market risk premium return and only pursue the Alpha return. Global macro strategic investment has a larger geographical scope, and its investment targets are closely related to the macroeconomic situation of different countries. Therefore, more attention should be paid to macro aspects, such as national policies and international situation.

At present, model and empirical analysis for Chinese market are relatively small in terms of market neutral strategy and global macro strategy theory. Under the condition of data is relatively rich in the future, one can derive more fruitful results about two strategies, from the aspects including optimization and implementation of the strategies. Overall, these results offer a guideline for investors to use market neutral and global macro strategy so as to have benefits from these trades to hedge risk.

REFERENCES

- [1] J. F. Caldeira, and G. V. Moura, "Selection of a portfolio of pairs based on cointegration: the Brazilian case," Federal University of Rio Grande do Sul, Federal University of Santa Catarina, Brazil, 2012.
- [2] Y. Tian, "Statistical arbitrage: Analysis of Chinese stock market," Diss of University of Zhejiang, 2013
- [3] K. Xie and H. Zeng, "Random Walk and Market validity Test - Analysis of Composite index of Shanghai and Shenzhen Stock Exchange," Market weekly, vol.25, 2010, pp. 56-57.
- [4] J. Lei and S. Lin, "Statistical arbitrage strategies based on high frequency data," Science Research Management, vol. 34(6), 2013, 138.
- [5] W. Sun. "An empirical study on the effectiveness of Shenzhen stock market," Economic Research Guide Serial vol. 56(18), 2009, 75.
- [6] X. Dou. "Effectiveness analysis of Chinese stock market," Business China, vol.184, 2009, pp. 13-14.
- [7] J. Li and X. Wang, "An Empirical Study on the Validity of Chinese Stock Market- A Test Based on Variance Ratio," Economic Survey, vol.1, 2010, pp. 137-140.

- [8] A. J. Patton, "Are Market Neutral Hedge Funds Really Market Neutral?" *The Economics & Social Sciences*, vol. 22, 2004, 7.
- [9] B. Ye, "Study on the Application Situation and Effect of Market-Neutral Strategy in China," *Chinese Economics and Trading*, vol. 11 2013, 2.
- [10] C. Zeng, "Hedge Fund, Hedging Strategies and Market-neutrality," *Financial market*, vol. 425(1), 2012, 61,

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

