Analysis of Investment Indicators for the Electronic Components Sector of the A-Share Market

Yufei Ouyang[1], Shuo Li[2(✉)], Kangning Yao[3], and Junkai Wang[4]

[1] Department of Tourism Management, South China University of Technology, Guangzhou, China
[2] Department of International Economics and Trade, XiangTan University Business School, Xiangtan, China
202005133305@smail.xtu.edu.cn
[3] Department of Finance, Shandong University of Science and Technology, Jinan, China
[4] Rosedale Academy, Beijing, China

Abstract. Contemporarily, the securities market of China has undergone rapid development and become more and more prosper. In the wave of the times, investors need more countermeasures and methods. Based on the "RiceQuant" quantitative investment analysis platform, we analyze the four investment indicators (MACD, CCI, KDJ and Aroon), hoping to further grasp the changes in China's A-share electronic components sector in this way. According to the results of 2016 as the simulation time, the relatively stable low backtest indicator is the Aroon indicator, but the MACD indicator and CCI indicator can achieve higher returns, while the KDJ indicator is between these three, maintaining a moderate level. These results exhibit the differences between individual investment indicators and their potential complementarities and shed light on quantitative investing strategy design.

Keywords: Stock Market · Investment Indicators · Electronic Components

1 Introduction

Investment technical indicators are one of the commonly used measurement methods in the current market. Investors use the method of data analysis and use the collected data to build investment models to test the feasibility of the investment plan, and finally get the corresponding investment analysis data report and investment strategy. It is closely related to developed quantitative investment. The advantage over other investment strategies is that it can use modern tools to process a large amount of data at the same time to obtain more trading opportunities.

Quantitative investment has the characteristics of both technological investment and financial investment. It avoids investors' subjective assumptions, has a wide range of

Y. Ouyang, S. Li, K. Yao and J. Wang—Contributed equally.

D. Qiu et al. (Eds.): ICBBEM 2022, AHIS 5, pp. 180–186, 2023.
https://doi.org/10.2991/978-94-6463-030-5_20

applications, and wins with valuation ideas and probability. Judging from the current situation of quantitative investment in the capital market, China's quantitative investment field is not well developed, and there is still huge room for development [2, 5, 8, 9]. Besides, with the continuous expansion of the capital market, the stock fund market will continue to expand, and the update cycle of data information will continue to shorten. Quantitative investment will still exist while providing investors with scientific investment data and strategies with reference value. Data security, system failure, market manipulation and other risks. For this promising research direction, it is necessary to continuously upgrade investment strategies, improve trading models, and control risks.

Since quantitative investment is affected by plenty of factors, current research tends to find more comprehensive models to accommodate more factors. New and complex models are constantly proposed, but there is little research to explore the rationality and significance of individual technical indicators. Therefore, we choose to back-test individual technical indicators and analyze them in depth to find more connections.

The rest part of the paper is organized as follows. The Sect. 2 will introduce the data origination, strategy design and backtesting parameters setting. Subsequently, the Sect. 3 will present the results for the MACD, CCI, KDJ and Aroon, respectively. Eventually, a brief summary and future outlook are given accordingly.

2 Data and Method

Based on the meter basket quantitative platform, this paper simulates the trading of A-share electronic components stocks, and selects the Shanghai and Shenzhen 300 index, including ST stocks. The return interval was selected from 4 January 2016 to 4 October 2016, with an initial capital of 1 million, a five-day trading cycle and a maximum holding stock of 10. Four indicators are chosen for the analysis: MACD, CCI, KDJ, Aroon.

MACD (Moving Average Convergence and Divergence), proposed by Geral Appel in 1979, is an improved moving average index developed according to the principle of moving average. The moving average has the characteristics of trend, which is relatively stable and has a certain lag [3]. Usually, when the stock price falls, MA will have a downward trend, which is not easy to grasp the trend of stock price. Therefore, based on the characteristics and defects of MA, the MACD index uses a smooth moving average to overcome the defects of frequent false signals of MA and greatly improve the hysteresis of MA. The parameters of EMA1, EMA2 and DIF are 12, 26 and 9 days, respectively. The formulae are given as follows:

$$\mathrm{EMA}(t, 12) = \mathrm{EMA}(t-1, 12) \times 11/13 + \text{closing price}(t) \times 2/13 \tag{1}$$

$$\mathrm{EMA}(t, 26) = \mathrm{EMA}(t-1, 26) \times 25/26 + \text{closing price}(t) \times 2/27 \tag{2}$$

$$\mathrm{DIF}(t) = \mathrm{EMA}(t, 12) - \mathrm{EMA}(t, 26) \tag{3}$$

According to the deviation to calculate the EMA of 9 days, namely the average deviation, is the MACD value. In order not to be confused with the original name of the index, this value is also called DEA or DEM:

$$\mathrm{DEA}(t) = \mathrm{DEA}(t-1) \times 8/10 + \mathrm{DIF}(t) \times 2/10 \tag{4}$$

The calculated DIF and DEA values are positive or negative and (DIF-DEA) × 2 is the MACD histogram [4]. Therefore, the MACD index is formed by the combination of two lines and one column [7]. The fast line is DIF, the slow line is DEA, and the histogram is MACD.

This paper takes the Shanghai and Shenzhen 300 index as the research object, studies whether there are optimal parameters in the field of electronic components stocks, and obtains excess returns through MACD trading strategy. MACD parameters are fast moving average, slow moving average and smooth moving average, fast moving average range is set to 3~15, slow moving average range is set to fast moving average parameter ~60, DIF cycle range is set to 3~20.

Due to the large amount of data and long operation time, the retest interval is selected from January 4, 2016 to October 4, 2016. The initial capital is 1 million. The position adjustment cycle is five trading days, and the maximum number of positions is 10 stocks.

In this paper, a quantitative investment analysis platform is used to quantitatively analyze the optimal MACD parameters and their returns in the field of electronic components for the constituent stocks of the CSI 300 index from January to October 2016. According to the retest results, the optimal 10 groups of parameters sorted by annualized return rate are (12, 26, 9), (12, 25, 9), (12, 24, 9), (12, 28, 8), (9, 28,10), (13, 23, 8), (11, 24, 9), (12, 28, 7), (11, 23, 9), (11, 25, 9).

CCI index, also known as the trend index, is proposed by Donald Lambert, an American stock market technology analyst in the 1980s, which is dedicated to measuring whether the stock price, foreign exchange or precious metal transactions have exceeded the normal distribution range [1]. According to the operation rules of CCI index, it is divided into three categories: greater, interval and less. Considering the operation range of CCI index, the retest is carried out in 10 [6].

The calculation process is as follows:

$$\text{CCI (N day)} = (\text{TP} - \text{MA})/\text{MD}/0.015 \tag{5}$$

where TP = (highest price + lowest price + closing price)/3,

and MA is the mean average of the price while MD represents the mean absolute values of the recent N days (MA-closing price)/N. Besides, the coefficients 0.015 is the calculation coefficient, and N is the calculation period.

KDJ index, also known as random index, mainly studies the relationship between the highest price, the lowest price and the closing price [10].

The Aroon indicator was invented by Tushar Chande. By calculating the number of periods since the price reached the recent highest and lowest values, it helps investors predict the changes between price trends and trend regions. First, we need to set a period. The period is usually five days. The formulae are given as follows: Aroon(up) = [(Calculation period − The number of days after the highest price)/Calculation period] * 100. Aroon(down) = [(Calculation period − The number of days after the lowest price)/Calculation period] * 100.

Specify a calculation section, The distance between the closing high and the starting high in this range is the numerator, divided by 25 days the result is the Aroon_Up indicator. It reflects how long stock prices have been trading below recent highs. Replace “closing high” with “closing low”, then one gets the Aroon_DN indicator.

We used the "RiceQuant" (www.ricequant.com) quantification platform to perform multiple back-tests on each of the above data. Meanwhile, in order to maintain the stability of time and data, we have selected the time from January 4th to October 4th, 2016 for electronic components in the A-share market as the simulation range.

3 Results and Discussion

3.1 MACD

The best parameter is (12, 26, 9), the correspondent annual yield rate is 49.994%. The annual yield rate of CSI 300 at the same period is 6.770%, Alpha is 37.35%, the drawdown of excess earnings is 45.64%, Sharp ratio is 1.7357. The optimal backtesting result is given in Fig. 1.

3.2 CCI

When the CCI is 50–60, the model testing income reaches 30.508%, annual yield is 44.003%, and the drawdown is 5.924%. The Table 1 summarizes the backtesting reports while Fig. 2 illustrated the best net values for the selecting parameters.

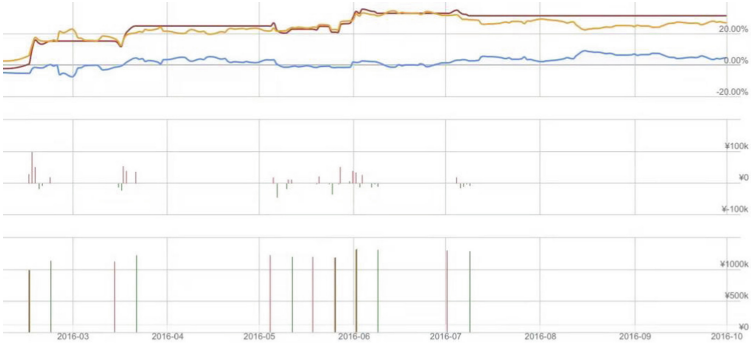

Fig. 1. The net values for the optimal parameter of MACD

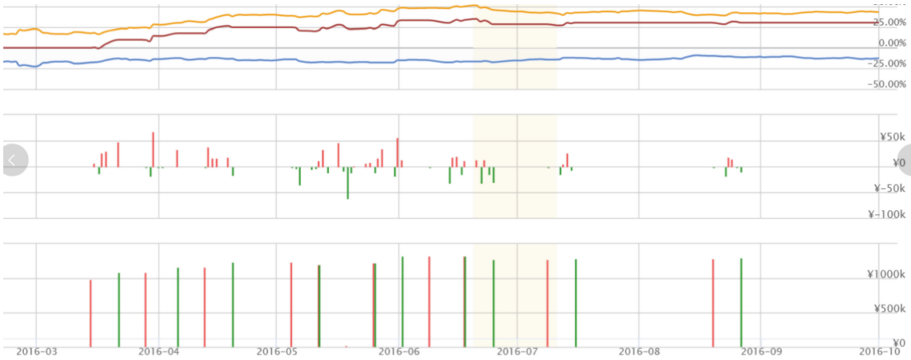

Fig. 2. The net values for the optimal parameter of CCI.

Table 1. CCI indicator partial backtest results

Range	Annual return	Alpha	Sharp	Max Drawdown
160–170	6.963%	0.1343	0.4167	16.133%
150–170	7.039%	0.1391	0.4252	16.722%
140–170	−4.879%	0.2948	−0.2914	21.862%
50–60	30.508%	0.3931	2.0559	5.924%
20–60	23.964%	0.4221	1.0499	13.115%
15–25	21.262%	0.3310	1.1658	12.983%
10–20	9.524%	0.1977	0.5532	16.55%
More Than				
150	5.484%	0.1216	0.3385	16.411%
140	−3.100%	0.0138	−0.1944	21.607%
80	0.300%	0.1173	0.0774	16.835%
70	2.144%	0.1449	0.1643	15.870%
40	5.415%	0.2089	0.3134	15.704%

Table 2. The KDJ Backtesting Results

Category	Range	Annual return	Alpha	Sharp ratio	Max Drawdown
Die fork	10–100	12.37%	−0.012	0.4643	16.35%
Long	10–100	−0.49%	−0.1585	0.778	22.77%
short	10–100	38.84%	0.1846	1.2221	12.27%

Table 3. The Aroon Backtesting Results

Category	Range	Annual return	Alpha	Sharp ratio	Max Drawdown
Gold fork	10–100	−1.00%	0.1493	0.0726	31.44%
Die fork	10–100	10.12%	0.2928	0.3857	24.00%
Long	10–100	17.06%	0.2807	0.6836	8.19%
short	10–100	12.92%	0.3511	0.4662	21.50%

3.3 KDJ

From current simulation, the range of index has no significant impacts on annual yield of model testing. The backtesting results are reported in Table 2.

3.4 Aroon

According to the backtesting results summarized in Table 3, the most optimal situation is that the annual yield rate reaches 17.063%, drawdown is 8.189%, Sharp ratio is 0.6836.

3.5 Comparison

Based on above results, one finds the maximum annualized yield of different indicators, MACD is 49.994%, CCI is 43.040%, KDJ is 38.84%, Aroon index is 17.063%. Among them, the annualized yield of MACD index is the largest, while the Aroon index is the smallest.

3.6 Limitation

The limitation of this article mainly lies in the scope of research. Our research goal is a single backtest of four technical indicators, so there are deficiencies in the combination strategy of technical indicators. At the same time, the performance of other technical indicators in the A-share market also needs to be discussed in the future. In addition, in order to stabilize the research results, we have selected the stock market at this time in 2016, which may be different from the current situation. In the future, we hope to make breakthroughs in this area. Moreover, one should note that technical indicators are not a panacea. When the "black swan" of the stock market appears, any technical indicator may fail, which also needs to be pointed out.

4 Conclusion

In summary, we analysis the four investment technical indicators based on backtesting, which differ significantly in performance based on the specific changes in the market. As far as the current situation is concerned, Aroon maintains a low retracement rate of 8.189%, becoming the most stable, while MACD has the highest profit and a relatively high retracement rate. CCI has a relatively low withdrawal rate, but at the same time obtains high profits, it is the best choice. KDJ tends to be normal, giving it the choice of prudent investment. Overall, these results offer a guideline for quantitative investment strategy design based on single technique indicator.

References

1. CCI indicator [J]. Finance and Accounting (Financial Management Edition), 2012(12):49.
2. Ding Junguang. Research on the Industry Rotation Law of my country's A-Share Market[D]. Southwestern University of Finance and Economics, 2011.
3. Feng Wei. Analysis of the top and bottom divergence of the MACD indicator [J]. Chinese Business (first half of the month), 2010(03):185–186.
4. Jiang Guoyan. Research on the Optimal Parameters of MACD Index—A Technical Strategy of Quantitative Investment [D]. Jilin University of Finance and Economics, 2018.
5. Li Chao. Research on Application Bottlenecks of Domestic Electronic Components in Aviation Equipment [J]. China Equipment Engineering, 2021(05):246–247.

6. Lin Zhaohua. Test and Analysis of the Return of CCI Index Strategy in Stock Investment Week [J]. Journal of Guangxi University of Finance and Economics, 2009, 22(02):64–69.
7. Shi Sainan. The Validity Test of MACD Index in Stock Technical Analysis [D]. Southwestern University of Finance and Economics, 2011.
8. Wang Xi. Expand the scale of the electronic components industry and build an industrial supply chain [N]. Securities Daily, 2021-03-10(A03).
9. Zhang Jiaxing.2.1 trillion yuan! The state sets goals for the electronic components industry [N]. Science and Technology Daily, 2021-06-29(003).
10. Zhao Wenlong. The Specific Application of KDJ Index in Securities Investment Analysis [J]. Shanghai Commercial, 2021(04):84–85.