Analysis of Multifactor Fundamentals Stock Selection Based on Backtesting

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Abstract: In recent years, quantitative finance has become a major trend for investing which brings stable returns with controllable risks. Among various different quantitative strategies, multifactorial stock selection strategy based on fundamental data (e.g., financial statements, macro- and micro-economy data) is one of the widely investigated strategies. On this basis, this study chooses Chinese listed company to verify the feasibility and effectiveness of the stock selection strategy. To be specific, the Ricequant platform is utilized to realize the backtesting as well as data retrieving in order to estimate and evaluate the performances of the strategies. According to the analysis, several indicators show great ability to gain extra returns compared with systematic risks and market performances. In other words, the feasibility of explicability of the quantitative strategy based on multifactorial model is verified in Chinese market. Overall, these results shed light on guiding further exploration of fundamental analysis of different underlying assets based on multifactorial analysis.

Keywords: quantitative finance, multifactorial model, fundamental analysis

1. Introduction

In the context of the just ended epidemic, the situation in various industries has undergone significant changes, and the stock market is constantly changing [1-3]. Therefore, it is of great significance to conduct data evaluation and continuously screen out the most effective factors for stock selection. The previous method of stock selection that allowed individuals to enter may no longer be applicable. It is particularly important to make the right stock selection strategy in the face of significant changes. Some of the stocks are not familiar with the market and company situation, and only randomly choose based on personal experience. Moreover, the stock market environment in China is already uncertain, making it even more difficult to speculate under the impact of the epidemic [4-8]. For investors, making the right stock selection strategy can bring significant advantages. It is necessary to conduct a detailed analysis of financial information and select potential value stocks to increase the probability of obtaining returns. In this era of rapid information dissemination, obtaining information has become more convenient than before, and basic multi factor analysis is also easier to achieve and influence. The combination analysis of multiple factors can reduce the uncertainty brought about by special situations, as the mutual cancellation of risks between factors increases the stability of the model. Choosing more and more effective candidate factors will enhance the model's information capture

ability, improve its stability, and be one of the key factors in obtaining excess returns. This study selects effective factors from multiple factors such as valuation, profitability, debt repayment, cost effectiveness, and operational capability [9, 10]. By utilizing the Ricequant platform to conduct back testing and factor selection research, it will enable factors with weak correlation to make different combinations and ultimately construct potential factors with strong correlation. It is hoped that it can serve as a reference for investors.

By constructing a multi factor stock selection model based on industry rotation, empirical analysis found that the investment efficiency obtained by combining industry rotation with market value explanatory factor model is much higher than the market average of the Shanghai and Shenzhen 300 markets, and is superior to the investment formula of simply using industry rotation model to select stocks. It is also found that the multi factor stock selection model of industry rotation is also effective in risk prevention. There are advantages. By obtaining historical data and corresponding factors with good returns during the cycle from the database, understanding the market conditions at that time and selecting advantageous factors corresponding to previous market conditions, conducting back testing calculations, estimating stock values, and selecting stock portfolios with higher returns.

2. Data & Method

In recent years, quantitative investment has gradually emerged in China and investment strategies are becoming more and more abundant. This situation is also the reason why people pay more attention to the choice of stock selection strategies. Stock returns are influenced by many factors, such as market environment, industry development, and investor expectations. The factor in the "multi-factor model" is the influencing factor, and the model is to find the factors that have a significant impact on stock returns. In this paper, we take CSI 300 stocks as the research object and use the RiceQuant quantitative trading platform to backtest different factor combinations and adjustments to collect and compare their returns. The empirical analysis concludes that factors such as the valuation factor, operating factor, and growth factor have significant effects on stock returns.

3. Results & Discussion

3.1. Growth Ability Indicators

The growth ability reflects the company's ability to expand its operations and its future development prospects. Strong growth ability can indicate a high market demand for a company's products, good future development prospects for the industry in which the company is located, and strong business expansion ability of the company. Growth factor refers to an indicator that reflects a company's medium to long-term growth ability. If the growth factor of a stock exceeds that of other stocks in the same class, it can be considered that the stock price of the company has a significant possibility of rising in the future.

The financial indicators reflecting growth ability mainly include the growth rate of total operating revenue, the growth rate of total profit, the growth rate of basic earnings per share, and the growth rate of net assets per share. After multiple back testing, we selected four growth factors and set corresponding numerical ranges to achieve the optimal back testing results. The range of stock selection factors is shown in Table 1. The back testing results are shown in Table 2. The annualized return on the testing was 11.744%, which is relative to the benchmark return of -21.775%, proving that the strategy has a relatively good result (seen from Fig. 1).

Table 1: Stock selection factors.

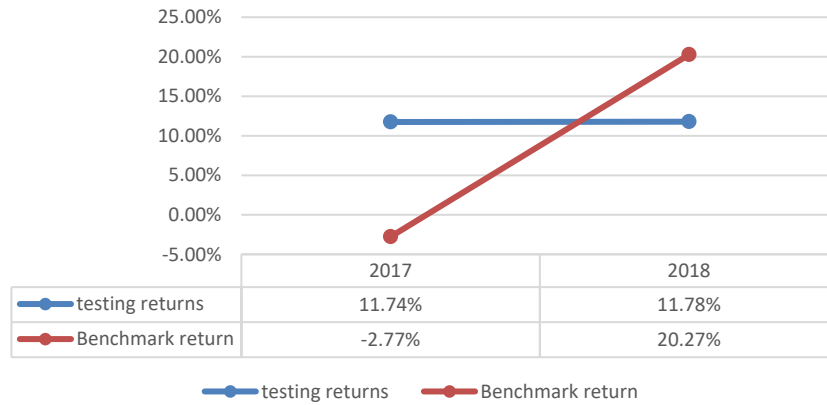| Growth factors	scope(%)	
	min	max
Basic earnings per share (year-on-year growth rate)	10.00	25.00
Operating profit (year-on-year growth rate)	31.00	52.00
Total assets (relative growth rate at the beginning of the year)	10.00	84.00
Total operating revenue (year-on-year growth rate)	15.00	23.00

	2017	2018
testing returns	11.74%	11.78%
Benchmark return	-2.77%	20.27%

Figure 1: Backtesting results for growth ability.

Table 2: Growth factor testing results.

|	
testing returns	11.351%
Retrospective annualized returns	11.744%
Benchmark return	-21.775%
Benchmark annualized income	-22.564%
Accumulated Net	1.114
Maximum withdrawal rate of excess returns	2.5564
Annual winning rate	0.2000
Quarterly winning rate	0.2500
Monthly winning rate	0.2500
Daily victory rate	0.4303
alpha	0.0959
Beta	-0.0297
Sharpe rate	0.7179
Sortino ratio	1.7010
Information ratio	0.9740
Annualized volatility	0.1275
Maximum fallback	5.024%
Annualized tracking error	0.1648
Annualized downside volatility	0.0539
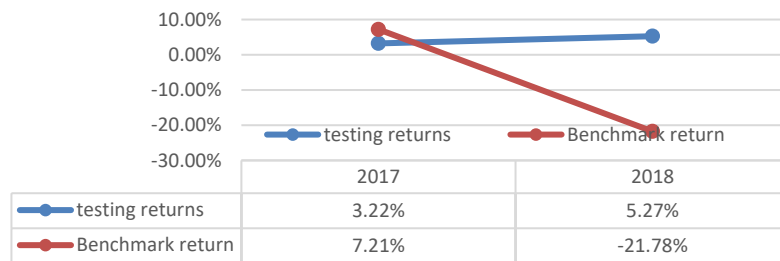
Figure 2: Backtesting results for debt paying ability.

3.2. Debt Paying Ability Indicators

The indicator of a company's debt repayment ability refers to its ability to repay debts. The measurement of a company's debt paying ability mainly depends on whether the company's capital structure is reasonable and stable, as well as the size of the company's long-term profitability. The solvency of a company mainly depends on the ratio between assets and liabilities, especially the capital structure and the profitability of the company. Long term creditors pay particular attention to their long-term solvency in order to assess the safety of their claims. Its indicators include asset liability ratio, equity ratio, contingent liability ratio, interest earned multiple, and interest bearing liability ratio. We selected three indicators: asset liability ratio, working capital, and current ratio to achieve the optimal testing results within a specific range. The range of stock selection factors is shown in Table 3. The relevant testing results are shown in Table 4. The annualized return on the testing is 4.21%, which is relative to the benchmark return of -21.77%, proving that the strategy has relatively good results (given in Fig. 2).

Table 3: Stock selection factors.

Debt paying ability indicators		
	Option	range
Asset liability ratio	Less	30%
Working capital	grater	9million
Current ratio	grater	2

Table 4: Testing results.

testing revenue	4.21%
Testing annualized income	5.27%
Benchmark return	-21.775%
Benchmark annualized income	-22.564%
Accumulated net value	1.1920
Maximum withdrawal rate of excess returns	5.1953
Annual winning rate	0.6667
Quarterly winning rate	0.6667
Monthly winning rate	0.5556
Daily winning rate	0.5110
Alpha	0.0855
Beta	1.0758
Sharpe rate	0.2682
Sortino ratio	0.3646
Information ratio	0.2686

Table 4: (continued).

Annualized volatility	0.1880
Maximum retreat	47.41%
Annualized tracking error	0.1514
Annualized downside volatility	0.1975

3.3. Operating Capacity Indicators

Operating capacity refers to the ability of an enterprise to operate, that is, the ability of the enterprise to use each asset to earn profits. The analysis of the enterprise's operating capacity should be calculated and divided by the indicators reflecting the efficiency and effectiveness of the enterprise's asset operation to determine the enterprise's operating capacity in order to clarify the investment plan that can improve economic efficiency.

Financial analysis ratios of enterprise operating capacity are inventory turnover, accounts receivable turnover, business cycle, etc. These ratios reveal the situation of the enterprise's capital operation and turnover, and reflect the efficiency of the enterprise's economic resources management and utilization. The faster the turnover of the enterprise's assets, the higher the liquidity, the stronger the solvency of the enterprise, and the faster the assets can obtain profits. The selection factor is given in Table. 5 and the results are given in Table. 6. The annual returns of the strategy are shown in the Fig. 3.
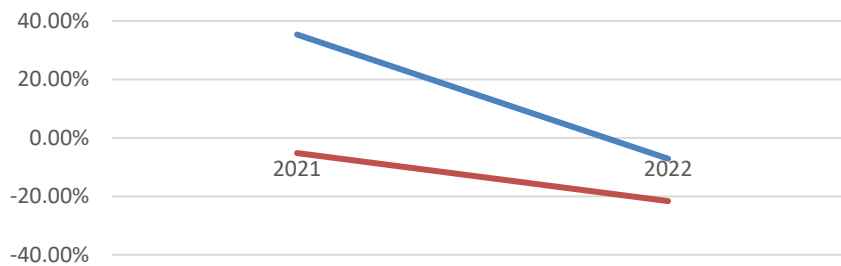

Figure 3: Backtesting results for operating capacity.

Table 5: Stock selection factor.

Operating Capacity Factor	Range (in %)	
	Minimum	Maximum
Total Assets Turnover	0.5	20
Accounts Receivable Turnover Ratio	18	20

Table 6: Backtest results.

Backtest Earnings	25.674%
Back-tested annualized returns	12.607%
Benchmark earnings	-25.707%
Benchmark Annualized Return	-14.307%
Cumulative net value	1.257
Excess return maximum retracement rate	2.5821
Annual Win Rate	1.0000
Quarterly Winning Percentage	1.6265
Monthly Win Rate	0.6667

Table 6: (continued).

Daily Win Rate	0.7500
Alpha	0.4990
Beta	0.1611
Sharpe rate	0.5184
Sortino Ratio	0.7810
Information ratio	0.7930
Annualized Volatility	0.2340
Maximum retracement	16.907%
Annualized Tracking Error	0.2562
Annualized Downside Volatility	0.1553

3.4. Valuation Type Indicators

Valuation factor is a very important type of factor. Valuation indicators generally include P/E ratio, P/N ratio, dividend yield, P/S ratio, etc. Valuation factors vary significantly among different industries (10), for example, the P/N ratio, which is generally between 0.8 and 1.2 for the banking sector, will be between 2 and 3 for the manufacturing sector, and is generally high for high-tech companies, which may be more than 5 (seen from Table. 7). This time, three indicators, P/E, P/N and PPC, were selected to achieve the optimal backtest results within a specific range (given in Table. 8).

Table 7: Stock selection for valuation type factors.

Valuation Factor	Range	
	Minimum	Maximum
P/E Ratio	10	
P/N Ratio	1.5	2.5
Price to Present Ratio	2	

Table 8: Backtest results for valuation type factors.

Backtest Earnings	29.040%
Back-tested annualized returns	30.123%
Benchmark earnings	21.775%
Benchmark Annualized Return	22.564%
Cumulative net value	1.290
Excess return maximum retracement rate	3.0900
Annual Win Rate	1.0000
Quarterly Winning Percentage	0.7500
Monthly Win Rate	0.6667
Daily Win Rate	0.4631
Alpha	0.0953
Beta	1.9005
Sharpe rate	1.8999
Sortino Ratio	2.7305
Information ratio	1.0810
Annualized Volatility	0.1287

Table 8: (continued).

Maximum retracement	5.122%
Annualized Tracking Error	0.0913
Annualized Downside Volatility	0.0896

4. Conclusion

In summary, we use the fundamental multi-factor stock selection strategy to test financial indicators in four aspects: solvency, growth, operating capacity, and valuation, and get four back-testing results with positive returns from 2017 to 2018, which we hope will be useful for investors. Apparently, there are certain risks and timeliness of multi-factor stock selection, and investors need to adjust and update according to their own experience and market conditions, which is the shortage of multi-factor stock selection strategy. However, the multi-factor stock selection is based on financial indicators, and there is value in setting and screening the relevant factor values to obtain a portfolio of stocks with higher returns. Overall, these results offer a guideline for quantitative fundamental analysis.

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