Research on Combination of Quantitative Investment on the Shanghai A-Share Factor

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Abstract—in a number of listed companies to choose stocks to invest in, stock-market investors are focused on the key issues. Based on Shanghai 180 index as a benchmark, net rates, earnings, municipal rates, cash flow increased four factor classification for quality, value growth three factors, construction quality-value, growth-value, quality-value, growth-quality growth, value and quality growth of seven large stock selection model. For each factor in order from lowest to highest rated, got the top elected a number of stock building portfolios. Quantitative methods in Shanghai a-share market to find some relatively good stock build a portfolio of different styles, and the historical data show that these combinations are valid, so as to provide investment reference for stock investors.

Keywords-combination; quantitative; SSE; stock

I. INTRODUCTION

The quantization stock is computer technology and market development to a certain stage of the product, as well as foreign experts and scholars in various institutional investors quantify stock and did a thorough and meticulous research. 1990 Nobel Laureate in Economics Markowitz portfolio theory put forward in 1952, multi-factor stock selection is based on a large number of quantization factor to analyze investment value of individual stocks, and then build a portfolio.

Yin by Piotroski based on P/B stocks characterized by financial indicators score stock picking on China A-share listed company's shares 2000-2012 years of historical market retrospective empirical research results show that, Piotroski stock-picking strategy structure the equity portfolio profitability is good, far more than the yield of the market index over the same period, so it is worth the investment to promote the use of stock-picking strategy. Ma Hui selected four aspects of industry investment ratio factor, beta, alpha, expected rate of return, re-use quadratic programming to investors stocks were asset allocation, allowing users to realize the risks and benefits between optimal asset allocations.

In the process of solving the problem of dynamic portfolio investment decision, scholars established a multistage stochastic programming model for 1% they are using statistics to estimate the joint probability distribution of the risk factors, and then predict future behavior of each risk factor, then use of stochastic programming Solver technologies to solving multi-stage model.

Chacko and Viceirai think that is the random fluctuation of stock price fluctuation process (depending on the price of a random process), stochastic control and HJB equation to study the portfolio problem of optimal investment strategy.

II. THEORETICAL MODEL

The alternative factors may be listed on the company's fundamentals indicators, such as book value (P/B), price-earnings ratio (P/E), earnings per share (EPS) and the like; it can be the level of technical analysis indicators such as moving average (MA), moving Average Convergence Divergence (MACD), mean difference (DMA) and the like; or indicators of other aspects, such as macroeconomic variables (interest rate policy), etc.

First select the effective removal of redundancy factor after the stock shares in the pool are in accordance with the significance factor of each attribute sorted (value class factor from small to large order, growth indicators and quality indicators descending order). then scoring for each indicator stock ordering, stock recorded in the first row 1, note 2 came in second, followed by scoring in the first row n on n is denoted as, final scores are in addition to the stock the total number of shares only n, that is, all fractional shares constituting the (0,1] distribution.

III. RESEARCH METHODS

This article preclude the use of Evans, Archer proposed method for the degree of dispersion of the combined measure. Specific methods are as follows:

1) The standard deviation of the portfolio as a result of a combination of variable size k reciprocal regression, the estimated regression coefficients a and b, the regression formula is:

$$S_p^k = a + b*k^{-1} + \varepsilon_k \tag{1}$$

Wherein S_p^k is the difference between the standard equity portfolio, k is the number of shares included in the combination. The regression results, a represents a non-spread risk, $b*k^{-1}$ represents risk diversification.

For different sizes of k, to calculate the proportion of the residual risk diversification $(b*k^{(-1)})/a$, and the residue can be dispersed, the better the smaller the risk of accounting for the degree of decentralization.

2) Date of initial positions assumed I, when the total equity positions, open date for J, while total equity positions, the total rate of return

$$R = \frac{M_2 - M_1}{M_1} * 100\% \qquad (2)$$

3) Look alone does not explain the total return of a portfolio of good or bad, because the term of the investment rate of return with the length of a relationship, the longer the investment period, the total yield is higher. Therefore, to determine the quality of a portfolio with a compound annual rate of return is more appropriate. Annualized yield

$$R = \left(1 + \frac{M_2 - M_1}{M_1} * 100\%\right)^{\frac{365}{J-I}} \qquad (3)$$

Where J-I said that the investment period, $\frac{M_2 - M_1}{M_1}$ represents the total rate of return in the J-I during the investment period.

4) Relative yield is used to view a portfolio yield with respect to how well the market benchmark yield, also called excess return. By the following formula:

Relative yield = total return - performance benchmark rate of return

5) β coefficient is often used as indicators of investment study the investment strategy to reduce volatility risk ability. In calculating the coefficient of performance data not only requires investment strategy, we also need to reflect the market benchmark performance data (usually the best performance of a market index). Coefficient defined as:

$$\beta_k = \frac{Cov(r_k, r_m)}{Var(r_m)} \qquad (4)$$

Where r_k is the yield of the portfolio, r_m is the rate of return on the market $Cov(r_k, r_m)$ is a portfolio k yields and market portfolio return covariance, $Var(r_m)$ variance market yields.

6) Sharpe ratio has been called Sharpe ratio, which measures the performance of the performance of financial assets.

$$S = \frac{p - f}{\sigma} \qquad (5)$$

Where in, p is the mean rate of return, f is the risk-free rate, σ is the difference between the standard rate of return.

Sharpe ratio reflects the extent of the unit portfolio average yield over the risk-free rate of return. The average yield of its value is positive, then the investment portfolio during the review period is greater than the risk-free rate, indicating that investment in the short term the portfolio returns higher than bank deposits. The larger the Sharpe ratio indicating that the risk-benefit unit of risk the portfolio can get more innings.

IV. TEST RESULTS

Algorithm for principal components is described below:

As can effectively translate into punishment for solving sparse principal components regression problems, General punishment regression problems can be solved by least-angle regression algorithm, can also take advantage of the smallest angle of solving sparse principal components regression algorithms are given. A typical algorithm for sparse principal component is Zou, it is a penalty structure based on elastic NET algorithm. Strategy is to look for a PCA regression and optimization framework, Lasso punishment by using elastic net direct amendments can be sparse principal components.

Characteristics of the algorithm:

The output does not change with the x has changed a lot, the default value is 0. Generally taken as a small positive number to overcome potential multicol linearity problems, in principle, needs to try a variety of combinations of the optimal parameter vector, which makes the fastest convergence rate, but there is a shortcut method for direct sparse approximation, the LARS-EN algorithm, this algorithm can quickly give each principal component of the sparse approximation. Therefore, you can select a group; the variance between the sparse and reached a good combination. When weighing the variance and sparsity, should give priority to the variance, select a larger variance.

In the paper, SSE 180 stock price index, for example, risk diversification from the perspective of trying to explain the best way scale A-share stock market portfolio. SSE 180 Index is the Central Securities Index Company (China Securities Index Co., Ltd) compiled by the Shanghai Stock Exchange issued reflect the overall A-share market index price movements, it reflects the Chinese stock market stock price changes and run situation.

Due to the large number of constituent stocks on the SSE 180 Index, covering the vast majority of Shanghai A-share market sector, hence the degree of risk dispersion sample stocks of the index i-wide release of A shares to the degree of risk dispersion is suitable, also the most Representative.

TABLE I. THE SSE 180 STOCK SELECTED

Stock	Weights	Stock	Weights
600000	0.069	600050	0.024
600015	0.049	600115	0.036
600016	0.062	600372	0.046
600028	0.089	600489	0.016
600030	0.091	600519	0.023
600036	0.093	601006	0.045
600048	0.049	601088	0.057

SSE 180 Index constituent stocks of residual risk diversification accounted for the equity portfolio of different sizes, can be seen from the figure, in combination with the continuous expansion of the scale, the proportion of the residual risk diversification decreased, while the rate of decline

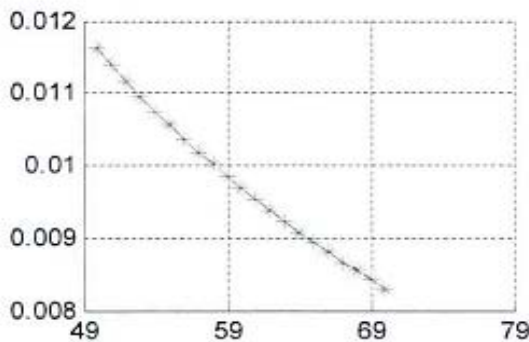in the proportion of risk diversification also showed a decreasing trend.

FIGURE I. THE COMBINED STOCKS

As it can be seen from the enlarged view of Figure 1, when the size of the combined stocks reached 59 only residual risk diversification accounting quality model portfolio decreased to less than 0.01; in addition, raised funds from domestic and foreign holdings to look, the average number of shares it issued about 60, while the actual Awkwardness general control within 50. This paper argues that in the A-share market to around 50 stocks to build stock quantify combination is suitable, so can effectively spread the risk and maximize benefit, but also to meet and holding positions need funds and other institutional investors.

TABLE II. FACTOR LOADING MATRIX

Stock	Factor 1	Factor 2
600000	-0.085	0.526
600015	0.856	0.145
600016	0.265	-0.046
600028	0.394	0.258
600030	-0.068	0.457
600036	0.126	0.865
600048	0.3549	0.852
600050	0.264	-0.056
600115	0.854	-0.061
600372	0.362	0.258
600489	0.154	0.864
600519	-0.064	0.245
601006	0.362	0.125
601088	-0.026	0.623

Known from Table 2, the biggest factor in the three values corresponding to the load value a stock is 600048, 600036 and 600000; factor 2 in maximum load value corresponding to the stock is 600048; factor 2 the maximum load value corresponding to the shares of Copper. So we elected more than five stocks in 180 resource sector.

V. CONCLUSIONS

Other segment analysis and 180 resource blocks similar to elect 32 stock into the stock pool, and analyzed by Markowitz MV model in a given portfolio expected return premise 9P, find the optimal investment ratio given 0.0008, with matlab financial toolbox calculates the optimal investment ratio. The values of the majority obtained is zero, this property is prohibited under normal conditions, short selling, it indicates that many stocks that not be investment or investment opportunities not be used by investors

From the historical data, this combination of benchmark for the market is significant. Through a combination of historical data empirical analysis can be found, although the time period sample interval only 19 months, but various combinations can with high probability to beat the market benchmark, and have passed the statistical test, indicating that the use these stock picking method is feasible and effective. A small portfolio of stocks scale can be in combination with the market benchmark at 99% confidence level by t test.

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