Research on the Influence Mechanism of Stock Returns of Listed Companies Based on Stepwise Regression Model

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Abstract: *A key feature of the stock market is the volatility of stock returns, which is caused by many factors, among which the analysis of financial indicators of listed companies has the most critical impact on stock returns. In order to deal with the principle of the influencing factors of stock returns better, the influencing factors of stock returns are studied in this paper. First, sort out and analyze the factors that may affect stock returns, and then use stepwise regression to extract the characteristic variables, and then test the significance of the equation and the significance of the variables to obtain the equation model. Through the analysis of economic meaning, it can be concluded that the coefficients are in line with the principles of economics, which can effectively predict the trend of future stock returns, help investors make reasonable investment decisions, and have certain practical significance.*

Keywords: *Stock returns, Financial indicators, Influencing factors, Stepwise regression*

1. Introduction

1.1. Research background

From the establishment of China's stock market in 1990 to today, it has gone through 31 years of rapid development. With the rapid development of China's stock market and the gradual improvement of relevant policies and regulations, management system and supervision mechanism, China's financial market has already had a very large scale, and has played a key role in the allocation of resources in China and even in the world.

Today, the stock market is becoming more and more standardized, the number of market participants is increasing, and its influence in the economic system is becoming more and more critical. To a great extent, changes in stock prices and returns affect the development of social economy. There are many factors affecting stock returns, such as fiscal policy, monetary policy and other macroeconomic factors, but also by the company's financial indicators, company emergencies and psychological factors of shareholders and other micro-factors. When investors invest, the first reference is financial information, so it is necessary to carry out correlation analysis between stock returns and financial indicators.

The starting point of this paper is to explore the correlation between stock returns and financial information of listed companies in China, so as to find out the main financial indicators that affect the fluctuation of stock returns.

1.2. Research content

As an important element in stock market research, stock returns are influenced by many factors. This paper takes the stock returns of listed companies in China as the research object, collects relevant data, and makes a deeper research and discussion on the financial indicators. At the micro level (corporate financial indicators), the paper studies the influence of different factors on stock returns, including profitability, solvency, operational capacity, development capacity, etc. It constructs equation models through stepwise regression. The significance of equations and variables is analyzed at the statistical and economic levels to provide analytical support for the government and investors. It is helpful for investors to make more correct investment strategies and improve the allocation efficiency of market resources.

2. Literature review

Throughout the research results of scholars at home and abroad, when studying the correlation between stock price and financial indicators, they all choose the return rate of stock as the indicator of stock price, which is convenient for the comparison between different companies.

In 1979, Beaver, Wright and Clark studied the correlation between financial ratios and stock prices based on a sample of 276 companies listed on the New York stock exchange. The results show that there is a correlation between the changes of stock price and the changes of financial indicators in the direction and proportion. Hao Yugui et al. Found through research that the earnings per share is directly proportional to the stock price, and there is no significant correlation between the operating cash flow per share and the stock in statistical analysis.

To sum up, foreign studies on the correlation between financial indicators and stock prices have adopted empirical research methods, but the systematic research on financial indicators reflecting the four types of business capabilities of enterprises needs to be improved. Therefore, this study also uses empirical analysis methods, and selects some representative indicators in the four types of financial indicators to study the correlation and explanatory power between the four types of indicators and stock prices more comprehensively and systematically.

3. Variable selection and research assumptions of factors affecting stock returns

3.1. Selection of explanatory variables and determination of research hypotheses

The volatility of stock returns of listed companies is affected by many factors, such as macroeconomic factors and microeconomic factors. This paper makes an empirical study of the microeconomic factors that affect the stock returns of listed companies, that is, the factors of the enterprises themselves, such as profitability, improvement, working capital and so on.

3.1.1. Profitability

Profitability refers to the ability of a company to make a profit over a period of time. This paper selects four indicators of net profit ratio of total assets, return on assets, return on equity and net profit ratio of fixed assets to reflect the profitability of listed companies.

Hypothesis 1: The stock returns of listed companies are positively correlated with their profitability

3.1.2. Operational Capability

Operational capability reflects the capital turnover of an enterprise's assets. By researching and analyzing the indicators of an enterprise's operational capability, it is possible to basically grasp the operation and management capability of an enterprise. This paper selects four indicators of shareholder's equity turnover rate, total asset turnover rate, current asset turnover rate, and fixed asset turnover rate to reflect the operating ability of listed companies.

Hypothesis 2: The stock returns of listed companies are positively correlated with their operating capabilities

3.1.3. Solvency

The company's repayment ability reflects the company's capital and operating conditions. The stronger the solvency, the lower the risk of the company going out of business and the lower the possibility of losses for investors. This paper selects five indicators: asset-liability ratio, current ratio, quick ratio, cash ratio and equity ratio to reflect the solvency of listed companies.

Hypothesis 3: The stock returns of listed companies are positively correlated with their solvency

3.1.4. Ability to develop

Development capability is the potential capability of a company to expand its business scale and develop its overall strength during its existence. This paper selects five indicators of net profit growth rate, operating profit growth rate, owner's equity growth rate, capital preservation and appreciation rate, and operating income growth rate to reflect the solvency of listed companies.

Hypothesis 4: The stock returns of listed companies are positively correlated with their solvency

3.2. Data selection and processing

This paper selects all listed companies in real estate industry and business service industry from 2019 to 2021 as a whole, in order to reflect the influencing factors of stock returns of listed companies in China's stock market and the differences between markets through empirical research. Considering the usefulness and other factors of the data, the samples of listed companies were screened based on the following principles: (1) The selected sample companies published complete annual financial reports and related data from 2019 to 2021, and replaced the listed companies with incomplete financial data. (2) During the sample period of the study, listed companies with significant asset restructuring or other major events that lead to significant changes in performance indicators will lead to dramatic changes in their share prices, so such stocks are replaced. (3) The outliers in the data are dealt with using the 3- σ principle.

The data used in this study come from the Guotai'an CSMAR database. The data analysis and processing software adopts SPSS.

4. Model Construction

4.1. Theoretical basis

The basic method of the stepwise regression analysis method is to automatically select the most important variable among many optional variables, and establish an explanatory model or a prediction model of the regression analysis. The process of variable selection by stepwise regression includes two basic steps: one is to eliminate insignificant variables from the regression model, and the other is to introduce new variables into the regression model.

4.2. Model establishment

The idea of the back-off method is to eliminate variables from more to less, and eliminate one at a time until there are no variables that can be eliminated. First, build a multiple regression model for the m regression independent variables $X_1, X_2, X_3, \ldots, X_m$ co-dependent variables Y:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + + \beta_m X_m + \varepsilon$$

Perform the F test of the regression coefficients on X_1、$X_2 \cdots X_m$ respectively, and denote the obtained m F values as $F_1^{(1)}, F_2^{(1)}, \ldots, F_m^{(1)}$, note $F_{i_1}^{(1)} = min\{F_1^{(1)}, F_2^{(1)}, \ldots, F_p^{(1)}\}$. For a predetermined significance level α, the critical value $F_\alpha(1, n - m - 1)$ can be checked. If $F_{i_1}^{(1)} \leq F_\alpha(1, n - m - 1)$, the corresponding variable X_{i_1} is eliminated from the regression equation; otherwise, the algorithm ends.

Set up a regression equation with the excluded independent variable subset $\{X_1, X_2, \cdots X_{i_1-1}, X_{i_1+1}, \cdots, X_m\}$ and Y, and calculate the The statistic value of the regression coefficient F test is recorded as $F_j^{(2)}$, $(j = 1,2,\cdots, j \neq i_1)$, and the smallest one is selected and recorded as $F_{i_2}^2$, that is, $F_{i_2}^2 = min\{F_1^{(2)}, \ldots, F_{i_1-1}^{(2)}, F_{i_1+1}^{(2)}, \ldots, F_m^{(2)}\}$, For a given significance level α, record the corresponding critical value as $F_\alpha(1, n - m)$, if $F_{i_2}^2 \leq F_\alpha(1, n - m)$, then delete the corresponding variable X_{i_2}. Otherwise the algorithm ends. And so on, until there are no variables to be eliminated after testing, so that the subset of independent variables selected by the backward method is obtained.

5. Empirical Analysis of Factors Influencing Stock Prices

From Table 1 below, we can see that when the number of independent variables increases, the coefficient of determination R square will increase, that is, with the increase of independent variables, the R square will become larger and larger, which will show that the regression model has high precision. better fitting effect. In fact, this may not be the case. Some independent variables are completely unrelated to the dependent variable. Adding these independent variables will not improve the level of fit and prediction accuracy. To avoid this phenomenon, we use the adjusted R-square.

Table 1: Model Summary

Model	R	R-square	Adjusted R-square	Standard Error
1	.624[a]	.390	.389	.349590765
2	.624[b]	.390	.389	.349572108
3	.624[c]	.390	.389	.349553633
4	.624[d]	.390	.389	.349536272
5	.624[e]	.390	.389	.349521426
6	.624[f]	.390	.389	.349509479
7	.624[g]	.390	.389	.349500881
8	.624[h]	.390	.389	.349500372
9	.624[i]	.390	.389	.349514412
10	.624[j]	.390	.389	.349537793

a. Predictor: (constant),X18,X3,X17,X13,X15,X7,X4,X11,X6,X14,X5,X16,X9,X1,X8,X12,X10,X2
b. Predictor: (constant),X18,X3,X17,X13,X15,X7,X4,X11,X6,X14,X5,X16,X9,X1,X8,X10,X2
c. Predictor: (constant),X18,X3,X17,X13,X15,X7,X4,X11,X6,X14,X5,X16,X9,X1,X8,X2
d. Predictor: (constant),X18,X3,X17,X13,X15,X7,X4,X11,X6,X14,X5,X9,X1,X8,X2
e. Predictor: (constant),X18,X17,X13,X15,X7,X4,X11,X6,X14,X5,X9,X1,X8,X2
f. Predictor: (constant),X18,X17,X13,X15,X7,X4,X11,X6,X14,X5,X9,X1,X2
g. Predictor: (constant),X18,X13,X15,X7,X4,X11,X6,X14,X5,X9,X1,X2
h. Predictor: (constant),X18,X13,X15,X7,X4,X11,X6,X14,X5,X9,X2
i. Predictor: (constant),X18,X13,X15,X7,X4,X11,X6,X14,X5,X2
j. Predictor: (constant),X18,X13,X15,X7,X4,X11,X14,X5,X2

Table 2 below shows the results of model 10 analysis of variance. The variance test is used to test whether the ratio (F value) of the two variances is significantly greater than 1. The larger the F, the larger the mean square between groups is greater than the mean square within the group, that is, the between-group variation is greater than the within-group variation. On the contrary, the smaller F is even close to 0, the between-group variation is smaller than the within-group variation. Relying on the F-distribution as the basis for the probability distribution, the F value was estimated by using the mean square between groups and within groups calculated by the sum of squares and degrees of freedom. Model works.

Table 2: ANOVA analysis of variance

Model	Sum of Squares	Degrees of Freedom	Mean Square	F	Significance
regression	723.764	9	80.418	658.212	.000[j]
residual	1134.166	9283	.122		
Sum	1857.930	9292			

Table 3 presents the results of the model 10 regression coefficients and the significance of each coefficient. Compared with the previous model, only the significance test sig of each coefficient in model 10 is the smallest, so other models are omitted, and only the results of model 10 are given in Table 3.

The multicollinearity test was carried out on the model. After testing, the VIF values of the seven variables of X_1, X_5, X_8, X_{11}, X_{12}, X_{14}, and X_{18} were all less than 10. Therefore, by X_1, X_5, X_8, X_{11}, X_{12}, X_{14}, X_{18} There is no multicollinearity in the regression equation obtained by regressing the seven variables on the stock returns of listed companies.

Table 3: Regression coefficient table

Model 10	Unstandardized coefficients		standard coefficient	t	Sig.	Collinearity Statistics	
						Tolerance	VIF
(constant)	-.235	.028		-8.316	.000		
X1	5.435	.093	.549	58.397	.000	.792	1.263
X5	.268	.009	.106	-4.889	.000	.548	1.824
X8	.046	.009	.066	5.027	.000	.410	2.439
X11	.015	.004	.033	3.272	.001	.679	1.474
X12	-.043	.031	-.055	8.619	.000	.467	2.141
X14	.181	.024	.071	7.574	.000	.789	1.267
X18	.132	.013	.091	10.102	.000	.864	1.157

Combining with Table 5, it can be concluded that the final regression equation of Model 10 is:

$$Y = 5.435X_1 + 0.268X_5 + 0.046X_8 + 0.015X_{11} - 0.043X_{12} + 0.181X_{14} + 0.132X_{18} + 36.197$$

Normalized equation:

$$Y = 0.549X_1 + 0.106X_5 + 0.066X_8 + 0.033X_{11} - 0.055X_{12} + 0.071X_{14} + 0.091X_{18}$$

It can be seen from the regression equation that the stock returns (Y) of Chinese listed companies are

related to X_1(return on assets), X_5(current asset turnover ratio), X_8 (shareholder equity turnover ratio), X_{11}(cash ratio), X_{14}(capital preservation and appreciation) rate), X_{18} (owner's equity growth rate) showed a significant positive correlation, while with X_{12} (asset-liability ratio) was significantly negatively correlated. At the same time, it can be seen that there is no significant relationship with macroeconomic factors.

6. Conclusions and Policy Recommendations

The demonstration results in this paper show that there is a very obvious correlation between the changes of financial indicators and the changes of stock returns, that financial indicators have a strong explanatory power to stock returns, and that the disclosure of financial information of listed companies will have a direct impact on stock prices. Therefore, listed companies should disclose financial information in a timely manner and eliminate the sources of insider information.

The coefficient corresponding to return on assets is the highest among these factors, far exceeding the impact of other financial indicators on stock returns. Therefore, when considering investing in listed companies in the Chinese medicine industry, investors can focus on enterprises with return on assets. In addition, they can consider investing in enterprises with high turnover rate of current assets, cash ratio and turnover rate of shareholders'equity.

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