Original Research Article

Analysis of Stock IPO Price Based on CAPM Model

Chengjiao Song,Guomao Tang,Jiazhang Wu

School of Finance and Statistics, Guilin University of Technology, Guangxi, China

ABSTRACT

In order to determine the issue price of China's nuclear construction (601985) stock, this paper established the relationship between stock return and risk premium through the capital asset pricing model, and obtains the stock return rate according to the rate of return = dividend / share price. Get the theoretical issue price of the stock. As China's nuclear construction is to apply for listing, historical data does not exist, so this article chose the same industry or situation similar to the listed companies as a reference, with the same type of enterprise listed on the performance of a rough estimate of China's nuclear IPO issue price. China's nuclear construction listed on May 27, this sample range selected from January 1, 2016 to March 31, 2016, selected the same industry, listed on the Shanghai Stock Exchange of China's nuclear value of β instead of China's nuclear construction β value. To retrieve their daily rate of return data and SSE A refers to the daily rate of return data (data from the Ruisi database). The risk-free rate is selected using a three-month time deposit rate of 1.1%. According to the CAPM model, Eviews software was used for regression analysis, and the respective β values were obtained. The mean value was calculated and the predicted price of China's nuclear construction was calculated.

KEYWORDS: capital asset; pricing; model regression; yield rate; β coefficient

1. Introduction

Since Markowitz and Sharpe et al. have proposed the CAPM model, the research on capital asset pricing model has been endless. Although the CAPM model is too harsh because of its model assumptions, the CAPM model is used in the fields of finance and insurance because of its inherent classic idea of asset pricing and the continuous development of future generations, continuous development and improvement. Based on the general idea of CAPM model, this paper constructs and estimates the model by using the investment portfolio of listed banks in China, and obtains the CAPM model in general statistic sense, and explains its meaning, but also needs to study later about the process of further improvement.

2. CAPM model introduction

2.1. Assumptions of the model

CAPM (capital asset pricing model) is based on the Markowitz model, the hypothesis of the Markowitz model is naturally included:

1. Investors want the more wealth the better, the utility is a function of wealth, wealth is a function of investment rate of return, and it can be considered a function of the yield as a function.

2. Investors can know in advance the probability of return on investment distribution for the normal distribution.

3. Investment risk with the investment rate of return variance or standard deviation logo.

4. The main factors affecting investment decision-making for the expected rate of return and risk two.

5. Investors are to comply with the principle of domination (Dominance rule), that is, the same level of risk, the choice of higher yields of securities; the same rate of return, select the lower risk of securities.

Additional assumptions for CAPM:

6. Can be in the risk of discount rate R under the unlimited borrowing or lending funds.

7. All investors on the securities yield probability distribution of the same view, so the market efficiency of the border is only one.

8. All investors have the same investment period, and only one period.

9. All the securities investment can be unlimited breakdown, in any one investment portfolio can contain non-integer shares.

10. Tax and transaction costs are negligible.

11. All investors can be free and timely access to adequate market information.

12. There is no inflation, and the discount rate unchanged.

13. Investors have the same expectation that they have the same expected value for the expected rate of return, the standard deviation and the covariance between the securities.

The above assumptions indicate that: First, the investors are rational and diversify in strict accordance with the rules of the Markowitz model and choose the portfolio from the effective boundary; second, the capital market is fully effective market, there is no friction to hinder investment.

2.2. The basic form of the model

Capital Asset Pricing Model (CAPM) was derived from Markowitz's mean-variance model theory in 1959 by Sharpe and Linter, respectively, in the 1964 and 1965 market risk assets.

Where the expected rate of return for the asset i, is the rate of return for the market portfolio with variance effectiveness, the rate of return on the riskless asset, the excess return for the asset i, the excess return for the market portfolio, expressed as the asset i The beta coefficient (which represents the size of the system i's risk).

The beta coefficient is the ratio of the risk level of a portfolio to the risk level of the market portfolio. If β> 1, the risk of this portfolio is greater than the market risk, the corresponding rate of return on investment will be greater than the market average return rate, the excess part of the risk premium, is the risk of more than part of the market risk compensation. On the other hand, if β> 1 shows that the risk of this portfolio is greater than the market risk, it can achieve the general purpose of the asset portfolio, that is, the asset portfolio is risky.

CAPM model can mainly explain two issues: first, in the same period, different assets of the price and income why there will be differences, this difference is a cross section of the income gap can be used to explain the difference; second, the same assets in the why is the difference between the price and the income of different periods? This difference is called the time series difference of the income, and can be explained by the difference of the excess return ( ) of the market combination in different periods.

2.3. Feasibility test of the model

Since the introduction of the CAPM model, the Western capitalist countries have extensively used this model to test the stock market. Basically, the early tests are supporting the model, that is, the stock returns and risks are positively correlated. Black, Jensen, and Scholes (1972) modeled the time series and cross-section of the model, confirming a positive linear relationship between the beta coefficient and the stock yield. Fama and Macbeth (1973) use the time series test to obtain the risk factor to predict the potential future rate of return of the portfolio. The experiment also shows that the linear relationship between stock returns and beta coefficients is established. Although the CAPM model has been widely used in the capitalist market, the skepticism also follows. In theory, the market mix is in accordance with the theory of optimal mean variance, but in the practice of the market could not prove that the market index portfolio is an effective combination of the market, it is bound to cause the CAPM test results questioned. In addition, Reinganum (1981) tested the model with the daily yield of the stock instead of the monthly yield of the stock. The experimental results showed that the stock yield and risk were inversely related. Basu (1983) used the 1957 to 1971 NYSE all the stock to test the model, the results found that the price-earnings ratio in the interpretation of the stock market risk than the β coefficient is more reliable. (2) Chen Langnan and Qu Wenzhou (2000) used the data of Shanghai stock market to test the model, and divided the three market patterns (rising, falling and sideways) according to the stock market. Explanatory power. The results show that the β value has a significant effect on the measurement of market risk. The explanatory ability of β value in three periods is unstable. Most of the time of risk-free rate is negative, and it is found that the CAPM model in the form of beta CAPM model has better ability to explain. Tang Haibin (2009) based on the A-share market earnings and risk issues on the CAPM model of the theoretical analysis and found that CAPM is not applicable to China's investment market.

Amihud, Christensen and Mendelsonf (1992) found that if more efficient statistical methods were used, the estimates of the average yield and value relationships were positive and significant. Black (1993) argues that Banz (1981) suggests that the firm's scale effect can only occur in a sample period. This result was also confirmed by Jagannathan and McGrattan (1995). Kothari, Shanken and Sloan (1995) argue that the conclusions of Fama and French (1992) and others may not be established under different group identification methods. They use the annual income to replace the monthly income to predict and test, the test results cannot refuse the annual and the income is positively related to the assumption. Clare, Priestly and Thomas (1998) test with UK data and the same cannot be rejected for assumptions that are positively related to the average earnings of the UK stock market.

Through the introduction of relevant literature at home and abroad, we can find that CAPM empirical research has made great achievements, research increasingly deep and mature. The conclusion of most studies in the empirical study of CAPM feasibility in China has rejected the hypothesis of CAPM in our country, and some have even put forward the opposite conclusion: that there is a significant linear negative correlation between systemic risk and expected return, and the study finds that non - systematic risk plays an important role in the stock pricing behavior, and analyzes the proportion of the share capital, the proportion of the outstanding shares in the total share capital, the return on net assets and the volume of the factors that affect the stock yield.

However, there are still some prerequisites in domestic research, such as the choice of market mix, and the choice of time period, this paper had made breakthroughs in these areas, so that empirical research more fully. And try to innovate in terms of factors that affect the yield, with a view to providing new ideas and methods for other researchers. □

3. CAPM model application

3.1. Application of the model

This is an ex ante model of the stock's rate of return. Now we assume that the return on any asset is a fair game, that is, the average yield that any asset has achieved is equal to its expected rate of return, that is, a risk-neutral assumption the model can be transformed into a linear regression model. The β value in the CAPM model is calculated by regression analysis. The mean value of β is obtained by analyzing the test results. The mathematical deformation has the following form:

Ri represents the stock rate of the i-th stock at time t, calculated as:

$$R_i - R_f = \alpha_0 + \beta \times (R_M - R_f) + \mu$$

Is the closing price of i-th stock at time t, the closing price of i-th stock at t-1, and D is the dividend, interest and other income of i-th stock at time t.

In foreign research, often with short-term Treasury interest rates or bank interbank interest rates as risk-free interest rates, according to China's actual situation, select the residents of this year's three-month time deposit rate as risk-free rate of return.

Symbol expressed the market portfolio return rate, indicates at time t, the closing price of A shares of Shanghai Stock Exchange at time t, and represents the closing price of A shares at time t-1.

Symbol α0 for intercept factors, when it is greater than 0, Ri-Rf>β×(RM-Rf)□which is Rt>Rf+β×(RM-Rf) (RM-Rf), indicating that the actual rate of return of the individual stocks is higher than the expected rate of return, Ri-Rf> The price of the stock is higher than its intrinsic value and the predicted stock price will be lower. When it is less than 0, Ri-Rf <β × (RM-Rf), such as Rt <Rf + β × (RM-Rf) the actual rate of return is lower than the expected rate of return, that is, the price of the stock is lower than its intrinsic value, the stock price will be higher; when it is equal to 0, Ri-Rf = β × (RM-Rf), which is Rt = Rf + × (RM-Rf), indicating that the actual rate of return of stocks is equal to the expected rate of return, forecast price movements stable.

β is the value of the i-th stock, which is calculated as follows:

The formula indicates covariance of the stock yield and the combined yield, is the variance of the combined yield, σ2M, β, which indicates the linear relationship between the rate of return of the stock and the market rate of return. In this paper, the time series data β calculate the formula obtained by the β comparison analysis, if the β passes the test, the CAPM model is valid.

μ is the interference term, μi~N(0,σ2)

This paper selected the same industry, has been listed on the Shanghai Stock Exchange of China's nuclear power to replace the β value of China's nuclear construction. China's daily return on nuclear power data and the Shanghai A refers

to the daily rate of return data (data from the Ruisi database). According to the CAPM model, Eviews software was used for regression analysis to obtain the Beta value.

4. Regression analysis

4.1. Data collection

Select the Shanghai Securities A-share index from January 1, 2010 to March 31, the daily rate of return data and China's nuclear power (601985) the daily rate of return. The riskless rate of return is based on the residents' three-month time deposit rate of 1.1%.

Stock code _Stkcd	Date	ri-rfy	rm-rfx
601985	2016/1/4	-0.0928	-0.0796
601985	2016/1/5	-0.0019	-0.0136
601985	2016/1/6	0.006	0.0115
601985	2016/1/7	-0.0944	-0.0814
601985	2016/1/8	0.0133	0.0087
601985	2016/1/11	-0.0537	-0.0643
601985	2016/1/12	0.01	-0.009
601985	2016/1/13	-0.0425	-0.0352
601985	2016/1/14	0.0065	0.0087
601985	2016/1/15	-0.043	-0.0465
601985	2016/1/18	-0.0135	-0.0066
601985	2016/1/19	0.0298	0.0212
601985	2016/1/20	-0.0196	-0.0213
601985	2016/1/21	-0.0406	-0.0433
601985	2016/1/22	-0.0059	0.0015
601985	2016/1/25	-0.0097	-0.0035
601985	2016/1/26	-0.0944	-0.0752
601985	2016/1/27	-0.0289	-0.0162
601985	2016/1/28	-0.0447	-0.0402
601985	2016/1/29	0.0181	0.0199
601985	2016/2/1	-0.0364	-0.0288
601985	2016/2/2	0.0165	0.0116
601985	2016/2/3	-0.0181	-0.0148
601985	2016/2/4	0.0018	0.0043
601985	2016/2/5	-0.0194	-0.0173
601985	2016/2/15	-0.0294	-0.0173
601985	2016/2/16	0.025	0.0219
601985	2016/2/17	0.0015	-0.0002
601985	2016/2/18	-0.0165	-0.0126
601985	2016/2/19	-0.0124	-0.012
601985	2016/2/22	0.0111	0.0125
601985	2016/2/23	-0.0002	-0.0191
601985	2016/2/24	-0.0137	-0.0022
601985	2016/2/25	-0.0889	-0.0751
601985	2016/2/26	0.0065	-0.0015
601985	2016/2/29	-0.0382	-0.0396
601985	2016/3/1	0.0052	0.0058
601985	2016/3/2	0.031	0.0316
601985	016/3/3	0.0152	-0.0075

601985 2016/3/40.0029 - 0 . 0 0 6

601985	2016/3/7	-0.0082	-0.0029
601985	2016/3/8	-0.0165	-0.0096
601985	2016/3/9	-0.0151	-0.0244
601985	2016/3/10	-0.0373	-0.0312
601985	2016/3/11	-0.0053	-0.009
601985	2016/3/14	0.006	0.0065
601985	2016/3/15	0.0043	-0.0093
601985	2016/3/16	-0.011	-0.0089
601985	2016/3/17	-0.0055	0.001
601985	2016/3/18	0.0026	0.0063
601985	2016/3/21	0.0065	0.0105
601985	2016/3/22	0.0194	-0.0174
601985	2016/3/23	-0.0225	-0.0075
601985	2016/3/24	-0.0084	-0.0273
601985	2016/3/27	0.0097	-0.0048
601985	2016/3/28	-0.0262	-0.0183
601985	2016/3/29	-0.0367	-0.0238
601985	2016/3/30	0.0167	0.0167
601985	2016/3/31	-0.0187	-0.0099

4.2. Using Eviews to do linear regression to calculate the β coefficient

Based on the single factor model, the excess return rate of the market portfolio is taken as a single economic factor, and the regression model is designed:

Where Ri represents the daily return on the stock, Rf represents the risk-free rate of return, RM represents the market rate of return, and εi represents the random error term.

Using the daily data from January 1, 2016 to March 31, 2016, EViews software was used for regression analysis to obtain regression results:

Dependent Variable: Y

Method: Least Squares

Date: 05/07/16 Time: 17:14

Sample: 1 59

Included observations: 59

	Coefficient	Std. Error	t-Statistic	Prob.	
C	0.000397	0.001474	0.269577	0.7885	Pass, significantly 0
X	1.081166	0.051805	20.87007	0	Did not pass. Significantly not 0

R-squared	0.884278	Mean dependent var	-0.01415
Adjusted R-squared	0.882248	S.D. dependent var	0.029073
S.E. of regression	0.009976	Akaike info criterion	-6.34389
Sum squared resid	0.005673	Schwarz criterion	-6.27346
Log likelihood	189.1446	Hannan-Quinn criter.	-6.31639
F-statistic	435.5599	Durbin-Watson stat	2.267792
Prob(F-statistic)	0		

We see that in the regression results, R2 is equal to 0.884278, indicating that the model simulation results are better. B = 1.081166, T test is 20.87007> 2.002 (95% confidence level), then β is not zero, the test is effective. The regression equation ri-rf = 1.081166 (rm-rf) can be obtained.

4.3 Analysis of regression results

In conclusion, the CAPM model is a simple abstraction of the real securities market, and it has a more stringent assumptions. First, there are a series of strict assumptions. Moreover, the CAPM theory attributes all the system risk factors to one (Relative risk), ignoring the impact of other factors on the yield of a single regime; and the CAPM theory assumes that there are enough securities in the market portfolio to completely offset the non-systemic risk of the regime. Faced with these assumptions and conditions, even in the more mature securities market cannot meet these harsh conditions. Therefore, CAPM in the premise of the conditions cannot be strictly satisfied, CAPM in the various securities market has the effect of the difference, that is, CAPM theory with the real market in line with the degree.

According to the results of the regression, China's nuclear yield rate is:

$$Ri = 1.1\% + 1.081166 \times (-0.00246-0.011) = -0.02555$$

The data show that the Shanghai A-share and China's nuclear yield is less than 0, which shows that in the first quarter of 2016 the overall stock market is not optimistic, the market must be cautious. And in the further estimate of the IPO price, from P = dividend / yield, we can get stock = dividend / yield. After looking for data, you can see China's nuclear stock in the first quarter of 2016 = 0.095, into the formula, get the stock price P = 3.7182.

According to the May 17 'Tencent Finance' reported the news 'bond analysis: IPO investment strategy manual, real-time attention to China's nuclear pricing adjustment' wrote: 'The new shares in the most concerned about the Chinese nuclear construction, fund-raising scale 20.21 billion, is the first venture after the larger size of the vote with the prospectus to raise the total amount of funds, divided by the number of new shares issued after the calculation price of 3.85 yuan, the corresponding issue price-earnings ratio of 17.30 times, more than China's nuclear industry construction (E) Monthly average price-earnings ratio of 16.33 times (as of last Friday) '

5. Summary and reason analysis

In the above table, the β coefficient of the regression equation can be tested by significance, then the CAPM model is valid. Therefore, the regression results show that the securities market line constructed by the regression model can explain the positive correlation between the risk and the return of the stock and the linear relationship between the system risk and the excess return.

But at the same time we also see the market returns and earnings per share yield is less than 0, indicating that the market portfolio (that is, the selection of the SSE A shares) market performance is not good, the stock's expected rate of return will be relatively low. Calculate the stock IPO price, the model is also more rough, there may be overestimated or underestimated the risk, so the accuracy of the price to be tested.

References

1. Guo DZ. Mathematical Finance - The principle and model of asset pricing [M. Beijing: Tsinghua University Press, 2006
2. Stampfli, Goodman, Cai MC, translation. Financial Mathematics [M]. Beijing: Mechanical Industry Press, 2004
3. Wang QS, Peng YC. design pricing model of time series characteristics of a-share price in China [J]. Economics Quarterly, 2007 (7)