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SHANGHAI UNIVERSITY OF FINANCE AND ECONOMICS

计量经济学课作业

COURSE THESIS

作业题目：Testing effect of Fama-French 3 factors models——based on data of Shanghai Stock Exchange during 2000-2016

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# Abstract

The aim of this project is to test the Fama- French Three Factors Model in Shanghai stock market during 2000-2016, and compare it with CAPM model. Since Fama(1996) cannot strict proof his model, in this project, I will only test if the coefficient of various factors is 0. I will not test whether the intercept is 0. We will use heteroskedasticity-robust OLS regression to analyze the data. I found that both CAPM and Fama-French 3 factors model can interpret the stock performance in Shanghai Stock Exchange. However, the advantage of Fama 3 factors model over CAPM is not significant.

Key words: Fama- French Three Factors Model, Shanghai stock market, CAPM

# Ⅰ. Introduction and background

The aim of this project is to test the Fama- French Three Factors Model in Shanghai stock market during 2000-2016, and compare it with CAPM model.

In 1996, Fama has tested the effective of his 3 factors model in the US stock market. Then, Ding (2008), Liao (2010) and Zhang (2011) has researched different time period performance of Chinese stocks. However, their research time period is so short. Before 2000, the market is so immature that it is meaningless to research. There is no one does such a research that using 17 years data. Besides, I only test the model using data of Shanghai Stock Exchange. As we all know, in Shenzhen Stock Exchange, there are many high-tech and Internet companies. Because of the special valuation of these companies, data of Shenzhen market will not be used to research this problem.

Since Fama(1996) cannot strict proof his model, in this project, I will only test if the coefficient of various factors is 0. I will not test whether the intercept is 0.

# Ⅱ. Research question and research hypothesis

We will test in 3 stages. At first stage, we test the classical CAPM model. The second stage will discuss other factors : HML and SML. At final stage, we will test the Fama- French Three Factors Model.

If CAPM is effective:

If Fama- French Three Factors Model is effective:

# Ⅲ. Variable description and methodology

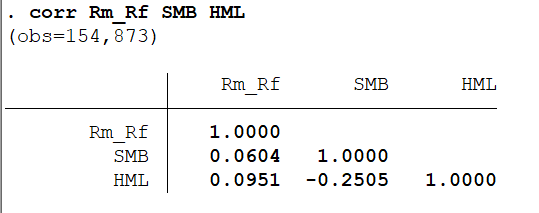
***R*(*t*)** is the return rate of one stock, ***Rf*(*t*)** is the risk-free interest rate, ***RM*(*t*)** is the return rate of market, ***e*(*t*)** is the error, ***SMB*(*t*)** is book-value factor, ***HML*(*t*)** is BV-over-price factor. ***a*** is intercept, ***b*** is ***β***. ***s*** is coefficient of book-value factor, ***h*** is coefficient of BV-over-price factor.

Before 2000, the market was so immature; after 2016, in 2017 the market started a trend that white horse and blue-chip stocks was significantly increased. Thus, I use data of Shanghai Stock Exchange during 2000-2016. Data source: CSMAR. I use the continuous interest rate monthly interest rate translated by the people’s Bank of China in three months as the risk-free interest, because in early years, there is no 3 months short term treasury bills.

I use the same method with Fama(1996). I sort the stocks according to book value and divide them by the median. Those who have smaller BV are group “S”, others are group “B”, and then calculate the premium factor(SMB). Then I sort the stocks according to ratio of book-value over market-value(B/M). They are divided by 3 groups. Those whose B/M is in the first 30% are group “H” , the last 30% are group “L”, and others are group “M”, then calculate the premium factor(HML).

I will use Heteroskedasticity-Robust OLS to regress.

This is the correlation matrix. We can know that there is almost no correlation among factors.



Next, I divide stocks into 25 groups according to Fama’s method. I divide them to 5 groups by BV (1 is the smallest and 5 is the biggest), and 5 groups by B/M (1 is the lowest and 5 is the highest), crossly classify them into 25 groups. This is the descriptive statistics of them.



Sd is standard Deviation.

# Ⅳ. Results

1. **CAPM Testing.**

***R*(*t*)−*Rf*(*t*)=*a*+*b*(*RM*(*t*)−*Rf*(*t*))+*e*(*t*)**

This is the report data by *heteroskedasticity-robust OLS regression* :



In the left, \_b\_Rm\_Rf is **β**, \_b\_cons is intercept, R2 is R-square.

In the right, t is t-value of t test, \_se is standard error.

The R-square is just fine. The CAPM can partly interpret stock performance of Shanghai Stock Exchange.

The t-value of **β** is larger than 1.96 (2-side test on 5% significance level). We can

reject the null hypothesis.

1. **Other 2 Factors Testing**

***R*(*t*)−*Rf*(*t*)=*a*+*sSMB*(*t*)+*hHML*(*t*)+*e*(*t*)**

This is the report data by *heteroskedasticity-robust OLS regression* :



In the left, \_b\_SMB is coefficient of book-value factor, \_b\_HML is coefficient of BV-over-price factor, \_a is intercept, R2 is R-square.

In the right, t is t-value of t test, \_se is standard error.

R-square is so small that these factors cannot interpret the premium rate well.



This is the p-value of F test. We can know that almost all groups pass under 1% significance, and all pass under 5%. We can reject the null hypothesis.

1. **Fama- French Three Factors Model Testing**

***R*(*t*)−*Rf*(*t*)=*a*+*b*(*RM*(*t*)−*Rf*(*t*))+*sSMB*(*t*)+*hHML*(*t*)+*e*(*t*)**

This is the report data by *heteroskedasticity-robust OLS regression* :





In the left, \_b\_Rm\_Rf is **β**, \_b\_SMB is coefficient of book-value factor, \_b\_HML is coefficient of BV-over-price factor, \_a is intercept, R2 is R-square.

F-p-value is the p value of F-test. The result is very good.

In the right, t is t-value of t test, \_se is standard error.

We can reject the null hypothesis.

# Ⅴ. Discussion

CAPM can partly interpret the stock performance. However, the advantage of Fama 3 factors model over CAPM is not significant.

One of the possible reason is that in Chinese stock market, there are large number of amateur investors (over 80%). They haven’t got enough education about finance. They decide to buy or sell a stock depending on their mood and the candlestick chart.

Another possible reason is that in Chinese stock market, there is no short-mechanism. An investor cannot profit from short those stocks whose price is obviously over its value, or those companies who have poor business performance. Thus, the Value factors lose their effects.

# Ⅵ. Conclusion

Both CAPM and Fama-French 3 factors model can partly interpret the stock performance in Shanghai Stock Exchange. However, the advantage of Fama 3 factors model over CAPM is not significant.

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