



*Department of Economics and Society, Dalarna University*

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# **Short-selling in the Chinese stock market: What would happen with returns?**

**Supervisor: *Kenneth Carling***

**Authors: *Yuanyuan Han, Tong Zhou, Jinliang Li***

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**Abstract**

Along with the reformation of China's stock market deeply, the development makes the short selling mechanism gradually become the focal point which the people studies increasingly. This article applies the Monte Carlo method, under the VaR restriction, and takes three kinds of typical finance properties in China capital market - Etf50 fund, the national bond, the enterprise bond as the examples, separately simulated the data to test whether the benefits of short sale are significantly increase or not for the investors.

The research indicated that, it is remarkable that the selling short mechanism makes the investors' income rate enhanced. Because Chinese government is regarding the interest of investors as the main goal, the short-sale mechanism is one of the vital tools.

## 1 Introduction

To short sell is to sell a financial instrument short by borrowing the asset being sold, a broker promises to deliver the asset to the broker later. Therefore, investors also can make a profit on the market which is falling off through short-sale.

However, the stock market in China has not imported the short-sale mechanism yet. This induces the results below directly:

(1) “Because of no short-sale mechanism, the investment on value always changes into the gambling on price, which is provide good conditions for excess gambling on stock market. And it is difficult to let the idea of investment on value as the main idea in the A stock market.”(Gang Liu, 2005, Huaxi city newspaper)

(2) Because the large institutions cannot change itself easily, without short-sale mechanism, their results not only always cannot sell the entire stock, but the whole money which the companies collect can only disposition in the market and it weakens the fluidness of bankroll maximum.

(3) “Without imported the short-sale mechanism, the stock market must be go up and go down in a large range. This will hurt the belief of the investors and the research ability of the institution cannot transform to the market behavior.” said by Zhiguo Huang, who is a Chinese economist.

(4) We cannot elude market risk through short-sale; the stock market also cannot reflect the situation of national economy and lost the function of barometer.

But along with reformation of the stock market, our market has had the basic condition of trying to short-sale mechanism. The short-sale mechanism will reduce the gambling and fluctuate of Chinese stock market, strengthen the discovery function of market value and increase the fluidness of the market.

Whereas, this article will discuss that how much the yield will be affected when we imported short-sale mechanism. And we will discuss it on both theoretic and method of calculating.

## **2 The fundamental of Monte Carlo method and analysis instrument**

The fundamental of Monte Carlo method is that let large amount random variables which have a certain probability distribution as parameters into mathematical model, then calculate the probability distribution of the attention variables. Accordingly, understanding how the target variables affected by different variables and the statistical property of the final result of the target variables.

The precondition of using Monte Carlo method is to confirm the mathematic model of the target variables and the probability distribution of every variable in the model. If we confirm the two points, we can make large amount random values according to the given probability distribution, and then put them into the model to get a lot of possible results of the target variables. So we can research the statistical property of the target variables.

Therefore, the detail steps of the application of the Monte Carlo method are:

Firstly, to establish a mathematical formula of describing the relationship between the profit of the project and several affecting factors, this is called Monte Carlo analysis model.

Secondly, to make sure the main risk variables are induced in the Monte Carlo analysis model.

Thirdly, we calculate the probability distribution of every risk variable according to the historical data. The common probably distributions are normal distribution, lognormal distribution, uniform distribution, triangular distribution; exponential decrease distribution and customer decide distribution.

Fourthly, we can make large amount random values with the given probability distribution by computer. Using these random values as parameters of every variable into analysis model and calculating expect income i.e. the value of the target variable of the model. We can get the probability distribution and statistical characters of the target variable through large amount simulation calculating. Consequently, to predict expect yield and its probability distribution which are affected by the many factors.

Monte Carlo method appeared in 1980s, which brings the people's attention at the beginning and applying engineering and computer firstly. But since the limit of the hardware and software of the computer, this method cannot spread. Recently the computer hardware is developing rapidly; the system of relevant computer software is much more perfect, so we can operate it on our own computers now.

### **3 The Effect of Short-sale mechanism**

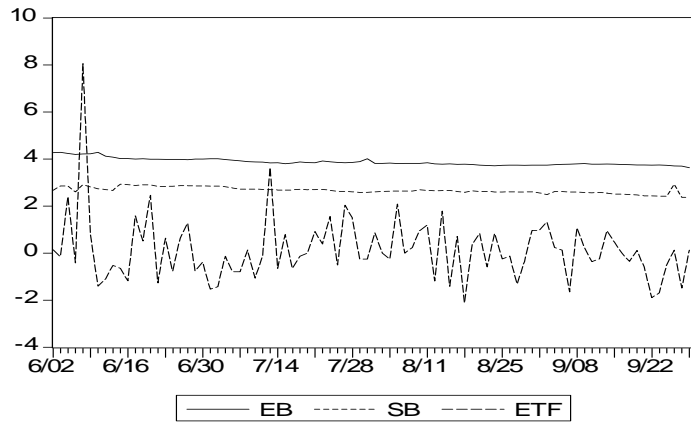
#### **3.1 Choice of Data**

Let us define a aim function:  $return = w_1 * r_1 + w_2 * r_2 + w_3 * r_3$  The set up is induced to maximize the investors' return under the condition:  $w_1 + w_2 + w_3 = 1$ .

In order to reduce the risk effectively, we choose 3 kinds of the investment properties in the financial market as an investment portfolio. Firstly, on January 10, 2005 the Etf50 index fund is promoted which is one kind of low risk new property, because it does not have the earlier period effect, therefore, it can quite objectively reflect the nowadays market. Secondly, the bond market is a low venture capital market. At last, the enterprise bond and the state bond also have the stable investment income. This article will choose short-term data to take the research object: From June 2, 2005 to September 30, 2005, that is, 86 days transactions situations of those daily return income rate.

The data is about the return rate as follow:

**Graph 1 Daily return income rates of 3 assets**

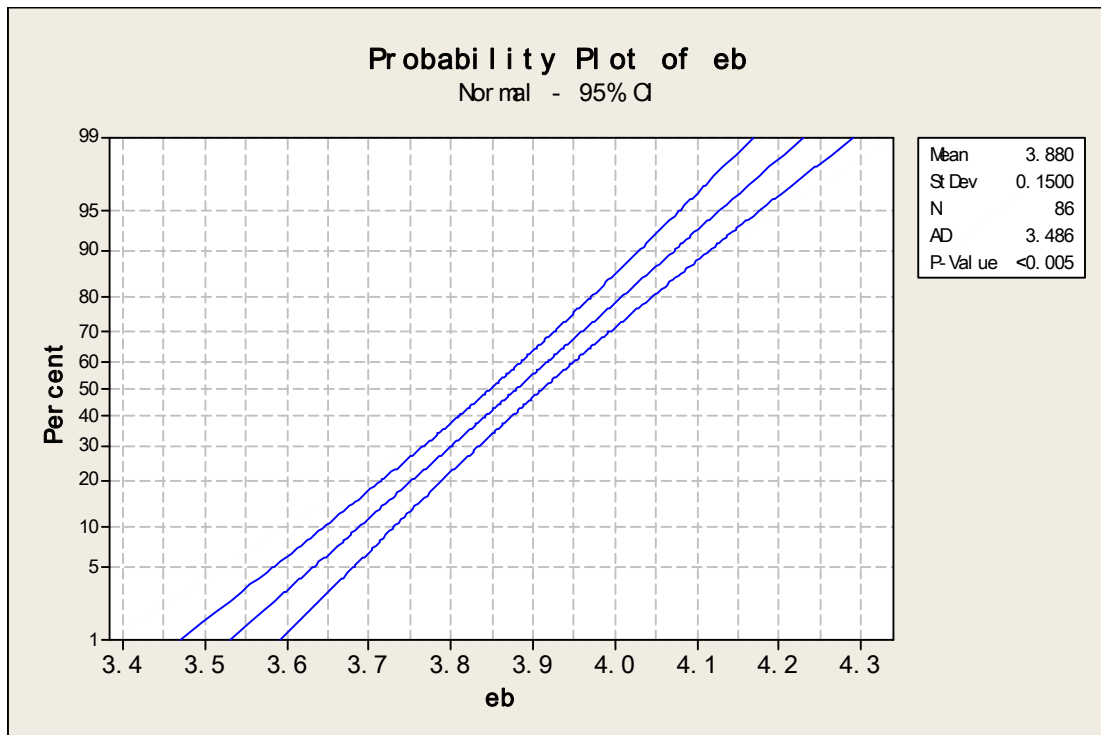


3.2 Distribution

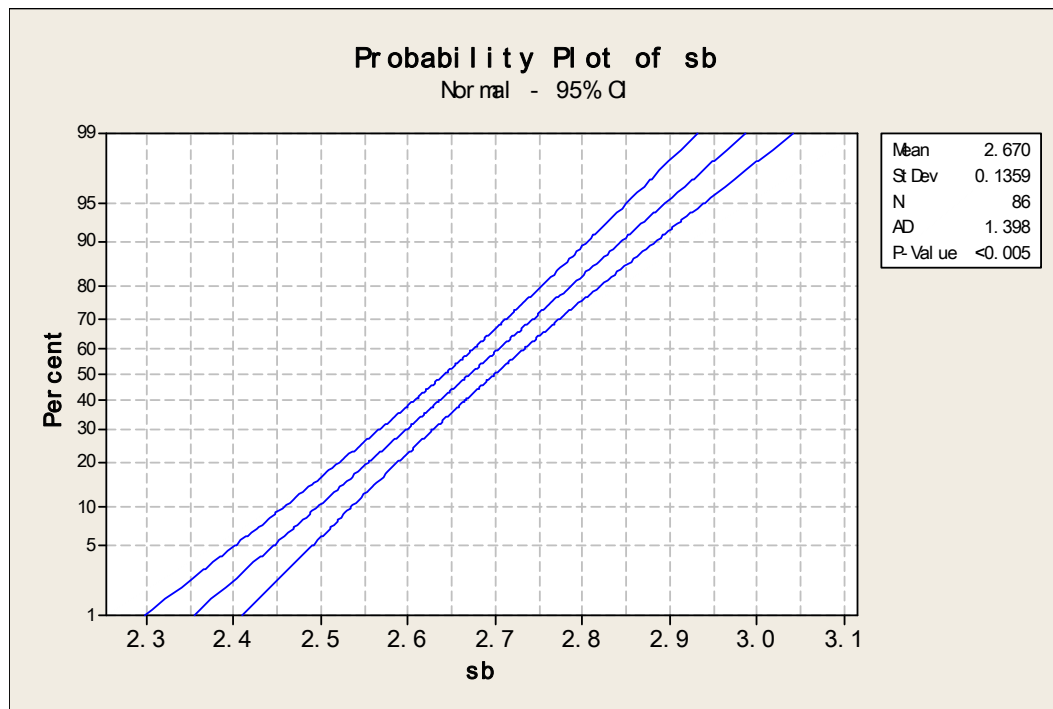
P-P plot (Probability-Probability Plot) can be used to judge whether the distribution correspond the given one or not. If the scattered distribution points show a straight line approximately, the data subject to the given distribution.

**Graph 2 P-P plots of 3 assets**

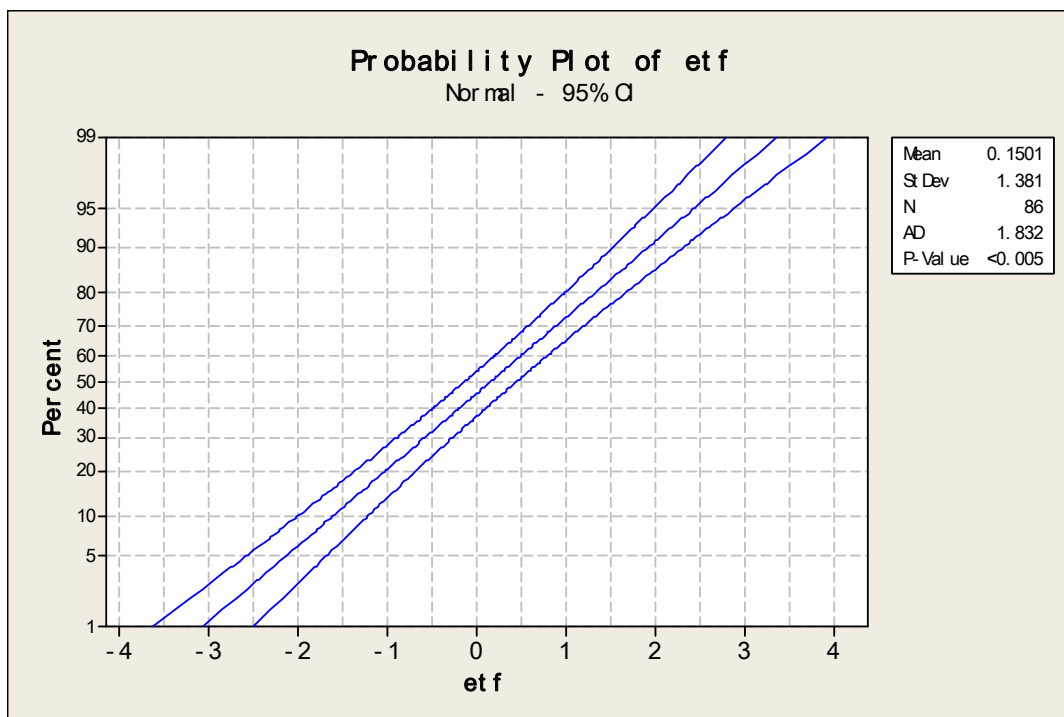
**a. Enterprise bond**



**b . State bond**



**c. Etf50**



We can see the lines of three asset income rates are approximately straight and we also want to simplify the process, therefore, we assume they are normality. That is, they are all normal distribution data.

### (3) Auto-correlation in the three time-series

Calculating the first order auto-correlation in the three time-series for each, we have

$$\begin{array}{lll} \hat{EB}=0.997983EB(-1) & \hat{SB}=0.997928SB(-1) & \hat{ETF}=-0.017108ETF(-1) \\ T \text{ value:} & (926.7787) & (236.1698) & (-0.156823) \end{array}$$

Therefore, the enterprise bond and state bond series are auto-correlated.

### (4) Simulation Process and Restraint

We get interest rate of etf50 (%), interest rate of state bond (%), interest rate of enterprise bond (%), correspond the  $N(0.15,1.38)$ ,  $N(2.67,0.14)$ ,  $N(3.88,0.15)$  separately. And we make use of “ $3\sigma$  rule” to get the domain of simulation parameters, that are, etf50 income rate (%), State Bonds income rate (%), and corporate bonds income rate(%) were  $(-3.971,4.300)$ ,  $(2.264,3.074)$ ,  $(3.433,4.326)$  separately. At last, we simulate 1000 times, and choose the biggest interest rate value as our goal both under short selling allowed and forbidden condition every time. Then we repeat 100 times the simulations as the above method to get two samples separately, at last we conduct the analysis of variance for them to test whether they are significantly different.

### (5) The infection of short-sale mechanism to yield

It is indicated that under the short-sale mechanism, investor can borrow negotiable securities and sale them on the open market. When the price of the negotiable securities down, they buy the negotiable securities and get profit. But nowadays we cannot do that in Chinese stock market, so the negotiable securities just can get profit when the index of the stock market increasing, when the index decreasing they only can changed with the lost.



We confirm the conclusion above through the analysis of simulation, i.e. as long as we import the short-sale mechanism under the same marketing condition, the return of the investors can be increasing (table 1):

**Table 1 The indexes of the best investment portfolio under no selling short and selling short**

	VaR	Weight of EB	Weight of SD	Weight of Etf50	Return rate (%)
No selling short	2%	0.3971	0.0561	0.5468	4.1907
Selling short	2%	0.9208	0.9371	-0.8579	9.0642

Notes: the fixed deposit rate of one year is 2.25%, “net return rate” indicate that it has eliminate the infection of the fixed deposit rate.

We should explain, in the result negative number represents selling short. Therefore, whether exists selling short mechanism, the simulation processes are only different in domain of the investment ratio: The investment ratio under the selling short condition is (-1, 1), if not, that should be (0, 1). Certainly, no matter whether there exists the selling short mechanism, the sum of the investment ratio should both be 1.

From table 2 we can know that under the level of Var equal to 2%, the return rate of no selling short is 4.19%, and the net return rate of eliminating the fixed deposit rate in one year (2.25%) is 1.9407%; but once we import the short-sale mechanism, the return rate and the net return rate will increasing to 9.062% and 6.814% separately. In order to test the importing of the short-sale mechanism make the yield increased significantly, we test whether the yield of the best investment portfolio under the two mechanisms exist significant difference or not, through one tail t-test.

$$t = \frac{\bar{Y}_1 - \bar{Y}_2}{S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$S_p = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

We get the

$$p = 1.22\text{E-}132$$

It is obvious that we can not reject that  $\mu_1 > \mu_2$ , the difference between the two arrays is significant under 1% the  $\alpha$  - level .

We can know that the result of the test indicate that the p value of the statistic F less than 1%, which based on the sample we choose in this article. I.e. we reject the null hypothesis that the hypothesis of the yields have the equal mean under the two marketing condition.

It is obvious that the yield under the selling short do higher than no selling short significantly under the value of risk. It shows that it is suit for protecting the benefit of the stock investor if we import the short-sale mechanism.

#### 4 Basic conclusion

The analysis of the article shows that the yield of the investors will increase significantly as long as importing short-sale mechanism. The policy sense of this conclusion is obvious, that is China should import short-sale mechanism for our stock market at the suitable time. In this way, not only can increase the expect yield of the investors, but also can accelerate to minish the differences with other countries. And the significant increasing yields of negotiable securities will active investors' passion of the stock market. Thereby let a large mount advised financing lead to securities business and make our securities business to walk out the mess which lasted for a long time.

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## 6 Appendix

Date	Enter prise bond (%)	State bond (%)	Etf50 (%)	Savi ng rate (%)	Date	Enter- prise bond (%)	State bond (%)	Etf50 (%)	Saving rate (%)
2005-6-2	4.273	2.68	0.138	2.25	2005-8-3	3.819	2.605	0.867	2.25
2005-6-3	4.289	2.86	-0.141	2.25	2005-8-4	3.82	2.62	0	2.25
2005-6-6	4.238	2.86	2.407	2.25	2005-8-5	3.827	2.63	-0.25	2.25
2005-6-7	4.198	2.61	-0.414	2.25	2005-8-8	3.816	2.636	2.093	2.25
2005-6-8	4.216	2.91	8.055	2.25	2005-8-9	3.817	2.636	0	2.25
2005-6-9	4.229	2.81	0.771	2.25	2005-8-10	3.818	2.639	0.241	2.25
2005-6-10	4.287	2.74	-1.403	2.25	2005-8-11	3.819	2.691	0.962	2.25
2005-6-13	4.12	2.7	-1.100	2.25	2005-8-12	3.84	2.67	1.191	2.25
2005-6-14	4.082	2.67	-0.517	2.25	2005-8-15	3.8	2.65	-1.18	2.25
2005-6-15	4.026	2.93	-0.650	2.25	2005-8-16	3.783	2.66	1.787	2.25
2005-6-16	4.024	2.91	-1.178	2.25	2005-8-17	3.797	2.671	-1.41	2.25
2005-6-17	3.998	2.88	1.589	2.25	2005-8-18	3.775	2.62	0.712	2.25
2005-6-20	4.015	2.9	0.521	2.25	2005-8-19	3.783	2.585	-2.12	2.25
2005-6-21	3.991	2.899	2.464	2.25	2005-8-22	3.765	2.645	0.361	2.25
2005-6-22	3.99	2.838	-1.265	2.25	2005-8-23	3.743	2.614	0.840	2.25
2005-6-23	3.986	2.831	0.641	2.25	2005-8-24	3.729	2.618	-0.59	2.25
2005-6-24	3.986	2.839	-0.764	2.25	2005-8-25	3.715	2.598	0.838	2.25
2005-6-27	3.988	2.869	0.641	2.25	2005-8-26	3.735	2.6	-0.24	2.25
2005-6-28	3.974	2.865	1.275	2.25	2005-8-29	3.744	2.608	-0.12	2.25
2005-6-29	4.002	2.854	-0.755	2.25	2005-8-30	3.746	2.603	-1.31	2.25
2005-6-30	4.002	2.855	-0.380	2.25	2005-8-31	3.737	2.605	-0.36	2.25
2005-7-1	4.017	2.849	-1.528	2.25	2005-9-1	3.746	2.607	0.969	2.25

2005-7-4	4.012	2.853	-1.423	2.25	2005-9-2	3.746	2.557	0.969	2.25
2005-7-5	3.978	2.826	-0.131	2.25	2005-9-5	3.747	2.485	1.320	2.25
2005-7-6	3.958	2.768	-0.788	2.25	2005-9-6	3.760	2.615	0.237	2.25
2005-7-7	3.929	2.72	-0.794	2.25	2005-9-7	3.775	2.618	0.123	2.25
2005-7-8	3.894	2.72	0.133	2.25	2005-9-8	3.781	2.604	-1.65	2.25
2005-7-11	3.881	2.719	-1.066	2.25	2005-9-9	3.799	2.6	1.081	2.25
2005-7-12	3.871	2.707	-0.134	2.25	2005-9-12	3.814	2.578	0.237	2.25
2005-7-13	3.832	2.697	3.643	2.25	2005-9-13	3.785	2.563	-0.36	2.25
2005-7-14	3.841	2.684	-0.651	2.25	2005-9-14	3.78	2.578	-0.24	2.25
2005-7-15	3.804	2.679	0.786	2.25	2005-9-15	3.788	2.548	0.954	2.25
2005-7-18	3.825	2.685	-0.650	2.25	2005-9-16	3.78	2.512	0.472	2.25
2005-7-19	3.881	2.713	-0.130	2.25	2005-9-19	3.77	2.512	0	2.25
2005-7-20	3.853	2.693	0	2.25	2005-9-20	3.763	2.49	-0.35	2.25
2005-7-21	3.844	2.698	0.917	2.25	2005-9-21	3.752	2.476	0.118	2.25
2005-7-22	3.916	2.71	0.389	2.25	2005-9-22	3.756	2.436	-0.59	2.25
2005-7-25	3.888	2.669	1.552	2.25	2005-9-23	3.748	2.435	-1.89	2.25
2005-7-26	3.859	2.625	-0.509	2.25	2005-9-26	3.755	2.42	-1.69	2.25
2005-7-27	3.84	2.617	2.048	2.25	2005-9-27	3.739	2.416	-0.49	2.25
2005-7-28	3.854	2.607	1.505	2.25	2005-9-28	3.707	2.936	0.123	2.25
2005-7-29	3.897	2.579	-0.247	2.25	2005-9-29	3.701	2.377	-1.48	2.25
2005-8-1	4.016	2.589	-0.247	2.25	2005-9-30	3.635	2.361	0.125	2.25