Analysis on Excess Return and Risk of Individual Stock—The Case Study of China

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Abstract. This paper discusses the excess return, January effect and condition of risk premium of individual stock in Shenzhen and Shanghai stock markets, combined with size effect and status of industry sectors. The results indicate that 103 listed companies in China have significant excess return, including up to 45.45% of these listed companies belongs to the financial industry. The risk of financial industry, however, is larger than that of the market. In other industry sectors, there exists relatively higher occurring of January excess return in hotel industry, food and beverage industry, transportation, warehousing and post services. This may be associated with the Chinese New Year Festival.

Keywords: Abnormal return · Capital asset pricing model (CAPM) Risk premium

1 Introduction

The concept of excess return was proposed by Fama et al. (1969), who suggested that events may contain hidden information and the fluctuation of stock price before or after a particular event can be used to test whether the market is swiftly and fully reflecting the information in the price. If the price fully reflects the information behind an event, then the market has price efficiency; thus, investors cannot obtain excess return from the release of new information.

The fluctuation of stock price not only reflects economic changes and business operation, but investors' psychological factors as well. Traditional financial theories in the past almost never took decision-making process into consideration. Behavioral finance, however, put more emphasis on human influence. According to behavioral finance, these factors include individual preferences, emotions and perception, relatively reducing the impact brought by the economy and corporate operation. Since Tversky et al. (1979) proposed the prospect theory, behavioral finance has become the new trend for market vision study.

As mentioned above, excess return thus becomes one of research topics in financing. The study of excess return is widely applied to the analysis of stock market. The most frequently applied situation of excess return is January effect, which means

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that excess return occurs in almost every January. Wachtel (1942) was the first to study January effect. He pointed out that New York stock market has excess return and transaction volumes in January. Besides the January effect, from 1953 to 1977, French (1980) found that Standard & Poor's Indexes has weekend effect. The result showed that the return rate on Monday is significantly lower than that of the last day of the last week. Moreover, Ariel (1990) found that the return rate at the beginning and end of each month is much higher than that of other time period.

The test of excess return is often measured by CAPM (Capital Asset Price Model, Sharpe 1964; Lintner 1965). As the return of individual stocks in CAPM and risk coefficient have a linear relationship, and based on this, Sharpe (1964) developed a singular index model. Fama (1969) was the first to use this model to analyze the impact of stock split on stock price. Mackinlay (1997) also contended that the market model analysis was more accurate than constant average return model.

This study is divided into for parts. The first part is the introduction and literature review on excess return. The second part describes the methodology, including the research method of this study, as well as the origin and description of data. The third part discusses the empirical analysis, including the analysis of excess return, risk return, and company scales and industry sectors. The last part is the conclusion of this study.

2 Methodology

2.1 CAPM and Excess Return Version of the CAPM

This paper discusses the excess return of individual stock of China using the most basic financial theory, capital asset pricing model (CAPM). CAPM was developed by American financial experts Sharpe (1964), Lintner (1965), and Mossin (1966) in the 1960s. The aim is to help investors decide the price of capital asset. The securities require the linear relationship between rate of return and market risk (systematic risk) in case of market equilibrium. Market risk coefficient is measured by β value. Capital asset refers to marketable securities like stocks and bonds, representing the reclaim right of return resulted from real asset. The model is as follows:

$$E(Ri) - Rf = \beta i\ [E(Rm) - Rf] \tag{1}$$

where:

Ri	Represents the return rate of individual asset (like individual stock)
E (Ri)	Represents the expected return rate of individual asset
Rm	Represents market (e.g.: indexes) return rate
Rf	Represents risk-free return rate

On the other hand, market model is the most commonly used method to test excess return by financial researchers. The dependent variable in this study is the return of individual stock of China minus risk-free interest rate, while the independent variable is the return of Shenzhen and Shanghai 300 index minus risk-free interest rate.

By referring to MacKinlay (1997)'s model, the above dependent variables and independent variables are conducted with linear regression for time series. The linear regression model of this study is as follows:

$$E(Ri) - Rf = \alpha i + \beta i\ [E(Rm) - Rf] \tag{2}$$

To be more specific, the model mentioned above is called excess return version of the CAPM. In the equation, α means the condition of excess return. If it is significant, it means the existence of excess return in the subject, on the contrary, there is no excess return. The other parameter β in the format reflects the sensitivity of individual stock to the market (or the tape), which is also the correlation between individual stock and the tape, and also the risk profile for individual stock. $\beta = 1$ means that the risk return rate of this single asset and the average risk return of market portfolio change in the equal ratio. The risk of this singular asset is consistent with market investment portfolio risk. $\beta > 1$ means that the risk return rate of this singular asset is higher than the average risk return of market portfolio, so the risk of this singular asset is larger than that of the overall market investment portfolio. $\beta < 1$ means that the risk return rate of this singular asset is smaller than that of the average risk return of market portfolio. The risk of this singular asset is smaller than that of overall market investment portfolio.

2.2 Data Collection

Based on the analytical method, the research data in this study include 3 indicators. The first one is market index. This paper adopts Shanghai and Shenzhen 300 index aimed at Chinese market index. Shenzhen and Shanghai 300 index is jointly issued by Shanghai and Shenzhen stock exchange on April 8, 2005. Thus, the research period of this study is from April 2005 to December 2014. The second index is risk-free interest rate. Generally, risk-free interest rate is substituted by treasury security rate. The shortest period of Chinese treasury security is one year. The calculation in this study adopted the deposit interest rate to substitute risk-free interest rate. The third index is individual stock price, which is the main data of this study. From May 2005 to December 2014, there are altogether 1171 listed companies, which are all residual companies whose transactions have not been suspended for over 1 month.

According to China Securities Regulatory Commission (CSRS), the industries of the 1171 listed companies are classified as shown in Table 1. As seen, most of Chinese

Table 1. Statistical table for the industry sectors of Chinese listed companies.

Industry sectors	Number
Agriculture, forestry, herding, fishing industry	20
Mining industry	38
Manufacturing industry	658
Electricity, heat, gas and water	65
Agriculture	22

listed companies are in the manufacturing industry, totally 658 companies, followed by wholesale and retail industry and real estate industry, which is 109 and 102 respectively.

Shenzhen and Shanghai 300 index and the deposit interest rate for Chinese market indicators are showed in Figs. 1 and 2.

Fig. 1. Chart for Shenzhen and Shanghai 300 monthly index.

As shown in Fig. 1, the Chinese stock market set the record in the October of 2007, followed by the global financial tsunami. The stock market came into a bear market. In October 2008, the Lehman Brothers went broke, the stock market declined to the lowest point of the wave band. However, due to the great internal demand, Chinese stock market gradually began rising again. After 2009, the whole stock market went through a period of consolidation. In July 2006, the overall stock market became busy again. Therefore, Chinese stock market is divided into 5 periods in this study, namely, July, 2006–October, 2007, bull market (before the global financial tsunami), November, 2007–October, 2008, bear market (after the global financial tsunami), November, 2008–July, 2009 bull market in the second stage (after the European debt crisis), August, 2009–June, 2014, consolidation period(consolidation of the stock market), July, 2014–November, 2014, bull market in the third stage(after the restriction policy on housing).

Figure 2 shows the deposit interest rate in China, gradually making down-regulation after the global financial tsunami. After the European debt crisis in 2010, it was gradually up-regulated again. Its scope, however, has been remained between 1.71% and 3.33%.

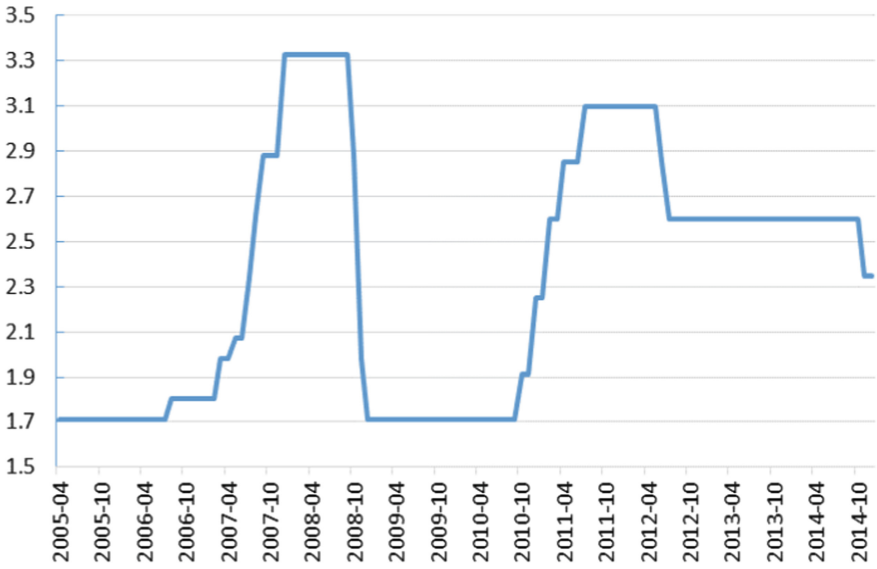

Fig. 2. Chart of deposit interest rate in China.

Descriptive Statistics of Variables

The measurement of return rate in this study is calculated in this way: the close index on the t-th day minus the daily close index on the t-1 day, divided by the daily close index on the t-1 day and multiplying by 100. The equation is as follows:

$$r_{i,t} = \left[\left(\frac{I_{i,t} - I_{i,t-1}}{I_{i,t-1}}\right)\right] \times 100$$

Basic statistics of variables of various studies are showed in Table 2. Jarque-Bera verified that the 3 groups of research data show normal distribution. Therefore, it is reasonable for this study to use general regression CAPM model to analyze excess return. The maximum monthly return rate of individual stock is 729.0941 in terms of the analysis of basic statistics. It occurs when transactions fill up four months after it is closed. Shenzhen and Shanghai 300 average value and individual stock general average value is 1.6171 and 2.5534 respectively, showing that the return of Chinese stock market is positive in the long run.

3 Empirical Result

The empirical analysis of this study is divided into two parts. The first part is to directly test the condition of excess return, analyze the condition of risk return rate of individual stock, and further analyze the effect of industry sectors and company scales. The second part is to analyze January effect.

The most basic theory—capital asset pricing model (CAPM)

Table 2. Basic statistics.

	SHZ 300	Risk-free return rate	Total of individual stock
Observations	116	116	135836
Mean	1.6171	0.1956	2.5534
Median	1.3070	0.2167	1.2307
Maximum	27.9290	0.2775	729.0941
Minimum	−25.8505	0.1425	−64.9024
Std. Dev.	9.6258	0.0480	15.2156
Skewness	−0.1076	0.2178	1.8834
Kurtosis	3.6792	1.6331	47.7866
Jarque-Bera	2.4539	9.9486	11589248
Probability	0.0932*	0.0069***	0.0000***

Notes: *, ** and ***Denote significance at the .1, .05 and .01 level, respectively.

$$E(Ri) - Rf = \beta i[E(Rm) - Rf]$$

Combined with excess return version of the CAPM of E(Ri) − Rf = α + βi [E (Rm) − Rf] CAPM by Campbell, Lo and MacKinlay (1997), this paper analyzes that from May 2005 to December 2014 in Shanghai and Shenzhen stock market of China there are altogether 1171 residual companies whose transactions have not been suspended for over 1 month. There are 103 companies having the excess return (α = 0.1, significant level). The excess return information of these 103 companies is enclosed in Tables 3 and 4. As the company number is huge, those with insignificant level are not listed.

As shown in Table 3, the excess return of 4 companies in this research is significant. The monthly excess return is high, which is 2.15%(000651), 2.70%(000826), 4.00%(600340) and 3.37%(600570) respectively. The significance degree is shown in Table 5.

Table 3. The significance of abnormal return-1

Code	α	Prob.	β	P	Code	α	Prob.	β	P
000028	2.2705	(0.0494)**	0.5160	(0.0000)***	**600111**	2.8483	(0.0255)**	1.2743	(0.0000)***
000049	2.3938	(0.0955)*	0.3824	(0.0104)***	**600118**	2.4154	(0.0365)**	0.9702	(0.0000)***
000157	1.8361	(0.0615)*	1.2436	(0.0000)***	**600139**	2.2393	(0.0941)*	1.0256	(0.0000)***
000417	1.7567	(0.0760)*	0.7905	(0.0000)***	**600199**	1.9630	(0.0645)*	0.8834	(0.0000)***
000516	1.9763	(0.0731)*	0.8105	(0.0000)***	**600201**	1.8076	(0.0833)*	0.8531	(0.0000)***
000538	1.9208	(0.0225)**	0.4081	(0.0000)***	**600252**	2.7377	(0.0397)**	1.0903	(0.0000)***
000540	2.5222	(0.0936)*	1.2434	(0.0000)***	**600256**	2.0524	(0.0807)*	0.8669	(0.0000)***
000550	1.7041	(0.0772)*	0.9931	(0.0000)***	**600276**	2.3317	(0.0116)**	0.3501	(0.0003)***
000566	2.0905	(0.0959)*	0.6591	(0.0000)***	**600312**	2.0362	(0.0782)*	0.5685	(0.0000)***
000568	1.4892	(0.0945)*	0.9219	(0.0000)***	**600335**	2.3030	(0.0833)*	0.9792	(0.0000)***
000596	2.9426	(0.0539)*	0.8868	(0.0000)***	**600340**	3.9964	(0.0086)***	0.8530	(0.0000)***

(*continued*)

Table 3. (*continued*)

Code	α	Prob.	β	P	Code	α	Prob.	β	P
000598	1.9359	(0.0800)*	0.9810	(0.0000)***	**600373**	2.2806	(0.0671)*	0.6524	(0.0000)***
000623	1.6531	(0.0997)*	1.6981	(0.0000)***	**600388**	2.1922	(0.0512)*	0.7227	(0.0000)***
000651	2.1546	(0.0099)***	0.8876	(0.0000)***	**600406**	2.2481	(0.0655)*	0.5472	(0.0000)***
000661	2.8474	(0.0520)*	0.8245	(0.0000)***	**600433**	2.5813	(0.0535)*	0.6707	(0.0000)***
000669	2.2398	(0.0690)*	0.7350	(0.0000)***	**600436**	1.6787	(0.0853)*	0.4407	(0.0000)***
000671	2.3115	(0.0886)*	0.8584	(0.0000)***	**600446**	3.0846	(0.0205)**	0.6483	(0.0000)***
000712	3.2486	(0.0331)**	0.8931	(0.0000)***	**600478**	2.6267	(0.0781)*	0.8865	(0.0000)***
000748	2.1799	(0.0653)*	1.1087	(0.0000)***	**600486**	1.7549	(0.0780)*	0.7028	(0.0000)***
000760	2.5334	(0.0986)*	0.8452	(0.0000)***	**600490**	2.9228	(0.0363)**	0.7584	(0.0000)***
000768	1.9174	(0.0819)*	1.0087	(0.0000)***	**600495**	2.3037	(0.0467)**	0.6073	(0.0000)***
000777	2.2659	(0.0678)*	1.1043	(0.0000)***	**600499**	2.3096	(0.0873)*	1.0113	(0.0000)***
000788	2.2920	(0.0764)*	0.6933	(0.0000)***	**600511**	2.8032	(0.0234)**	0.4290	(0.0009)***
000826	2.7041	(0.0049)***	0.5628	(0.0000)***	**600517**	2.7546	(0.0375)**	0.5730	(0.0000)***
000848	2.4061	(0.0364)**	0.5939	(0.0000)***	**600518**	2.4431	(0.0187)**	0.5152	(0.0000)***
000887	2.8667	(0.0144)**	0.8166	(0.0000)***	**600519**	1.8975	(0.0600)*	0.6285	(0.0000)***
000915	1.8115	(0.0918)*	0.6846	(0.0000)***	**600522**	1.5128	(0.0984)*	0.8334	(0.0000)***

Table 4. The significance of abnormal return-2

Code	α	Prob.	β	P	Code	α	Prob.	β	P
000963	2.2179	(0.0371)**	0.4950	(0.0000)***	**600535**	1.9516	(0.0351)**	0.4951	(0.0000)***
000977	2.4827	(0.0680)*	0.7693	(0.0000)***	**600547**	2.5091	(0.0927)*	0.9788	(0.0000)***
000996	2.4827	(0.0680)*	0.7693	(0.0000)***	**600557**	2.1365	(0.0357)**	0.4475	(0.0000)***
002001	2.3286	(0.0546)*	0.7474	(0.0000)***	**600562**	2.7889	(0.0777)*	0.9653	(0.0000)***
002007	2.7431	(0.0115)**	0.4711	(0.0000)***	**600570**	3.3656	(0.0057)***	1.0041	(0.0000)***
002008	2.0283	(0.0782)*	0.7702	(0.0000)***	**600572**	1.9422	(0.0587)*	0.5818	(0.0000)***
002013	2.7571	(0.0471)**	0.9373	(0.0000)***	**600587**	2.8331	(0.0116)**	0.5088	(0.0000)***
002022	2.2104	(0.0264)**	0.4774	(0.0000)***	**600588**	2.3872	(0.0362)**	0.5669	(0.0000)***
002030	2.2182	(0.0422)**	0.7832	(0.0000)***	**600594**	2.2967	(0.0727)*	0.5710	(0.0000)***
002038	2.8205	(0.0125)**	0.5027	(0.0000)***	**600612**	2.0675	(0.0673)*	0.7841	(0.0000)***
200028	2.0492	(0.0520)*	0.6623	(0.0000)***	**600645**	2.6623	(0.0449)**	0.8025	(0.0000)***
200418	1.4869	(0.0772)*	0.8047	(0.0000)***	**600674**	2.3099	(0.0603)*	0.8430	(0.0000)***
200550	1.9736	(0.0237)**	0.7797	(0.0000)***	**600685**	1.9595	(0.0851)*	1.2676	(0.0000)***
200553	1.5893	(0.0981)*	0.7628	(0.0000)***	**600690**	1.4065	(0.0951)*	0.8333	(0.0000)***
200596	2.9790	(0.0434)**	0.7809	(0.0000)***	**600697**	1.2389	(0.0861)*	0.6120	(0.0000)***
600000	1.2226	(0.0975)*	1.0240	(0.0000)***	**600763**	2.5699	(0.0871)*	0.7720	(0.0000)***
600016	1.3235	(0.0664)*	0.9391	(0.0000)***	**600783**	2.4243	(0.0840)*	1.1417	(0.0000)***
600030	2.0921	(0.0469)**	1.5898	(0.0000)***	**600794**	2.1333	(0.0653)*	0.8035	(0.0000)***
600031	2.0484	(0.0463)**	1.3520	(0.0000)***	**600804**	2.8481	(0.0532)*	1.0628	(0.0000)***
600056	1.6241	(0.0896)*	1.0316	(0.0000)***	**600867**	2.3884	(0.0404)**	0.5197	(0.0000)***
600066	1.7479	(0.0190)**	0.8423	(0.0000)***	**600887**	1.7792	(0.0734)*	0.5655	(0.0000)***
600079	2.0849	(0.0518)*	0.6569	(0.0000)***	**600967**	2.3554	(0.0489)**	0.8213	(0.0000)***
600089	2.0541	(0.0787)*	0.8734	(0.0000)***	**600990**	2.5062	(0.0658)*	0.9113	(0.0000)***
600109	2.8750	(0.0980)*	1.5365	(0.0000)***	**900904**	2.1941	(0.0409)**	0.9388	(0.0000)***
					900938	2.2162	(0.0716)*	0.8843	(0.0000)***

Table 5. Statistical table for the significance of excess return.

Significance level	0.01	0.05	0.1	No
Number	4	34	65	1608

This paper discusses the risks of individual stocks, listing the risk significance of the 1171 companies in the Table 6. The risk return rate of 325 companies in the research sample is higher than that of the market risk return rate (accounting for 27.75%), while the risk return rate of 67.21% of companies is lower than that of the market risk return rate, and 5.04% of companies have the same risk conditions with the market.

Table 6. Table for risk degree of individual stock.

Significance level		0.01	0.05	0.1	Total	No
Number	+	312	6	7	325	28
	%	26.64%	0.51%	0.60%	27.75%	2.39%
	−	766	9	12	787	31
	%	65.41%	0.77%	1.02%	67.21%	2.65%

The paper further analyzes the industry conditions as shown in Table 7. One company of scientific research and technological service as well as health and social work has excess return in the listed table. Apart from these 2 industries, the financial industry has highest ratio of excess return, which is up to 45.45%, followed by information transmission & software and manufacturing industry. The excess return proportion is respectively 18.52% and 10.33%.

Table 7. Table for the analysis on excess return in industry sectors.

Industry sectors	Total	Number of significance	%
Agriculture, forestry, herding, fishing industry	20		0.00
Mining industry	38	3	7.89
Manufacturing industry	658	68	10.33
Electricity, heat, gas and water	65	3	4.62
Agriculture	22		0.00
Wholesale and retail industry	109	9	8.26
Transportation, storage & post services	57	2	3.51
Accommodation and food and beverage industry	7		0.00
Information transmission & software	27	5	18.52
Financial industry	11	5	45.45

(*continued*)

Table 7. (*continued*)

Industry sectors	Total	Number of significance	%
Real estate	102	3	2.94
Leasing and business service industry	10		0.00
Scientific research and technological service	1	1	100.00
Water conservancy, environment and public facilities	15	1	6.67
Education	1		0.00
Health and social work	1	1	100.00
Culture, sport and entertainment industry	9	1	11.11
Comprehensive industry	18	1	5.56

However, there is no excess return in companies of agriculture, forestry, herding, fishery, construction, leasing and business service industries have (and only 1 education industry).

The analysis of risks and industry sectors is listed in Table 8, which shows that the risk return rate is the highest in the financial industry (63.64%), followed by construction industry and real estate industry, accounting for over 40%.

Table 8. Table for the analysis on risk return in industry sectors.

Industry sectors	B < 1		B > 1		β = 1		Total
	Number	%	Number	%	Number	%	
Agriculture, forestry, herding, fishing industry	18	90.00	2	10.00	0	0.00	20
Mining industry	14	36.84	24	63.16	0	0.00	38
Manufacturing industry	449	68.24	178	27.05	31	4.71	658
Electricity, heat, gas and water	48	73.85	15	23.08	2	3.08	65
Agriculture	11	50.00	10	45.45	1	4.55	22
Wholesale and retail industry	79	72.48	23	21.10	7	6.42	109
Transportation, storage & post services	46	80.70	9	15.79	2	3.51	57
Accommodation and food and beverage industry	6	85.71		0.00	1	14.29	7
Information transmission &software	23	85.19	2	7.41	2	7.41	27
Financial industry	4	36.36	7	63.64	0	0.00	11
Real estate	44	43.14	48	47.06	10	9.80	102
Leasing and business service industry	8	80.00	2	20.00	0	0.00	10
Scientific research and technological service	1	100.00		0.00	0	0.00	1

(*continued*)

Table 8. (*continued*)

Industry sectors	B < 1		B > 1		β = 1		Total
	Number	%	Number	%	Number	%	
Water conservancy, environment and public facilities	15	100.00		0.00	0	0.00	15
Education	1	100.00		0.00	0	0.00	1
Health and social work	1	100.00		0.00	0	0.00	1
Culture, sport and entertainment industry	9	100.00		0.00	0	0.00	9
Comprehensive industry	10	55.56	5	27.78	3	16.67	18
Total	**787**	67.21	**325**	27.75	**59**	5.04	**1171**

Some relevant size effects show that the return rate on investment for small companies is better than the large companies. Stock return rate and the size of the company are negatively related. The studies of Banz (1981), Reinganum (1981) and Basu (1983) on the U.S. stock market have the same result. This paper further analyzes whether the size of the company affects the excess return of individual stocks. The company scale in this research is measured by the number of employees. They are divided into 5 categories. Their excess return analysis is shown in Table 9, which shows that the excess return rate of companies with less than 1000 people is just 3.57%. The rest is all over 10%. The research results show that the excess return of small companies is lower than that of large companies.

Table 9. Table for analysis of company scale and excess return.

Scale	Total	Number of significance	%
Under 1000	252	9	3.57
1000 ~ 2499	291	32	11.0
2500 ~ 4999	252	22	8.33
5000 ~ 9999	195	21	11.28
Above 10000	181	19	10.05

The analysis on risk and company scale is listed in Table 10. As mentioned above, the risk return rate of most companies is lower than that of the market. As the company gets larger, the required risk return rate also increases (from around 20% to 43%).

Table 10. Table for the analysis on company scale and risk.

Scale	B < 1		B > 1		β = 1		Total
	No.	%	No.	.%	No.	No.	
Under 1000	172	68.25%	67	26.59%	31	12.30%	252
1000 ~ 2499	214	73.54%	64	21.99%	0	0.00%	291
2500 ~ 4999	186	73.81%	55	21.83%	2	0.79%	252
5000 ~ 9999	124	63.59%	61	31.28%	1	0.51%	195
Above 10000	91	50.28%	78	43.09%	0	0.00%	181

4 Conclusion

This paper explored the excess return and the risk return of individual stock in Chinese listed companies, and analyzed the occurrence of January effect, combined with size effect and industry sectors.

The result showed that 103 China's listed companies have significant excess return. Up to 45.45% companies in financial industry has such condition. The risk of financial industry, however, is higher than that of the market. Investors must evaluate this situation while making investment decisions. However, no enterprises in agriculture, forestry, herding, fisheries, construction, leasing and business service industries have excess return. Their risk is lower than that of the market. From the point of size effect, excess return of small companies is lower than that of large companies, which seems inconsistent with the size effect proposed by Banz (1981) and Reinganum (1981).

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