Journal of Theoretical and Applied Information Technology
10th February 2013. Vol. 48 No.1

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

RESEARCH ON THE SUPERIOR RATE OF RETURN BASED ON EVENT STUDY

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ABSTRACT

Event Study （or Residual Analysis） is an analysis tool which is often used in the field of financial research. In this paper, a detailed statement about the procedures of Event Study has been made. Via the Event Study, the authors have researched whether there is a superior rate of return in the pilots on the resume trading day after the sub-owned shares reform was declared by China's Securities Regulatory Commission. In this paper, the authors have listed all the factors possibly influence the superior rate of return as explanatory variables, accordingly, the superior rate of return on the resume trading day as the explained variables. Using partial least square regression analysis, a final conclusion has been made. It shows that the superior rate of return is positively correlated with the proportion of dividend share in the consideration plan, and the net capital of previous year, and is negatively correlated with the scale of board of directors and the share holding proportions of the controlling shareholders.

Keywords: *Event Study, Superior Rate of Return, Sub-owned Shares Reform*

1. INTRODUCTION

Event Study, or Residual Analysis is a frequently-used analysis tool in financial research, which was originally used by Dolly in 1933 [1], [2], and was subsequently expanded by Ball and Brown in 1968, Fama, Fisher, Jensen and Roll in 1969 [3]. It was from then on that the Event Study begun being widely used in securities market research. Event study is ordered to measure the fluctuation situation of a security in a specific event, such as a declaration of a new transaction system, whether the situation of public offering' s price volatility (for instance, earnings release, combination release, and security segmentation) has brought the shareholders superior return, which is the balance of actual return and its return [4], [5]. In the fields of theoretical accounts and finance, Event Study is applied to various kinds of companies or economic affairs, such as combination or recombination of enterprises, profits distribution, macroeconomic variables' release (business deficit, for example), the public announcement of national macroeconomic policies and so on. And in the fields of law and science, it is used to measure the effects on the company's value in the financial market once the policies are changed. Michael and Rinjai, born in 1994, made a census on the 416 piece of articles published on Journal of Financial Economics from 1980 to 1992, and the statistics showed that 97 pieces among the them were using Event Study, sharing a 23% proportion, which speaks a volume for the widespread application of Event Study.

The hypothesis of the Event Study is market rationality; the return of each stock would be predicted in some extent because the stock is in the auction market, or we can call it the "Perfect Market" similarly according to the economics conception. In the perfect market, stock price may reflect the alternation that financial market has made for the import of new information. Using the securities price that observed in short-term would predict what effects the event will bring on economy [6]. Researchers observe the rate of real return in the period that was interested to them, and figured out the balance between predictive rate of return and the rate of real return [7]. Provided the result is quiet far away from "0", which means the event has definitely made an effect on the rate of stock return, and also has exposed the investor's reaction to the event.

2. THE BASCI PROCEDURES OF EVRNT STUDY

The standard procedures of Event Study are as follows:

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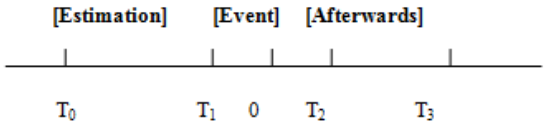
1) Indentify the event. The important first step of Event Study is to indentify the things interested in. The range is wide, such as the national macroeconomic situation, or the declaration of supporting an industry, the combination or recombination of enterprises, the exposure of accounting information, increase issues in stocks, even the step-down of a company's executive could be the matter to concern of Event Study [8].

2) Distinguish the date when the event happens and the relevant time frame, which includes the estimation window, time window, and afterwards window. Let's put it into detail, if τ =0 refers to the date when the event happens, and the event window means the period between T1 days before event date, and T2 days after, that is τ =T_1 to τ =T_2.Usually, in the empirical study, the length of event window is 30 days or 60 days. The period of estimation window is from τ =T_0 to τ =T_1-1,it is usually 150-250 days. And the τ =T_2+1 to τ =T_3 means the afterwards window to measure the long-term effects the event has brought on stock's price.



Graphic 1. Time line of Event Study

3) Average rate of return and the superior rate of return. Estimate the average rate of return of the stock via the estimation window. There are three ways to figure out the average rate of return, market mode, mean value adjusted mode, and the market adjusted mode. Among which the market mode is frequently used.

Mean value adjusted mode:

$$R_{jt} = \bar{R}_j + \varepsilon_{it} \quad (2.1)$$

Market mode:

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{it} \quad (2.2)$$

Market adjusted mode:

$$R_{jt} = R_{mt} + \varepsilon_{it} \quad (2.3)$$

Measure of superior rate of return:

$$AR_{it} = R_{it} - \mathrm{E}[R_{it}|X_t] \quad (2.4)$$

4) Figure the accumulative superior rate of return out, and add up the time and cross section of the superior rate of return.

Security i's accumulative superior rate of return is $CAR_i(\tau_1,\tau_2)$, variance is $\sigma_i^2(\tau_1,\tau_2)$, the average accumulative superior rate of return is $CAAR(\tau_1,\tau_2)$, the variance is $\sigma_i^2(\overline{\tau_1,\tau_2})$ during the period of $[\tau_1,\tau_2]$. Among which

$$[\tau_1,\tau_2] \subseteq [\mathrm{T}_1,\mathrm{T}_3]$$

$$CAR_i(\tau_1,\tau_2) = \sum_{\tau=\tau_1}^{\tau=\tau_2} AR_{i\tau}$$

$$CAAR(\tau_1,\tau_2) = \frac{1}{N}\sum_{\tau=\tau_1}^{\tau=\tau_2} CAR(\tau_1,\tau_2) \quad (2.5)$$

$$\sigma_i^2(\tau_1,\tau_2) = (\tau_2 - \tau_1 + 1)\sigma_{\varepsilon_i}^2$$

$$\sigma_i^2(\overline{\tau_1,\tau_2}) = \frac{1}{N^2}\sum_{i=1}^{N}\sigma_t^2(\tau_1,\tau_2) \quad (2.6)$$

5). Hypothesis testing, Testing frame for abnormal return Null hypothesis: there is no superior rate of return in stock $t = AAR_0/S(AAR_0) \approx \mathrm{T}(\mathrm{N})$, among which

$$AAR_0 = \frac{1}{N}\sum_{i=1}^{N} AR_{i0}$$

$$S(AAR_0) = \sqrt{\frac{1}{L_1 - 1}\sum_{t=t_0}^{t=t_1}(AAR_0 - \overline{AAR})^2}$$

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

$$\overline{AAR} = \frac{1}{N}\sum_{t=T_0}^{t=T_1} AAR_t \quad (2.7)$$

Form an inspection measure of census t- to test whether the average accumulative superior rate of return is 0, if the inspection result denies the null hypothesis, that is to say an accumulative superior rate of return would definitely exists.

Null hypothesis constructor: Event has effects neither on average value of return nor on variance

$$J = \frac{CAAR(\tau_1,\tau_2)}{Var^{0.5}(CAAR(\tau_1,\tau_2))} \sim N(0,1) \quad (2.8)$$

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

If the inspection refuses the null hypothesis, which means Event does have an impact on both average of return and variance.

6) You should make the conclusion clear after the economic plans have been measured. Regression analysis for superior rate of return or accumulative superior rate of return is the way often used to study the relationship between a company's detail variance of characteristics (such as scale, profit and so on), and abnormal gain. In the practical study, we can divide the research object into groups to study the impacts of securities of different characteristics on event.

3. RESEARCH IN SUB-OWNED SHARES REFORM WITH EVENT STUDY

1) Samples and Statistics

We set the 46 listed companies of pilot companies which begun sub-owned shares reform on May 09, 2005 as research objects, and the stock names have listed in Form 1 [9]. Both the samples and statistics are sourced from the website of China's Securities Regulatory Commission, Dazhihui Stock Software, and the Website of Yahoo Finance. Writers have made a research on whether the investors benefit a real superior gain from the sub-owned shares reform via Event Study. We chose the daily gain of the 201 trading days which included the event day as sample, and defined the first resume trading day when the sample stock released the consideration plan as day No.0. The sample interval is from the -190th day to t he +10th day. The Event Window is 21 trading days (from the -10th day to the +10th day). The premier 180th trading day (from the -190th day to the -11th day) is the Estimation Window, Then the superior gain of Security i from the t th day of the Event Window can be count through the following way:

$$AR_{it} = R_{it} - E[R_{it} \mid X_t] \qquad (3.1)$$

The AR_{it} , R_{it} and $E[R_{it}|X_t]$ among it are correspondingly the superior gain, actual gain and normal return of the Security i on the t th day, and X_t is the info set. In this paper, $R_t = (P_t - P_{t-1})/P_{t-1}$, among which the P_t is the security's terminal value in period t . And $E[R_{it} \mid X_t] = \hat{\alpha}_i + \hat{\beta}_i R_{mt}$, among which R_{mt} is the earning ratio of the Shanghai Composite Index or the Shenzhen Component Index in period t , and $\hat{\alpha}_i$, $\hat{\beta}_i$ are respectively the estimated value of constant term and slope term of Market Mode in Estimation Window. When the superior rate of return of Security i from the t th day of the Event Window is out, you can count the accumulative superior rate of return from the t th day(including the t th day) of the security in the following method:

$$CAR_{iT} = \sum_{t=-10}^{T} AR_{it} \qquad (3.2)$$

You can figure out the average superior rate of return and the accumulative superior rate of return of a security combination including N kinds of securities by means of the following two equations:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

$$CAAR_T = \sum_{t=-10}^{T} AAR_t \qquad (3.3)$$

2) Variance

The paper takes the superior rate of return (AR) on the t=0 day of the 35 pilot companies as explaining variance, and picks up 8 factors that we think are possible to have effects on AR, which includes (Initial Public Offering)IPO, closing price for Stock A before releasing the plan (clpr_b), previous year's return of each stock before reform(eps_b), each stock's net capital of previous year before reform(na_b), scale of the board of directors(bdsize),controlling shareholders ratio (ctratio), stock-merger ratio(sgratio), and sub-valuable .The equation is as follows:

$$\begin{aligned} AR = {} & \beta_0 + \beta_1 \mathrm{IPO} + \beta_2 \mathrm{clpr\_b} + \beta_3 \mathrm{eps\_b} \\ & + \beta_4 \mathrm{na\_b} + \beta_5 \mathrm{bdsize} + \beta_6 \mathrm{ctratio} \\ & + \beta_7 \mathrm{sgratio} + \beta_8 \mathrm{issec} + \varepsilon \end{aligned} \qquad (3.4)$$

3) Conclusion of Research

We have given the superior rate of return and the relevant t- inspection on the event date of the 35 listed companies, and result shows that 28 of them had a positive superior rate of return, among which 20 companies enjoyed a significant 10% superior rate of return. The rest 7 were on the contrary, and suffered a distinctive negative superior rate of return of 10%.

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Form 1.The Superior Rate Of Return After Released The Final Sub-Owned Shares Reform Plans Of The 46 Listed Companies

Name	AR(t=0)	Name	AR(t=0)	Name	AR(t=0)
SDIC Power	-0.0233（-0.808）	Sany Heavy Industry	0.1224***（5.450）	Hualian Hypermarket	0.0728***（2.785）
Huangshan Novel	0.1439***（5.733）	Henan Yinge Industrial Investment Holding	-0.0973***（-3.685）	Canal Scientific And Technological Co., Ltd	0.0931***（3.495）
Xinfu Pharmaceutical	0.0465（1.783）	Wuhan Humanwell Hi-tech Industry	-0.0931***（-3.554）	Aeolus Tyre	0.0061（0.183）
Zojie Sewing Machine	0.1276***（4.389）	Guangzhou Development Industrial Holdings	-0.1359***（-4.612）	Jiangsu Hengtong Photoelectric Stock	0.0565*（1.959）
Haite High-tech	0.0309（0.383）	Tshinghua Tongfang	0.1316***（6.123）	Sinochem Group	-0.0765**（-1.698）
Name	**AR(t=0)**	**Name**	**AR(t=0)**	**Name**	**AR(t=0)**
Suning Appliance	0.0413*（1.827）	Zhenzhou Coal Industry & Electric Power	-0.0070（-0.350）	Nanchang Changli Iron& Steel	0.0004（0.023）
Septwolves	0.0633***（1.992）	Kingfa Sci.&Tech.	0.0493（1.639）	Huahai Pharmaceutical	0.0227*（2.316）
Supor	0.0581**（2.160）	Shanghai Zijiang Enterprise	0.1302***（5.176）	Tainwei Baobian Electric	0.0529（1.421）
Agricultural Products	0.2083***（3.279）	Oriental Pearl TV Tower	0.1328***（3.048）	Handsome Electronics	0.0351（1.193）
Jilin Aodong Medicine Industry	0.0673***（3.291）	Zhejiang Transfar	0.0935***（3.341）	Zhejiang Wolong Hi-tech	0.0447**（2.013）
SGIS Songshan	-0.0217*（-1.613）	Yangtze Power	0.0281（1.391）	Henan Zhongfu Industry	-0.0181（-1.170）
Luxi Chemical Group	0.0235（1.261）	Baosheng Science and	0.0435**（1.961）		

[a]t- * significant level of 10% ** significant level of 5% *** significant level of 1%

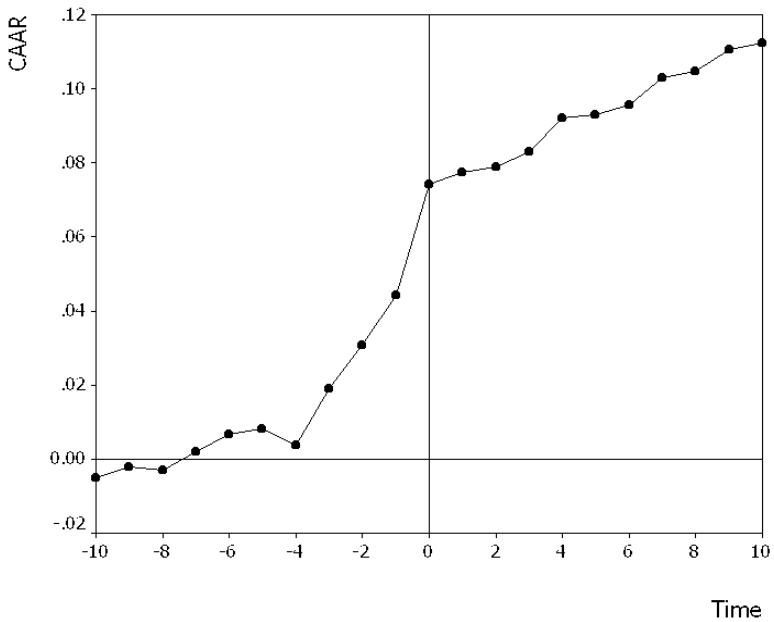
Form 2 shows the statistic of the superior rate of return from t= -10 to t=10 of the 35 pilots, and from this form we can easily see that the average rate of return increased at a ratio of around 1.5% from t= -3 to t= -1, which meant the market had predicted the coming of stock reform. Meanwhile, Form 2 gives the average accumulative rate of return of the 35 pilots, and from which we can see that the average accumulative rate of return has up to 7.43% on t=0, and on t=10 it has obtained 11.25%. After suffering the keeping declining of China's securities market since 2001 , the supervisors and the investors were in urgent need of breaking out from the shares dividing dilemma in the securities market, and it's definite a matter of a course that the release of the sub-owned shares pilots plan let the investors see a light. So, a positive superior rate of return has risen since t=0. But the standard deviation was big on the day t=0, which was to say that the investors couldn't sum up a consensus.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Form 2. AAR And CAAR Of The 35 Pilots In The Period Of Event Window

Date	AAR	CAAR
-10	-0.004321	-0.004321
-9	0.0028353	-0.00102
-8	-0.000832	-0.002641
Date	**AAR**	**CAAR**
-7	0.0048001	0.0017582
-6	0.0047135	0.0037672
-5	0.0015706	0.0061486
-4	-0.00336	0.0035523
-3	0.0132133	0.0179715
-2	0.0113511	0.020731
-1	0.0125301	0.0312531
0	**0.0300177** ** **(3.002[a])**	**0.0742812**
1	0.0010338	0.0671138
2	0.0013471	0.0739541
3	0.003781	0.0723461
4	0.0080321	0.0312841
5	0.000423	0.0721051
6	0.0013213	0.0834962
7	0.0064221	0.1028603
8	0.0017151	0.1046521
9	0.0035113	0.1203332
10	0.0015702	0.1134102
Total Samples	35	

[a]t- * significant level of 10% ** significant level of 5% *** significant level of 1%



Graphic 2 Curve Chart Of CAAR Of The 35 Pilots In The Event Window

The regression result of the partial least square regression analysis is listed in Form 3. The inspection F- for the whole mode is meaningful, and the inspection t- of the four variances is significant. We found the superior rate of return on the resume trading date is negatively correlated

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

with the consideration plan, which means that the circulating shareholders pay highly attentions to the consideration plan, and the party with a higher consideration would gain a higher superior return rate. With the net capital of the previous year, the superior rate of return show a positive correlation, which refers to the effects that company's fundament has brought to the superior rate of return, however, it has no arresting relationship with each stock's profit of last year. And the superior rate of return is negatively correlated with the scale of board of directors and the share holding proportions of shareholders, which means that the investors concentrate on the structured problems of shares in the listed companies, and that is no doubt an important purpose of the shares reform.

Form 3 Regression Result With The Superior Rate Of Return On Resume Date As Explanatory Variance

Argument	Unstandardized coefficient	Standardized coefficient	Standard deviation	t –	Pr > |t|
c	0.03105	0	0.05132	0.63	0.5323
Ctratio*	-8.01131	-0.25213	5.32021	-1.63	0.0783
Sgratio*	0.01241	0.23451	0.01331	1.76	0.0353
Bdsize**	-0.00641	-0.27243	0.00303	-2.03	0.0345
na_b**	0.01773	0.43300	0.00821	2.01	0.0483
eps_b	-0.06183	-0.36351	0.04645	-1.41	0.1375
clpr_b	0.00203	0.13713	0.00163	0.63	0.4553
IPO	-0.00238	-0.16536	0.00253	-1.31	0.2575
issec	0.00357	0.02705	0.02356	0.17	0.7531
R^2	0.3733	F-	2.77	**Total**	35
Adj-R^2	0.2305	Pr>F	0.0331	**Samples**	

[a]t- * significant level of 10% ** significant level of 5% *** significant level of 1%

4. CONCLUSION

The paper is based on leading out the procedures of Event Study, and takes the 46 pilots which have been undertaking the sub-owned shares reform since May 09, 2005 as sample. Using the Event Study, the paper has inspected the superior rate of return on the day they released the consideration plan, and a regression analysis has been undertaken with the factors that might affect the superior rate of return as explanatory variance. And the regression result shows that on the resume trading day, the superior rate of return is positively correlated with the stock dividing proportions and the net capital of previous year, and negatively with the scale of board of directors and the controlling shareholders' share holding ratio.

Funding: Fujian province Natural Science fund (2010J05145); Fujian province soft science fund (2012R0003)

REFRENCES:

[1] Fama E., L. Fisher, M.Jensen & R.Roll. The Adjustment of Stock Prices to New information [J].International Economics Review, 1969, 10:121:135.

[2] Yaming Sun , General survey for the sub-owned shares reform plan of the listed companies and the process [J]. , Stock Market Analysis 1 (2005)

[3] Harris, L. A. Transaction Data Study of Weekly and Intradaily Patterns in Stock Returns[J].Journal of Financial Economics, 1986,16:99-117.

[4] Jain, P.& G.H. Joh. The Dependence between Hourly Prices and Trading Volume [J].Journal of Financial and Quantitative Analysis,1987, 10:109-126

[5] Xin Wang, Sub-owned Shares Reform and Pilot Project: Challenges and Strategies [J].China Finance 13 (2005)

[6] McInish, T., & R. Wood .Intraday and Overnight Returns and Day-of-the-Week Effects [J]. Journal of Financial Research, 1985, 8:119-126.

[7] Neely, Walter P. Banking Acquisitions: Acquirer and Target Shareholder Returns [J]. Financial Management, 1987, 16 : 66-74.

[8] Partell, J. & M.Wolfson. The Intraday Speed of Adjustment of Stock Prices to Earnings and Dividend Announcements [J]. Journal of Financial Economics, 1984, 13:223-252.

[9] Website of Yahoo Finance: http://cn. finance.yahoo.com