New Evidence of Stock Split
When Uncertain Event Window is Identified

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Abstract

The stock split is a popular practice in many markets despite the fact that it does not fundamentally change the value of the firm. Many past evidences supported the liquidity hypothesis and found positive abnormal return around stock split date. However, all studies employed traditional event studies methodology and defined the event date as either the announcement date or effective date. Drawback of the traditional method is the incapability to detect the impact when the event date is uncertain. This paper uses the new approach called EVARCH that can uncover the event window from the data. In addition, it takes the possible impact of stock split on stock's systematic risk and variance into account. New evidence from the Stock Exchange of Thailand during 2001-2005 reveals that there is no significant positive abnormal return. However, the study finds that the corporate might use stock split as a 'signal' of future capital increase to alleviate negative impact.

I. Introduction

The stock split occurs when firm adjusts par value of its stock. For example, when the firm lowers the par value by half, these will double the number of shares whose stock prices should be reduced by half as a result. There is no value creation in the process. However, the stock split activities are frequent events in many stock markets including the Stock Exchange of Thailand such that there were 121 events of stock splits during 2001-2005.

When one considers the split ratio as shown in Table 1, the most frequent one is the case of 1 to 10 which occurs 62% of total splits.

[Insert Table 1 here]

Although stock split seems not to contribute to firm's value, there are some hypotheses that support stock split as a signaling device. Some hypotheses consider that there is optimal trading range of stocks and stock split helps adjust the stock's price to be within optimal range. An increase in trading volume either from signaling

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or optimal trading range will enhance stock price eventually. Judging from the high split ratio by Table 1, the evidence in Thailand seems to support these hypotheses.

Table 2 shows stock prices' change after the split. The comparison of price changes before and after the effective split date is, however, not in favor of the hypotheses. When the stock prices are adjusted by new outstanding shares, most stocks do not experience change in prices while only 31.5% records price increases. Even the sample in 2003 which is the most active year of stock split, the percentage of stocks whose prices were increased is equal to the percentage of stocks whose prices decline after the splits.

[Insert Table 2 here]

However, drawing conclusion from descriptive statistics of changes in prices has drawbacks.

First, changes in stock prices do not depend only on the event of our interest. There are many events happen on the same day and the observed price changes are the mixed results of all events.

Second, the efficient market hypothesis exerts that all investors competitively seek and exploit new information. The stock split is an anticipated event and its effect has already reflected in the stock price a few days before the effective date. The study of the impact should therefore cover the period before the event.

Fama *et al* (1969) proposed the methodology called an event study to solve these drawbacks. However, the key assumption of this method is the ability to identify the event date. In case of stock split, two key event dates are usually studied, i.e., the announcement date and the effective date. This study finds that the data of announcement dates is not complete so this study defines the effective date as the event date. However, we will later deploy a new method proposed by Cyree and DeGennaro (2001) to identify an appropriate event window for each sample. The result will be compared with a traditional method.

This paper consists of 5 sections. The next section will discuss relevant theories and previous empirical studies. Then, the traditional event study will be elaborated in comparison with the new method proposed by Cyree and DeGennaro (2001). The empirical result based on stock splits in the Stock Exchange of Thailand will be presented in section 4. The last section will conclude and recommend further study.

II. Review of Literature

1. Signaling Hypothesis

The stock split event is considered as the first case of event study method proposed by Fama *et al* (1969). The result is in support of the signaling hypothesis. The executive uses stock split as a signal to represent positive news. The stock split is usually followed by an increase in EPS and dividend payment. The signal is reliable if an investor can separate among the 'real' signal and a 'fake' one. In order to separate these, there must be prohibitive cost to deter the fake signal. Brennan and Copeland (1988) present a theoretical model to prove that when firm splits the stock, the transaction cost will increase due to a price increase after the split. Only the firm with positive performance will send the signal with the belief that its favorable performance will offset an increase in transaction cost. Firm which does not really possess good news will not mislead the market by using this signal because negative impact from transaction will overwhelm the benefits from sending fake signal.

Asquith *et al* (1989), McNichols and Dravid (1990) find the evidence that the stock split is followed by positive performance announcement. Doran (1994) finds that after the stock split, the firm usually announces better profit than analysts' forecasts. The stock split is therefore used to send the signal to analysts to lift their forecast on earning. In addition, his study finds that those firms that use signal to mislead the market cannot sustainably use this signal.

However, there are also a number of studies that cannot find any difference between the stock split firms and non-stock split firms, e.g., Grinblatt *et al* (1984) and Huang *et al* (2002).

Korajczyk (1992) proposes that stock split can be used to reduce asymmetric information between executives and investors. When the executives get an opportunity to invest and finance it by raising new capital, the investors might misinterpret this event as due to overvaluation of stock price. The reaction of investors towards new issues is therefore negative. In order to reduce the information asymmetry, the executives split the stocks and follow by new issues. Guo and Mech (2000) test this hypothesis and find the evidence in support of the signaling hypothesis.

2. Liquidity Hypothesis

High-priced stock tends to be illiquid due to the psychological reason and transaction cost. Therefore, when the price climbs up to certain level, the executive will split the stock to lower price to facilitate trading and hence enhance the liquidity. The survey by Baker and Powell (1993) reveals that the main motivation for the executives to split stock is for improved liquidity.

Mascarella and Vetsaypens (1996) investigate the splits of ADRs (American Depository Receipts) which are virtually foreign stocks listed on the US board. If the underlying stocks are split, their ADRs will be consequently split in the same proportion. There is a case that ADRs are solely split irrelevant to the underlying stocks. This event provides an opportunity for them to test the liquidity hypothesis since there is no signaling motivation involved in this case. The result suggests an increase of 1-2% on the event date which supports liquidity hypothesis. Elfakhani and Lung (2003) also find the evidence in Canadian market that supports both the signaling and liquidity hypotheses.

However, some studies such as Copeland (1979), Ohlson and Penman (1985), Lamourex and Poon (1987), and Conroy *et al* (1990) do not support this hypothesis. These studies find declining trading volume after the split. In addition, bid-ask spread which is normally used to proxy stock's liquidity widens.

There are hypotheses that consider the stock split as a means to increase the shareholder base but not for liquidity purpose. Baker and Gallagher (1980), Lakonovich and Lev (1987), and Lamourex and Poon (1987) argue that the executives might use the split to protect their interests from takeover threats. Larger investor base makes it difficult for potential acquirer to control the company's stake. However, Szewczyck and Tsetsekos (1995) find contradict evidence. The proportion of institutional investors increases after the split. In addition, one is supposed to find negative response from investor if the split is used to defend the executive's interest. Most studies however support positive feedback.

In Thailand, Gorkittisunthorn *et al* (2006) finds that the proportion of 'insiders' declines after the split. The result is consistent with the asymmetric information framework of market microstructure that lower informed traders will result in narrower bid-ask spread and hence support liquidity hypothesis. Khositsakul (2003) studies with more data during 2000-2002 and do not find the evidence in support of signaling hypothesis. By using traditional event study method, he finds positive response on the announcement and effective dates.

III. Methodology

This study will test if there is any impact from stock splits in the Stock Exchange of Thailand during 2001-2005. There are 100 samples left for study since some sample during that period do not have accounting data in Worldscope database for us to investigate the relationship. Daily data on stock price is from Datastream in which the price after split is already adjusted backward to make prices comparable. The event date is defined as the effective date.

The event study approach is used by separating data into two windows. Pre-event or estimation window is defined as (-200,-21) or around 6 months before the event. The event window is defined as (-20,20) or 1 month around the event date.

The market model is estimated by the data in estimation window.

$$R_{it} = \alpha + \beta R_{mt} + \varepsilon_{it} \quad (1)$$

where $E(R_{it})$ is actual return of stock *i* at time *t*,

R_{mt} is actual market return at time *t*.

This study uses the percentage change of SET Index to represent market return. The estimated model from (1) will be used to estimate expected returns during event window. The difference between actual return and expected return is presumed to be the abnormal return (AR) from the stock split.

$$AR_{it} = R_{it} - E(R_{it}) \quad (2)$$

where AR_{it} is abnormal return of stock *i* at time *t*.

Since the impact from the event might occur before or after the event, the traditional event study also measures the impact from the event by the cumulative abnormal return (CAR). The CAR is the cumulative summation of all ARs during the event window.

$$CAR_{it} = AR_{it} + CAR_{it-1} \quad (3)$$

where CAR_{it} is cumulative abnormal return of stock *i* at time *t*.

To eliminate the impact from other events besides the split, ARs and CARs from all samples are cross-sectional averaged to get AAR (Average Abnormal Return) and CAAR (Cumulative Average Abnormal Return), respectively.

$$AAR_t = \frac{\sum_{i=1}^{N} AR_{it}}{N} \tag{4}$$

$$CAAR_t = AAR_t + CAAR_{t-1} \tag{5}$$

The t-test is normally used to test the significance of AAR and CAAR. With the null hypothesis of no significant abnormal return on the event date, the t-stat can be set up as equation (6). The standard deviation is estimated from data during estimation window. Note that this test assumes that the event does not induce variance.

$$\frac{1}{N}\sum_{i=1}^{N} AR_{iE} \Bigg/ \frac{1}{N}\sqrt{\sum_{i=1}^{N}\frac{1}{T-1}\sum_{i=1}^{N}\left(AR_{it} - \sum_{t=1}^{T}\frac{AR_{it}}{T}\right)^2} \tag{6}$$

where AR_{iE} is abnormal return of stock *i* on event date.

Cyree and DeGennaro (2001) extend traditional event study by relaxing the strict assumptions of subjective fixed event window and constant variance around event date. They even allow the systematic risk in the market model to change around the event date.

The new method defined equation (7) to estimate the returns.

$$R_{i,t} = \beta_{i,0} + \beta_{i,1}R_{m,t} + \beta_{i,2}R_{m,t}(T_{1i} - t)(t - T_{2i})D_{1,i,t} + \beta_{i,3}R_{m,t}\left[(t - T_{1i})D_{1,i,t} + (T_{2i} - T_{1i})D_{2,i,t}\right] + \varepsilon_{i,t} \tag{7}$$

where $T_{1,i}$ is a starting event date of stock *i*,

$T_{2,i}$ is an ending event date of stock *i*,

$D_{1,i,t}$ is a dummy variable whose value is 1 when *t* is in event window of stock *i* and 0 otherwise,

$D_{2,i,t}$ is a dummy variable whose value is 1 when *t* is post-event window of stock *i* and 0 otherwise,

They relax the assumption of constant variance by defining variance of error terms in (7) to follow ARCH(1) process.

$$Var(\varepsilon_{i,t}) = h_{i,t} = \alpha_{i,0} + \alpha_{i,1}\varepsilon_{i,t-1}^2 \tag{8}$$

They name this model as 'Event-ARCH' or EVARCH which can be estimated by MLE. Note that the estimation of (7) and (8) needs the whole data during estimation and event windows. Moreover, one needs to identify $T_{1,i}$ and $T_{2,i}$ first. All dummy variables depend on this pair. Cyree and DeGennaro suggest that the estimation shall be done on a trial and error basis by varying values of the pair for the whole data set until the model with the highest log likelihood is attained.

Model (7) also enables the systematic risk to change around the event. If β_2 is negative, it implies that the systematic risk declines during the event. The adjustment can be either temporary or permanent depending on β_3.

This study will apply both the traditional and the new approaches to test if there is significant abnormal return from stock split in Thailand. To test the hypotheses discussed in section 2, this study will use multiple regression model as (9).

$$\overset{}{CAR_i} = f(\overset{+}{\Delta EPS}, \overset{+}{\Delta Div}, \overset{+}{D_1}, \overset{+}{D_2}, \overset{+}{\Delta Vol}, \overset{-}{\Delta Spread}, \overset{-}{\Delta Top10}, \overset{+}{\Delta NShare}) \qquad (9)$$

where CAR_i is cumulative abnormal return of stock *i* during (-1,0),

ΔEPS is percentage change of earning per share (*EPS is adjusted for the split effect),

$$\Delta EPS = \frac{EPS_t - EPS^*_{t-1}}{EPS^*_{t-1}}$$

ΔDiv is percentage change of dividend payment per share,

$$\Delta Div = \frac{Dividend_t - Dividend^*_{t-1}}{Dividend^*_{t-1}}$$

D_1 is a dummy variable whose value is 1 when the stock did not pay dividend the year before but pays dividend within 1 year after the split and 0 otherwise,

D_2 is the dummy variable whose value is 1 when the stock increases capital within 1 year after the split and 0 otherwise,

ΔVol is change in trading volume after the split (the volume is already adjusted for the split effect)

$$\Delta Vol = \frac{Volume_t}{Total \quad Stock_t} - \frac{Volume_{t-1}}{Total \quad Stock_{t-1}},$$

ΔSpread is change in bid-ask spread,

$$\Delta Spread = \frac{\frac{\sum_{t=-20}^{20}(Ask_t - Bid_t)}{T1}}{\frac{\sum_{t=-20}^{20} S_t}{T1}} - \frac{\frac{\sum_{t=-21}^{-180}(Ask_t - Bid_t)}{T0}}{\frac{\sum_{t=-21}^{-180} S_t}{T0}}$$

ΔTop10 is a percentage change of the proportion of shares held by Top 10 large shareholders,

ΔNShare is change in the number of shareholders.

The expected signs of each variable are in consistent with the prediction of the signaling and liquidity hypotheses.

IV. Results

The traditional event study method allows us to estimate the average abnormal return from 100 splits in the Stock Exchange of Thailand as shown in Table 3. There are 41 trading days as the event window is defined as (-20,20). Among these days, the significant abnormal return is detected 20 days before the effective date and it lasts for 18 days after the event. However, most significant returns are clustered around (-8,4) of the event date.

[Insert Table 3 here]

Figure 1 shows the CAAR during the event window. There is obvious negative trend from the event. The t-test of CAAR confirms significant negative return during the event window.

[Insert Figure 1 here]

The negative CAAR found in this study contrasts with earlier results in Khositsakul (2003) that study the event during 2000-2002. However, the result is consistent with the evidence in Spain found by Reboredo (2003). He conjectures that the split is used as a signal for optimist analysts to revise down their forecast.

The declining trend around the event in Figure 1 is interesting such that there is a hump around (-2,12). The puzzle of the brief hump around downward trend leads us to interpret the result that there might be a weak positive impact from the stock split. Since the stock split is an anticipated event, an investor might overreact at the beginning and then reverse his trade when the event date is approaching. The pattern is consistent with the hypothesis that the executive will signal investor by gradually releasing the news to alleviate possible negative impact in the future.

The traditional event study assumes that the systematic risk and variance are unaffected from the event. Ohlson and Penman (1985) find that the split is a variance-induced event. Brennan and Copeland (1988) discover that the systematic risk increases by 20% after the announcement date and reach 30% on the effective date. The increase continues after the event for 75 days and ends up 18% higher than the level before the event.

Boehme (2001) investigates long term effect from the split in the US market during 1950-2000 and finds that the abnormal return is detected only in the first year and subsides afterwards. He reports that the significant abnormal return only occurs during 1975-1987 period because of lower systematic risk.

For comparison purpose, this study then uses EVARCH model to investigate the event. Table 4 shows the average values of all coefficients estimated by equation (7) and (8). More than half of the sample support significant β_2 in which 22 samples are positive and 28 samples are negative resulting in -0.14669 on average. There are only 15 samples that report significant β_3 with the zero mean. This implies that after the event, the systematic risk reverses to prior value.

[Insert Table 4 here]

Change in systematic risk according to equation (7) can be shown in Figure 2. On the average, most samples have systematic risk close to zero and falling during the event before reverse to the previous level after the event.

[Insert Figure 2 here]

The estimation result is consistent with intuition that the stock split shall not have any impact on systematic risk. However, there is still a puzzle why it declines during the split. Boehme (2001) finds that the systematic declines but not during the event. It declines after the event. He does not attempt to explain the reason why it declines either.

Table 4 indicates change in variance which can be explained by ARCH(1). Both α_0 and α_1 are significant. A positive α_1 implies that the variance increased from the split. An increase in variance during the event will result in overestimated t-stat if the estimation of the standard deviation is done by the data before the event.

This study extends the data sample to be (-120,120) around the event date and try varying the starting and ending dates of the event window to maximize the log-likelihood of equation (7). Appendix A shows the distribution of event windows for all samples. The average starting date is -26.31 in which the minimum value is -103 and the maximum value is 20. The average ending date is -0.58586 ranging from -48 until 98 days after the event. Each sample has its own event window but the median window is (-25,-15). Therefore, the traditional test we use that defines event window as (-20,20) has partially covered part of the impact.

Since the samples estimated from EVARCH model have different event windows, the CAAR can be calculated as the average of all samples and all ranges.

$$CAAR = \frac{\sum_{i=1}^{N}\sum_{t=T_{1,i}}^{T_{2,i}} AR_{i,t}}{N} \qquad (10)$$

The t-test is used to test the null hypothesis by defining a standard deviation of (10) as shown in (11).

$$\sigma_{EVARCH} = \frac{\sum_{i=1}^{N}\sum_{t=T_{1,i}}^{T_{2,i}} \sqrt{h_{i,t}}}{N} \qquad (11)$$

CAAR from EVARCH model is 0.0449 and the standard deviation is 0.883514. The t-test proves that there is no significant cumulative abnormal return during the event window. This is contrast with the result found earlier by the traditional method.

The multiple regression model (9) is set up to test the relationship of key variables determined from the hypotheses discussed in section 2 with CAR(0,1) uncovered by the traditional method. Table 5 presents descriptive statistics of key variables.

[Insert Table 5 here]

Earning and dividend seem to increase after the split. There are increases in both the proportion of large shareholders and the number of investors. The bid-ask spread is narrower. However, trading volume is lower than before around 34%.

We then classify the samples into two groups based on dividend payment. Dummy variable D_1 is equal 1 for the 'turn-around' stocks that did not pay the dividend the year before the split but becomes profitable and pay dividend within a year after the split. Another group is the stocks that either pay dividend consistently or do not pay dividend within a year after the split. The result suggests that earning of the turn-around group is still lower. The proportion of large shareholders declines but the investor base is expanded. Bid-ask spread of the turn around group is wider which explains a 70% drop in trading volume.

Another classification is dummy variable D_2 that is equal 1 for the group that issues new shares within a year after the split. The differences between the 'new issue' group and the 'non-issue' group are an increase in earning of more than 70%

and increase dividend payment for the ‘new-issue’ group. Both groups have narrower bid-ask spread but there is no impact on trading volume. Both groups can expand investor base after the split but the large shareholders in the ‘new-issue’ group tend to increase their positions.

The estimation result of model (9) is presented in Table 6.

[Insert Table 6 here]

The regression model needs many data on independent variable. This forces us to delete some samples whose data are either outliers or missing. We have 76 samples left to estimate equation (9).

The estimation model includes the interaction independent variables with dummy variables. The result shows that the interaction terms with D_1 are not significant. For presentation purpose, table 6 shows only the interaction terms with D_2 which describes the stocks that issue new shares within 1 year after the split.

The result does not support the signaling hypothesis of future positive news. D_1 is not significant. In addition, the variables explaining liquidity after the split do not have significant impact on CAR(0,1) either. Although bid-ask spread declines by 6.33%, no evidence of increasing trading volume is found. On the other hand, the trading volume has declined by 33.58% on average.

The dummy variable, D_2, is significantly negative. This might be interpreted that investors anticipate possible new issues from the signaling of stock split. According to pecking order theory, financing projects by new equity conveys negative information. The stock price therefore declines after investors observe the signal. The independent variables related with shareholder are significant. There is negative relationship between abnormal return and change in the proportion of stocks held by large shareholders. One might interpret the negative sign as the evidence against the corporate governance concept which expects increased return when large shareholders increase their positions in the company. The explanation may lie on a distinctive characteristic of Thai company whose major shareholders are usually the executives of the company. An increase in the proportion of large shareholders might be interpreted as worsening condition of corporate governance and the market responds by declining abnormal return of 6.7%.

The interaction terms with D_1 which are significant are change in large shareholders position and an increase in the number of investors. The evidence supports the hypothesis that the executive wants to gradually signal the market before the capital increase. Model 1 in Table 6 indicates that although there is negative relationship between large shareholders position and abnormal return in general, the relationship for the new issue firms is positive. An increase of 1% in large shareholders position results in an increase of 13.5% of two-day cumulative abnormal return.

There is no significant relationship between abnormal return and the number of shareholders. However, for the new issue firms, the interactive term shows significant positive value of 4% of every 1% increase in the number of shareholders.

When we delete insignificant variables from Model 1 and re-estimate, the results are shown in Model 2, 3, and 4 in Table 6. The results are still the same but adjusted R-squared is improved.

This study checks the robustness of the result by repeating the estimation of equation (9) but use CAR from EVARCH model instead. The result is presented in Table 7.

[Insert Table 7 here]

There are new variables in the Model that represent the varying event window for each sample. The results are mostly consistent with previous model. D_2 is still significant variable and positive relationship of the earning from the new issue firm is confirmed. The starting date of the event has no explanation power on CAR but the number of event days is significantly positive which is not surprising.

The result from EVARCH has some differences from the traditional method. The variables related with shareholders are now insignificant. The coefficient of the interaction term between D_2 and volume is significant but negative. This does not support the liquidity hypothesis.

In conclusion, this study does not support the original signaling hypothesis that predicts increase in earning or dividend after the split. However, significant D_2 leads us to reconsider the role of stock split as the signal to alleviate negative impact from capital increase.

Figure 3 and 4 show CAAR computed from traditional method around event window (-20,20) for the 'non-issue' group and the 'new-issue' group, respectively. The mysterious humps a few days before the effective date are found in both figures. However, the positive impact around the effective date is obviously more persistent in the 'new-issue' group. This new evidence supports the hypothesis that the stock split in Thailand is used to gradually signal the market on future capital increase. It is an effective tool to alleviate the negative impact from financing by new equity.

[Insert Figure 3 here]

[Insert Figure 4 here]

V. Conclusions

The traditional event study which assumes fixed systematic risk and variance is usually used to investigate corporate event. These assumptions possibly lead to overestimation of t-stat to test the significant of null hypothesis.

This study investigates the stock splits in the Stock Exchange of Thailand by using more recent data around 2001-2005. In contrast with previous studies in Thailand, this study finds that CAAR(-20,20) around the effective split date is significantly negative.

However, when the new method proposed by Cyree and DeGennaro (2001) is used, there seems to be no significant impact from the event to cumulative abnormal return. This study also finds the evidence that the systematic risk is lower during the split date but return to previous level after the split. The result is in line with Boehme (2001) who finds the systematic risk declines after the split. There is no attempt to explain why there is a change in systematic risk and the issue worths more investigation in future study.

The regulator in Thailand seems to believe in the liquidity hypothesis judging from the fact that the new Public Company Act allows company to set the par value of stock at any price without minimum floor. Before this Act, the Stock Exchange of Thailand imposed the rule that all listed companies must set the par value at 10 Baht.

After this Act was promulgated in 2001, there have been many stock splits in Thailand.

The new evidence found in this study supports neither the liquidity nor the original signaling hypotheses. However, our results support Korajczyck *et al* (1992) that the split is used to alleviate negative impact from capital increase in the future. The theoretical model to explain this behavior shall be developed in future research.

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Table 1
The Number of Stock Splits in the Stock Exchange of Thailand
Classified by the Split Ratio

	1 : 2	1 : 5	1 : 10	Others	Total
2001	2	-	8	-	10
2002	6	4	9	1	20
2003	1	6	33	1	41
2004	4	8	16	3	31
2005	3	7	9	-	19
Total	16	25	75	5	121

Table 2
The Percentage of Change in Price After the Stock Split
(Before and After the Effective Split Date)

Year	% of Declining Price	% of Price Unchanged	% of Increasing Price
2001	40%	50%	10%
2002	65%	5%	30%
2003	41.5%	17%	41.5%
2004	68%	16%	16%
2005	10.5%	58%	31.5%

Table 3
Abnormal Return Calculated from Traditional Event Study
During Event Window (-20,20)

T	AAR	*t*-stat	T	AAR	*t*-stat
-20	-0.00113	-0.41153	1	0.00528	1.91444*
-19	-0.00299	-1.08599	2	0.00151	0.54590
-18	-0.00187	-0.67759	3	-0.00020	-0.07215
-17	0.00312	1.13145	4	-0.00524	-1.90088*
-16	-0.00179	-0.64981	5	-0.00121	-0.43753
-15	0.00116	0.42003	6	0.00186	0.67309
-14	0.00091	0.32962	7	-0.00200	-0.72643
-13	-0.00005	-0.01831	8	0.00166	0.60077
-12	-0.00304	-1.10353	9	0.00049	0.17837
-11	0.00205	0.74273	10	0.00295	1.07078
-10	-0.00466	-1.68896*	11	-0.00171	-0.61962
-9	-0.00357	-1.29416	12	-0.00607	-2.2002**
-8	-0.00781	-2.8336**	13	-0.00464	-1.68329*
-7	-0.00291	-1.05426	14	-0.00136	-0.49485
-6	-0.00245	-0.88918	15	-0.00032	-0.11444
-5	-0.00434	-1.57425	16	0.00041	0.14887
-4	0.00745	2.70220**	17	-0.00357	-1.29308
-3	0.01174	4.25895**	18	-0.00546	-1.9811**
-2	0.00381	1.38072	19	0.00082	0.29693
-1	-0.00811	-2.9429**	20	0.00002	0.00830
0	0.00036	0.12933			

Note t-stat is reported in parenthesis
**Significant at α=0.05
* Significant at α =0.10

Table 4
The Estimation Result of EVARCH Model: Equation (7) and (8)

	Average	Min	Max
β_0	0.0012	-0.0031	0.0225
	(0.6535)	(-5.2096)	(5.5717)
β_1	0.0458	-0.4977	2.5742
	(-0.0977)	(-18.6158)	(15.1342)
β_2	-0.1467	-20.2356	12.1070
	(-1.4228)	(-25.6063)	(6.4397)
β_3	-0.0046	-0.3680	0.0979
	(-0.0577)	(-5.0336)	(4.7274)
α_o	0.0027	0.0001	0.1408
	(26.7987)	(12.7929)	(99.4549)
α_1	0.3544	-0.0239	2.8887
	(-30.5095)	(-3325.7163)	(15.5227)
T_1	-26.3131	-103.0000	20.0000
T_2	-0.5859	-48.0000	98.0000
Adj-R2	0.0006	-0.1035	0.1099
D.W.	2.0564	1.5787	2.5100
LogL	1126.9887	-353.7669	1536.1334

Note t-stat is reported in parenthesis

Table 5
Descriptive Statistics of Independent Variables in Equation (9)

	∆EPS	∆Div	∆Vol	∆Spread	∆Top10	∆NShare
Mean (Whole Sample)	0.4020	1.6342	-0.3299	-0.0601	0.0059	0.4848
Minimum	-1.0000	-1.0000	-0.9863	-0.9816	-0.2300	-0.2390
Maximum	10.3103	33.0000	17.8921	1.9956	1.0078	2.9086
Mean D1=1	-0.0308	1.2019	-0.7130	0.0642	-0.0210	0.6508
Minimum	-1.0000	0.1111	-0.9691	-0.6504	-0.2300	-0.2390
Maximum	0.6667	2.2500	0.0220	1.9956	0.1239	2.9086
Mean D1=0	0.4943	1.6558	-0.2390	-0.0896	0.0123	0.4454
Minimum	-1.0000	-1.0000	-0.9863	-0.9816	-0.2260	-0.0981
Maximum	10.3103	33.0000	17.8921	1.3261	1.0078	2.5967
Mean D2=1	0.7322	2.4203	-0.7039	-0.0480	0.0144	0.5350
Minimum	-0.4061	-1.0000	-0.9827	-0.6595	-0.2219	-0.0981
Maximum	10.3103	33.0000	1.2945	1.3261	0.3703	2.9086
Mean D2=0	0.2314	1.1975	-0.1067	-0.0674	0.0008	0.4549
Minimum	-1.0000	-1.0000	-0.9863	-0.9816	-0.2300	-0.2390
Maximum	4.6933	9.4706	17.8921	1.9956	1.0078	2.5967

Note D_1 is a dummy variable whose value is 1 when the stock did not pay dividend the year before but pays dividend within 1 year after the split and 0 otherwise,
D_2 is the dummy variable whose value is 1 when the stock increases capital within 1 year after the split and 0 otherwise,

Table 6
Regression Model from Equation (9) CAR(0,1) Computed from Traditional Event Study Method

	Obs	constant	ΔEPS	D2ΔEPS	ΔDiv	D2ΔDiv	D1	D2	ΔSpread	D2ΔSpread	ΔVol	D2ΔVol	ΔTop10	D2ΔTop10	ΔNShare	D2ΔNShare	Adj-R2	DW.
Model 1	79	0.016	-0.005	0.005	-0.001	0.003	-0.006	-0.029*	0.005	-0.012	0.001	-0.010	-0.067*	0.202**	-0.009	0.044**	0.058	2.451
		2.20	-0.98	0.84	-0.60	1.08	-0.23	-1.64	0.45	-0.40	0.45	-0.49	-1.89	2.15	-1.00	2.29		
Model 2	79	0.015	-0.005	0.006	-0.001	0.003		-0.027*			0.001	-0.007	-0.063*	0.209**	-0.008	0.044**	0.096	2.387
		2.24	-1.06	0.95	-0.68	1.21		-1.63			0.39	-0.43	-1.89	2.60	-0.97	2.47		
Model 3	79	0.015	-0.005	0.006	-0.001	0.003		-0.023*					-0.063*	0.212**	-0.008	0.044**	0.118	2.384
		2.24	-1.10	1.03	-0.65	1.25		-1.78					-1.91	2.69	-0.94	2.48		
Model 4	79	0.017	-0.007	0.008				-0.028**					-0.063*	0.223**	-0.006	0.052**	0.18	2.342
		2.83	-1.42	1.39				-2.41					-1.83	2.83	-0.77	4.04		

Note ** Significance at 5%

* Significance at 10%

Table 7
Regression Model Adapted from Equation (9) CAR Computed from EVARCH Model

	Obs	constant	ΔEPS	D2ΔEPS	ΔDiv	D2ΔDiv	D1	D2	ΔSpread	D2ΔSpread	ΔVol	D2ΔVol	ΔTop10	D2ΔTop10	ΔNShare	D2ΔNShare	T1	Day	Adj-R2	DW.
Model 5	79	0.005	-0.06*	0.061	0.009	-0.016	-0.097	-0.18*	0.074	-0.117	0.007	-0.162	-0.243*	-0.065	-0.043	0.055	-0.002	0.002	0.035	2.364
		0.0856	-1.785844	1.5528	0.7854	-1.1873	-0.7144	-1.768	1.0814	-0.7049	0.6582	-1.4309	-1.1719	-0.1225	-0.8555	0.5061	-1.12082	1.570212		
Model 6	79	0.0136	-0.052*	0.058*				-0.15**			0.0057	-0.139*						0.0016**	0.089	2.098
		0.4113	-1.784775	1.7174				-2.061			0.6382	-1.6187						2.274598		

Note ** Significance at 5%

* Significance at 10%

Figure 1
Cumulative Average Abnormal Return of the Whole Sample
Around An Effective Split Date (-20,20)

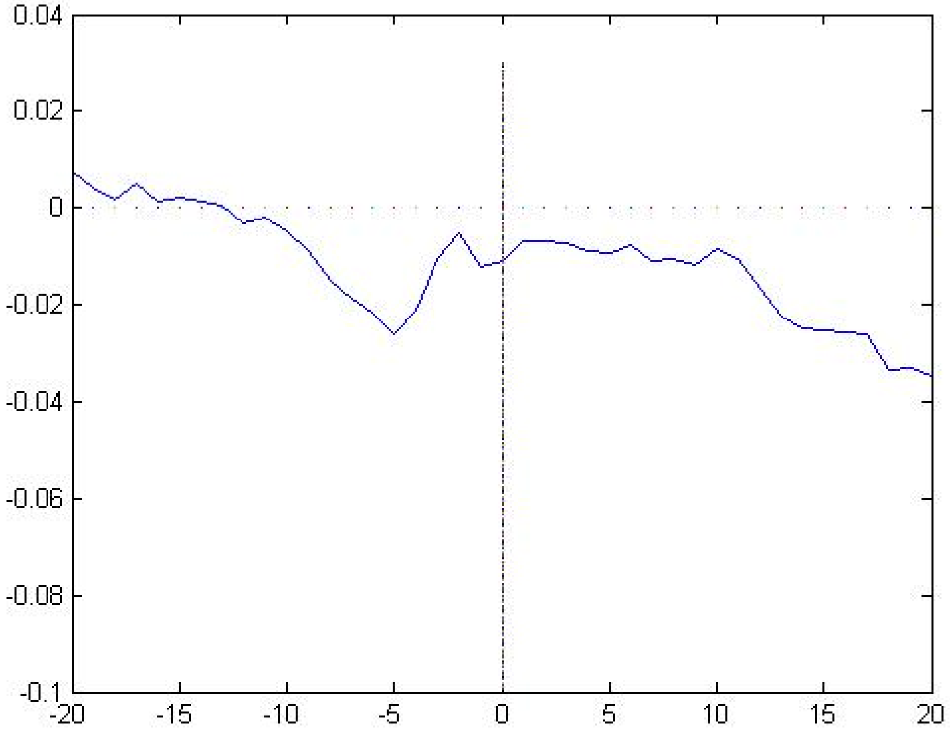


Figure 2
Change in Systematic Risk Estimated by EVARCH Model

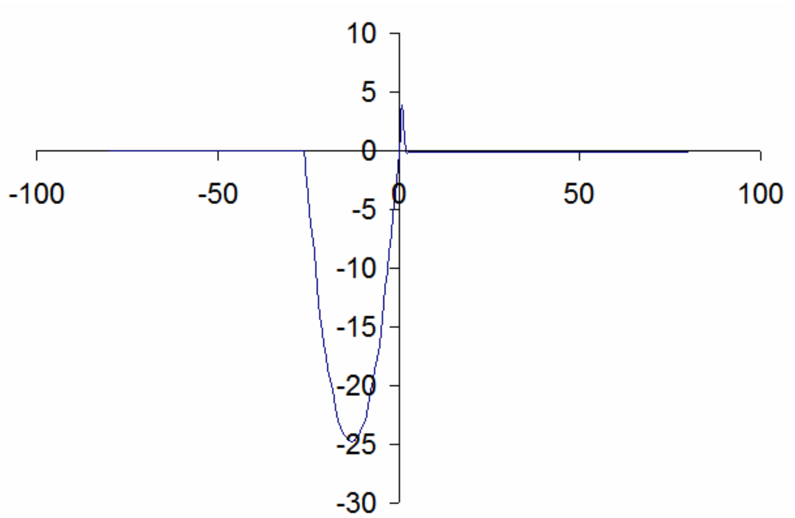


Figure 3
Cumulative Average Abnormal Return of the Stocks
that Did Not Issue New Shares Within 1 Year After the Split

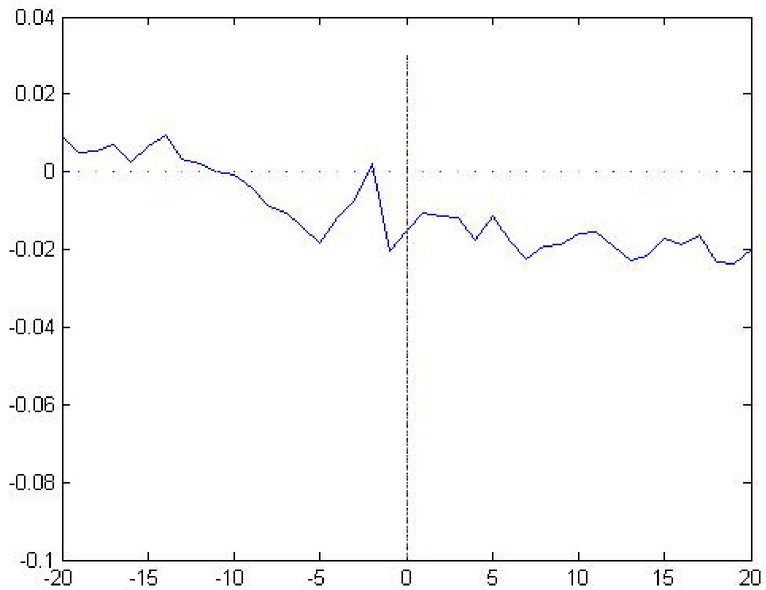
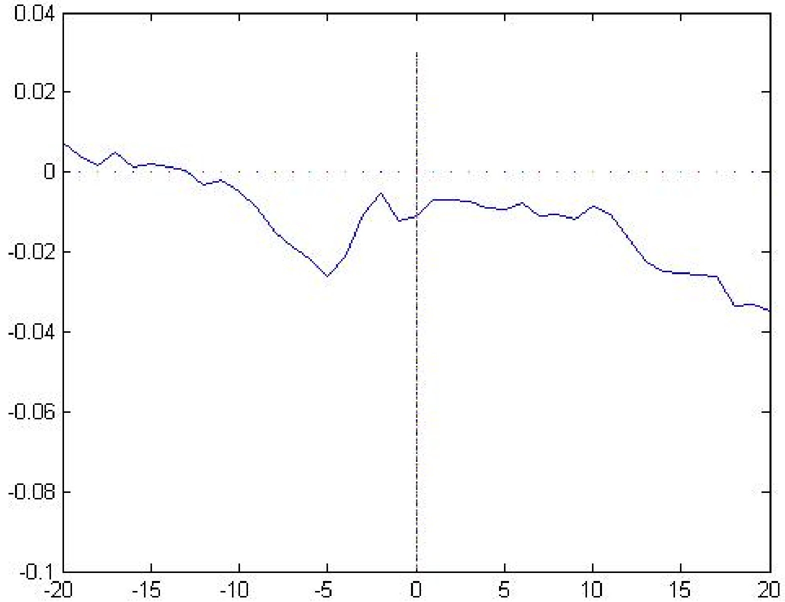
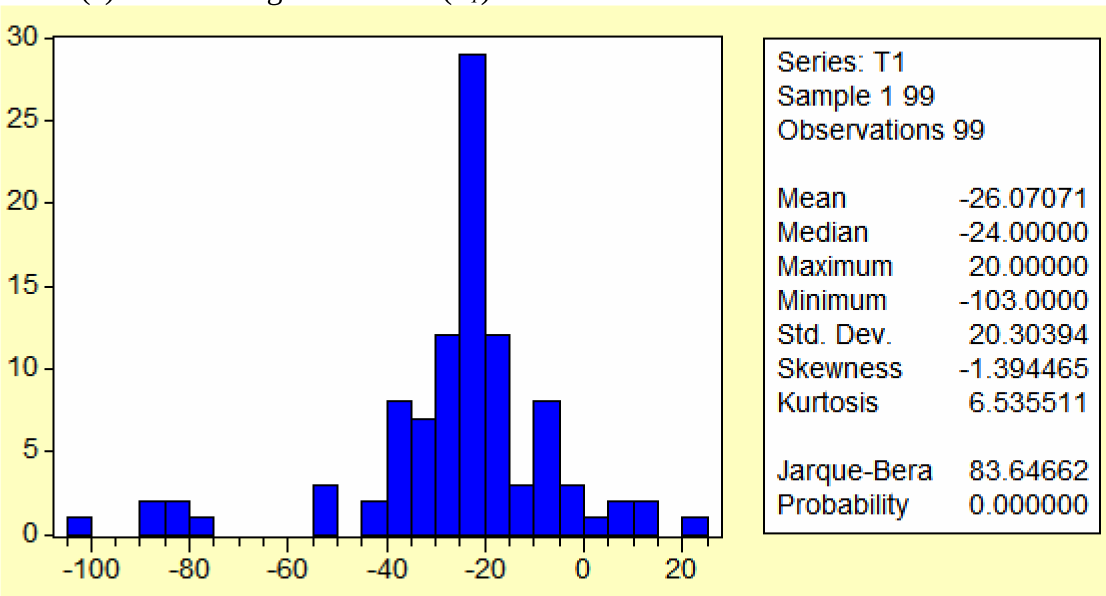


Figure 4
Cumulative Average Abnormal Return of the Stocks
that Issue New Shares Within 1 Year After the Split

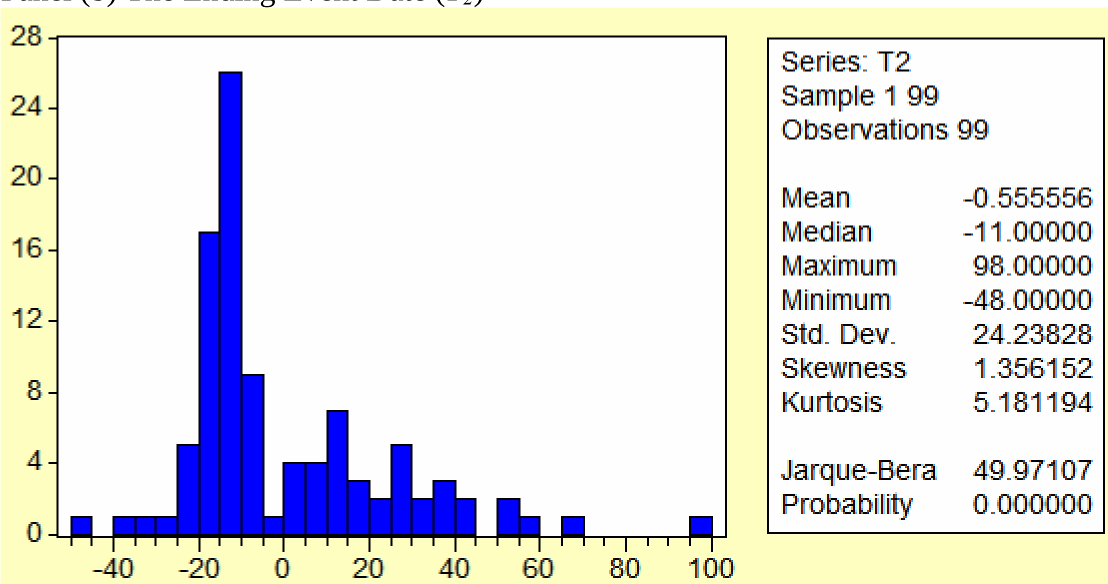


Appendix A
Histogram of Event Windows Estimated From EVARCH Model

Panel (a) The Starting Event Date (T_1)



Panel (b) The Ending Event Date (T_2)



Panel (c) The Length of Event Window (T_2-T_1+1)