

THE EFFECT OF STOCK SPLITS ANNOUNCEMENT AND IMPLEMENTATION TO SHARE PRICES

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***ABSTRAK:** Kajian ini berusaha untuk menerangkan kesan 'stock splits' ke atas harga pasaran saham berkenaan. Sorotan literatur menunjukkan bahawa firma yang terlibat di dalam aktiviti ini akan memperolehi pulangan diluar jangka semasa pengumumannya. Kajian ini cuba-cuba memastikan komponen berkenaan. Walau bagaimanapun, kajian ini hanya mencakupi syarikat yang mengumumkan dan melaksanakan program 'stock splits'nya dari 1 Januari 1980 sehingga 31 Disember 1993. Kaedah Mean Adjusted Return (MAR) digunakan untuk memperakui kesignifikan dan kesan pengumuman tersebut. Selain dari itu, Uni-variate Ordinary Least Squared digunakan untuk mengkaji hubungan di antara Cumulative Average Abnormal Returns (CAAR) dengan perolehan dividen sebelumnya. Hasil kajian ini menunjukkan tiada kesan pulangan abnormal berlaku semasa pengumuman, tetapi terdapatnya pulangan luar jangka (abnormal) semasa tempoh pelaksanaan program tersebut. Kajian ini juga menunjukkan terdapatnya hubungan yang signifikan dalam hubungkait di antara perubahan di dalam perolehan dividen sebelumnya untuk firma yang mengumumkan program ini dengan pulangan luar jangka, begitu juga dengan firma yang melaksanakan program ini. Akhir sekali, peningkatan CAAR sebelum pengumuman atau pelaksanaan program 'stock splits' menunjukkan berlakunya kebocoran maklumat di dalam pasaran*

***ABSTRACT:** This research tries to clarify the role of stock splits, especially in views of its market effect. Past researches showed that firms engaged in these exercises record a substantially significant amount of abnormal returns occurs upon its announcement. This research covers only companies that announced and implemented its stock splits program between 1st. January 1980 up to 31st. December 1993. Mean Adjusted Return (MAR) Models is use to validate the significance of the events. Furthermore, Ordinary Least Square – Uni-variate is use to test relationship between Cumulative Average Abnormal Returns (CAAR) and prior dividend yield. Test results show there is no significant abnormal returns occur on. However, results confer abnormality in returns during the observed period of stock splits implementations. A change in prior dividend yield, to stock splits announcement significantly correlated to abnormal returns and a similar occurrence were viewed with split implementation. Lastly, ever increasing CAAR, before the announcement or implementation to stock splits, indicate an information leakage and information discount by the market.*

1.0 Introduction

Researchers have long been puzzled over the role of stock splits, especially in views of its market effect. Basically, in a stock split, a certain number of new shares are substituted for one outstanding share. Although stock splits increases number of equity shares outstanding but have no effect on the shareholder proportional ownership or their wealth.

Moreover, theoretically, stock splits are supposed not to have any effect on firm value in perfect capital market. Nevertheless, firms engaged in these exercise records a substantially significant amount of abnormal returns occurs upon its announcement. Numerous research such as by Fama, Fisher, Jensen, and Roll (1969), Bar-Yosef and Brown (1977), Charest (1978), and Grinblatt, Marsulis, and Titman (1984) confirm these abnormality and denies theoretical stands on the matter.

A widely held view is that when a company splits its shares, firms' management is giving a positive information signal to investors that the stock is undervalued. Numerous research such as by McNichlos and David (1990), Brennan and Copeland (1988), Lanonishok and Lev (1987), and Desai and Jain (1995) on the American market , namely New York Stock Exchange, supports this notion. Furthermore and still a widely held practitioner view is that, practitioner such as Baker and Gallagher (1980); Baker and Powell (1993) views, stock splits restore share prices to a lower and more suitable trading range, which in turn improve firm liquidity.

Nevertheless, it interesting to know that although stock split are a normal occurrence in western bourses its however seldom implemented in Malaysia and after direction from Security Commissions, halted after 1993. It is hope that this research will provide an insight into this so call "non value added" to equity

releases. Furthermore, split ratio and shares outstanding of related companies are collected from KLSE's Annual Companies Handbook and KLSE's Investor Digest.

Data is categorized into 4 main groups; (i) Closing stock price of 40 days prior to announcement until 40 days after the announcement (excluding announcement date), (ii) KLSE composite indexes 81 days over the period (40 days before and 40 days after including the announcement date) on the announcement, (iii) Closing stock price of 40 days prior to implementation until 40 days after the implementation (including implementation date), and (iv) KLSE composite indexes 81 days over the period (40 days before and 40 days after including the implementation date) on the implementation.

Mean Adjusted Return (MAR) Models is use to validate the significance of the announcement of stock splits and been used previously by other researcher such as Dennis and McConell (1986), Kamarun (1995), Zahiruddin (1996), Mukhreji, Lee and Kim (1996) and, Nohayati, Rusmawati and Zahiruddin (1998). Primarily this model is chosen because its ease of use and provides equally powerful test method tools (Dennis and McConell, 1986). Moreover, the model is applied to test the following hypotheses;

- Ho1: Stock splits announcement does not provide significant abnormal returns
- Ho2: Stock splits implementation does not provide significant abnormal returns

MAR is computed based on the following procedures:

(i) MAR Adjustments

Adjustments are made for non-trading day, where such day is treated as missing observation and a multiple-day return is used. In order to

calculate the multiple-day return for the next existing observation on which the firm does not trade, the following formula is used:

$$R_{it} = \frac{P_{it} - P_{it-T}}{P_{it-T}} \quad (\text{Eq. 1})$$

Where P_{it} = i Stock prices at day t
 P_{it-1} = i Stock prices at day $t-1$

and $t-T+1$ are non-trading days and therefore R_{it-T+1} to R_{it-1} are considered as invalid.

Furthermore, in order to achieve the mean of the market-adjusted returns, a multiple-day market returns too is adjusted accordingly. The equation is as follows:

$$R_{mt} = \frac{CI_t - CI_{t-T}}{CI_{t-T}} \quad (\text{Eq. 2})$$

Where CI_t = Composite indexes on day t
 CI_{t-1} = Composite indexes on day $t-1$

(ii) Abnormal Returns

Subsequent to obtaining the paired values for the daily stock returns and market returns for each announcement date, the daily abnormal return for each day t is calculated as follows:

$$AR_{it} = R_{it} - R_{mt} \quad (\text{Eq. 3})$$

Where AR_{it} = Abnormal returns for share on day t

R_{it} = Daily stock returns

R_{mt} = Market Returns on day t

(iii) Average Abnormal Return (AAR)

After obtaining all abnormal returns for shares specified t day, a cross-sectional average daily abnormal return on day t is then calculated. Averaging the valid daily abnormal returns across companies on the specified day t does this. The following formula is used:

$$AAR_t = \frac{1}{N_t} \sum AR_{it} \quad (\text{Eq. 4})$$

Where N_t = number of firms trading on day t

(iv) Cumulative Abnormal Return (CAR)

In order to obtain a CAR on designated intervals, cross sectional daily average abnormal returns is summed over the interval, as follows;

$$CAR_{t1,t2} = \sum_{t=t1}^{t2} AAR_t \quad (\text{Eq. 5})$$

(v) Cumulative Average Abnormal Return (CAAR)

CAAR is calculated by adding the daily average abnormal return in time period t1 to t2. The formula used is as follows:

$$CAAR_{t1,t2} = \sum_{t=t1}^{t2} AAR_t \quad (\text{Eq. 6})$$

Consecutively, statistic-t is used to determine that the average daily abnormal return on trading day t is equal to zero (0). In other words, firms neither gain any abnormal return nor experience any loss on trading day t. The formula used is:

$${}^t\text{AAR} = \frac{\text{AAR}_t}{\sigma \text{AAR}_t / (N_t)^{1/2}} \quad (\text{Eq. 7})$$

Where;

$$\sigma \text{AAR}_t = \left\{ \left[\sum_{f=1}^{N_t} (\text{AR}_{ft} - \text{AAR}_t)^2 \right] / N_t \right\}^{1/2} \quad (\text{Eq. 8})$$

t-Statistic is also use to test the null hypotheses that is; Cumulative Average Abnormal Returns on the observed period t1 to t2 is equal to zero. Formula being use for this test is as follows;

$${}^t\text{CAAR} = \frac{\text{CAAR}_{t1,t2}}{(\sigma \text{CAAR}) (T)^{1/2}} \quad (\text{Eq. 9})$$

Where,

$$\sigma \text{CAAR} = \left[\frac{1}{T} \sum_{t=t1}^{t2} (\text{AAR}_t - \text{CAAR}_{t1,t2})^2 \right]^{1/2} \quad (\text{Eq. 10})$$

With T is total number of days between t1 and t2

In order to test relationship between CAAR and prior dividend yield, Ordinary Least Square – Univariate is used. In this test, CAAR is determined as an independent variable while prior dividend yield as a dependent variable. This relationship is mathematically computed as follows;

$$\text{CAAR} = \alpha + \beta (\% \text{ dividend yield}) \quad (\text{Eq. 11})$$

Last but not least, whilst verify variance changes on the splits announcement, we calculate the auto-correlation of returns using close-to-close transaction prices.

4.0 Finding and Discussion

In this section, analysis of test results are discussed base on test performed on the three-research objective. All test results are obtained based on the T-Statistic (t-stat) at Alpha (α) = 0.05 for a two-tailed test.

In order to ease deliberation and understanding, this section is divided into three (3) distinct sections. These are; firstly, on the market reaction to stock splits announcement follow by market reaction to stock splits implementation and lastly, relationship between dividend yield and excess returns.

The data analysis for the first two (2) section are based on steps discussed on part 3.3.2.4 (equation 4) onwards. Furthermore, in the last section, regression test analyses were carried out to deliberate on how dividend yield could provide an answer for market reaction to stock splits announcement, and implementation.

CAAR of 0.103783 and 0.004712, and daily Abnormal Returns (AR) of 0.104296 and 0.003074 respectively. Nevertheless, it must be pointed out that between the two peaks, only minor movement or changes in returns either positively or otherwise, are visible. Furthermore, none of the observed period after splits announcement shows a significant test value.

Table 2
Cumulative Abnormal Returns (CAR) and
Cumulative Average Abnormal Returns (CAAR)
for Companies Announcing Stock Splits in Malaysia from 1980 – 1993

Event Period	CAR	CAAR	t-Statistic		
-40 to +40	0.000991	0.080282	1.573184		
-20 to +20	0.002083	0.085416	2.061664	*	**
-40 to 0	0.001688	0.069217	2.029597	*	**
-20 to 0	0.002638	0.055410	2.343220	*	**
-10 to 0	0.002543	0.027975	1.812864	*	
-5 to 0	0.003087	0.018523	2.058189	*	
-3 to 0	0.002351	0.009404	1.124256		
-2 to 0	0.002502	0.007507	0.848365		
-1 to 0	-0.000183	-0.000365	-0.086268		
0 to +1	0.012681	0.025362	0.846585		
0 to +2	0.009185	0.027556	0.984715		
0 to +3	0.008067	0.032268	1.205837		
0 to +5	0.003516	0.021098	0.686472		
0 to +10	0.001701	0.018709	0.591616		
0 to +20	0.001319	0.027708	0.799969		
0 to +40	0.000214	0.008767	0.231145		

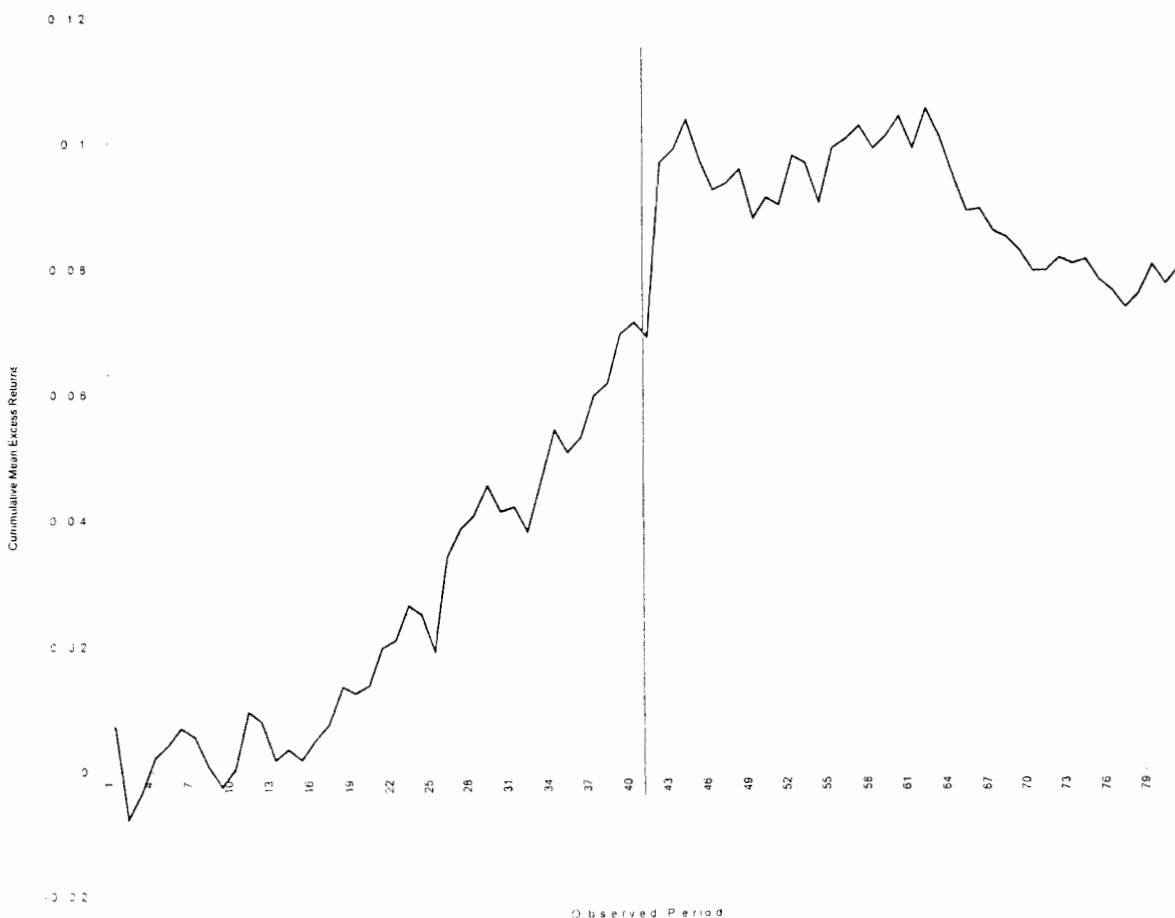
* Significant at 10 % level

** Significant at 5 % level

Reported T-Statistic is based on two-tailed univariate t-test

On the whole stock splits announcement events, it only records a AAR of 0.000991 and CAR of 0.080282. Furthermore with T-stats reading of 1.573184, it is obvious that it could only register an insignificant result. From Grapn 1, there is visible sign of positive market reaction to the announcement especially on the announcement day until day 2 after it, where CAAR and CAR, records 0.027556 and 0.009185 respectively. However, observed t-statistic at this period only records an insignificant result of 0.984715.

Graph 1
Cumulative Daily Abnormal Returns of Announcing Firms



From Graph 1, it is obvious that information dissemination had occurs subsequent to the announcement. This is clearly visualize as CAAR shows a gradual upward trends through-out the observed period prior to the announcement before a sudden positive hike on day +1 after the announcement. This evident is further substantiate as most observed period, except for event period -3 day to 0 day, - 2 day to 0 day and, -1 day to 0 day, shows a significant t-statistic readings.

After the splits announcement, a sudden hike in CAR are noted but without fail, tested insignificant. What possibly could have trigger such hike is that market react positively on the announcement but with caution, that is investor(s) were trading actively in the market based on the assumption that the market would continue to be bullish from the announcement. Furthermore, it must be noted that companies tend to either announce a dividend rightly after, simultaneous with, or immediately after, a splits announcement. Thus this would further enhance market activities from such event. These findings concurred with past research by Asquith and Mullins (1983), Brickley (1983), and, Healy and Palepu (1989).

After peaking at day +3, CAAR trend line show a declining momentum prior a slight upward trend as it peaks again on day + 19. However, after day +19 CAAR trend line shows a gradual declining momentum with all observed period records an insignificant t-statistic value.

From test result and plotted graph it is clear trading on splitting shares occurs prior to the announcement rather than after the announcement were made. Although there are substantial positive returns are made after the announcement it is however tested insignificant. This indicates that market players have adequate information on trade direction and it is possibly due to information dissemination, which in turn could possibly lead to insider trading.

All test reading and market movement concurred with earlier researcher such as Kryzanowski and Zhang (1991), Brennan and Hughes (1991), Lakonishok and Bev (1987), Lamourek and Poon (1987), Baker and Gallagher (1980), Copeland (1979), and several other, where market react positively prior to the announcement and adjust accordingly after the announcement were made.

What possibly trigger such movement is that in stock splits, numbers of splitting shares are based on shares available for trading prior to the announcement. Thus owning more shares prior to the announcement will certainly enables owner(s) to receive more shares after it been tabulated. Although ownership of the company remain unchanged but would enable investor(s) to have liquidity in trading. Therefor, price increases at these periods are possibly due to demand by investor(s) for such shares.

As visualized, returns on share prices at these period are increasing and, as shown in Graph 1, sore after the announcement been made. However in why such movement prolong until the very day of the announcement is that possibly the price of shares is due to strike price placed previously or investor(s) trying to capture more ownership of the company.

Another possible explanation on why CAAR increase overtime is that, firm awaits until a certain level of price before splits announcement is made. This is to ensure that after announcement is made, share prices will reconcile to more supple or optimum trading price range.

4.2 Stock Splits Implementation

As in splits announcement, data analysis for this test is also done based on steps discussed on part 3.3.2.4 (equation 4). From the initials total sample of 38 companies implementing splits, 6 were omitted due to unavailability in any form

of data prior 1989. The sample consists of 32 companies implementing splits during the years 1983 through 1993. There were as follow;

Table 3
Companies Implementing Stock Splits
1980 - 1993

Year	Number of Company
1982	12
1983	8
1984	2
1987	2
1991	3
1992	1
1993	4

Source: Kuala Lumpur Investor Digest 1980 – 1994

From table 3 it is clear that less and less companies implement splits and after 1993, stock splits exercise have been abolished from the system following steps taken by Security Commissions to set the par value of Malaysian share to either RM1 or RM0.50 per share, for companies which done so prior to December 1993. This is similar to what been implement in the Korean Share Market since September 1986.

Table 4
Cummulative Abnormal Returns (CAR) and
Cumulative Average Abnormal Returns (CAAR)
for Companies Implementing Stock Splits in Malaysia from 1980 – 1993

Event eriod	CAR	CAAR	t-Statistic		
-40 to +40	0.001474	0.1194	2.148658	*	**
-20 to +20	0.001841	0.075484	1.815621	*	
-40 to 0	0.003096	0.126949	3.100113	*	**
-20 to 0	0.004226	0.088748	4.423815	*	**
-10 to 0	0.005525	0.060771	5.018265	*	**
-5 to 0	0.005233	0.031399	3.609332	*	**
-3 to 0	0.005599	0.022394	2.996914	*	**
-2 to 0	0.006756	0.020267	3.257329	*	**
-1 to 0	0.007388	0.014775	2.159141		
0 to +1	0.009318	0.018635	1.741101		
0 to +2	0.001077	0.00323	0.122335		
0 to +3	0.000354	0.001417	0.056543		
0 to +5	-0.000565	-0.003391	-0.138141		
0 to +10	-0.001631	-0.017936	-0.618096		
0 to +20	-0.000443	-0.009298	-0.276298		
0 to +40	-0.000008	-0.003583	-0.101647		

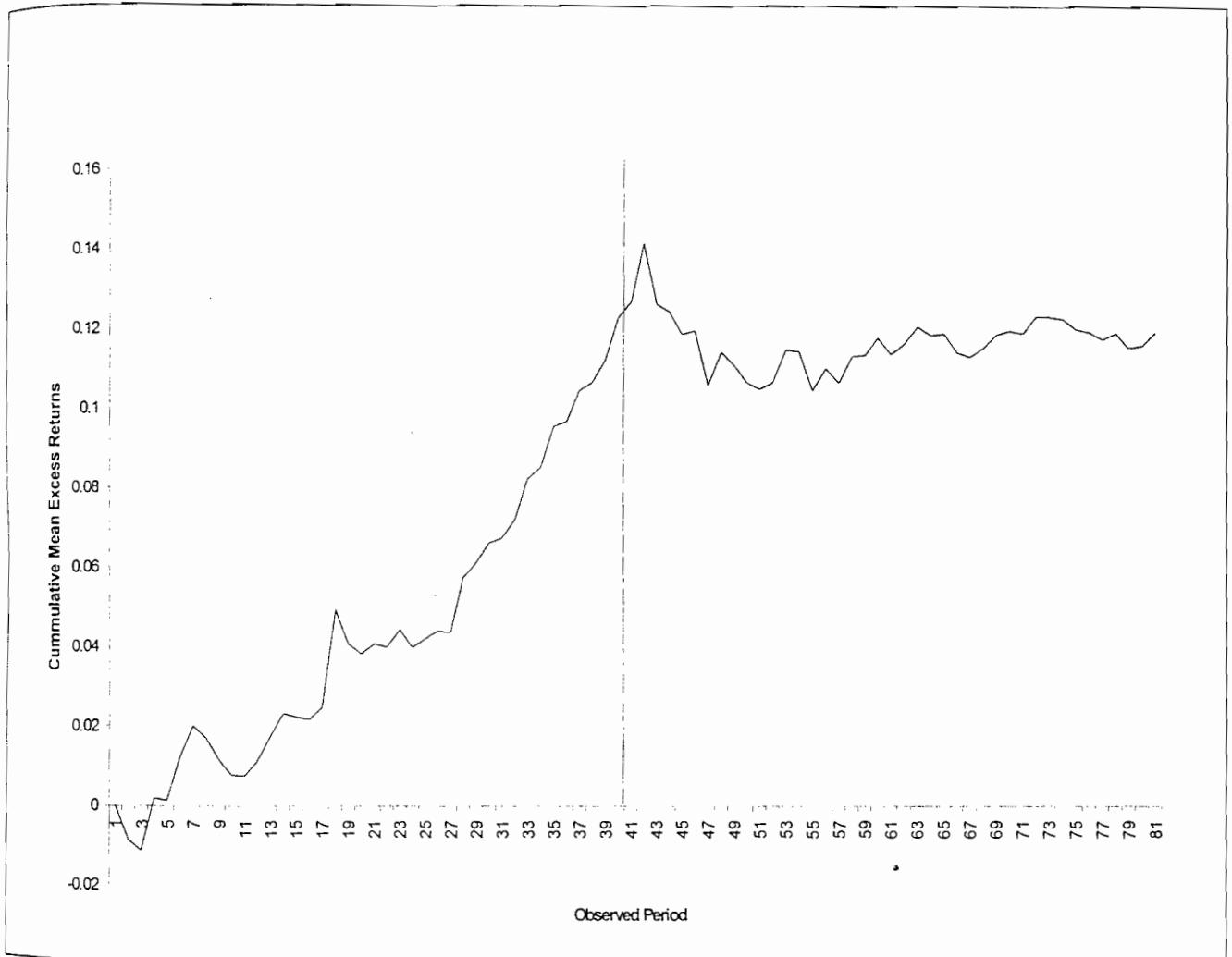
* Significant at 10 % level

** Significant at 5 % level

Reported T-Statistic is based on two-tailed univariate t-test

From Table 4 and Graph 2, a continuum increase of CAAR occurs prior to the splits implementation is noted. A positive market return continues until it peaks at day +1, which at this point daily CAR records 0.190702 and CAAR of 0.141618, however tested insignificant. After day +1, a sharp decline in returns is apparent, where daily CAR records -0.200263 and CAAR of 0.126213 with significant daily t-test value of -2.940937.

Graph 2
Cumulative Daily Abnormal Returns of Implementing Firms



After day +2, CAR only records minor or minimal changes either positive or otherwise. Furthermore, none of the observed period records any significant abnormality in returns after the implementation.

From Table 4, for the whole event of splits implementation records a CAR of 0.001474. Moreover, the CAAR records a value of 0.1194 and tested significant using t-test at 2.148658. Therefore, reject H_0 hypotheses that is, there are evidence that splits implementation will cause an abnormality in returns. What possibly contribute to these abnormality is that all observed period prior to the implementation, except for between day -1 to 0, records a significant t-test value. This concurred with Lee and Ready (1991) which also finds trade direction to shift significant from sell to buy prior to ex-date.

Although Baker and Gallager (1980) reports that most investor(s) believe stock splits will facilitate small investor purchases of broad lots, and splits will increase company shareholder liquidity (marketability) by returning the per-share prices to an optimum price range. However such case does not or could not occurs in Malaysian share market, as market does not or poorly reconcile to such event. This is evidently clear since CAAR continue to record an increase and although slump on day +2, share prices remains the same.

An increase of CMER throughout the implementation event, probably indicate an increase volatility in trading where after a sudden dip at day +2, share prices stabilize throughout the whole observed period after the implementation. This trading pattern and market direction are similar to findings by Kryzanowski and Zhang (1996), (1993), and Amir Sheikh (1989), where decrease in volatility and stagnant market trading after the implementation will follow after a sudden increase in volatility prior to the implementation.

Kryzanowski and Zhang (1996) explains such behavior could possibly due to that market moves to a higher permanent level after splits implementation. This supports the notion that after splits implementation, share prices had moved into an optimal price range, which is, one of the main reason for splits exercise.

Furthermore research by Lee (1993) also found that liquidity premium will decrease at and after the implementation date of a splits.

Either such event in Malaysian Stocks Market could be explained by these is another research by itself.

4.3 Relationship Between Dividend Yield And Excess Returns

Strangely enough all samples companies are either announcing or implementing 2-for-1 stock splits. Which implies theoretically that share price will decrease to about 50 % on ex-splits date. Although there were companies in the initials samples such as Hua Joo Seng Enterprise Berhad in 1993 implement an 100-for-1 splits, it is however omitted as the exercise commence prior from being listed to 'the board'.

In order to investigate the relationship between dividend and CMR possibility, we regress companies individual AAR obtained to percent of changes in prior dividend yeild of companies announcing, or implementing the splits. In order to comply with acceptable level of confidence, a two tailed t-test is consider appropriate at $\alpha = 0.05$.

4.3.1 Stock Splits Announcement

The estimate regression equation for splits announcement, with t-statistics given below in parentheses, is as follows:

$$\text{CMER} = 0.033828 + 0.0401089 (\text{PDY})$$

$$(-0.70012) \quad (3.638477)$$

$$\text{Adjusted } R^2 = 0.03518$$

The coefficient of PDY is positive and significant at 5 % level (p-value: 0.002686). However, the intercept is insignificant (p-value: 0.495321). The adjusted R^2 indicates that only 3.3742 % of the variation in excess returns can be associated with splits announcement may be explained by prior dividend yield.

What can be concluded from this equation is that although prior dividend yield can provide some explanation to share price on splits announcements, it is however, a near minimal. Which in turn mean there are other factors such as insider information, dividend pay-out ratio, or corporate capital ownership structure that also might pose a considerable effect to share price on splits announcement

4.3.2 Stock Splits Implementation

The estimate regression equation for splits implementation, with t-statistics given below in parentheses, is as follows;

$$\begin{aligned} \text{CMER} &= 0.000892 & + & & 0.043972 \text{ (PDY)} \\ &(-1.06674) & & & (3.35226) \\ \text{Adjusted } R^2 &= 0.08237 \end{aligned}$$

The coefficient of PDY is positive and significant at 5 % level (p-value: 0.005756). However, the intercept is insignificant (p-value: 0.919258). The adjusted R^2 indicates that only 8.237 % of the variation in excess returns can be associated with splits implementation may be explained by prior dividend yield.

Although the equation provide some explanation about excess returns between share prices implementation and prior dividend yield, it is however, not an absolute or the primary causal factors. Corporate capital ownership structure records an adjusted $R^2 = 7.88$ %. Which mean that's there are other intervening

factors to consider such as insider information, dividend pay-out ratio, or corporate capital ownership structure that also might contribute a considerable effect to share price reaction on splits implementation.

4.3.3 Autocorrelation of Returns

In order to verify variance changes on the splits announcement and implementation, we calculate the auto-correlation of returns using close-to-close transaction prices. The results are as follows;

Table 5
Close to Close Returns Auto-correlation
Around Splits Announcement and Implementation

Lag	Stock Spltct Annoucement		Stock Splits Implementation	
	ρ	q-value	ρ	q-value
1	-0.098	0.812	-0.078	0.515
2	-0.026	0.870	0.105	1.461
3	0.047	1.058	-0.051	1.688
4	-0.057	1.343	0.041	1.837
5	0.223	5.728	0.058	2.139
6	0.042	5.885	-0.021	2.178
7	-0.050	6.108	0.122	3.324
8	0.096	6.964	-0.053	3.581
9	-0.105	7.986	-0.070	4.036
10	0.118	9.302	0.025	4.094
11	0.063	9.686	0.057	4.411
12	-0.140	11.584	0.132	6.117
13	0.159	14.069	-0.198	10.006
14	-0.089	14.868	0.158	12.479
15	0.060	15.233	-0.183	15.913

Notes: The autocorrelation (ρ) are based on close-to-close quotes for 31 companies announcing stock splits and 31 companies implementing stock splits

From Table 5, auto-correlation for splits announcement on close-to-close price are positive on the 3, 5 and

From Table 5, auto-correlation for splits announcement on close-to-close price are positive on the 3, 5 and 6, 8, 10 and 11, and 13. However, none of the negative auto-correlation is significant at either $\alpha = 0.05$ or $\alpha = 0.10$. This suggest and consistent with prior findings that clustering of returns occurs on the splits announcement trading.

Also from the same table auto-correlation for splits implementation are positive on the 2, 4 to 5, 7, 10 to 12, and 14, and similarly to splits announcement, none of the negative auto-correlation is tested significant. Although this is consistent with prior findings, however it is found that greater clustering in abnormal returns especially at earlier lags.

5.0 Conclusions

As mention earlier, this research is geared to satisfy several objectives;

1. To empirically investigate the impact of stock splits announcement on abnormal returns;
2. To empirically investigate the impact of stock splits implementations on abnormal returns;
3. To instigate that changes in prior dividend yield will have a positive impact on the abnormal returns of companies announcing stock splits;
4. To instigate that changes in prior dividend yield will have a positive impact on the abnormal returns of companies implementing stock splits.

Test results from this research provide the following conclusions to the mention objectives;

1. There are no significant abnormal returns register during the observed period of stock splits announcement. Although there are indications that significant abnormality in return does occur prior to the announcement, but as a whole, it is tested insignificant. This result accept and supports Ho1, therefore, it can be concluded that there are no abnormality in returns that can be link to stock splits announcement;
2. Test results confer abnormality in returns during the observed period of stock splits implementations. Furthermore, there are indications that significant returns abnormality does occur prior to the implementation of the exercise. This result rejects Ho2, therefore, fully supports Ha2 that is; abnormal returns do occur on stock splits implementations. Lastly, it can be concluded that abnormality in returns can be link to stock splits implementations;
3. Changes in prior dividend yield, to stock splits announcement is insignificantly correlated to abnormal returns at 5 % significant level;
4. Similarly, changes in prior dividend yield, to stock splits implementation is insignificantly correlated to abnormal returns at 5 % significant level;
5. Lastly, ever increasing CAAR prior to the announcement or implementation to stock splits indicated an information leakage and information discount by the market.

Although additional work is needed to explain on why market react as such especially prior to splits announcement or implementations. Moreover, it is also suggested that future research includes analysis of parameters (α and β), and other factors influencing relationship between dividend issues and abnormal returns. However, it must be warn that data availability is far below expectation and probably consume much of the time spent.

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