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Test Statistics with Event-Induced Variance: Evidence from Stock Dividend

Chee-Pung Ng[1,2], Wei-Chong Choo[3], Amin Noordin Bany-Ariffin[4]* and Md Nasir Annuar[5]

[1]*Putra Business School, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[2]*Department of Finance, Faculty of Business and Finance, Universiti Tunku Abdul Rahman (Kampar Campus), Jalan Universiti, Bandar Barat, 31900 Kampar, Perak, Malaysia*
[3]*Department of Management and Marketing, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[4]*Department of Accounting and Finance, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[5]*School of Economics and Management, Xiamen University Malaysia, Jalan Sunsuria, Bandar Sunsuria, 43900 Sepang, Selangor, Malaysia*

ABSTRACT

Even though many researchers have found the problem of event-induced variance in event studies, they are tended to neglect these hazards by using conventional event-study methods, such as the Patell test. This test tends to reject the null hypothesis of zero average abnormal returns too often when it is true (higher type I error). In this study, we had implemented a more advanced event-study method, Boehmer, Mucumeci, and Poulsen (BMP) test, to remedy the issue of event-induced variance. Using stock dividend, the empirical findings demonstrated that the BMP test produced six significant abnormal returns from day 10 before the event to day 30 after the event while the Patell test generated 11 significant abnormal returns. In other words, the over-rejection rate in Patell test was 83.33%. At the same time, the level of significance in test values increased from 1%-5% in the Patell test to 5%-10% in the BMP test. A possible explanation for the two main findings might be due to the presence of event-induced variance. We found that the BMP test generated equally powerful tests as the null was false as well as suitable rejection rates as it was true. In addition, there has the impact of the stock dividend event on the Malaysia stock market returns. This paper provides an empirical comparison between

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E-mail addresses:
cpng101@hotmail.com (Chee-Pung Ng)
wcchoo@upm.edu.my (Wei-Chong Choo)
bany@upm.edu.my (Amin Noordin Bany-Ariffin)
annuar.nassir@xmu.edu.my (Md Nasir Annuar)
* Corresponding author

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conventional event-study methods and the BMP test to resolve event-induced variance in event studies.

Keywords: Abnormal return, BMP test, event-induced variance, Malaysia stock market, Patell test, stock dividend

INTRODUCTION

The event-study is an important tool in economics and finance analyses; it measures the impact of a financial event on company value. In other words, it is an analysis of whether there is a statistic significant reaction in capital markets to occurrences of a given type of event. Fama et al. (1969), who studied stock splits, had set up a new milestone in event studies. More specific, they inspected the effects of particular events on the distribution of stock returns. Brown and Warner (1980, 1985) claimed that conventional test statistics performed well when a particular event had the same effect on all companies. In addition, they warned that the variance of returns would increase and conventional test statistics might not work well when an event had differing effects on companies. This is because these researchers had advocated using daily data in 1985's paper instead of monthly data in 1980's paper. In 1985, they became pioneer researchers using simulations to verify their findings. In addition, the variance in returns amplifies significantly when particular events occur, as suggested by some scholars (Beaver, 1968; Boehmer et al., 1991; Christie, 1983; Collins & Dent, 1984; Dann, 1981; Ederington et al., 2015; Kalay & Loewenstein, 1985; Kothari & Warner, 2007; Patell & Wolfson, 1979; Rosenstein & Wyatt, 1990). For instance, the standard deviation of event-period is more than 3.5 times bigger than that of the estimation period through Dann's study in stock repurchases. Despite many researchers also found that the variance of returns does in fact increase at the time of significant events (Boehmer et al., 1991), some researchers still take risk to ignore these problems.

One of the conventional test statistics used in event-study is the Patell test, or the standardised residual test (Patell, 1976). The Patell test assumes that stock residuals are uncorrelated; hence, the event-induced variance is insignificant. The Patell test shows that when a particular event leads to even a slight increase in variance, the conventional method rejects the null hypothesis of zero average abnormal return too frequently when it is, in fact, true. In other words, the Patell test tends to produce high type I errors.

Some papers ignore estimation-period information on the variance of residuals with a stated assumption that the variance is invariant throughout the whole study. They instead use the cross-sectional variance in the event period to develop the test statistics. Boehmer et al. (1991) showed eight event studies that applied the cross-sectional method and documented both the estimation period and event-period cross-sectional standard deviations. These studies were based on the previous works (Charest, 1978; Dann, 1981; Mikkelson, 1981; Penman, 1982; Rosenstein & Wyatt,

1990) with several of the papers containing more than one event study. In these studies, the standard deviation in the event period is greater than in the estimation period.

Higgins and Peterson (1998) keenly argued that an increase in cross-sectional variance was induced by all events. They urged researchers and academicians to employ every test to evaluate the statistical significance of event-study abnormal returns and to take event-induced variance into account for estimations as well as adjustments. A variety of remedies to tackle the problem of event-induced variance has been documented in the event-study literature. Christie (1983) proposed that if multiple events were examined for each company, event-induced variance might be estimated. Although Christie successfully recognised the hazards of neglecting event-induced variance, researchers generally do not use the suggestions for dealing with event-induced variance because of data limitations. In addition, Ball and Torous (1988) simulated an event that increased the stock returns mean as well as variance by using the maximum likelihood estimation (MLE) method for stock return data. They simultaneously estimated event-period returns, the variance of these returns, and the probability of the event's occurrence for any given day during the event window. With the presence of abnormal returns, their simulations indicated that the MLE technique rejected the null hypothesis more frequently than the conventional method, while it did not reject the null too frequently when it was true.

Numerous events lead to changes in both risk and return for individual securities. Brown et al. (1988, 1989) showed that a temporary increase in the variance of the abnormal returns tended to be associated with a shift in the mean. Consequently, Boehmer et al. (1991) proposed a simple modification to the cross-sectional method which resulted in equally powerful tests when the null was false and appropriate rejection rates when it was true. Both the power and the size of the modified test unchanged when applied to portfolios subject to event-date clustering. This standardised cross-sectional test is also known as the Boehmer, Mucumeci and Poulsen (BMP) test. In fact, the BMP test is a hybrid of the Patell test and the ordinary cross-sectional method. Recently, the event-induced variance in Oman and Saudi Arabia stock markets has been highlighted (Selamat et al., 2015).

The BMP test is easy to apply and is a combination of Patell's (1976) standardised residual approach and the ordinary cross-sectional methodology as proposed by Penman (1982). A *t-test* dividing the mean event-period residual by its contemporaneous cross-sectional standard deviation is known as the ordinary cross-sectional method. According to Boehmer et al. (1991), the ordinary cross-sectional method varies from the Patell test as it does not consider event-induced variance to be insignificant. The drawback with this test is that if the event-period residuals for various companies are drawn from different distributions, the test will be misspecified (Boehmer et al., 1991). The BMP test integrates variance information from both the estimation and the event periods (Boehmer et al., 1991). Boehmer et al. (1991) simulated the occurrence of an event with stochastic effects on security returns to examine the robustness of their method compared to conventional methods. Unlike the generally used methods that neglect changes in variables, their test produces an appropriate rejection rate when the null is true but is equally powerful when the null is false. Thus, this study proposes to use the BMP test to examine abnormal returns of stock dividend in Malaysia listed companies; in this context, the stock dividend is more frequently known as the bonus share in Malaysia. Gupta and Reid (2013) examined the macroeconomic news in the event-study while this paper investigates the microeconomic news, especially financial events.

There are some literatures analysing the impact of stock dividend on abnormal returns such as Woolridge (1983a) who compared the theoretical opening price to actual opening price on the ex-dividend date and the result obtained supports the retained earnings hypothesis. In another study, by restricting the sample to non-cash dividend- paying companies, Woolridge (1983b) noted that investors interpreted the dividend as a signal from managers and the size of the stock dividend had an impact on the abnormal returns within the event period. Bhattacharya (1979) signaling framework was further extended by Dionne and Ouederni (2011), who added the possibility of hedging the future cash flow. Their results are supported by the theory of the positive relationship between information asymmetry and dividend policy. Recently, Chowdhury et al. (2014) had investigated the signaling and free cash flow hypotheses of dividends in an emerging financial market.

This paper intends to compare the performance of the BMP test and the conventional event test statistic (Patell test) when an event increases the variance of returns (event-induced variance). In addition, we provide empirical evidence on the impact/effect of stock dividend events on stock returns. The Malaysia stock market is chosen for this study because Malaysia is one of the Southeast Asian (SEA) 'tiger cub' stock market members. Furthermore, Heng and Niblock (2014) documented the current rapid growth in the Malaysia stock market. In 2011, the percentage of stock market capitalisation to gross domestic product (GDP) in Malaysia was beyond 100% (Asian Development Bank, 2013). After the subprime crisis, the swift recovery of the SEA tiger cub stock markets had captivated the global investment community. According to the ASEAN Secretariat (2012), the Association of Southeast Asian Nations (ASEAN) seeks to strengthen regional economic cooperation as well as financial market integration in the SEA region by 2015. The most obvious finding to emerge from the analysis is that the BMP test produces six significant abnormal returns whereas the Patell test produces 11 significant abnormal returns throughout event period. The results of this study show that the level of significance on test values increases from 1%-5% in the Patell test to 5%-10% in the BMP test. To our limited knowledge, our study offers the only empirical evidence of the ability of the BMP test specifically within the stock dividend event.

DATA AND METHOD

Event-study

For this study, the event study methodologies were employed to measure the impact of stock dividend on the returns of the underlying stocks. Therefore, this paper extracted information of chosen companies and years. By using cross-section data, this study quantified abnormal returns for event window surrounding the event dates of interest to investigate any patterns emerge from before, at, or after the event date (Batchelor & Orakcioglu, 2003). In this context, the event day was defined as the ex-date of stock dividend for selected companies. These approaches minimise concern on monitoring a great number of other influences which impacted on abnormal returns throughout the sample in the study (Batchelor & Orakcioglu, 2003). As a result, it was assumed that the stock dividends were the only significant determinant affecting all stocks in the days surrounding the events (Batchelor & Orakcioglu, 2003).

This paper used similar approach of Batchelor and Orakcioglu (2003) and 24 sample events of 20 large market capitalisation listed companies in the Malaysia stock market (Bursa Malaysia, formerly known as Kuala Lumpur Stock Exchange) in June 2012 were employed. To be included in the sample, each company had to have at least 20 daily returns in the estimation period (-30 through -11) with none absence of returns in the 41 days surrounding the event date (-10 through +30). The daily data cover 62,600 observations from January 1996 through December 2011; the data available on the Bursa Malaysia website have been used throughout this study. All the daily data of the Financial Times Stock Exchange (FTSE) Bursa Malaysia Composite Index and individual company share price were collected via Data Stream. The ex-date of stock dividend was obtained from the Bursa Malaysia website.

The individual stock return, R_{it} and market return are calculated before computing the abnormal return. The each price series *i* daily percentage log-return, $R_{it,}$ is calculated as follows:

$$R_{it} = 100.\ln(P_{it}//P_{it-1}) \quad (1)$$

where P_{it} and P_{it-1} are the (adjusted) closing prices of company *i* on days *t* and *t-1,* respectively.

The market return daily percentage log-return, R_{mt} is calculated as follows:

$$R_{mt} = 100.\ln(CI_t//CI_{t-1}) \quad (2)$$

Where CI_t and CI_{t-1} are the (adjusted) closing prices of FTSE Bursa Malaysia Composite Index.

The changes in the market value are well captured in the stock return. To operationalise the notion that the stock dividend effect is readily impounded into prices, the concept of the abnormal returns serves as the central key of event study methods. The market model with the risk-adjusted approach has been applied to compute the abnormal returns. This approach considers both the market-wide factors and the systematic risk of an individual share (Annuar & Shamsher, 1993). This model is estimated by comparing the daily stock return, or raw return (RR), with the market return, $R_{m,t}$. The difference between these returns is known as unexpected, abnormal returns or abnormal profits. This is one of the models most commonly used in the event-study. This model is believed to bypass many problems arising while applying the Capital Asset Pricing Model approach. Furthermore, this model is widely accepted by many researchers (Kim & Lee, 1990; Marsh, 1977; Tsangarakis, 1996). Here, the FTSE Bursa Malaysia Composite Index was used as a reference for average market returns. By running the five years rolling window ordinary least squares (OLS) on the individual share and market daily log return series, the abnormal return, $AR_{i,t}$ can be estimated as follows:

$$AR_{i,t} = R_{it} - (\alpha_i + \beta_i R_{mt}) \qquad (3)$$

where:

$AR_{i,t}$ = Abnormal return for stock *i* on day *t*

R_{it} = Stock return for stock *i* on day *t*

R_{mt} = Market return on day *t* estimated from the CI

$\alpha_i + \beta_i$ = Constant and coefficient of the linear relationship between the performance of the stock *i* and the performance of the market portfolio

In this study, day 0 was referred to as the ex-date (event date) of a stock dividend event for a given stock. The design of the event window (day -30 to day 30) in this study was similar to average event windows of prior studies (Akron, 2011; Asiri, 2014; Balachandran et al., 2005; Batchelor & Orakcioglu, 2003; Isa et al., 2011). For every sample of stock dividend events, a maximum of 61 daily abnormal returns observations was implied throughout this study. This was for the time around its event samples beginning at day -30 and ending at day -11 relative to the event. The estimation period was defined from the first 20 days (-30 through -11) and the subsequent 41 days (-10 through 30) was the event period. The terminologies related to event-study periods were expressed in the Figure 1.

Test Statistics

Two test statistics had been used in this paper to test for abnormal returns. First, the Patell test (Patell, 1976) is a conventional test statistic in event-study. Second, the BMP test (Boehmer et al., 1991) is an advanced test statistic to tackle the event-induced variance problem. Each test statistic is being explained and formally defined as follows.

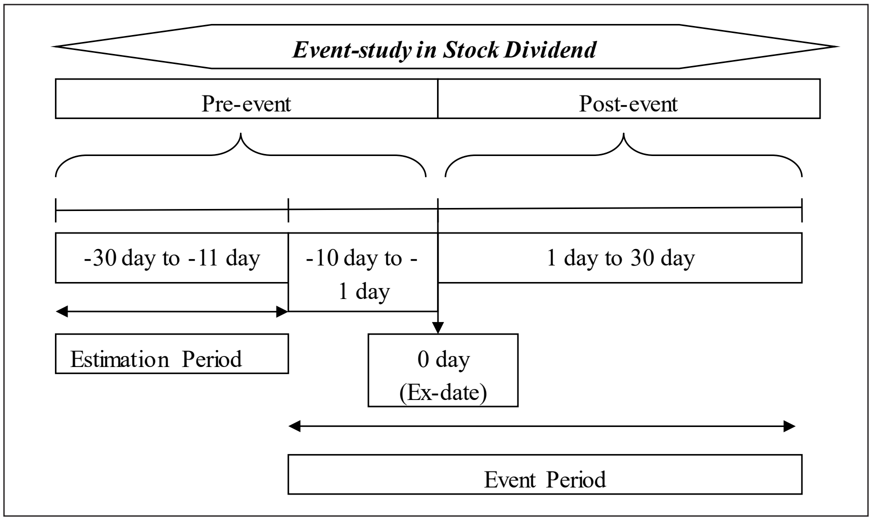

Figure 1. Research design of event-study in stock dividend

Like the conventional method, the Patell test assumes that stock residuals are uncorrelated so event-induced variance is insignificant. The Patell test standardises the residuals before forming portfolios. This standardisation has two objectives. First, the standardisation adjusts for the fact that the event-period residual is an out-of-sample forecast, so it has a higher standard deviation than an estimation-period residual [see, for example, Judge et al. (1988)]. Second, it permits for heteroscedastic event-day residuals and avoids having stock with huge variances dominate the test. The standardised residual equals the event-period residual divided by the standard deviation of the estimation-period residuals. This adjustment reflects the prediction error. The Patell test's advantages feature of inserting identical statistical weight on every stock-event date combination contributing to this test continues to be popular among financial researchers.

Before forming portfolios, the residuals have been normalised through the Patell test. The formula of the Patell test, t_p is calculated as follows:

$$t_P = \sum_{i=1}^{N} SR_{iE} \Bigg/ \sqrt{\sum_{i=1}^{N} T_i - 2/T_i - 4} \quad (4)$$

where:

N = Number of days in stock i's estimation period (the subscript i is omitted as there is no potential confusion)

T_i = Number of days in stock i's estimation period (the subscript i is omitted as there is no potential confusion)

SR_{iE} = Stock i's standardised residual on the event day

$$A_{iE} \Big/ \hat{s}_i \sqrt{1 + \frac{1}{T_i} + \frac{(R_{mE} - \bar{R}_m)^2}{\sum_{t=1}^{T_i} (R_{mt} - \bar{R}_m)^2}}$$

where:

A_{iE} = Stock i's abnormal return in the event day

$\hat{s}_i$ = Stock i's estimated standard deviation of abnormal returns in the estimation period

R_{mE} = Market return in the event day

$\bar{R}_m$ = Mean market return in the estimation period

R_{mt} = Market return on day t

The BMP test is a hybrid of the Patell test and the ordinary cross-sectional method. The misspecification issue of the ordinary cross-sectional test has been well addressed by the BMP test (Boehmer et al., 1991). The BMP test is analogous to the test statistic developed by Ball and Torous (1988) though Boehmer et al. (1991) considered a few different studies of event-induced variance and evaluated their estimator against most of the standard methodologies.

The BMP test has two important steps. The first is to standardise the residuals by the estimation-period standard deviation, also known as adjusting for the forecast error. In the second step, to standardise residuals, the ordinary cross-sectional method is to be used. Similar to the ordinary cross-sectional test, this test tolerates changes in event-induced variance. Furthermore, this method integrates information from the estimation period. This might contribute to improve its power and efficiency. This test obliges the stock residuals to be cross-sectionally uncorrelated.

In the BMP test, first the standardised residuals are calculated as in the Patell test. Next, the ordinary cross-sectional approach described is implemented. The detail of the BMP test can be found in the Boehmer et al. (1991). The BMP test, t_{bmp}, is as follows:

$$t_{BMP} = \frac{1}{N}\sum_{i=1}^{N} SR_{iE} \Bigg/ \sqrt{\frac{1}{N(N-1)}\sum_{i=1}^{N}\left(SR_{iE} - \sum_{i=1}^{N} SR_{iE}\Big/N\right)^2} \qquad (5)$$

DATA ANALYSIS AND DISCUSSIONS

Table 1 reports the average abnormal returns, accumulative average abnormal returns and analysis results of the Patell test and BMP test. The number of stock dividend event samples is 24. At 10%, 5% and 1% significance levels, the critical values of both the Patell and BMP test statistics are ±1.71, ±2.07 and ±2.81, respectively.

From the results of the Patell test in Table 1, we can see that the average abnormal returns before the stock dividend event day, days -10, -6 and -1, are 0.34%, 0.36% and 0.46% and their respective values in the Patell test statistic are 2.93, 1.81 and 2.58, which are significantly different from zero average abnormal return at the 1%, 10% and 5% levels, respectively. By looking at the average abnormal returns after the stock dividend event day, days 1, 11 and 18 are

Table 1
Patell and BMP Tests for abnormal returns around stock dividend event

Days relative to event day (0)	Average Abnormal Returns	Average Cumulative Abnormal Returns	Patell Test		BMP Test	
-10	0.34	0.34	2.93	***	2.56	**
-9	0.13	0.48	-0.14		-0.06	
-8	0.21	0.68	1.00		0.76	
-7	0.30	0.98	1.48		2.04	*
-6	0.36	1.34	1.81	*	2.39	**
-5	0.39	1.73	1.38		0.61	
-4	-0.01	1.72	0.09		0.26	
-3	-0.20	1.52	0.45		-0.19	
-2	-0.10	1.42	-0.64		-1.02	
-1	0.46	1.88	2.58	**	1.35	
0	-0.03	1.85	-0.93		-0.67	
1	0.23	2.08	1.83	*	0.19	
2	-0.14	1.94	-2.26	**	-0.98	
3	-0.66	1.28	-2.15	**	-1.92	*
4	0.00	1.28	-1.09		-0.64	
5	-0.42	0.86	-1.34		-0.43	
6	0.32	1.18	1.16		0.37	
7	-0.51	0.67	-2.53	**	-2.33	**
8	-0.33	0.34	-2.11	**	-0.89	
9	-0.02	0.32	-0.17		-0.22	
10	-0.02	0.30	-0.42		-1.12	
11	0.30	0.59	2.23	**	2.00	*
12	-0.06	0.53	-0.87		-0.93	
13	-0.42	0.11	-2.58	**	-1.13	
14	0.07	0.18	-1.00		-0.33	
15	-0.09	0.09	-1.65		-0.87	
16	0.15	0.24	0.99		0.33	
17	0.37	0.62	1.61		0.46	
18	0.20	0.82	2.12	**	0.99	
19	0.19	1.01	-0.18		0.24	
20	0.11	1.12	0.97		0.64	
21	-0.09	1.03	-0.44		0.22	
22	0.20	1.22	1.14		0.92	
23	0.01	1.23	0.64		0.69	
24	-0.24	0.99	-1.47		-1.22	

Table 1 *(continue)*

Days relative to event day (0)	Average Abnormal Returns	Average Cumulative Abnormal Returns	Patell Test	BMP Test
25	0.06	1.05	-0.06	-0.07
26	-0.03	1.02	0.58	-0.40
27	0.10	1.12	1.35	1.55
28	-0.46	0.66	-1.51	-1.01
29	0.06	0.72	1.52	0.86
30	-0.03	0.69	0.76	0.30

Note: The symbols *, **, and *** show statistical significance at the 10%, 5%, and 1% level, respectively.

0.23%, 0.30% and 0.20%. Their respective values of Patell test statistics are 1.83, 2.22 and 2.12, which are significant at the 10% and 5% levels, respectively. However, there are also negative average abnormal returns on days 2, 3, 7, 8 and 13 with their respective values -0.14%, -0.66%, -0.51%, -0.33% and -0.42%. Their respective Patell test statistics are -2.26, -2.15, -2.53, -2.11 and -2.58, which are all significant at the 5% level. The summary of the findings of Patell test has been illustrated in Figure 2 for a clearer picture.

According to the BMP test results shown in Table 1, the average abnormal returns before the stock dividend event day, days -10, -7 and -6, are 0.34%, 0.30% and 0.36% and their respective values of the BMP test statistic are 2.56, 2.04 and 2.39, which are significantly different from the zero average abnormal return at the 5%, 10% and 5% levels, respectively. By looking at the average abnormal returns after the stock dividend event day, only one day, which is day 11, has a 0.30% positive return. Its respective value of the BMP test

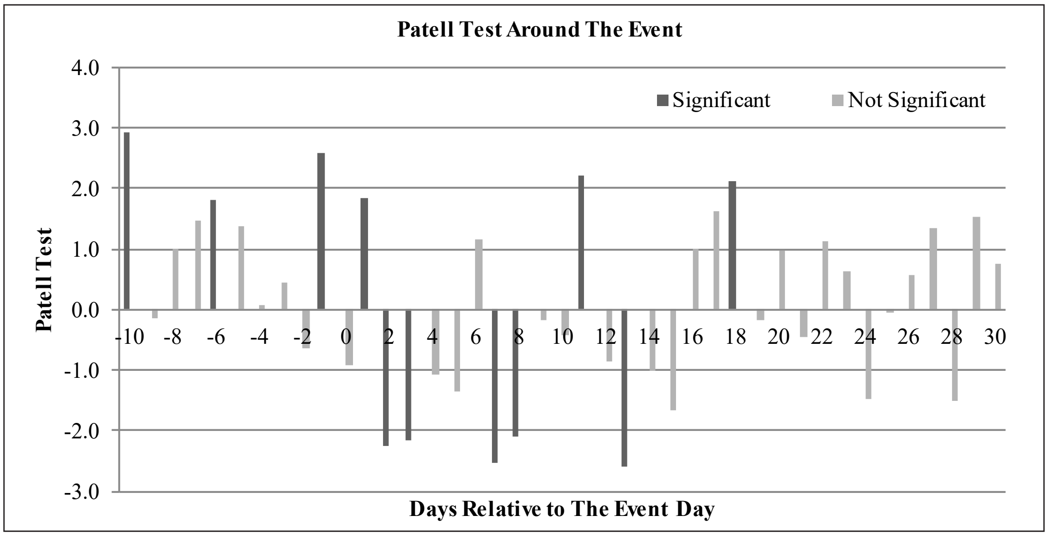

Figure 2. The Patell test around the event

statistics is 2.00, which is significant at the 10% level. However, we also find negative average abnormal returns on days 3 and 7, with their respective values of -0.66 and -0.51%. Their respective BMP test statistics are -1.92 and -2.33, which are significant at the 5% and 10% levels, respectively. Similarly, the summary of the findings of the BMP test is presented in the Figure 3 for better understanding of the abnormal returns.

Note that before the stock dividend event day, the Patell test and BMP test have the similar number of three significant abnormal return days. On day -10, *t*-values drop from the Patell test (2.93 at the 1% significance level) to the BMP test (2.56 at the 5% significance level). We also find a change of *t*-values in the Patell test from 2.58 at the 5% significance level to 1.35 that is insignificant in the BMP test on day -1. On the other hand, on day -7, the insignificant value of 1.48 of the Patell test has changed to a significant value of 2.04 in the BMP test at the 5% level. Similarly, on day -6, the value of 1.81 in the Patell test with a 10% significance level has changed to 2.39 in the BMP test, which is significant at the 5% significance level.

On the other hand, after the event day, we note that the number of significant abnormal return days in the Patell test has dropped from eight to three in the BMP test. Only on day 7 do both the Patell and the BMP tests show an abnormal return significantly different from zero at the 5% level, with *t*-values changing from -2.53 to -2.33. On days 3 and 11, the level of significance changes from 5% in the Patell test to 10% in the BMP test with *t*-values changing from -2.53 to -1.92 with the negative abnormal return and from 2.23 to 2.00 with the positive abnormal return, respectively. We also find that the significant values of the Patell test on days 1, 2, 8, 13 and 18 at the 10% and 5% significance level, respectively have become insignificant under the BMP test.

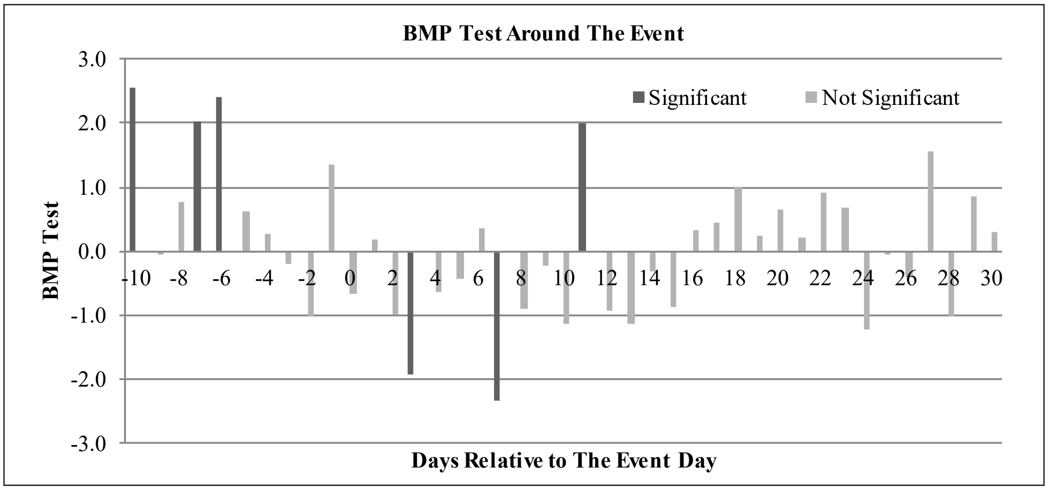

Figure 3. The BMP test around the event

Based on the results shown in Table 1, generally, the number of significant abnormal returns has decreased from 11 in the Patell test to six in the BMP test. To put it in another way, the over-rejection rate under Patell test is 83.33%. Specifically, these changes are reflected on the abnormal returns on days -1, 1, 2, 8, 13 and 18. In general, we also find that the level of significance for test values has increased from 1%-5% in the Patell test to 5%-10% in the BMP test. A possible explanation for an over-rejection rate in number of significance abnormal returns days and increasing level of significance might be the presence of event-induced variance in the stock dividend event. This finding is similar with the simulation result from Boehmer et al. (1991), where they claimed that the underestimation of event-period variance led the null hypothesis to be rejected too often as there was no average abnormal return. The BMP test offers an appropriate rejection rate when the null is true but is equally powerful when the null is false. Hence, the BMP test successfully resolves the tendency to over-reject the null hypothesis in the conventional methods. To our limited knowledge, our study provides the only empirical evidence of the BMP test's ability to overcome event-induced variance problems, especially within the stock dividend event.

From the BMP test, there are some evidences from the sample to suggest that there is the presence of average abnormal returns in stock dividend. In other words, the null hypothesis of zero average abnormal return is rejected which is consistent with finding of Woolridge (1983b). Although Aktas et al. (2004) employed the BMP test in the European Regulation of Business Combinations event, they did not compare between conventional statistical tests and the BMP test. The BMP test was also applied by Isa and Lee (2014) to investigate stock repurchase. However, they did not provide complete justification for employing the BMP test. As a result, this paper contributes to the explanation of event-induced variance problems. In addition, it offers an empirical study and thorough evaluation of the BMP test compared with the Patell test, especially with respect to the significance level and reduction type I error.

According to Table 1 and Figure 4, the optimum average cumulative abnormal return of the stock dividend event is on day 1 at 2.08. Based on this result, in general, if an investor buys 20 the largest market capitalisation stocks (same sample size in this study) in their portfolio on day -10 of the stock dividend event, that investor earns the maximum abnormal returns by holding that particular stock portfolio and selling on day 1 at 2.08%. The graph pattern in Figure 4 is similar to the study of Batchelor and Orakcioglu (2003). Stock dividend functions as an effective device in signaling. As a consequence, this alleviates the predicament of asymmetric information. In the presence of asymmetric information between market participants and companies, any evidence on information content would aid companies to disentangle asymmetric information issue. This study helps market participants by making them aware of the information that are being signaled through stock dividend.

The information in Table 1 and Figure 4 aids the public in forming investment timing strategy. This is in line with Xiang and Yang (2015), who stated that investment timing played a critical role in the capital structure. This is empirical evidence for all retail and institutional investors, fund managers, corporate finance policy makers, top-level managers of listed companies and others to consider in their strategic planning and decision making.

Overall, this section has covered the findings of the Patell test and BMP test. We also discuss the comparison between the Patell test and BMP test in terms of average abnormal returns. The BMP test outperforms the Patell test. Hence, we propose that under the uncertainty regarding the existence of event-induced variance, the better choice is to employ the BMP test so that the investors will not over-react due to over-rejection in conventional statistical tests, such as the Patell test.

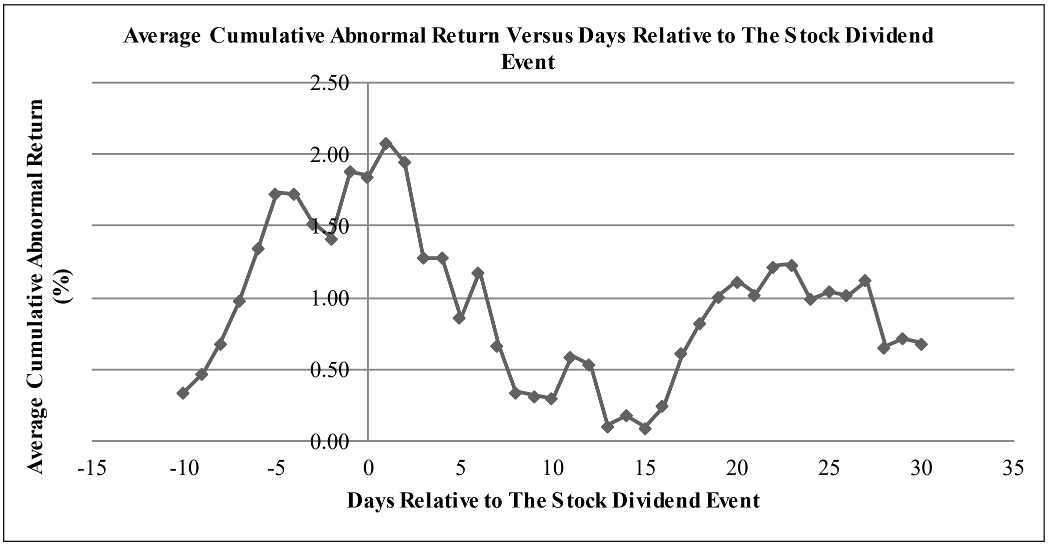

Figure 4. Average cumulative abnormal return versus days relative to the stock dividend event

CONCLUSION

Many events increase the variance of event-period returns (event-induced variance), especially for individual stocks, as discussed in the introduction. A temporary increase in the variance tends to be associated with a shift in the mean of the abnormal returns. Conventional event-study test statistics, such as the Patell test (1976), do not take into account the event-induced variance in event studies. Specifically, the test statistics reject the null hypothesis of zero mean abnormal return too often when it is true. In other words, higher type I errors will result from using these methods (Boehmer et al., 1991). We mention that to remedy the issue of event-induced variance, by which Boehmer et al. (1991) proposed a more advanced event-study test statistic, the BMP test, which is a hybrid of the Patell test and the ordinary cross-sectional method. Via a simulation and comparison between conventional test statistics and BMP test study, Boehmer et al. (1991) found that BMP results in an equally powerful test when the null was false and an appropriate rejection rate when it was true. Moreover, some studies (Aktas et al., 2004; Isa & Lee, 2014; Krüger, 2015) used BMP test to conduct event studies. Both the power and the size of BMP unchanged when applied to portfolios subject to event-date clustering. In this paper, we have used the daily stock prices from 20 listed companies (with the largest market capitalisation on June 2012) in the Malaysia stock market. These data series span 16 years from January 1996 through December 2011, as presented in the data and methodology section.

According to the BMP test, there is an impact of the stock dividend event on the average abnormal returns, as pointed out in the data analysis and findings. We compared the performance of the BMP test against the Patell test. From the empirical results, we found that the number of rejections in null hypotheses is more in the Patell test than in the BMP test. Hence, the Patell test exhibits 83.33% over-rejection. This over-rejection rate of null hypotheses might be due to the existence of event-induced variance. In other words, the BMP test is better than the conventional event-study method that applies the Patell test. Hence, when we do not know whether any event-induced variance exists in the stock returns, we propose using the BMP test. This empirical evidence is similar to the simulation results of Boehmer et al. (1991). For future research, we suggest to employ the in other events such as hybrid stock, Basel III, and air crash MH370, tax changes on dividends and capital markets, which extend the work of earlier researchers (Chia et al., 2015; Maros & Nasharudin, 2016; Rahim & Rahman, 2015; Selamat et al., 2012, 2015). In addition, more information on updated daily data of Malaysia stock market and other regional stock markets would help us to establish a greater degree of accuracy on BMP test. It would be interesting to compare with other models to estimate abnormal returns in investigating inefficiency conventional event-study methodologies. To our limited knowledge, our study provides the only empirical evidence of the BMP test's ability to overcome the event-induced variance issues with respect to the impact of stock dividend events on stock market returns from a developing nation.

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