IJEM
International Journal of Economics and Management
Journal homepage: http://www.ijem.upm.edu.my

Contemporary Event Study Test: Event-Induced Variance and Cross Correlation Among Abnormal Returns in Dividend

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ABSTRACT

Although many literatures related to event studies have reported the problem of event-induced variance and cross correlation among abnormal returns, a lot of researchers still employ conventional event-study methods which tend to reject the null hypothesis of zero average abnormal returns too frequent when it is true (higher type I error). In this paper, we applied a more advanced event-study method, namely the adjusted Boehmer, Mucumeci, and Poulsen (Adj-BMP) test, to provide a remedy to the issue of event-induced variance and cross correlation among abnormal returns. Using cash dividend increase to evaluate a battery of both statistical tests, the empirical results found the presence of the cross-correlation among abnormal returns. Consequently, the Adj-BMP test produces four significant abnormal returns from day 10 before the event to day 30 after the event while the BMP test generates eight significant abnormal returns. The BMP test exhibits 100% over-rejection of null hypothesis. At the same time, the level of significance has been decreased from 5% to 1% in the BMP test to 10% to 5% in the Adj-BMP test. Thus, we show that the Adj-BMP test is a robust test in presence of cross correlation among abnormal returns. According to the Adj-BMP test, this study found that there is an impact of cash dividend increase events on the average abnormal returns. This study makes a major contribution to research on providing an empirical comparison between BMP test and Adj-BMP test to resolve event-induced variance and cross correlation among abnormal returns in event studies of emerging market.

JEL Classification: M42, M41

Keywords: Abnormal return; Adj-BMP test; Cross correlation; Cash dividend increase; Event-induced variance

Article history:
Received: 8 June 2018
Accepted: 21 November 2018

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INTRODUCTION

It is well known that 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 statistically significant reaction in financial markets to occurrences of a given type of event. Informational efficiency requires that markets to absorb the news into prices in anticipation of the event outcomes

The new milestone in event studies is the landmark seminar paper by Fama et al. (1969). After their research, event-study has since become ubiquitous in capital markets research. However, the paper of Fama et al. (1969) provided only the value of abnormal returns. Later, some researchers improve this research area by adding in test statistics elements to examine the significance of abnormal returns. However, these test statistics fail to take the event-induced variance and cross-sectional correlation into account which is common in the event-study case. For instance, Brown and Warner (1985) advise that the variance of returns will increase lead to the conventional test statistics might not perform well when an event has differing effects on companies. Therefore, type I error might occur.

Boehmer et al. (1991) introduce Boehmer, Mucumeci and Poulsen (BMP) test, which is also known as the standardised cross-sectional test. This test is modified from the cross-sectional method. In fact, it is a hybrid of the Patell test and the ordinary cross-sectional method. BMP test results in equally powerful tests when the null is false and appropriate rejection rates when it is true. After two decades, Kolari and Pynnönen (2010) challenge the testability of the BMP test by voicing up the issue of cross-sectional correlation among abnormal return when the event day is the same for sample companies in event-study. They illustrate that when a specific event has slightly cross-correlation, the test statistics will reject the null hypothesis of zero average abnormal return too regularly when it is true. In other words, event-date clustering causes type I error. In order to solve this challenging issue, Kolari and Pynnönen (2010) recommend a more robust new test statistic that is the Adjusted Boehmer, Mucumeci and Poulsen (Adj-BMP) test. This test takes cross-correlation and inflation of event-date variance into account in improving the power of test statistics. Their simulation findings show that the Adj-BMP test is the sole parametric method robust to these event-date clustering problem.

There is a few researches about cross-correlation and event-induced variance. Realising the gap in the extant literature, more research is needed for these areas. To our knowledge, no research has been carried out to compare the performance of the Adj-BMP test over the BMP test in the case of an event cross-correlation and increasing in the variance of the returns (event-induced variance). To address these gaps, this paper intends to provide empirical evidence on the impact/effect of cash dividend increase event on the stock returns by comparing findings of Adj-BMP test over the BMP test. At the same time, we demonstrated that Adj-BMP test mitigates the issue of tends to over rejecting the null hypothesis in the BMP test. To our knowledge, this study offers the only empirical evidence of the ability of the Adj-BMP test to resolve the event-induced variance and cross correlation among abnormal returns problems.

This study selects the Malaysian stock market because Malaysia is one of the Southeast Asian (SEA) 'tiger cub' stock markets members. Malaysia is also is defined as one of the emerging market. In addition, Heng and Niblock (2014) report that Malaysian stock market has recently grown rapidly. The most obvious finding to emerge from the analysis of the cash dividend increase is the existence of the cross-correlation among abnormal returns. Thus, the findings of this study show from day 10 before the event to day 30 after the event through Adj-BMP test produces four significant abnormal returns as the BMP test produces eight significant abnormal returns. The results of this study show the level of significance has been reduced from 1-5% in the BMP test to 5-10% in the Adj-BMP test. To our limited knowledge, our study offers the only empirical evidence of the ability of Adj-BMP test particularly within the cash dividend increase event.

In the following section, we review the literature on the issues of event-induced variance and cross correlation among abnormal returns in event-study methodology as well as summarise remedies suggested by researchers. We also introduce advance test statistics in data and methodology. We illustrate how this advanced test can be used in the event-study, especially the cash dividend increase event on the Malaysian stock market returns. As for data analysis and findings, we use 20 large market capitalisation listed firms in Malaysian stock market to compare the performance of this test statistic to a conventional test statistic. The conclusion section provides summary and concluding comments.

LITERATURE REVIEW

The relationship between dividend and stock abnormal return is one of the mainstream researches on the event study. Many researchers examine the effect of dividend changes in abnormal return, and one of them is Pettit (1972). He documents that dividend increase is followed by significant abnormal return increment of the 0.935%. His study reveals that substantial information is conveyed by the dividend changes and the market is efficient in incorporating information into abnormal return. Meanwhile, Woolridge (1983) compares the theoretical opening price to that of actual opening price on the ex-dividend date. Their finding supports the retained earnings hypothesis.

Cheng and Leung (2006) conclude that the signals from dividend and earnings are evaluated simultaneously and these two are dependent on each other in the eyes of shareholders. Yilmaz and Gulay (2006) examine the impact of the cash dividend payment on stock return and trading volume for the companies listed under Istanbul Stock Market. They report that the abnormal return increases before the cash dividend payments, and on the ex-dividend date, it falls less than dividend payment and eventually decrease in the session after the payment. Thus, there is a significant signalling effect of cash dividend on the abnormal return. In the Malaysian context, Norhayati et al. (2006) conclude that abnormal return is significantly positive (negative) corresponding to the dividend increase (decrease) in Malaysian stock market.

The signalling framework of Bhattacharya (1979) is further extended by Dionne and Ouederni (2011) through adding the possibility of hedging the future cash flow. Their results are supported by the theory of the positive relation between information asymmetry and dividend policy. In the United States stock market, the dividend triggers abnormal returns (Acker and Duck, 2013). Recently, the study argues that there is a relationship between past stock returns and dividend changes (De Cesari and Huang-Meier, 2015).

The event-study tests are well specified as well as reasonably powerful (Brown and Warner, 1985, Brown and Warner, 1980). However, they observe the potential testing problems made by an event-induced increase in variance (1985, pp. 22-25). Hence, they argue that when the variance is underestimated, the test statistic will tend to produce high type I errors. Moreover, few studies like Beaver (1968), Patell and Wolfson (1979), Dann (1981), Christie (1983), Kalay and Loewenstein (1985), Rosenstein and Wyatt (1990) have attempted to explain the variance of returns amplifies significantly when particular events happens. Based on the studies of the Charest (1978), Dann (1981), Mikkelson (1981), Penman (1982) and Rosenstein Wyatt (1990) which have more than one event study, Boehmer et al. (1991) report that these early studies have the standard deviation in the event period which is greater than in the estimation period.

Generally, the events induce an increase in cross-sectional variance (Higgins and Peterson, 1998). They urge the scholars to raise concerns about event-induced variance in estimation and the adjustments for every test being used in the analysis statistical significance of the event-study abnormal returns. Fortunately, the event-study literature offers remedies to tackle the challenging issue of event-induced variance. For instance, event-induced variance may be estimated when multiple events are investigated for each company as suggested by Christie (1983). However, researchers commonly do not adopt this method due to the data limitations. Later, Ball and Torous (1988) simulate an event that increases the stock returns mean as well as variance by using the maximum likelihood estimation (MLE) method to stock return data.

The BMP is a combination of Patell's (1976) standardised residual approach and the ordinary cross-sectional methodology suggested by Penman (1982). The BMP test integrates variance information from both the estimation as well as the event periods (Boehmer et al., 1991). The BMP test is very much related to the unique study of Ball and Torous' (1988) estimator in which there is no event-day uncertainty.

Several studies such as Collins and Dent (1984), Bernard (1987), Salinger (1992), Aktas et al. (2004), Kothari and Warner (2007) reveal that when the contemporaneous correlations in event-date clustered analyses of returns is neglected, the downward bias in the standard deviation might occur. Thus, the *t*-statistic is overstated, which causes the over-rejection of the null hypothesis. This is known as the type-I error.

Kolari and Pynnönen (2010) provide in-depth analysis of the work of parametric tests in the event-study. They discuss the parametric tests which refer to the scaled abnormal returns approaches that have been analysed to be superior in terms of the power over the non-scaled returns which are relevant to the current study. The scaled (standardised) abnormal returns are defined as the abnormal returns divided by the standard deviation of estimation period residuals adjusted by the prediction error. The *t*-statistics developed by Patell (1976) as well as Boehmer et al. (1991) are commonly used in the scaled tests. Later, the BMP test has been modified by

Savickas (2003) through scaling the abnormal returns under conditional standard deviations estimated by a generalised autoregressive conditional heteroscedasticity (GARCH) model. The BMP test attempts to solve the issues of the potential event-induced volatility, and potential return autocorrelation (Kolari and Pynnönen, 2010). These show the BMP test is superior than the Patell test. It is good to study the event-induced variance topic because Collins and Dent (1984), Brown and Warner (1980, 1985), Kothari and Warner (2007), and Harrington and Shrider (2007) conclude that the cross-sectional variation in the effects of events constantly generate event-induced variance.

Kolari and Pynnönen (2010) trace the development of the alternatives to resolve the cross-correlation and event-induced variance. They infer numerous event studies from previous studies that put effort to regulate for event-induced variance as well as cross-correlation. However, they keep away from efficient scaled tests due to the cross-correlation effect. Hence, Kolari and Pynnönen (2010) extend the work of the Boehmer, Masumeci, and Poulsen. Finally, Kolari and Pynnönen develop Adj-BMP test. Unlike the generally used methods, that neglect the cross-correlation and event-induced variance, their test in the simulation produces appropriate rejection rate as the null is true and yet is equally powerful as the null is false. Thus, this study proposes to use Adj-BMP test in examine abnormal return of cash dividend increase in Malaysian listed companies.

DATA AND METHODOLOGY

Event-Study

The event-study methodologies of this study were applied in the emerging market. Following the research of the Batchelor and Orakcioglu (2003), 286 cash dividend increase events in this study of 20 large market capitalisation listed companies in the Malaysian stock market (Bursa Malaysia, formerly known as Kuala Lumpur Stock Exchange) in June 2012 are employed. The cash dividend increase events are defined as whenever there is increasing amount of cash dividend during this year compared with last year. To be included in the sample, each company is required to be having at least 20 daily returns in the estimation period (-30 through -11) and no absence of returns in the 41 days surrounding the event date (-10 through +30). The daily data cover 78,260 observations from January 1996 through December 2014; the data available on the Bursa Malaysia website have been used throughout this study. All the daily data of the FTSE Bursa Malaysia Composite Index and individual company share price are collected via Data Stream. The ex-date of cash dividend is obtained from the Bursa Malaysia website.

The each price series *i* daily percentage log-return, $R_{it,}$ is calculated as follows:

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

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

The market model with the risk-adjusted approach has been applied to compute the abnormal return. This method considers both the market-wide factors and the systematic risk of an individual share (Annuar and 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. Here, the FTSE Bursa Malaysia Composite Index is used as a reference for average market returns. This index includes a minor basket of 30 stocks. 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:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t}) \tag{2}$$

Where $AR_{i,t}$ = Abnormal return for stock *i* on day *t*;
$R_{m,t}$ = Market return on day *t* estimated from the FTSE Bursa Malaysia Composite Index (CI)
= $100.ln(CI_t/CI_{t-1})$

Day 0 is referred as the ex-date (event date) of a cash dividend increase event in a given stock. For each cash dividend increase event in this paper, a maximum of 61 daily abnormal return observations is implied throughout this study. This is for the time around its event in this study beginning at -30 day and ending at -11 day relative to the event. The estimation period is defined from the first 20 days (-30 through -11), and the subsequent 41 days (-10 through 30) is the event period. The terminologies related to event-study periods are expressed in Fig.

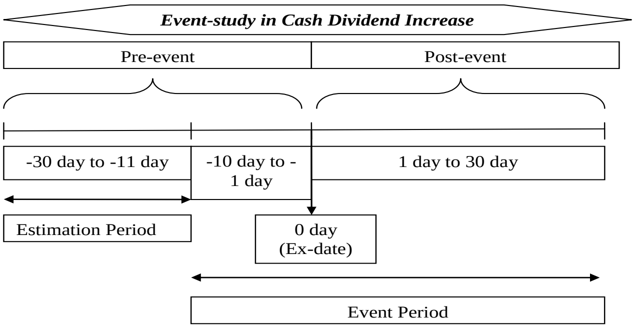

Figure 1 Research design of Event-study in cash dividend increase

Statistical Test

This study uses two test statistics to test for abnormal returns in the cash dividend increase. First, the BMP test (Boehmer et al., 1991), and the second is Adj-BMP test which is an advanced test statistic to tackle the cross-correlation and event-induced variance issue. Each test statistic is explained and their formula defined below.

The BMP Test

Boehmer et al. (1991) state that there are two solutions for the event-induced variance which are an ordinary cross-sectional test and a sign test in conjunction with a parametric test. The BMP test is a hybrid of Patell test and the ordinary cross-sectional method. The misspecification issue of the ordinary cross-sectional test has been well addressed by BMP test (Boehmer et al., 1991). There are two important steps in the BMP test. The first step standardises the residuals by the estimation-period standard deviation which is also known as adjusted for the forecast error. The second step, in order to standardise residuals, the ordinary cross-sectional method is used. Similar to the ordinary cross-sectional test, this test tolerates event-induced variance changing. Furthermore, this method integrates information from the estimation period. This might contribute to improve its power and efficiency. This test obliges the stock residuals be cross-sectionally uncorrelated.

In the BMP test, first, the standardised residuals are calculated as performed by Patell. Next, the ordinary cross-sectional approach described is implemented. The BMP test t_{bmp} is shown as follows:

$$t_{BMP} = \frac{1}{N}\sum_{i=1}^{N} SR_{iE} \Bigg/ \sqrt{\frac{1}{N(N-1)}\sum_{i=1}^{N}\left(SR_{iE} - \sum_{i=1}^{N} SR_{iE} \Big/ N\right)^2} \quad (3)$$

Where N = Number of events in the sample

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

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

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 Adj-BMP Test

The ignoring cross-sectional correlation in event studies tends to understate variance as well as upwardly bias rejection rates of test statistics as explained in the literature review. In other words, the BMP test commits to type I error. Hence, the more powerful test statistic like the Adj-BMP test is required in high demand.

Kolari and Pynnönen (2010) refer to the Section 4.3 of the Campbell et al. (1997) in forthcoming theoretical derivations for making the conventional assumption that asset returns r_{1t} , r_{2t} , . . . , r_{nt} of n companies for calendar time period t are serially independently multivariate normally distributed random variables with constant average as well as constant covariance matrix for every t. This paper takes into the account the issue induced by cross-correlation in the straightforward setting of testing for zero-average abnormal returns with a t-ratio on an individual common event day. The Section 2 of the Kolari and Pynnönen (2010) explains in detail the approach to resolve cross-sectional correlation among the abnormal return in theoretical derivations.

The Adj-BMP test takes both cross-correlation and event-induce variance into consideration. The simulation results of the Kolari and Pynnönen (2010) show that the Adj-BMP test is equally powerful tests when there is none average abnormal return is false and proper rejection rates when it is true. Actually, the Adj-BMP test is a modification test from BMP test. The Adj-BMP test t_{AB} is shown as follow,

$$t_{AB} = t_{BMP}\sqrt{\frac{1-\bar{r}}{1+(n-1)\bar{r}}} \quad (4)$$

where $\bar{r}$ = Average of the sample cross-correlations in the estimation-period residuals

When the mean abnormal return cross-correlation is zero, the Adj-BMP test yields the equivalent results with BMP test even if the event days are clustered with cross-correlated abnormal returns. As a result, the Adj-BMP test improves the BMP test.

DATA ANALYSIS AND FINDINGS

Table 1 presents the average abnormal returns, cumulative average abnormal returns and analysis results of the BMP test and Adj-BMP test. The number of cash dividend increase event in this study is 286. At 10%, 5% and 1% significance levels, the critical values of both the BMP test and Adj-BMP test statistics are ±1.66, ±1.98 and ±2.63, respectively.

Table 1 BMP test and Adj-BMP test around cash dividend increase event

Days relative to event day	Average Abnormal Return (%)	Average Cumulative Abnormal Return (%)	BMP Test		Adj-BMP Test	
-10	0.07	0.07	0.71		0.50	
-9	0.05	0.12	1.71	*	1.22	
-8	0.16	0.28	1.30		0.92	
-7	0.27	0.55	3.71	***	2.64	***
-6	0.02	0.57	0.71		0.50	
-5	0.20	0.77	2.20	**	1.56	
-4	-0.10	0.68	-0.57		-0.40	
-3	0.12	0.79	2.81	***	1.99	**
-2	0.06	0.86	0.71		0.50	
-1	0.12	0.97	1.30		0.92	
0	-1.20	-0.22	-10.19	***	-7.24	***
1	0.04	-0.19	0.27		0.19	
2	-0.09	-0.28	-0.50		-0.35	
3	0.07	-0.21	0.93		0.66	
4	-0.02	-0.23	-0.62		-0.44	
5	0.05	-0.18	0.66		0.47	
6	-0.12	-0.30	-1.29		-0.92	
7	-0.02	-0.32	0.26		0.18	
8	0.00	-0.32	-0.86		-0.61	
9	0.01	-0.32	0.22		0.16	
10	-0.11	-0.42	-1.06		-0.76	
11	-0.06	-0.48	-1.31		-0.93	
12	-0.22	-0.70	-2.09	**	-1.48	
13	-0.06	-0.77	-0.72		-0.51	
14	0.01	-0.76	0.18		0.13	

Table 2 Cont.

15	0.05	-0.71	1.23		0.87	
16	-0.11	-0.82	-0.69		-0.49	
17	0.14	-0.68	1.79	*	1.27	
18	-0.04	-0.72	-1.36		-0.97	
19	-0.01	-0.74	0.75		0.53	
20	0.05	-0.69	0.10		0.07	
21	0.06	-0.63	0.73		0.52	
22	0.02	-0.61	0.19		0.14	
23	-0.08	-0.69	-0.71		-0.51	
24	-0.20	-0.89	-2.96	***	-2.10	**
25	0.05	-0.84	0.16		0.11	
26	0.05	-0.80	0.83		0.59	
27	-0.05	-0.85	-0.70		-0.50	
28	-0.03	-0.87	-0.89		-0.63	
29	0.02	-0.85	0.14		0.10	
30	-0.07	-0.92	-0.31		-0.22	

*, **, and *** show statistical significance at the 10%, 5%, and 1% level, respectively.
Average cross-correlation among abnormal returns = 0.003

From the data in of the BMP test in Table 1, we can see that the average abnormal return before the cash dividend increase event day, days -9, -7, -5 and -3, are 0.05%, 0.27%, 0.20% and 0.12% and their respective values in the BMP test statistic are 1.71, 3.71, 2.20 and 2.81, which are significantly different from zero average abnormal return at the 1%, 10% and 5% levels, respectively. There is significantly different from zero average abnormal return at the 1% on 0 day with values in the BMP test statistic is -10.19 and average abnormal return -1.20%. By looking at the average abnormal returns after the cash dividend increase event day, days 12, 17, and 24 are -0.22%, 0.14% and -0.20%. **Error! Reference source not found.** shows the BMP test around the event and summarises the information within this paragraph.

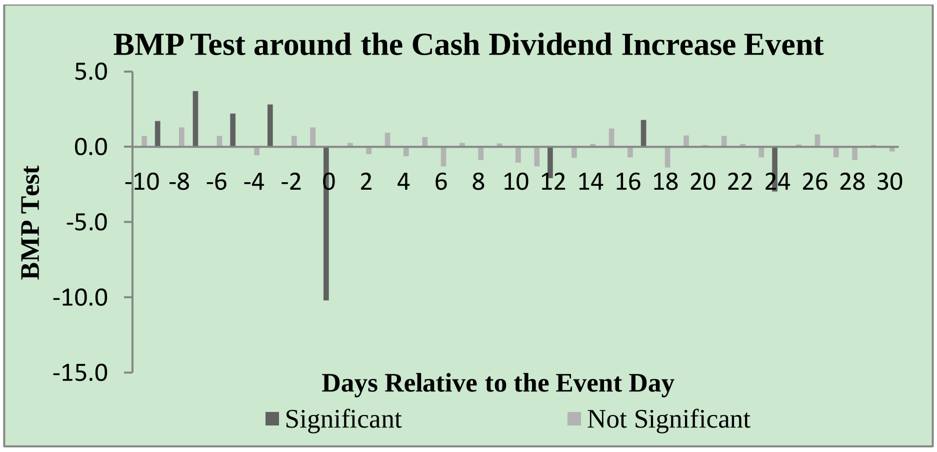

Figure 2 The BMP test around the event

It is apparent from Table 1 that Adj-BMP test results show the average abnormal returns before the cash dividend increase event day, days -7 and -3, are 0.27% and 0.12% and their respective values of the Adj-BMP test statistic are 2.64 and 1.99, which are significantly different from the zero average abnormal return at the 1% and 5% level. At 0 day, the average abnormal returns is -1.20% values of the Adj-BMP test statistic are -7.24, which are significantly different from the zero average abnormal return at the 1% level. By referring at the average abnormal returns after the cash dividend increase event day, only one day, which is day 24, has a -0.20% negative return. Its respective value of the Adj-BMP test statistics is -2.10, which is significant at the 5% level. Fig summarises the information in this paragraph and shows the Adj-BMP test around the event.

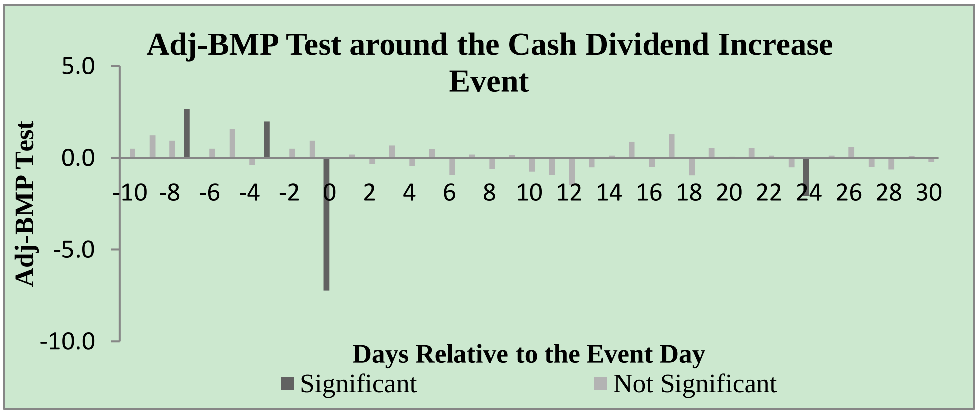

Figure 3 The Adj-BMP test around the event

From Table 1 we can see that before the cash dividend increase event day, the numbers of significant abnormal return days in the BMP test has reduced from four to two in the Adj-BMP test. We also find a change of *t*-values in the BMP test from 1.71 and 2.20 at the 10% and 5% significance levels to 1.22 and 1.56 that are insignificant in the Adj-BMP test on day -9 and -5, respectively. On day -7 and -3, *t*-values drop from the BMP test (3.71 and 2.81 at the 1% significance level) to the Adj-BMP test (2.64 and 1.99 at the 1% and 5% significance level, correspondingly). Both BMP test and Adj-BMP test indicate that there is a significantly different from the zero average abnormal return at the 1% level on day 0. However, the *t*-values decrease from the BMP test, -10.19 to the Adj-BMP test, -7.24.

After the event day, we note that the numbers of significant abnormal return days in the BMP test has decreased from three to one in the Adj-BMP test. This finding is similar to pre-event day. On day 12 and 17, the BMP test illustrates a significant value of -2.09 and 1.79 at the 5% and 10% level, respectively, but has changed to insignificant value of -1.48 and 1.27 of the Adj-BMP test. We also find that on day 24, the value of -2.96 in the BMP test with a 1% significance level has changed to -2.10 in the Adj-BMP test, which is significant at the 5% significance level.

Table 1 is quite revealing in several ways. First, generally the number of significant abnormal returns has decreased from eight in the BMP test to four in the Adj-BMP test. To put it in another way, the over-rejection rate under BMP test is 100%. Specifically, these changes are reflected on the average abnormal returns on days -9, -5, 12, and 17, which are significant in BMP test and have been changed into insignificance based on the Adj-BMP test. Second, in general, our finding reveals that the level of significance has decreased from 1-5% in the BMP test to 5-10% in the Adj-BMP test. Based on our findings, the average cross-correlation among abnormal returns in this event is 0.003. Even though this value is fairly low, the effect still substantially on the distributional properties of the conventional test statistics. This finding is consistent with the simulation result from Kolari and Pynnönen (2010) where they point that neglecting of event-induced variance and cross correlation among abnormal returns leads to the null hypothesis to be rejected too often but in fact there is no significant average abnormal return. A possible explanation for this might be that presence of event-induced variance and cross correlation among abnormal returns. Fortunately, the Adj-BMP test offers an appropriate rejection rate as the null is true and yet is equally powerful as the null is false. Hence, the Adj-BMP test successfully resolves the issue of tendency of over rejecting the null hypothesis in the BMP test. To our limited knowledge, the most obvious finding to emerge from this study is that it provides the only empirical evidence of the ability of the Adj-BMP test to overcome the event-induced variance and cross correlation among abnormal returns problems, especially within the cash dividend increase event.

From the Adj-BMP test, we find an impact of cash dividend increase events on the average abnormal return in the emerging market. In other words, the null hypothesis of zero average abnormal return is rejected. This finding is consistent with the result of the Yilmaz and Gulay (2006) in Istanbul Stock Market. Apart from that, the outcomes of this study is much more parallel in the Vietnam stock market, which shows the abnormal return increase before the ex-date of the dividend then decrease (Ngoc and Cuong, 2016). The Adj-BMP test is not being applied widely. Aktas et al. (2004) employ the BMP test in the European Regulation of Business Combinations event. The BMP test is also applied in Isa and Lee (2014) to investigate stock repurchase. As a result, this paper contributes to the explanation of event-induced variance and cross correlation among abnormal returns issues. We also introduce an advance test statistic known as Adj-BMP test. In addition, this study offers an empirical study and thorough evaluation of the Adj-BMP test compared with the BMP test, especially with respect to the significance level and reduced type I error.

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

CONCLUSION

Numerous events increase the variance of event-period returns and cross correlation among abnormal returns, particularly 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 and BMP test do not take into account the cross correlation among abnormal returns in event studies. Thus, the higher type I errors will result from using these methods (Kolari and Pynnönen, 2010).

In the literature review, we mention the needs to remedy the issue of event-induced variance and cross correlation among abnormal returns. Kolari and Pynnönen (2010) propose a more advanced event-study test statistic, the Adj-BMP test, which is an extension of the BMP test. Via a simulation study, Kolari and Pynnönen (2010) find that Adj-BMP test results in an equally powerful test when the null is false and an appropriate rejection rate when it is true.

In this paper, we use the emerging market data like the daily stock prices from 20 listed firms (with the largest market capitalisation on June 2012) in the Malaysian stock market. These data series span 19 years from January 1996 through December 2014, as presented in the data and methodology section.

This study applies Adj-BMP test to examine emerging of the type I error which is caused by the cross correlation among abnormal returns in the cash dividend increase event in the emerging market. Based on the Adj-BMP test, there is an impact of the cash dividend increase event on the average abnormal return, as pointed out in the data analysis and findings. We compare the performance of the Adj-BMP test against the BMP test. The average cross-correlation among abnormal returns in this event is 0.003. This study provides evidence that even the average cross-correlation among abnormal returns is relatively low, its effect is fairly drastic on the distributional properties of the unadjusted *t*-statistics. Hence, our empirical results manifest that the over-rejection rate in the BMP test is 100%. At the same time, the number of rejections in null hypotheses is less in the Adj-BMP test than in the BMP test. This reduction in the rejection rate of null hypotheses might be due to the existence of event-induced variance and cross correlation among abnormal returns. In other words, the performance of Adj-BMP test is better than the BMP test. This is because Adj-BMP test will not reject the null hypotheses too often, as in the case of the BMP test. Hence, when we do not know whether any event-induced variance and cross correlation among abnormal returns exists in the stock returns, we propose using the Adj-BMP test. This empirical evidence is similar to the simulation results of Kolari and Pynnönen (2010). From the Adj-BMP test, the data provide sufficient evidence to reject the null hypothesis of zero average abnormal return. Therefore, this study claims that there is an impact of cash dividend increase events on the average abnormal returns. Nonetheless, the Adj-BMP test demonstrates that the impact of dividend on stock abnormal return is less significance compared to conventional event-study test. Thus, by adopting this advance test to analyse the impact of dividend on stock abnormal return, market participants able to minimise inappropriate investment decision-making. This is because they might reduce over-react on dividend event, which caused by over-rejection in conventional statistical tests. Based on finding of this study, signaling theory is supported. In other words, companies might use dividend as signal to inform the market participants.

With the review and research in the event-study methodologies, this paper might provide a paradigm shift of the test refinement of the event-study. Future research might further extend to analyse the performance of Adj-BMP test in stock market of underdeveloped countries especially dividends event. More broadly, research is also needed to determine applicable of Adj-BMP test in other events like auditor switching events and corporate governance events, which extend the work of earlier researchers (Chee-Wooi and Guat-Khim, 2017; Tan et al., 2016). To our limited knowledge, the most obvious result to emerge from our study is that it offers the only empirical evidence of the Adj-BMP test's ability to overcome the event-induced variance and cross correlation among abnormal returns issues with respect to the impact of cash dividend increase events on stock market returns from a developing nation.

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