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Full Length Research paper

Analysis of calendar effects: Day-of-the-week effects in Indonesia, Singapore, and Malaysia stock markets

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Efficient market hypothesis suggests indifferent return of stock regardless its trading day. In fact, investors could made different return on certain day because of calendar effects. This different return is called an abnormal return which can affect investor in deciding their investment strategy, portfolio selection and profit management. The study researched day-of-the-week effects in Indonesia, Singapore and Malaysia stock markets in order to find out the existence of anomaly in the three countries. Previous research showed evidence of day-of-the-week effects in emerging markets. Our study employs EGARCH econometric models. The result shows that there was Friday positive abnormal return in Indonesia and Malaysia. In Singapore, there was no Friday positive abnormal return. The study also concludes that, there was no Monday negative abnormal return in the three countries.

Key words: Efficient market, abnormal return, calendar effects, day-of-the-week effects, EGARCH.

INTRODUCTION

All investors expecting high return and low risk investment. Actually, investor does not exactly now their exact risk and realized return (Alam, 2009). Normally, before making an investment decision they will conduct investment analysis. Investment analysis conducted by doing the research on existing anomalies, technical and fundamental analysis on stock, and also global economic condition (Alam et al., 2010; Butt, 2010; Rahman, 2009).

The efficient market hypothesis suggests that all securities are efficiently-priced to fully reflect all information of its intrinsic value. In financial markets, especially in stock markets, there is evidence of seasonal effects that will create higher or lower return than its intrinsic value. We can define this as an anomaly because it cannot be explained by existing theories. Anomaly in stock markets are effected by several factors, such as: firm's characteristic and calendar anomaly (Cheng, 2010; Fama and Frence, 1993; Fama and French, 1995; Haugen, 1995; Kothari, 1995).

Every firm's characteristic in a country is different one another. Factors that effected firm's characteristic are: size, earnings to price ratio (E/P), cash flow to price ratio (CF/P), sales growth, and book to market equity ratio (B/M) (Lau, Lee and McInish, 2002; Lim and Dollery, 2007; Morelli, 2007). A research in UK using data from July 1, 1980 until June 30, 2000 showed there is no relation between size and return. Meanwhile, research conducted in Singapore using 1988 to 1996 data, concluded that size and return are related each other. Wong and Lye (1990) conducting research in Singapore using data from 1975 to 1985 found the same evidence. Moreover, they found that there was significant relation between E/P and return. Research by Pettengill et al. (2002) concluded a significant relationship between size and return either in bullish or bearish market.

Study on calendar anomaly needed long-term period of stock's historical price. Different statistical test used by researchers on calendar anomaly, depends on data availability. Historical price of stock can be used to predict future price. Historical price has important implication for financial markets, especially for seasonal behavior researcher (Wang, 2010). There have been many research in calendar anomaly, such as: day-of-the-week effects, January effects, and month-of-the-year effects (Ariel, 1987; De Bondt and Thaler, 1987; Kato and Schallheim, 1985).

Day-of-the-week effects is the most popular anomaly in

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stock markets. It also known as weekend effect or blue Monday effect. Observation of day-of-the-week effects show there is difference on return of each day in a week. Day-of-the-week effects are caused by market sentiment that make investors turn irrational in stock market (Keong, 2010). It has important implication for investors in deciding their investment strategy, portfolio selection and profit management. Study of calendar anomaly showed that investor can use the existing anomalies for predicting stock price movement in a certain single day.

These anomalies impacted market efficiency, although, price of asset (stock) is not changing but prediction is made by investor using these anomalies. This allows investor to develop trading strategy for getting abnormal return based on existed anomalies. For example, an investor could be selling the securities on Friday and buy it on Monday to get the profit because of lower return on Monday and higher on Friday (Gibbon and Hess, 1981; Jaffrey and Westerfield, 1985). Another researchers also found evidence in emerging stock market, such as study conducted by Condoyanni et al. (1987) and Ajayi et al. (2004).

The objective in our study is to find out the existence of day-of-the-week effects anomaly in Indonesia, Singapore and Malaysia stock markets.

LITERATURE REVIEW

Anomalies

An event considered as anomalous when the event is hard to explain rationally with existing theories or illogical assumptions are needed to explain the current paradigm. There are two kinds of anomalies: firm's characteristic anomaly and calendar anomaly.

Firm's characteristic anomaly

Basu (1977), Banz (1981), Rosenberg et al. (1985) and Lakonishok et al. (1994) conclude that stock's return positively correlated with earning to price ratio, cash flow to price ratio and book to market equity ratio. Meanwhile, stock's return negatively correlated with size and sales growth.

An empirical study analyzes the relationship between firm's characteristic and return. Higher return found in large capitalization firms, compared to small capitalization firm. Reingaum and Banz (1981) found abnormal return in small capitalization firm.

Jaffe et al. (1989) conduct a research testing the relationship between stock's return, size and earning to price ratio in accordance with January effect. They found that size effect is significant only in January. Meanwhile, effect of earning to price ratio significantly existed every month.

Wong and Lye (1990) conducted research in Singapore using 1975 to 1985 data, their research showed that stock's return in Singapore related to firm's size and earning to price ratio. In 1994, Davies found that book to market equity ratio, earning to price ratio, cash flow to price ratio and sales growth significantly correlated with return. But, this significant correlation only exist in January. Chui and Wei (1998) found evidence between stock's return with book to market equity ratio, size of firm and stock's return in Hong Kong, Korea, Taiwan, Malaysia and Thailand. They found that stock's return and book to market equity ratio positively correlated in Hong Kong, Korea and Malaysia. Besides, they also found size effect in Hong Kong, Korea, Malaysia and Thailand.

Calendar anomaly

The first study in calendar anomaly starts in 1930s. Some research documented there is obvious pattern on time difference for investor to create stock's return. Return can be systematically higher or lower depends on time difference. Some kind of calendar anomalies are: time-of-the-day effects, day-of-the-week effects, week-of-the-month effects and month-of-the-year effects.

Several research show distribution of stock return is indifferent for each day in a week. Major result of the researches is Monday return is lower than any other day in a week. Lower return on Monday mainly caused by higher trading activity in the first day of trading week. Besides, there is also high selling action because of unfavorable information that comes to the market after closure of trading on Friday days (Chia, 2007).

There is also evidence that return on Friday is higher than any other day in a week. Although, it is found that there is higher return on Friday in certain stock markets, several researches show that this anomaly could be different in another stock market.

There is also January effect, which means return in January is higher than other months of the year. Research in Japan show January effect caused by bonus distribution in December. After receiving their bonus, many investors invest their bonus in January which in turn will create higher stock's price and also stock's return. Beside fixed calendar anomaly we have discussed earlier, there is also moving calendar anomaly. Example of moving calendar anomaly is holiday season effect and also Ramadhan effect. Bonus distribution in Japan is usually done in December or January. In Indonesia most of the companies distribute bonus (or so-called holiday allowance) in Ramadhan. In fact, there is a possibility that investor make an investment after having their bonus/allowance.

Previous research

Several research has been done to test the difference of time pattern in stock price. First day-of-the-week effects

research in US conducted by Gibbon and Hess (1981), with sample period from 1962 to 1978, and using S&P 500 and CRSP indices. When they divide the data into sub-period, they found the lowest return on Monday. Only in November 1974 till December 1979, that negative return on Tuesday had been found. Gibbon and Hess(1981) also reported there is significantly higher return on Wednesday and Friday.

Jaffe and Westerfield (1985) researched the day-of-the-week effects on anomaly in four international stock markets (UK, Japan, Canada and Australia). In UK and Canada, they found the lowest return on Monday. While in Japan and Australia are on Tuesday. They documented new evidence for the negative Tuesday effect.

Condoyanni et al. (1987) conducted research in six countries (Canada, UK, Australia, France, Japan, and Singapore; using data from 1969 to 1984). Their result confirmed there is Monday negative return in Canada and UK. There is also Tuesday negative return in France, Japan, Australia and Singapore. Their research proved this anomaly could be different for one stock market to another.

Research by Lakonishok and Smidt (1988) also documented Monday negative return in US capital market. Arsad and Coutts (1997) researched this anomaly using data from 1935 to 1994 using FT30 index. They also found a significantly negative Monday return, compared to another day.

Brooks and Persand (2001) researched of day-of-the-week effects in emerging markets. They research on Taiwan, South Korea, Philippines, Malaysia and Thailand stock markets. In Thailand and Malaysia, they found there is significant positive return on Monday and negative return on Tuesday. While in Taiwan, there is negative return on Wednesday.

Ajayi et al. (2004) found more evidence for the day of the week effects in emerging markets. They research in 11 East European stock markets. From their research, they found evidence on Monday negative return (six stock markets), and Monday positive return (another five stock markets).

Basher and Sadorsky (2006) researched all emerging markets in the world. They found evidence of day-of-the-week effects in three stock markets (Philippines, Pakistan and Taiwan) from 21 markets. Day-of-the-week effects of three countries are as follow: Taiwan has Friday positive effect, Pakistan has Tuesday negative effect, and Philippines has Tuesday positive effect.

Hypothesis development

From earlier discussion and explanation, the study could conclude major result from previous research. One of the result is return on Monday is lower than any other day in a week. Besides, there is also evidence that concludes return on Friday is higher than another day in the week.

From result of previous research, the study develops two hypotheses:

1. There is positive abnormal return on Friday in Indonesia, Malaysia, and Singapore.
2. There is negative abnormal return on Monday in Indonesia, Malaysia, and Singapore.

METHODOLOGY

Data used in this research are main indices of each stock markets [Jakarta Stock Exchange Composite Index (JKSE), Singapore Strait Times Index (STI) and Kuala Lumpur Stock Exchange Composite Index (KLSE)] and S&P Global 1200 indices from Jul 1, 2003 to Jun 30, 2008. For computing percentage of daily return, the study uses:

$$R_t = 100 \times \ln(I_t / I_{t-1})$$

where:

R_t = Return at period t,

I_t = Stock indices at period t.

Econometric models used in this research are exponential GARCH (EGARCH) developed by Nelson (1991). EGARCH model have some advantages than GARCH. Firstly, using of ln (σ^2_t) though with negative parameter σ^2_t, would still result to positive, and it also allows asymmetries. The models are:

$$R_t = \sum_{i=1}^{5} d_i \delta_{it} + \sum_{i=1}^{k} e_i R_{t-i} + \beta_i \sum_{i=1}^{5} R_{global} + \varepsilon_t$$

where

$$\ln(\sigma^2_t) = \omega + \sum_{j=1}^{p} \beta \ln(\sigma^2_{t-1}) + \sum_{i=1}^{q} \gamma \frac{\mu_{t-1}}{\sqrt{\sigma^2_{t-1}}} + \sum_{i=1}^{r} \alpha \left[\frac{|\mu_{t-1}|}{\sqrt{\sigma^2_{t-1}}} - \sqrt{\frac{2}{\pi}} \right]$$

$\sum_{i=1}^{5} d_i \delta_{it}$ = Dummy variable from Monday to Friday,

$\sum_{i=1}^{k} e_i R_{t-i}$ = Indices lag return,

$\beta_i \sum_{i=1}^{5} R_{global}$ = S&P Global 1200 indices,

ε_t = Error,

$\sum_{j=1}^{p} \beta \ln(\sigma^2_{t-1})$ = Effect from previous variance,

$\sum_{i=1}^{r} \alpha \left[\frac{|\mu_{t-1}|}{\sqrt{\sigma^2_{t-1}}} - \sqrt{\frac{2}{\pi}} \right]$ = Effect from previous error,

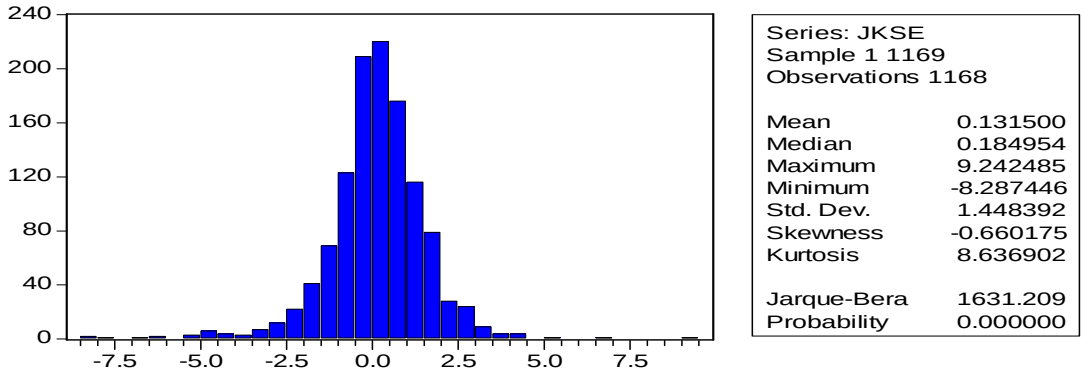

Figure 1. Histogram and descriptive statistics for JKSE (Indonesia). Source: Processed data.

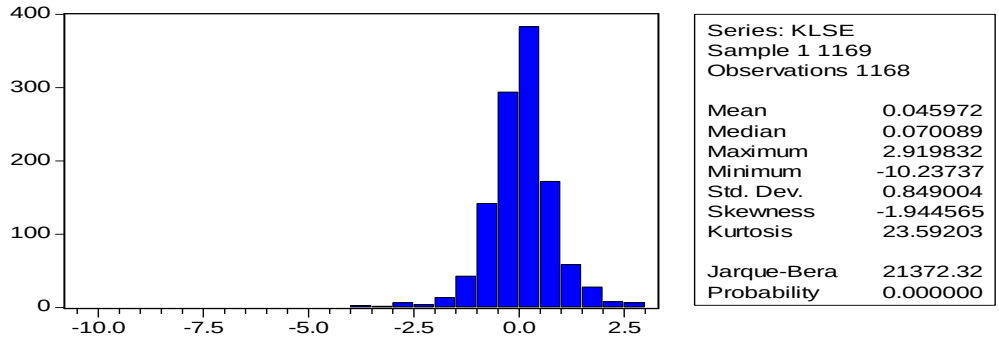

Figure 2. Histogram and descriptive statistics for KLSE (Malaysia). Source: Processed data.

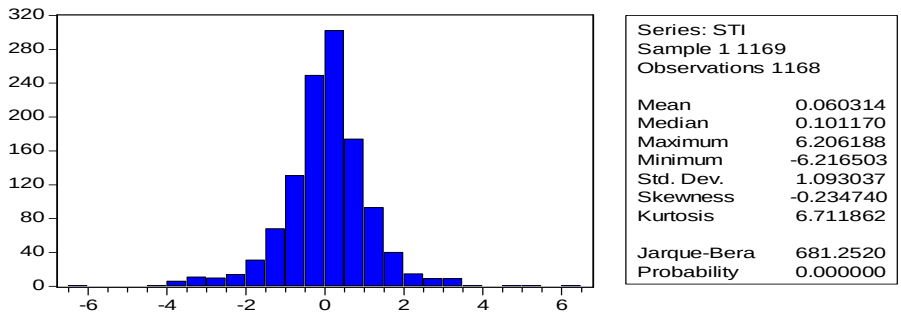

Figure 3. Histogram and descriptive statistics for STI (Singapore).Source: Processed data.

$\sum_{i=1}^{q} \gamma \frac{\mu_{t-1}}{\sqrt{\sigma^{2}_{t-1}}}$ = asymmetries effect.

RESULT AND DISCUSSION

Descriptive statistics

Figures 1, 2 and 3 show histogram and descriptive statistics for three countries. In Figure 1, maximum value of 9.242485 is on January 24, 2008. This high value is result of deletion data on January 23, 2008 caused by missing data of KLSE (Malaysia) on that day. Meanwhile, minimum value also caused by deletion data is on May 12, 2006. On that day, data of KLSE also does not exist.

In Figure 2, maximum value of 2.919832 is on August 20, 2007. Deletion data is on August 17, 2007 because there is not trading activity in Indonesia on that day (Independence Day) causing this maximum value.

Table 1. ARCH-LM test for OLS model.

	JKSE	KLSE	STI
F-statistic	26.50871***	10.8907***	19.27419***

***Significant at 1%. Source: Processed data.

Otherwise, minimum value is on March 10, 2008 because of missing data on KLSE on March 7, 2008 so we delete the whole data.

In Figure 3, maximum value is return on January 24, 2008. On January 23, the study has no found data in KLSE and for that reason all data of the indices must be deleted. Minimum value caused by significant declining value of STI is on January 21, 2008. STI index lost 187.1 point from previous trading day, made its downturn from 3,104.25 to 2,917.15.

Ordinary least square (OLS) model testing

A good model for testing must be under assumption where var $(u_t) = \sigma^2 < \infty$. If error in the research has no constant variance, it called as heteroscedasticity. Residual testing with ARCH-LM test in OLS method done in order to find out whether there is heteroscedasticity in OLS model being used. With 5% significance level, the hypothesis for the testing is there is no autoregressive conditional heteroscedastic. While alternate hypothesis is there is autoregressive conditional heteroscedastic.

From Table 1, the results are significant at 1%, while 5% significance level was used in the study. Therefore, it can be concluded that the hypothesis is rejected which means there is autoregressive conditional heteroscedastic. It shows that we should apply GARCH model in this research.

EGARCH model testing

In this part, we will discuss results of EGARCH model used for testing three indices (Indonesia, Singapore and Malaysia) applying S&P Global 1200 index as risk factor in the model.

Analysis of Indonesia (JKSE)

In Table 2, it can be seen that JKSE index (Indonesia) affected significantly with 99% confidence level by positive return on Friday as of 0.3887% (coefficient in FRI plus C). It also affected significantly by Wednesday positive return as of 0.2193% in 10% significance.

For Monday return (0.0512%), Tuesday return (0.2128%) and Thursday return (0.2172%) do not affected JKSE index. S&P Global 1200 index as risk factor showed significance in 1% on Monday, Wednesday, Thursday and Friday. On Tuesday, we found it has 10% significance.

This model is significant in 5% by using lag of 2 days. This model is suitable using EGARCH model, it can be seen from the variance equation that it is significant at 1%. R-squared for JKSE indicates that an independent variable is able to explain its effect on a dependent variable by 14.56%. The rest is explained by other variables. Adjusted R-squared of 0.135171 shows that an independent variable can express its effect on a dependent variable by 13.52%; the rest is expressed by other variables.

The number of F-statistic and its probability showed that there is a suitability of model employed in this research, and this model affecting whole dependent variable. In analysis of JKSE index, we can conclude that there is positive abnormal return in Indonesia on Friday, and Monday negative abnormal return does not exist in Indonesia.

Analysis of Malaysia (KLSE)

As can be seen in Table 2, KLSE index significantly is affected by positive return on Friday as of 0.1285% with 99% confidence level. There is also evidence of Thursday positive return as of 0.0838% with 95% confidence level. Meanwhile, Monday, Tuesday and Wednesday return do not affected KLSE index. S&P Global 1200 as risk factor showing significance at 1% on Monday, 5% on Tuesday to Thursday, and show no significant on Friday.

This model is significant at 5% by applying lag of 1 day. With variance equation also significant in 1%, it can be conclude that using EGARCH model in this research is suitable. R-squared result of KLSE is 0.092537, and adjusted R-squared is 0.081509. This means that an independent variable can express its effect on a dependent variable by 9.25%; the rest of 90.75% is expressed by other variables.

From the result of F-statistic and its probability, it can be conclude that, it is suitable to use EGARCH model in this study. Therefore, we can make conclusion from evidence found in this study.

From analysis of KLSE result above, it can be conclude there is positive abnormal return on Friday in Malaysia and there is no negative abnormal return on Monday.

Table 2. Result of EGARCH model testing.

Parameter	JKSE	KLSE	STI
C	0.051152[a]	-0.019717	0.073707
	(0.075558)[b]	(0.036722)	(0.047841)
TUE	0.161626	0.049806	-0.051148
	(0.100563)	(0.057332)	(0.067249)
WED	0.168128*	0.066184	-0.000304
	(0.102140)	(0.049751)	(0.069185)
THU	0.165992	0.103491**	0.002084
	(0.108262)	(0.048392)	(0.067604)
FRI	0.337477***	0.148172***	0.051916
	(0.106130)	(0.056717)	(0.072844)
MMON	0.927136***	0.322023***	0.963324***
	(0.081490)	(0.041817)	(0.054697)
MTUE	0.162635*	0.129590**	0.473374***
	(0.091777)	(0.054373)	(0.075811)
MWED	0.422919***	0.091927**	0.532464***
	(0.086052)	(0.045064)	(0.065308)
MTHU	0.629293***	0.108087**	0.599694***
	(0.093030)	(0.051059)	(0.074411)
MFRI	0.308151***	0.082215	0.314718***
	(0.113596)	(0.060263)	(0.082221)
JKSE(-2)	-0.055410**		
	(0.028026)		
KLSE(-1)		0.076922**	
		(0.032168)	
STI(-1)			-0.109345***
			(0.026573)
C(12)	-0.200431***	-0.208131***	-0.128342***
	(0.028029)	(0.020998)	(0.019021)
C(13)	0.316576***	0.243895***	0.163251***
	(0.041776)	(0.022006)	(0.024085)
C(14)	0.082198***	0.070192***	0.030418***
	(0.024690)	(0.019157)	(0.018608)
C(15)	0.909583***	0.964468***	0.987434***
	(0.022793)	(0.009419)	(0.005475)

Tables 2. Contd.

R-squared	0.145564	0.092537	0.272628
Adj R-squared	0.135171	0.081509	0.263788
F-statistic	1.400625	8.390978	3.084164
Prob(F-statistic)	0.000000	0.000000	0.000000

Source: Processed data using EViews 5. [a], coefficient; [b], standard error; ***, significant at 1%; **, significant at 5%; *, significant in 10%.

Analysis of Singapore (STI)

Result on Table 2 shows that STI is not significantly affected by daily return on Monday to Friday because of all of their significance level are above 10%. Meanwhile, S&P Global 1200 index as risk factor show significance in 1% on Monday to Friday.

This model is significant in 1% by using lag of 1 day. Besides, using of EGARCH model in this research is suitable for variance equation is significant at 1%. R-squared and adjusted R-squared for STI is consecutively 0.272628 and 0.263788. The interpretation of R-squared result for STI shows that 27.26% of a dependent variable is explained by an independent variable, while 72.74% is explained by other variables.

Result of F-statistic and its probability confirmed that this model is suitable and could explain the whole dependent variable. Therefore, it can be conclude that no such Friday positive abnormal return and Monday negative abnormal return exists in Singapore.

Analysis of EGARCH testing

Efficient market hypothesis suggests that stock return is indifferent each trading day. On the contrary, day-of-the-week effects anomaly stated that, there is return's difference on each trading day in a week, it is called abnormal return.

The study of EGARCH testing above show that, there is no negative abnormal return on Monday. Meanwhile, positive abnormal return on Friday is found in Indonesia and Malaysia. This Friday positive abnormal return could be affected by buying activities anticipating good news in non-trading day (Saturday and Sunday). If there were bad news on weekend, then this could cause investors to sell their stocks on Monday. However, this explanation cannot apply to the whole day-of-the-week effects anomaly because it is possible that the result and evidence would be change if different sample data are applied.

From Table 2, it can be seen that the model is suitable with EGARCH because variance equation for three countries is significant at 1%. Coefficient C12 for JKSE, KLSE and STI show negative variable consecutively (-0.200431, -0.208131 and -0.128342). This is not a problem, because EGARCH model could handle non-negativity.

From the three, JKSE is the most reactive if compared to KLSE and STI. This means when stock price declining significantly, it will directly reacted to dependent variable. It can be seen from ARCH (C13) where value of JKSE is 0.316576, KLSE 0.243895 and STI 0.163251. Leverage effect (C14) value is also the highest on JKSE (0.082198), while KLSE and STI consecutively are 0.070192 and 0.030418. Persistency means a consistent event in long-term period. In context of persistency/ consistency, the study can analyze from GARCH (C15) where it can found that STI index is the most persistent compared to KLSE and JKSE.

Conclusion

The research is conducted by applying EGARCH model because of heteroscedasticity has been found by ARCH-LM test. Overall, EGARCH model is applicable to the research model because variance equation for three countries showed significance at 1%.

The conclusions of the research based on the study objective are as follows:

1. In Indonesia, we do not reject the first hypothesis because there is positive abnormal return on Friday with 1% significance level. The second hypothesis is rejected because there is no negative abnormal return on Monday in Indonesia.
2. In Malaysia, the first hypothesis is rejected because there is Friday positive abnormal return with 99% confidence level. Meanwhile, we reject the second hypothesis, because Monday negative abnormal return does not exist in Malaysia.
3. In Singapore, both the first and second hypotheses is rejected. There is no abnormal return on Monday and Friday in Singapore.

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