Sunway College Journal 1, 1–11(2004)

SEASONAL ANOMALIES OF STOCKS IN ASEAN EQUITY MARKETS

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ABSTRACT

This study examines the daily anomalies in the five ASEAN equity markets of Malaysia, Singapore, Thailand, Indonesia and the Philippines before, during and after the Asian financial crisis. The regression results reveal different patterns among these markets for each of the three periods. The Monday and Friday effects are most predominant during the pre-crisis period. Only the Tuesday effect in Thailand and the Philippines is observed during the crisis period. While the pattern of daily anomalies in Thailand during the post-crisis period reverts to that of the pre-crisis period, the other four markets exhibit different patterns of daily anomalies compared to the pre-crisis period. When the time-varying return volatility is taken into account through the use of GARCH-M model, the Monday effect remains significant while some of the other daily anomalies have become insignificant during the pre-crisis period. The Tuesday effect in Thailand and the Philippines disappears altogether during the crisis period. Only the Monday and Friday effects in Thailand persist in the post-crisis period.

Key words**:** GARCH-M, seasonal anomalies, day-of-the-week effect, market return volatility, Asia financial crisis.

INTRODUCTION

In the last couple of decades, a number of studies have been conducted to examine seasonal anomalies in stock returns in markets ranging from developed ones such as U.S., U.K. and Japan, to less developed ones such as Malaysia, Singapore, Thailand, Philippines, Korea, Taiwan and Australia. These anomalies include the day-of-the-week effect, the January effect and the firm-size effect.

The day-of-the-week effect has been found to be a predominant phenomenon in most markets since the study by French (1980) of the US market, using the daily returns of the S&P 500 Composite Index for the period 1953–1977, found that the mean Monday return was significantly negative. Gibbons and Hess (1981) also investigated the US market by using the S&P 500 Composite Index for the period 1962–1978 and found that the mean Monday return was also abnormally low and, at times, negative. Keim and Stambaugh (1984) also used the S&P Composite Index over a longer period 1928–1982 to examine the weekend effect in the US market and found, consistent with earlier findings, the existence of a strong negative mean Monday return. Using the S&P 500 Composite Index and the Dow-Jones Industrial Averages, Rogalski (1984) also obtained a negative mean Monday return and showed that the negative mean Monday return was mainly attributed to the mean Friday

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close to Monday open return, that is, the non-trading weekend effect. Studies that also reported findings of a negative mean Monday return and a positive mean Friday return include those conducted by Lakonishok and Levi (1982) and Smirlock and Starks (1986).

Jaffe and Westerfield (1985a) examined the weekend effect in four other developed markets, namely, those of UK, Japan, Canada and Australia, and found that these markets exhibited a significantly negative mean Monday return and positive mean Friday or Saturday return. Arsad and Coutts (1996) also found a weekend effect in the London Stock Exchange. In fact, in Japan, where there was trading on some Saturdays until January 1989, Jaffe and Westerfield (1985b) showed that it was the mean Saturday return and not the mean Friday return that was significantly high and positive. Various possible explanations of the weekend effect such as settlement procedures, specialist biases and measurement errors were examined but their findings did not find any support for these factors.

The relationship between the day-of-the-week effect and other factors was examined by several authors. Jaffe, et al. (1989) explored the possible link between the low mean Monday return and the market rise or decline. Liano (1989) explored the day-of-the-week effect in stock returns over business cycles. Both Lakonishok and Maberly (1990) and Sias and Starks (1995) examined the relationship between the day-of-the-week effect and the stock trading behaviour of institutional and individual investors.

In the Asian-Pacific region, Wong and Ho (1986) examined the day-of-the-week effect on the Singapore stock market and found a strong seasonal pattern of a low negative mean Monday return and a high positive mean Friday return. Later, Wong, el al. (1992) extended the study to the stock markets of Singapore, Malaysia, Hong Kong, Thailand and Taiwan, and found that these markets, except that of Taiwan, exhibited the day-of-the-week effect with a negative mean return on Monday or Tuesday and a high positive mean return on Friday. Kamath, et al. (1998) also confirmed similar findings in Thailand by using a GARCH model that allows for varying return volatility. Studies by Kim (1988), Jaffe and Westerfield (1985a) and Aggarwal and Rivoli (1989) also confirmed the existence of the day-of-the-week effect in some Asian markets including Hong Kong, Taiwan, Korea, Singapore and Japan. The authors reported a significantly negative mean return on Monday and positive mean return on Friday in these markets. Easton and Faff (1994) also reported the day-of-the-week effect in Australia. Annuar and Shamsher (1987) conducted a similar study on the Kuala Lumpur Stock Exchange (KLSE) by using the New Straits Times (NST) Industrial Index over the period 1975–1985 and obtained findings of negative mean Monday and Tuesday returns that are generally consistent with the findings of other studies. Clare, et al. (1998) used a GARCH-M model to allow for variation in return volatility and still found a strong day-of-the-week effect in the KLSE. Following the approach taken by Clare, et al. (1998), similar findings were obtained by Foo and Kok (2000) on the KLSE Second Board. Kok (2001) also adopted the same approach to show the existence of some day-of-the-week effects in the Asia-Pacific markets of US, Hong Kong, Australia, Singapore and Malaysia, and revealed that some of these effects in the larger markets—but not in the smaller—could be explained by the varying market volatility. Lucey (2000) employed the same approach to show that there is evidence of day-of-the-week effect but no evidence of daily variation in equity risk. However, using the KLSE Composite Index over the period 1986–1993, Davidson and Peker (1996) employed a GARCH model to show that there is no day-of-the-week effect once the time-varying volatility of the KLSE is allowed for.

OBJECTIVES OF THE STUDY

The primary objective of this study is to examine the possible presence of the day-of-the-week effect in the stock markets of five ASEAN countries, comprising Malaysia, Singapore, Indonesia, Thailand and the Philippines. In particular, we compare this seasonal effect among the five ASEAN markets for each of the three periods as divided by the Asian financial crisis that first occurred in 1997, namely, the pre-crisis period, the crisis period and the post-crisis period. In addition, we also examine the changing pattern of this seasonal effect for each market over these three periods. Where the day-of-the-week effect exists, the GARCH-M model in the form as used by Clare, et al. (1998) would be employed to determine whether such day-of-the-week effects could be due to the varying volatility of the stock returns during each period.

DATA AND METHODOLOGY

The data used in the study are the daily closing values of the Kuala Lumpur Stock Exchange Composite Index, Singapore Stock Exchange All-Share Index, Stock Exchange of Thailand Index, Jakarta Composite Index and the Philippines Composite Index over the period of 2 January 1992 to 12 August 2002. The data are obtained from the financial data provider Bloomberg. The daily market returns are computed as log index relatives.

Three periods are identified in this study: 2 January 1992 to 31 January 1997, 1 February 1997 to 30 September 1998, and 1 October 1998 to 12 August 2002. In relation to the Asian financial crisis, these 3 periods correspond approximately to the pre-crisis period, the crisis period, and the post-crisis period, respectively.

For each period, two estimation models are used to test statistically the presence of daily effects in these five markets: the ordinary least squares (OLS) regression model and the GARCH(p,q)-M model for capturing the time-varying volatility in the return series. The OLS regression model used to examine the day-of-the-week effect is given by:

$$R_t = \sum_{d=1}^{5} m_d \, d_t^{\,d} + e_t$$

where R_t is the market return; $d_t^{\,d}$ are 5 daily seasonal dummies; μ_d are the OLS coefficients; and e_t is an error term.

The GARCH(p,q)-M model given below that allows for varying return volatility of each market is also used to examine the day-of-the-week effect:

$$R_i = a_0 + a_1 h_t^{1/2} + a_2 R_{t-1} + \sum_{m=1}^{d} m_m d_t^{\,m} + x_t$$

$$h_t = b_0 + \sum_{i=1}^{q} b_i x_{t-i}^{\,2} + \sum_{j=1}^{p} g_j h_{t-j} + \sum_{m=1}^{d} m_m^{*} d_t^{\,m}$$

where x_t is an error term with zero mean and conditional variance h_t; a_0 and b_0 are constants; a_1 is the reward to risk ratio; a_2, b_i, g_j, m_m and m_m* are coefficients; $d_t^{\,m}$ is the set of deterministic daily seasonal dummies; and where p is the order of GARCH terms and q is the order of ARCH terms, with the values $p \geq 0$ and $q \geq 0$.

The Schwarz Information Criterion (SIC) is used to determine the appropriate orders of p and q. The highest order of p and q considered in this study is 5. The SIC is based on the following formula:

$$\text{SIC} = 1 + \log(2p) + \log\left(\frac{ESS}{n}\right) + \frac{k \log n}{n}$$

where ESS is the sum-of-squared residuals of the regression in which k parameters are estimated using n observations. The model chosen is the one associated with the smallest SIC.

We adopt the approach taken by Clare, et al. (1998), that is, if the mean returns or coefficients of the daily dummy variables are found to be significant through the OLS method, they are used as explanatory variables in the GARCH-M model.

RESULTS

Table 1 presents the OLS results of the day-of-the-week effects in the five ASEAN equity markets for each of the three periods. The results in Panel A for the pre-crisis period show that the day-of-the-week effect exists in all five markets but in different patterns. The daily seasonal anomaly is most prevalent in Malaysia, with a negative Monday effect and positive Wednesday and Friday effects. The negative Monday effect also exists in Singapore and Thailand while the positive Friday effect is present in Indonesia and again in Thailand. The pattern in the Philippines is very different from the other four ASEAN countries; it records positive Wednesday and Thursday effects. Thus, the Monday and Friday effects are the predominant effects in the five ASEAN stock markets during the pre-crisis period.

Panel B presents the results for the crisis period. The daily seasonal anomaly disappears completely in Malaysia, Singapore and Indonesia. Apparently, the only effect present is the negative Tuesday effect that is found in Thailand and the Philippines. This effect could be due to the influence from the well-documented negative Monday effect in the U.S stock market. Hence the equity markets in the five ASEAN countries hardly experienced much daily seasonal effect during this volatile period of the financial crisis.

The results given in Panel C show that the patterns of daily seasonal anomaly have changed considerably for the post-crisis period. Malaysia now shows only a positive Tuesday effect while the daily seasonal anomaly in Singapore is now on Friday. Thailand reverts to the Monday and Friday effects as in the pre-crisis period. Indonesia registers only a Thursday effect while for the Philippines, the Tuesday effect that existed during the crisis period now persists in this post-crisis period. Empirically, this shows that the Asian financial crisis has certainly altered the patterns of the daily seasonal effect in all these ASEAN stock markets except Thailand.

The results obtained so far are based on the OLS method, which does not take into account the varying daily volatility in the market returns. Such volatility needs to be modeled in order to provide a clearer picture of the daily seasonal anomalies in the equity markets of these five ASEAN countries. A GARCH-M model is used for this purpose. The days with significant mean returns obtained by the OLS method are identified and they are then included as part of the explanatory variables in the GARCH-M model. The objective of

Table 1. OLS Results for Day-of-the-Week Effect in Malaysia, Singapore, Thailand, Indonesia and Philippines

Day	Malaysia	Singapore	Thailand	Indonesia	Philippines
Panel A: Pre-Crisis Period					
Monday	−0.1900*	−0.1632*	−0.3274**	0.0119	−0.0258
Tuesday	0.0251	0.0500	−0.0589	−0.0134	−0.0671
Wednesday	0.2077**	0.0916	0.1577	0.1080	0.1727*
Thursday	0.0433	0.0685	0.0691	0.1424*	0.2182**
Friday	0.2133**	0.0665	0.1778*	0.1686**	0.1277
ARCH-LM (p-value)					
5 lags	0.000	0.000	0.000	0.000	0.000
10 lags	0.000	0.000	0.000	0.000	0.000
Panel B: Crisis Period					
Monday	−0.2899	−0.3917	−0.5359	−0.0165	−0.2539
Tuesday	−0.7143	−0.0789	−0.7432**	−0.4284	−0.4349*
Wednesday	0.1180	0.0439	0.0258	−0.2529	0.0297
Thursday	−0.5468	−0.2709	−0.1261	−0.2903	−0.3573
Friday	−0.0302	−0.0856	−0.0243	−0.1315	−0.1978
ARCH-LM (p-value)					
5 lags	0.000	0.000	0.000	0.000	0.000
10 lags	0.000	0.000	0.000	0.000	0.000
Panel C: Post-Crisis Period					
Monday	−0.2347	−0.2013	−0.4424**	−0.2566	0.1147
Tuesday	0.2906**	0.0136	−0.0041	0.0944	−0.2365**
Wednesday	0.0763	0.0237	0.1772	−0.0612	−0.1408
Thursday	0.0730	0.1017	−0.0077	0.2740*	0.0173
Friday	0.1325	0.2278*	0.4305**	0.2122	0.1889
ARCH-LM (p-value)					
5 lags	0.000	0.000	0.000	0.000	0.174
10 lags	0.000	0.000	0.000	0.000	0.659

*Denotes significance at 5% level. **Denotes significance at 1% level. Figures in parentheses are standard errors. ARCH-LM refers to the Engle's (1982) LM test for presence of ARCH effects. The significance test is based on Newey and West's (1987) heteroskedastic consistent standard errors.

this analysis is to determine whether the day-of-the-week effect in the equity markets could be due to the varying volatility in the market returns.

The results of the mean and variance equations for the pre-crisis period, crisis period and post-crisis period are presented in Tables 2-4, respectively. From the results given in Table 2, we may conclude that the Monday effect remains significant in the stock returns of Malaysia, Singapore and Thailand during the pre-crisis period. Similarly, the Friday effect

in Indonesia and both the Wednesday and Thursday effects in the Philippines remain significant even after considering the varying volatility of the market returns. The non-significance of the previously significant Wednesday and Friday effects in Malaysia and the Friday effect in Thailand may be explained by the varying market volatility.

Table 2. Conditional Mean Returns And Variance Equation Of Mean Returns of GARCH-M Model for Malaysia, Singapore, Thailand, Indonesia and Philippines: Pre-crisis Period

Parameter	Malaysia	Singapore	Thailand	Indonesia	Philippines
Conditional Mean Returns					
α_0	−0.0654	0.1277	−0.3416**	−0.0695	−0.1370
$h_t^{1/2}$	0.1294	−0.1031	0.3353**	0.0886	0.1274
R_{t-1}	0.2025**	0.1590**	0.1469**	0.3340**	0.2527**
δ_1	−0.1888**	−0.1593**	−0.4439**		
δ_2					
δ_3	0.1277				0.1542*
δ_4				0.0982	0.1462*
δ_5	0.0786		0.1381	0.1527**	
Variance Equation					
β_0	0.0739**	0.3263**	0.6174**	0.0314	0.0203
x^2_{t-1}	0.0779**	0.2915**	0.1135**	0.3642**	0.1116**
x^2_{t-2}		0.2156*	0.1969**	0.2267**	
x^2_{t-3}			0.1967**	−0.1374**	
x^2_{t-4}				−0.3152**	
x^2_{t-5}					
h_{t-1}	0.8987**		−0.7159**	−0.4188**	0.8584**
h_{t-2}			0.4078**	0.5095**	
h_{t-3}			0.5204**	0.8652**	
h_{t-4}				−0.1321	
h_{t-5}					
d_1^*	−0.2092**	0.2064	0.0441		
d_2^*					
d_3^*	−0.0170				0.3311**

Table 2 (continued)

Parameter	Malaysia	Singapore	Thailand	Indonesia	Philippines
d_4^*				−0.0242	−0.1841
d_5^*	−0.0285		−0.2447**	0.0200	
ARCH-LM (p-value)					
5 lags	0.406	0.856	0.899	0.969	0.490
10 lags	0.746	0.991	0.500	0.970	0.498
(p, q)	(1, 1)	(0, 2)	(3, 3)	(4, 4)	(1, 1)

*Denotes significance at 5% level. **Denotes significance at 1% level. Figures in parentheses are standard errors. ARCH-LM refers to the Engle's (1982) LM test for presence of ARCH effects. The significance test is based on Bollerslev and Wooldridge's (1992) robust standard errors and covariance.

Table 3. Conditional Mean Returns And Variance Equation Of Mean Returns of GARCH-M Model for Malaysia, Singapore, Thailand, Indonesia and Philippines: Crisis Period

Parameter	Malaysia[@]	Singapore[@]	Thailand	Indonesia[@]	Philippines
Conditional Mean Returns					
α_0			−1.7163**		−0.3501
$h_t^{1/2}$			0.6526**		0.1242
R_{t-1}			0.0762		0.1972**
δ_1					
δ_2			−0.3596		−0.1216
δ_3					
δ_4					
δ_5					
Variance Equation					
β_0			1.5682**		0.2696*
x_{t-1}^2			0.2656**		0.2348**
x_{t-2}^2					
x_{t-3}^2					
x_{t-4}^2					
x_{t-5}^2					
h_{t-1}			−0.1319**		0.7793**
h_{t-2}			0.6551**		
h_{t-3}					

Table 3 (continued)

Parameter	Malaysia[@]	Singapore[@]	Thailand	Indonesia[@]	Philippines
h_{t-4}					
h_{t-5}					
d_1^*					
d_2^*			−1.3460**		−0.5917
d_3^*					
d_4^*					
d_5^*					
ARCH-LM (p-value)					
5 lags			0.772		0.996
10 lags			0.830		0.979
(p, q)			(2,1)		(1, 1)

[@]GARCH-M model is not estimated for these countries because daily seasonal anomalies are not present during this period. *Denotes significance at 5% level. **Denotes significance at 1% level. Figures in parentheses are standard errors. ARCH-LM refers to the Engle's (1982) LM test for presence of ARCH effects. The significance test is based on Bollerslev and Wooldridge's (1992) robust standard errors and covariance.

Table 4. Conditional Mean Returns and Variance Equation of Mean Returns of GARCH-M Model for Malaysia, Singapore, Thailand, Indonesia and Philippines: Post-crisis Period

Parameter	Malaysia	Singapore	Thailand	Indonesia	Philippines
Conditional Mean Returns					
α_0	−0.2185*	−0.3202*	−0.1047	−0.0569	−0.1562
$h_t^{1/2}$	0.2155*	0.2460	0.0585	0.0549	0.1222
R_{t-1}	0.2032**	0.0516	0.0553	0.1554**	0.1804**
δ_1			−0.3378*		
δ_2	0.0942				−0.3491**
δ_3					
δ_4				−0.0044	
δ_5		0.1705	0.4301**		
Variance Equation					
β_0	0.0257*	0.0441	0.5312**	0.5111**	0.0153
x_{t-1}^2	0.1482**	0.0985**	0.1813**	0.2985**	0.1257*
x_{t-2}^2	0.0113				

Table 4 (continued)

Parameter	Malaysia	Singapore	Thailand	Indonesia	Philippines
x^2_{t-3}	−0.0654**				
x^2_{t-4}	−0.0759**				
x^2_{t-5}					
h_{t-1}	0.8015**	0.8672**	0.7010**	0.5417**	1.2686**
h_{t-2}	0.4768**				−0.4540**
h_{t-3}	0.0987				
h_{t-4}	−0.9523**				
h_{t-5}	0.5572**				
d^*_1			−0.4425		
d^*_2	−0.1312*				0.9059
d^*_3					
d^*_4				0.3043	
d^*_5		0.1429	0.1349		
ARCH-LM (p-value)					
5 lags	0.408	0.487	0.985	0.944	0.993
10 lags	0.248	0.768	0.999	0.933	0.999
(p, q)	(5, 4)	(1, 1)	(1, 1)	(1, 1)	(2.1)

*Denotes significance at 5% level. **Denotes significance at 1% level. Figures in parentheses are standard errors. ARCH-LM refers to the Engle's (1982) LM test for presence of ARCH effects. The significance test is based on Bollerslev and Wooldridge's (1992) robust standard errors and covariance.

Interestingly, the results in Table 3 reveal that the Tuesday effect that is observed in Thailand and the Philippines through the OLS method is no longer significant in the GARCH-M model. We may, hence, conclude that there is actually no daily seasonal anomaly during this crisis period of prevailing high volatility.

As for the post-crisis period, the results in Table 4 show that the Monday and Friday effects that are observed in Thailand through the OLS method stay significant and this means that they are not due to the varying volatility in the market returns. In contrast, the Tuesday effect in Malaysia and the Philippines, the Friday effect in Singapore, and the Thursday effect in Indonesia are no longer significant. Again, this reversal of significance in Malaysia, Singapore, Indonesia and the Philippines may be explained by the varying market volatility. Thus, except for Thailand, the other four ASEAN stock markets do not exhibit any day-of-the-week effect once the time-varying return volatility is taken into consideration.

CONCLUSION

The OLS results reveal different patterns of daily anomalies among the five ASEAN equity markets for each of the three periods. Not surprisingly, the Monday and Friday effects feature predominantly during the pre-crisis period. Except for the Tuesday effect in Thailand and the Philippines, there are practically no other daily anomalies during the crisis period. The pattern of daily anomalies in Thailand during the post-crisis period reverts to that of the pre-crisis period. However, the other four ASEAN markets exhibit different patterns of daily anomalies in the post-crisis period when compared to the pre-crisis period.

When the time-varying volatility in the market returns is taken into account, the Monday effect remains significant during the pre-crisis period. However, some of the other daily anomalies have become insignificant. During the crisis period, the Tuesday effect in Thailand and the Philippines disappears altogether. From this, we may conclude that there are actually no significant day-of-the-week effects in the crisis period. In the case of Thailand, the Monday and Friday effects persist in both the pre-crisis and the post-crisis periods. As for the other four stock markets, the daily anomalies no longer prevail in the post-crisis period.

The scope of this study can be extended into finding the reasons for these patterns of daily anomalies. Evidently, the 1997 Asian financial crisis has had a tremendous effect on the economic conditions in these five ASEAN countries, albeit to varying degrees. In turn, this has an effect on the trading sentiments in the financial markets. A future line of research may be to investigate the factors that account for these changing patterns of daily anomalies in relation to this crisis.

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