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TIME-OF-THE-MONTH ANOMALY IN ASEAN EQUITY MARKETS

Kim-Lian Kok[a*] and Yoke-Chen Wong[b]

[a]Taylor's Business School
[b]Sunway College

Abstract

This paper examines a recently documented time-of-the-month anomaly in five ASEAN equity markets before, during and after the Asian financial crisis. The results show that this anomaly exists in the smaller markets of Indonesia and the Philippines in the pre-crisis period and Indonesia in the post-crisis period. The other bigger markets of Malaysia, Singapore and Thailand do not exhibit such anomaly in any period at all. This anomaly is still observed even when the autocorrelation in stock returns is taken into consideration.

Keywords: Third-month anomaly; Asian financial crisis; Autocorrelation; Structural changes.

1. Introduction

There are abundant studies in the finance literature on the seasonal anomalies of stock market returns. These anomalies include the day-of-the-week effect, holiday effect, firm-size effect and the monthly effect. Three types of monthly effect have been identified so far, namely the turn-of-the month effect, the half-month effect and the third-month effect, and these effects have been examined by a number of authors.

The turn-of-the-month effect is a phenomenon whereby the mean daily return of four trading days – the last trading day of the month and the first three trading days of the following month – is higher than that of the other days of the month. This was first found by Lakonishok and Smidt (1988) who, in their study, showed that the US market had such turn-of-the-month effect. Cadsby (1989) obtained similar results for Canada. In a wider study involving the use of leading stock indices of 10 countries

[*] Corresponding author: Kim-Lian Kok, Taylor's Business School, Wisma Subang Jaya, Jalan SS15/4, 47500 Subang Jaya, Selangor Darul Ehsan, Malaysia. E-mail: kok.kimlian@taylors.edu.my.

and spanning different time periods till the late eighties, Cadsby and Ratner (1992) obtained the following results: The turn-of-the-month effect was found in the US, Canada, Switzerland, West Germany, United Kingdom and Australia but not in Japan, Hong Kong, Italy and France.

The half-month effect refers to the anomaly whereby the mean daily return of the first half of the month (comprising the last trading day of the month and the eight trading days of the following month) is significantly higher than the mean daily return of the second half of the month (comprising the nine trading days before the last trading day of the month). Ariel (1987) first identified this half-month effect in the US by using the Center for Research in Security Prices' (CRSP) value-weighted and equally-weighted stock indices over the period 1963-1981. In addition, he found a significantly positive mean daily return for the first half of the month while the mean daily return of the second half of the month was not significantly different from zero. Various factors such as pre-test bias, biased data, mismatch between calendar and trading time, dividend effect, manifestation of the January effect and small firms effect were examined but could not account for this half-month effect. However, Liano *et al*. (1992) showed that the half-month effect existed in over-the-counter stocks during periods of economic expansion but not during periods of economic contractions.

Extending the study to Japan, Canada, Australia and United Kingdom, Jaffe and Westerfield (1989) found that Australia exhibited such half-month effect while Japan had a reverse half-month effect in that the mean daily return for the first half of the month was significantly less than that for the last half of the month. Canada and United Kingdom did not have this half-month effect. Wong (1995) also extended the study to five developing stock markets of Hong Kong, Taiwan, Thailand, Malaysia and Singapore, and showed that the half-month effect hardly existed in these developing markets. Boudreaux (1995) also investigated the half-month effect in the stock markets of seven countries – Denmark, France, Germany, Norway, Singapore/Malaysia, Spain and Switzerland – in the period 1978-1992. The half-month effect was found in three countries, Denmark, Germany and Norway while a significantly inverted half-month effect was found in Singapore/Malaysia. Balaban and Bulu (1996) examined the half-month effect in Turkey and found that it did not exist except in 1994. However, Mills *et al*. (2000) found a half-month effect in Greece.

Lately, a new time-of-the-month anomaly, called the third-month anomaly in this paper, has been identified by Kohers and Patel (1999). They divided a calendar month into three segments. The first segment extends from the 28th day of the previous month to the 7th day of the current month, the second segment from the 8th day to the 17th day of the current month and the last segment consists of the remaining days - 18th day to 27th day - of the current month. Using the Standard & Poor's index and the NASDAQ index covering the periods from January 1960 to June 1995 and from January 1972 to June 1995, respectively, Kohers and Patel (1999) showed that the returns were highest during the first third of the month while the returns in the last third of the month were the lowest and mostly negative. These results held steadfastly during periods of economic expansion and contraction, as well as over different sub-periods.

In this study, we examine the third-month anomaly in the five ASEAN stock markets of Malaysia, Singapore, Thailand, Indonesia and the Philippines. In particular, we examine the presence of this third-month anomaly for each of the three periods as divided by the Asian financial crisis that first occurred in 1997, that is, the pre-crisis period, the crisis period and the post-crisis period. We also examine whether this third-month anomaly, if it exists, could be due to the autocorrelation in stock returns.

2. Data and Methodology

The data for this study are obtained from Bloomberg and consist of the daily closing values of the leading stock indices of the five ASEAN countries – Malaysia, Singapore, Thailand, Indonesia and the Philippines – spanning the period from 2 January 1992 to 12 August 2002. The indices are the Kuala Lumpur Composite Index, Singapore Stock Exchange All-Shares Index, Stock Exchange of Thailand Index, Jakarta Composite Index and the Philippines Composite Index.

Three periods have been identified for this study. In relation to the Asian financial crisis, the first period corresponds to the pre-crisis period from the beginning of January 1992 to the end of January 1997, the second period from the beginning of February 1997 to the end of September 1998 is the crisis period while the third period from the beginning of October 1998 to August 2002 corresponds to the post-crisis period.

The daily stock return R_{it} at day t for market i is computed as follows:

$$R_{it} = 100 \times \ln(P_{it} / P_{i,t-1}), \quad (1)$$

where P_{it} is the stock index of market i at day t and $P_{i,t-1}$ the stock index of market i at day $t-1$.

The dummy variable approach is used to test for structural changes in the market returns that may be attributed to the Asian financial crisis. The following autoregressive process is fitted:

$$R_{it} = \beta_0 + \beta_1 D_{1t} + \beta_2 D_{2t} + \sum_{k=1}^{p} \alpha_k R_{i,t-k} + D_{1t} \sum_{k=1}^{p} \theta_k R_{i,t-k} + D_{2t} \sum \phi_k R_{i,t-k} + \varepsilon_{it}, \quad (2)$$

where ε_{it} is the error term, assumed to be identically independently distributed, and p is the optimal lag length based on the Schwarz Information Criterion (*SIC*). The two dummy variables are defined as follows: $D_{1t} = 1$ for observations in the crisis period (February 1997 to September 1998) and 0, otherwise. $D_{2t} = 1$ for observations in the post-crisis period (October 1998 to August 2002) and 0, otherwise.

The *t* test is used to ascertain whether β_1 and β_2 are significantly different from zero. β_1 and β_2 are the differential intercept coefficients which indicate how much the intercepts of the crisis and the post-crisis periods differ from the benchmark pre-crisis period. The *F*-test is used to test the joint significance of θ_k and the joint significance of ϕ_k, where $k = 1, 2, ..., p$. θ_k and ϕ_k represent the differential slope coefficients which indicate how much the slope coefficients of the crisis and the post-crisis periods differ from those of the pre-crisis period. Their significance would suggest structural changes in the behaviour of the market returns.

The mean daily return of the first segment of a calendar month is the average of daily returns from the 28th day of the previous month to the 7th day of a calendar month. The averages of daily returns from the 8th day to the 17th day and from the 18th day to the 27th day of a calendar month contribute to the mean daily returns of the second segment and the third segment, respectively.

The standard *F* test is used to test for the third-month anomaly in the five ASEAN stock markets. If this anomaly exists, then Tukey's test is used to identify significant difference in the mean daily returns between any two segments of a month. But the *F* test assumes independence in the daily returns. Since the stock return series are often serially correlated, we perform a regression analysis to determine whether this would bias the results of the *F* test. This regression analysis is only used for the stock index return series that exhibit this anomaly. We extend the regression model of Jaffe and Westerfield (1989) to cater for the three segments of a month. It may be expressed as:

$$R_{it} - \rho R_{i,t-1} = \mu(1-\rho) + \lambda_2(S_{2t} - \rho S_{2,t-1}) + \lambda_3(S_{3t} - \rho S_{3,t-1}) + v_{it}, \quad (3)$$

where the two dummy variables are defined as follows: S_{2t} = 1 for the second segment of the month and 0, otherwise; and S_{3t} = 1 for the third segment of the month and 0, otherwise. ρ is the first-order serial correlation coefficient of the untransformed error term over the regression estimation period and it is estimated using the Cochran-Orcutt iterative procedure. The resulting estimate obtained is then used to transform the variables given in Equation (3). Thus, the estimates of the regression coefficients μ, λ_2 and λ_3 are obtained by the feasible generalized least squares method. The estimates of λ_2 and λ_3 provide the tests for a significant difference between the mean daily returns of the first and the second segments, and between the first and the third segments, respectively. v_{it} is the error term.

3. The Results

We first perform the test of structural changes arising from the Asian financial crisis. The results for the five ASEAN equity markets are presented in Table 1. For each market, the independent variable return is fitted up to three lags and the optimal lag length based on the *SIC* is one for all the markets.

Table 1
Regression Results for Testing for Significance of Structural Changes due to the Asian Financial Crisis

Dependent	**Independent Variables**					
Variable R_{it}	Constant	D_{1t}	D_{2t}	$R_{i,t-1}$	$D_{1t}\ R_{i,t-1}$	$D_{2t}\ R_{i,t-1}$
Singapore	0.0241	-0.1531*	0.0077	0.0296	0.1409**	0.0343
	(0.0343)	(0.0694)	(0.0522)	(0.0394)	(0.0533)	(0.0484)
Malaysia	0.0521	-0.3433**	0.0081	0.1732**	-0.1793**	-0.0349
	(0.0503)	(0.1017)	(0.0766)	(0.0437)	(0.0508)	(0.0593)
Indonesia	0.0541	-0.2339*	-0.0113	0.3523**	-0.1509*	-0.1906**
	(0.0454)	(0.0910)	(0.0687)	(0.0524)	(0.0603)	(0.0596)
Thailand	0.0068	-0.2242*	0.0291	0.1172**	0.0954	-0.0348
	(0.0523)	(0.1058)	(0.0795)	(0.0358)	(0.0507)	(0.0469)
Philippines	0.0666	-0.2537**	-0.0790	0.2051**	0.0178	-0.0612
	(0.0436)	(0.0883)	(0.0663)	(0.0341)	(0.0486)	(0.0460)

Notes: * Significant at 5% level. ** Significant at 1% level. The figures in parentheses are the standard errors. The optimal lag length of 1 is based on *SIC*.

The coefficients of D_{1t} are significantly negative in all the five markets, suggesting a decline in the average market returns during the crisis period. Conversely, the non-significance of the coefficients of D_{2t} suggests that there is no significant difference between the average market returns of the pre-crisis period and the post-crisis period. The significantly positive coefficient of $D_{1t}\ R_{i,t-1}$ in Singapore and the significantly negative coefficients of $D_{1t}\ R_{i,t-1}$ in Malaysia and Indonesia suggest that there is an increase in Singapore and a decrease in Malaysia and Indonesia of lag dependence during the crisis period compared to the pre-crisis period. However, none of the coefficients of $D_{2t}\ R_{i,t-1}$ is significant. This suggests that there is no significant difference in lag dependence of the market returns between the pre-crisis and the post-crisis periods. We may, therefore, conclude that there are structural changes in the behaviour of the market returns due to the Asian financial crisis. This justifies the choice of the three periods in this study.

The results of the third-month anomaly are presented in Table 2. In the pre-crisis period, only Malaysia, Indonesia and the Philippines recorded highest mean daily returns in the first segment of the month. The lowest mean daily returns were recorded in the second segment of the month for Malaysia and Indonesia. All five ASEAN markets have different patterns of the third-month anomaly. Only the Philippines has the same pattern as the US that was documented by Kohers and Patel (1999) where the first third of the month has the highest mean daily return and the last third of the month the lowest mean daily return. The results of the *F* test show that there are significant differences in the mean daily returns among the three segments of

the month in Indonesia and the Philippines. The results of Tukey's test show further that it is the first segment of the month that has significant different mean daily returns from those of the second and the third segments of the month for both markets.

In the crisis period where almost all the mean daily returns of the three segments of the month are negative, two distinct patterns of the third-month anomaly are observed in the five ASEAN markets. Malaysia and Thailand recorded highest mean daily returns in the first segment of the month and lowest mean daily returns in the second segment of the month. The other three markets of Singapore, Indonesia and the Philippines recorded highest and lowest mean daily returns in the third and second segments of the month, respectively. Thus, during this period of high volatility, none of the markets has the same pattern as that of the US. Furthermore, the results of the *F* test show that the mean daily returns of the three segments of the month are not significantly different.

In the post-crisis period, all the markets except Malaysia recorded the highest mean daily returns in the first segment of the month. However, only the Indonesian market has the same pattern of anomaly as that of the US with the third segment of the month registering the lowest and negative mean daily return while the other three markets have their lowest mean daily returns in the second segment of the month. In the case of Malaysia, the second segment of the month has the highest mean daily return while, surprisingly, the first segment of the month has the lowest and negative mean daily return. The *F* test results reveal that only Indonesia has significant differences in mean daily returns among the segments of the month. Tukey's test results further reveal that this is attributed to the difference between the first and the third segments of the month.

It is worthwhile examining whether the significant differences in the mean daily returns between two segments of the month as revealed by the results of Tukey's test for Indonesia in the pre-crisis and the post-crisis periods and for the Philippines in the pre-crisis period could be attributed to the first order autocorrelation in stock returns. The results of the regression model given by Equation (3) are given in Table 3. In the pre-crisis period, both λ_2 and λ_3 coefficients are significantly negative for Indonesia and the Philippines. This shows that the mean daily return of the first segment of the month is significantly greater than those of the second and the third segments of the month and, thus, cannot be attributed to the first order autocorrelation in stock returns. Similarly, in the post-crisis period, the λ_3 coefficient is significantly negative. Therefore, the mean daily return of the first segment of the month is significantly greater than that of the third segment of the month and, again, cannot be attributed to the first order autocorrelation in stock returns.

Table 2
Third-month Anomaly in ASEAN Equity Markets, January 1992 – August 2002

		Malaysia	Singapore	Thailand	Indonesia	Philippines
Panel A. Pre-Crisis Period: January 1992-January 1997						
1st third of month	Mean	0.0948	0.0162	0.0563	0.2048	0.2292
	Std. Dev.	1.1705	0.8364	1.5193	0.8801	1.2776
2nd third of month	Mean	0.0361	0.0197	0.0911	0.0088	0.0155
	Std. Dev.	1.2014	0.9813	1.4023	0.9169	1.2804
Last third of month	Mean	0.0559	0.0369	-0.1195	0.0303	0.0116
	Std. Dev.	1.0666	0.7865	1.4593	0.7697	1.2583
F statistic		0.286	0.068	2.494	6.555	4.064
p-value		0.752	0.934	0.083	0.001	0.017
Tukey's test (*p*-value)					1 & 2 (0.003)	1 & 2 (0.039)
					1 & 3 (0.010)	1 & 3 (0.034)
Panel B. Crisis Period: February 1997-September 1998						
1st third of month	Mean	0.0463	-0.1839	-0.1335	-0.0720	-0.2121
	Std. Dev.	4.0999	1.7757	2.8303	2.8093	2.2788
2nd third of month	Mean	-0.6583	-0.2200	-0.4791	-0.5516	-0.3433
	Std. Dev.	3.4139	1.8884	2.4338	2.7249	2.3476
Last third of month	Mean	-0.2397	-0.0640	-0.2295	-0.0540	-0.1707
	Std. Dev.	2.5661	1.3001	2.3694	2.3289	2.0020
F statistic		1.463	0.331	0.653	1.562	0.227
p-value		0.233	0.718	0.521	0.211	0.797
Panel C. Post-Crisis Period: October1998-August 2002						
1st third of month	Mean	-0.0220	0.1181	0.1088	0.2296	0.0839
	Std. Dev.	1.4841	1.3480	1.9182	1.7495	1.6485
2nd third of month	Mean	0.1918	-0.0810	-0.0120	0.0697	-1.2088
	Std. Dev.	1.5276	1.5197	2.2219	1.9124	1.5553
Last third of month	Mean	0.0399	0.0607	0.0183	-0.1561	-0.0060
	Std. Dev.	1.2867	1.3254	1.7882	1.7484	1.6509
F statistic		1.861	1.740	0.318	3.647	1.298
p-value		0.156	0.176	0.728	0.026	0.274
Tukey's test (*p*-value)					1 & 3 (0.019)	

Note: The numbers for the Tukey's test refer to the three segments of the month. The figures in parentheses are the *p*-values.

Table 3
Third-month Anomaly and Autocorrelation of Stock Returns in ASEAN Equity Markets, January 1992 – August 2002

	Pre-crisis Period		Post-crisis Period
Parameter	**Indonesia**	**Philippines**	**Indonesia**
μ	0.2052**	0.2164**	0.2197*
	(3.721)	(3.069)	(1.997)
λ_2	-0.1861*	-0.1949*	-0.1515
	(-2.444)	(-2.058)	(-0.886)
λ_3	-0.1837**	-0.2028*	-0.3639*
	(-2.959)	(-2.048)	(-2.338)
ρ	0.3476**	0.2003**	0.1549**
	(10.896)	(7.563)	(4.182)

Notes: * denotes significant at 5% level . ** denotes significant at 1% level. The figures in parentheses are the *t* statistics.

4. Conclusion

Kohers and Patel (1999) documented a new time-of-the-month anomaly in the US market with a pattern showing highest mean daily return in the first segment of the month and the lowest negative mean negative return in the last segment of the month. The results of this study reveal that only Indonesia in the pre-crisis and the post-crisis periods and the Philippines in the pre-crisis period exhibit such an anomaly in stock returns. The anomaly can be attributed to the mean daily return of the first segment of the month being significantly greater than those in the second and the third segments of the month. In fact, the anomaly in Indonesia in the pre-crisis period is different in that it is the second segment of the month that has the lowest mean daily return. The anomaly is still observed even when the first order autocorrelation in stock returns is taken into consideration. The other three bigger ASEAN markets of Malaysia, Singapore and Thailand do not exhibit this type of anomaly in any period at all. Thus, rather surprisingly, it is the two smaller ASEAN markets of Indonesia and the Philippines that seem to exhibit the same type of anomaly as that found by Kohers and Patel (1999) in the large US market.

In the pre-crisis period, the ASEAN markets have very different patterns of stock returns in the three segments of the month. Only the Philippines has the same pattern as that of the US where the mean daily return in the first segment of the month is the highest while that in the third segment is the lowest. In the crisis period, not only the ASEAN markets do not have such anomaly, they also have very different patterns of stock returns in the three segments of the month. In the post-crisis period, only Indonesia has the same pattern as that of the US.

The results of our study seem to indicate that the bigger ASEAN markets of Malaysia, Singapore and Thailand are more efficient than the two smaller markets of Indonesia and the Philippines. This would imply that the investors in these bigger markets would not be able to exploit the third-month anomaly for abnormal gains while those in the smaller markets may be able to exploit such an anomaly by devising a trading rule to reap abnormal returns.

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