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STRUCTURAL CHANGE IN THE EFFICIENCY OF THE ASEAN STOCK MARKETS AFTER THE MILLENNIUM

Sheung Tat Chan and Terence Tai-Leung Chong[1]

[1] *Department of Economics, The Chinese University of Hong Kong*

Abstract

This paper examines the performance of the time-series model based trading rules in the ASEAN stock markets. Our results show that the trading rules are in general profitable, especially in the Malaysian and Indonesian stock markets, but the profitability has declined in recent years. Using a structural-change test, we find evidence that the efficiency of the ASEAN stock markets has improved after the millennium.

JEL Classifications: G10, G12.
***Keywords*:** Trading Rules; Millennium; Market Efficiency.

1. Introduction

Technical analysis has long been adopted in securities trading. It has attracted the attention of academics since the seminal work of Fama (1965) and Jensen and Benington (1970). Most of the previous studies examine the profitability of the Variable Length Moving Average (VMA) rules. For example, Brock *et al.* (1992) show that the VMA trading rules generate excess returns in the US market. Hudson *et al.* (1996) and

[1] Corresponding Author: Terence Tai-Leung Chong, Department of Economics, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong. Homepage: http://www.cuhk.edu.hk/eco/staff/tlchong/tlchong3.htm.
Email: chong2064@cuhk.edu.hk. Tel: (852) 26098193. Fax: (852) 26035805.

Mills (1997) also find that the rules are profitable in the FT30 index. LeBaron (2000) examines the stability of returns to the VMA rules. It is found that the difference between conditional means during buy and sell periods has changed dramatically in recent years, whereas the difference in conditional variances does not changed much. Li *et al.* (2008) have shown that the profitability of the Moving Average Convergence-Divergence (MACD) rules has fallen after the millennium.

These earlier studies, however, focus on developed markets. Recently, there have been studies on the effectiveness of technical trading rules in the Asian stock markets.[2] For example, Bessembinder and Chan (1995) implement the VMA trading rules of Brock et al. (1992) on Asian indices and conclude that they are quite successful in the stock markets of Malaysia, Thailand and Taiwan. Ito (1999) applies the VMA rules to the indices of six Pacific-Basin countries. It is found that the rules have predictability in Indonesia and Taiwan. Ratner and Leal (1999) conclude that the rules have predictive power in six Asian stock markets. Hameed and Ting (2000) find evidence of predictability in the Malaysian stock market. Coutts and Cheung (2000) conclude that the VMA rules are profitable in the Hong Kong stock market. Following the work of Coutts and Cheung (2000), Chong and Lok (2007) show that the high efficiency of the Hong Kong stock market is not affected by the handover in 1997.

This paper evaluates the profitability of time-series based trading rules in the stock markets of Malaysia, Singapore and Indonesia. The efficiency of these markets before and after the millennium will also be investigated. The methodology follows closely those of Chong and Chan (2008). We find that our trading rules perform well in these three ASEAN markets, but the profitability has dropped after the millennium. The remainder of the paper is structured as follows: Section 2 describes the data and trading rules. Section 3 reports the results and Section 4 concludes the paper.

[2]There are also studies on the performance of trading rules in the currency market. For example, Ahmed, Beck and Goldreyer (2005) find that the moving average rules can beat the buy-and-hold strategy in the daily spot exchange rates of Indonesia, the Philippines, South Korea and Thailand. Chong and Ip (2009) show that the buy-the-winner-and-sell-the-loser momentum rule is profitable in emerging currency markets.

2. Data and Methodology

Our sample consists of daily stock indices from 1985 to 2006 of three ASEAN markets, including the Straits Times Index of Singapore, Kuala Lumpur Composite of Malaysia and Jakarta Composite Index of Indonesia. All the data are obtained from DataStream. The total number of observations is 5723. Table 1.0 shows the descriptive statistics for these three markets.

-Table 1.0 about here-

Note from Table 1.0 that the autocorrelations in the return series are statistically significant. The autocorrelation functions of the three return series are plotted in Figure 1, which shows that the Straits Times Index and Jakarta Composite Index have a significant first-order autocorrelation (with $\rho(1) > 0.10$). This is consistent with Harvey (1995), who observes that the level of serial correlation in emerging market share prices is typically much higher relative to their developed market counterparts. The presence of serial correlation implies potential gains from applying the trading rules.

-Figure 1 about here-

-Table 2.0 about here-

Table 2.0 reports the summary statistics of the subsamples before and after the millennium. From the Ljung-Box Q statistics, it is concluded that the degree of autocorrelations in the Straits Times Index and the Jakarta Composite Index have been dropped after the millennium.

Two sets of trading rules are studied. The first set is based on the following AR(1) model on stock returns:

$$\Delta Y_t = \lambda_0 + \lambda_1 \Delta Y_{t-1} + \varepsilon_t \,, \qquad (1)$$

where Y_t is the natural logarithm of a stock index and ΔY_{t+1} is the one-day return from time t to time $t + 1$. The trading rule is as follows:

$$\text{Buy if } E_t^w(\Delta Y_{t+1}) > 0,$$

$$\text{Sell if } E_t^w(\Delta Y_{t+1}) < 0,$$

where E_t^w refers to the expectation conditional on the previous w observations up to day t.

The second set of trading rules is based on the variable length moving average (VMA) rules of Brock et al. (1992). The VMA rule states that one should take a long position if the short-term VMA is above the long-term VMA and stay short otherwise. It is an appealing trend-following trading rule, and has been proven profitable in many studies (Brock et al., 1992; Bessembinder and Chan, 1995; Ito, 1999; Coutts and Cheung, 2000). To implement the VMA rules, we first define the w-day moving average as:

$$MA_t(w) = \frac{\sum_{t=1}^{w} P_t}{w}. \tag{2}$$

The trading rule is as follows:

$$\text{Buy if } MA_t(S) > MA_t(L),$$
$$\text{Sell if } MA_t(S) < MA_t(L),$$

where $MA_t(S)$ and $MA_t(L)$ represent the short-term MA and the long-term MA respectively, where $S < L$. The VMA(S,L) rules under study are VMA(1,50), VMA(1,150), VMA(1,200), VMA(5,150) and VMA(2,200).

We define the daily mean buy (sell) return ($\pi_{b(s)}$) as:

$$\pi_{b(s)} = \frac{1}{N_{b(s)}} \sum_{t=1}^{N} \Delta Y_{t+1} I_t^{b(s)}. \tag{3}$$

The sample variance ($\sigma^2_{b(s)}$) of the above return is

$$\sigma^2_{b(s)} = \frac{1}{N_{b(s)}} \sum_{t=1}^{N} (\Delta Y_{t+1} - \pi_{b(s)})^2 I_t^{b(s)} \quad , \tag{4}$$

where $N_{b(s)}$ stands for the number of buy (sell) days, N is the number of observations for the complete sample, $I_t^{b(s)}$ is an indicator function that equals one if a buy (sell) signal is generated at time t and equals zero otherwise. Following Brock *et al.* (1992), we test the difference of the mean buy return and the mean sell return from the one-day unconditional mean, and the buy-sell return from zero. The null and alternative hypotheses and the conventional t-statistic for the mean buy (sell) return are respectively given as follows:

$H_0 : \quad \pi_{b(s)} = \overline{\pi}$

$H_1 : \quad \pi_{b(s)} \neq \overline{\pi}$

$$t_{b(s)} = \frac{\pi_{b(s)} - \overline{\pi}}{\left(\frac{\sigma^2}{N_{b(s)}} + \frac{\sigma^2}{N} \right)^{1/2}} \quad , \tag{5}$$

where $\overline{\pi}$ is the unconditional one-day mean and σ^2 is the unconditional variance. For the buy-sell return, the null and alternative hypotheses are as follows:

$H_0 : \quad \pi_b - \pi_s = 0$

$H_1 : \quad \pi_b - \pi_s \neq 0$

$$t_{(b-s)} = \frac{\pi_b - \pi_s}{\left(\frac{\sigma^2}{N_b} + \frac{\sigma^2}{N_s} \right)^{1/2}} \quad . \tag{6}$$

3. Empirical Results

Tables 3.1 to 3.3 show the empirical results of the trading strategies for Singapore, Malaysia and Indonesia respectively using the whole sample. AR(1,w) stands for the AR(1) trading rule with a window width of w.

-Table 3.1 to 3.3 about here-

Columns 2 and 3 report the number of buy and sell signals respectively. Columns 8, 9 and 10 show the one-day conditional mean for buy, sell and buy-sell returns respectively. The buy-sell return can be considered as the proxy of return of a complete transaction. The numbers in the parentheses are the t-statistics for the corresponding null hypothesis. In general, the time-series based trading strategies are profitable in the three ASEAN stock markets. Note that most of the trading rules are able to obtain a significant buy-sell return. The t-ratios for the buy-sell return in most of the cases are significant at the 1% level. The return is the highest in the Indonesian market, as shown in Table 3.1. In particular, the AR(1,150) rule generates a daily return of 0.004155. Note that the AR rules outperform the VMA rules, especially in the Jakarta Composite Index. Among the VMA rules, the VMA(1,50) yields the highest return.

From Tables 4.1 and 4.2, for the case of Singapore, the buy-sell returns are much higher before the millennium. For example, the returns of the AR rules can be as high as 0.0035 before the year 2000, while the highest return after the millennium is only 0.001. The t-values of the buy-sell returns for all rules have dropped after the millennium. The reduction in profitability is partly due to the reduction of serial correlation in returns as reported in Table 2.0.

-Table 4.1 to 4.6 about here-

From Tables 4.3 to 4.6, for the cases of Malaysia and Indonesia, the AR rules still beat the VMA rules although the t-values have dropped. The t-values of the VMA rules have also diminished after the millennium, especially for the case of Indonesia. This is also consistent

with the reduction in the Ljung-Box Q statistic reported as in Table 2.0.

To compare the buy-sell return before and after the millennium, we conduct a structural-change test on the buy-sell return. The mean return of the corresponding period is subtracted from the buy-sell return to adjust for the mean-shift effect. We test

$$H_0 : (\pi_{b1} - \pi_{s1}) - \overline{\pi}_1 = (\pi_{b2} - \pi_{s2}) - \overline{\pi}_2$$

$$H_1 : (\pi_{b1} - \pi_{s1}) - \overline{\pi}_1 \neq (\pi_{b2} - \pi_{s2}) - \overline{\pi}_2$$

The test statistic is defined as

$$t = \frac{((\pi_{b1} - \pi_{s1}) - \overline{\pi}_1) - ((\pi_{b2} - \pi_{s2}) - \overline{\pi}_2)}{\sigma\sqrt{\frac{1}{N_{b1}} + \frac{1}{N_{s1}} + \frac{1}{N_1} + \frac{1}{N_{b2}} + \frac{1}{N_{s2}} + \frac{1}{N_2}}} \quad , \qquad (7)$$

where $\pi_{b(s)i}$ stands for mean buy (sell) return in period i (i = 1, 2), and $\overline{\pi}_i$ stands for the mean return in subsample i (i = 1, 2). N_{bi} is the number of observations of buy in the i^{th} subsample, N_{si} is the number of observations of sell in i^{th} subsample, and N_i is the total number of observations in the i^{th} subsample. σ is the sample standard deviation of the whole sample.[3] Table 5.0 compares the difference of the buy-sell return before and after the year 2000.

-Table 5.0 about here-

For the AR rules, all the t-ratios for the Kuala Lumpur Composite Index and the Jakarta Composite Index are strictly positive. This indicates that the buy-sell difference has fallen after the millennium, and that the AR trading rules have become less profitable. For the VMA rules, most of the t-ratios are positive but insignificant.

[3] For more details of structural-change models, one is referred to Hawkins (1977) and Chong (2001).

4. Conclusion

This paper examines the profitability of the AR and VMA trading strategies in the stock markets of Singapore, Malaysia and Indonesia. It is found that the AR rules outperform VMA rules in these three ASEAN markets. However, the profitability of both rules has fallen after the millennium. The result implies that the three ASEAN markets have become more efficient in recent years, which is consistent with the findings of Chong and Chan (2008) and Li *et al.* (2009). The improvement of market efficiency can be attributed to the increase in information flows arising from increased access to modern telecommunication technology, market structuring and the tightening of regulations of these countries after the Asian Financial Crisis.

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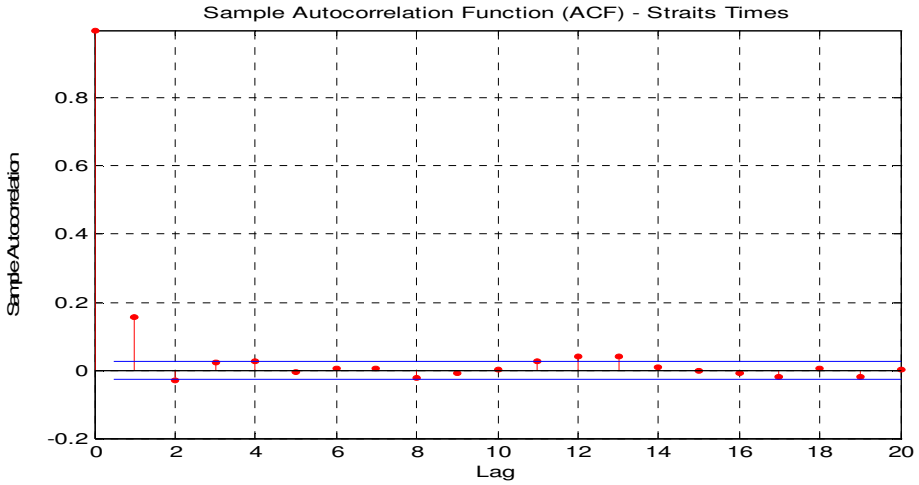
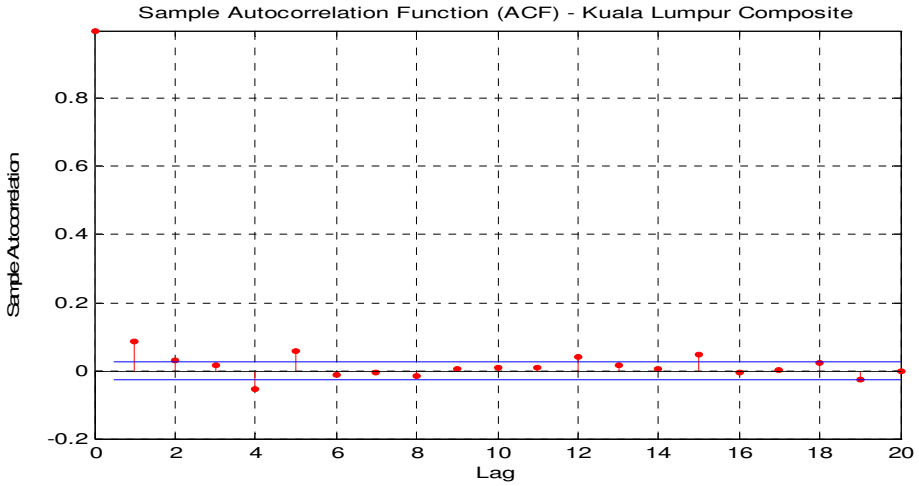
Figure 1 – Autocorrelation Plots





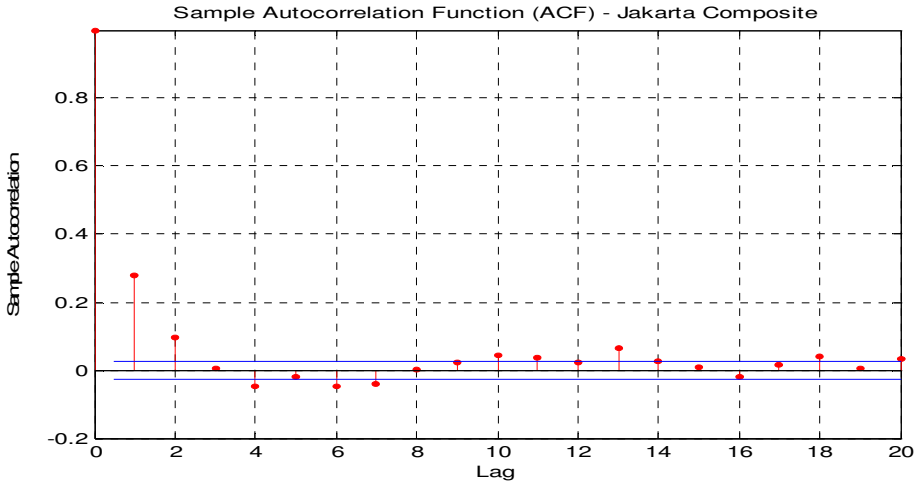


Table 1.0: Summary statistics for the return series for the whole sample

	Straits Times	Kuala Lumpur	Jakarta
Observations	5722	5722	5722
Mean	0.000267	0.000228	0.000568
Maximum	0.154809	0.208174	0.403102
Minimum	-0.291864	-0.241534	-0.225269
Std. Dev.	0.01345	0.01513	0.01583
Skewness	-1.95737	-0.30210	3.33586
Kurtosis	56.55	41.11	102.39
Jarque-Bera	687270	346392	2365447
Probability	0	0	0
Sum	1.52817	1.30429	3.24915
Sum Sq. Dev.	1.03476	1.30916	1.43344
Ljung-Box Q-Statistic(5)	152.01**	85.88**	507.26**
ρ(1)	0.15612	0.08640	0.27738
ρ(2)	-0.02879	0.03141	0.09512
ρ(3)	0.02406	0.01677	0.003514
ρ(4)	0.02751	-0.05472	-0.04739
ρ(5)	-0.00375	0.05719	-0.01882

Notes: Returns are defined as the log difference of the stock index level. "JB stat" represents the Jarque-Bera test for normality. As for the Ljung-Box Q-statistic (5), *(**) indicates that the numbers are significant at the 5%(1%) level.

Table 2.0: Summary statistics for the return series for the subsamples

	Jakarta	Kuala Lumpur	Straits Times
Subsample 1: Jan 1985 to Dec 1999			
Observations	3910	3910	3910
Mean	0.000587	0.000259	0.000351
Maximum	0.403102	0.208174	0.154809
Minimum	-0.225269	-0.241534	-0.291864
Std. Dev.	0.01691	0.01729	0.01442
Skewness	4.16873	-0.26758	-2.20927
Kurtosis	113.66	34.94	61.25
Jarque-Bera	2006506	166229	556029
Probability	0	0	0
Sum	2.29672	1.01171	1.37369
Sum Sq. Dev.	1.11759	1.16872	0.81295
Ljung-Box Q-Statistic(5)	505.02**	55.80**	150.80**
Subsample 2: Jan 2000 to Dec 2006			
Observations	1812	1812	1812
Mean	0.000526	0.000161	0.000085
Maximum	0.053223	0.045027	0.049052
Minimum	-0.109336	-0.063422	-0.090950
Std. Dev.	0.01321	0.00881	0.01107
Skewness	-0.74542	-0.53039	-0.58068
Kurtosis	8.17	10.07	8.69
Jarque-Bera	2182	3853	2547
Probability	0	0	0
Sum	0.95243	0.29258	0.15449
Sum Sq. Dev.	0.31584	0.14043	0.22173
Ljung-Box Q-Statistic(5)	24.01**	62.92**	16.20**

Notes: Returns are defined as the log difference of the stock index level. "JB stat" represents the Jarque-Bera test for normality. As for the Ljung-Box Q-statistic (5), *(**) indicates that the numbers are significant at the 5%(1%) level.

Table 3.1: Empirical result for the Straits Times Index, Singapore

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	3152	2520	0.01080	0.01608	0.000258	0.01348	0.001487	-0.001279	0.002767
							(4.1050**)	(-4.7647**)	(7.6814**)
AR(1,150)	3174	2398	0.01107	0.01619	0.000289	0.01356	0.001285	-0.001030	0.002315
							(3.3036**)	(-3.9814**)	(6.3091**)
AR(1,200)	3275	2247	0.01115	0.01641	0.000294	0.01360	0.001395	-0.001311	0.002706
							(3.6701**)	(-4.7148**)	(7.2617**)
VMA(1,50)	3329	2344	0.01070	0.01660	0.000259	0.01348	0.000900	-0.000652	0.001553
							(2.1802*)	(-2.7532**)	(4.2726**)
VMA(1,150)	3232	2341	0.01068	0.01672	0.000289	0.01356	0.000801	-0.000417	0.001218
							(1.7070)	(-2.1157*)	(3.3106**)
VMA(1,200)	3354	2169	0.01083	0.01701	0.000293	0.01360	0.000594	-0.000172	0.000766
							(1.0102)	(-1.3495)	(2.0437*)
VMA(5,150)	3217	2356	0.01071	0.01666	0.000289	0.01356	0.000843	-0.000467	0.001310
							(1.8446)	(-2.2695*)	(3.5629**)
VMA(2,200)	3359	2164	0.01197	0.01580	0.000293	0.01360	0.000473	0.000014	0.000459
							(0.6044)	(-0.8094)	(1.2244)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 3.2: Empirical result for the Kuala Lumpur Composite Index, Malaysia

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	3239	2433	0.01352	0.01698	0.000219	0.01517	0.001413	-0.001369	0.002782
							(3.5730**)	(-4.3227**)	(6.8379**)
AR(1,150)	3274	2298	0.01302	0.01784	0.000248	0.01524	0.001256	-0.001188	0.002444
							(3.0027**)	(-3.7999**)	(5.8914**)
AR(1,200)	3213	2309	0.01335	0.01749	0.000243	0.01527	0.001348	-0.001294	0.002642
							(3.2610**)	(-4.0627**)	(6.3426**)
VMA(1,50)	3271	2402	0.01224	0.01836	0.000218	0.01517	0.001023	-0.000878	0.001902
							(2.4184*)	(-2.9701**)	(4.6666**)
VMA(1,150)	3413	2160	0.01130	0.01993	0.000242	0.01525	0.000699	-0.000480	0.001180
							(1.3796)	(-1.8694)	(2.8138**)
VMA(1,200)	3540	1983	0.01110	0.02070	0.000239	0.01527	0.000668	-0.000528	0.001196
							(1.3057)	(-1.9170)	(2.7914**)
VMA(5,150)	3405	2168	0.01140	0.01981	0.000242	0.01525	0.000770	-0.000588	0.001358
							(1.5924)	(-2.1491*)	(3.2404**)
VMA(2,200)	3536	1987	0.01151	0.02029	0.000239	0.01527	0.000609	-0.000421	0.001030
							(1.1266)	(-1.6507)	(2.4056*)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 3.3: Empirical result for the Jakarta Composite Index, Indonesia

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	3240	2432	0.01614	0.01531	0.000562	0.01589	0.002150	-0.001552	0.003702
							(4.5352**)	(-5.4894**)	(8.6817**)
AR(1,150)	3366	2206	0.01570	0.01620	0.000588	0.01603	0.002233	-0.001922	0.004155
							(4.7007**)	(-6.2245**)	(9.4619**)
AR(1,200)	3302	2220	0.01619	0.01558	0.000590	0.01610	0.002406	-0.002111	0.004517
							(5.1272**)	(-6.6758**)	(10.2221**)
VMA(1,50)	3300	2373	0.01623	0.01521	0.000562	0.01589	0.001897	-0.001295	0.003192
							(3.8379**)	(-4.7794**)	(7.4629**)
VMA(1,150)	3521	2052	0.01573	0.01649	0.000588	0.01603	0.001077	-0.000252	0.001329
							(1.4185)	(-2.0293*)	(2.9863**)
VMA(1,200)	3468	2055	0.01594	0.01631	0.000590	0.01610	0.001189	-0.000422	0.001612
							(1.7192)	(-2.4327*)	(3.5960**)
VMA(5,150)	3520	2053	0.01599	0.01603	0.000588	0.01603	0.001231	-0.000515	0.001746
							(1.8642)	(-2.6654**)	(3.9232**)
VMA(2,200)	3458	2065	0.01596	0.01628	0.000590	0.01610	0.001145	-0.000339	0.001484
							(1.5892)	(-2.2374*)	(3.3143**)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 4.1: Empirical Result of Straits Times Index, Singapore from Jan 1985 to Dec 1999

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	2177	1683	0.01149	0.01740	0.000340	0.01447	0.001885	-0.001659	0.003544
							(3.9830**)	(-4.7275**)	(7.5436**)
AR(1,150)	2133	1627	0.01165	0.01759	0.000387	0.01461	0.001786	-0.001448	0.003234
							(3.5332**)	(-4.2313**)	(6.7243**)
AR(1,200)	2193	1517	0.01187	0.01778	0.000396	0.01469	0.001862	-0.001723	0.003585
							(3.7059**)	(-4.7352**)	(7.3104**)
VMA(1,50)	2275	1586	0.01121	0.01808	0.000340	0.01447	0.001194	-0.000885	0.002080
							(2.2336*)	(-2.8392**)	(4.3933**)
VMA(1,150)	2214	1547	0.01146	0.01816	0.000387	0.01461	0.000951	-0.000419	0.001369
							(1.4388)	(-1.8262)	(2.8277**)
VMA(1,200)	2284	1427	0.01155	0.01862	0.000395	0.01468	0.000742	-0.000160	0.000901
							(0.8875)	(-1.2129)	(1.8191)
VMA(5,150)	2212	1549	0.01152	0.01810	0.000387	0.01461	0.000972	-0.000447	0.001419
							(1.4930)	(-1.8923)	(2.9319**)
VMA(2,200)	2286	1425	0.01309	0.01692	0.000395	0.01468	0.000586	0.000088	0.000498
							(0.4901)	(-0.6707)	(1.0054)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 4.2: Empirical Result of Straits Times Index, Singapore from Jan 2000 to Dec 2006

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	959	803	0.00865	0.01303	0.000183	0.01088	0.000678	-0.000408	0.001086
							(1.1332)	(-1.2755)	(2.0860*)
AR(1,150)	976	686	0.00874	0.01237	0.000211	0.01040	0.000338	0.000030	0.000307
							(0.3027)	(-0.3827)	(0.5936)
AR(1,200)	992	620	0.00850	0.01285	0.000241	0.01040	0.000522	-0.000209	0.000731
							(0.6706)	(-0.9162)	(1.3742)
VMA(1,50)	1042	721	0.00917	0.01295	0.000187	0.01088	0.000332	-0.000024	0.000356
							(0.3423)	(-0.4373)	(0.6752)
VMA(1,150)	981	682	0.00817	0.01291	0.000205	0.01040	0.000643	-0.000424	0.001066
							(1.0450)	(-1.3308)	(2.0576*)
VMA(1,200)	1014	599	0.00804	0.01347	0.000231	0.01040	0.000598	-0.000392	0.000990
							(0.8819)	(-1.2504)	(1.8468)
VMA(5,150)	970	693	0.00810	0.01291	0.000205	0.01040	0.000713	-0.000506	0.001219
							(1.2100)	(-1.5134)	(2.3586*)
VMA(2,200)	1016	597	0.00812	0.01342	0.000231	0.01040	0.000560	-0.000330	0.000889
							(0.7901)	(-1.1242)	(1.6581)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 4.3: Empirical Result of Kuala Lumpur Composite Index, Malaysia from Jan 1985 to Dec 1999

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	2240	1620	0.01543	0.01956	0.000246	0.01737	0.001686	-0.001744	0.003430
							(3.1212**)	(-3.8723**)	(6.0567**)
AR(1,150)	2247	1513	0.01476	0.02086	0.000290	0.017520	0.001371	-0.001316	0.002686
							(2.3140*)	(-3.0098**)	(4.6108**)
AR(1,200)	2194	1516	0.01521	0.02041	0.000283	0.01758	0.001478	-0.001446	0.002924
							(2.5228*)	(-3.2259**)	(4.9786**)
VMA(1,50)	2262	1599	0.01385	0.02130	0.000245	0.01736	0.001161	-0.001051	0.002212
							(1.9922*)	(-2.5092*)	(3.8984**)
VMA(1,150)	2376	1385	0.01248	0.02378	0.000281	0.01753	0.000816	-0.000637	0.001452
							(1.1646)	(-1.6658)	(2.4515*)
VMA(1,200)	2405	1306	0.01239	0.02439	0.000276	0.01759	0.000792	-0.000673	0.001464
							(1.1193)	(-1.6770)	(2.4222*)
VMA(5,150)	2373	1388	0.01259	0.02366	0.000281	0.01753	0.000878	-0.000740	0.001618
							(1.2996)	(-1.8548)	(2.7321**)
VMA(2,200)	2402	1309	0.01287	0.02392	0.000276	0.01759	0.000718	-0.000534	0.001252
							(0.9585)	(-1.4329)	(2.0714*)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 4.4: Empirical Result of Kuala Lumpur Composite Index, Malaysia from Jan 2000 to Dec 2006

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	959	803	0.00721	0.00990	0.000078	0.008564	0.000685	-0.000647	0.001332
							(1.7662)	(-1.9879*)	(3.2512**)
AR(1,150)	928	734	0.00672	0.00941	0.000186	0.008069	0.000982	-0.000821	0.001803
							(2.4075*)	(-2.8145**)	(4.5224**)
AR(1,200)	901	711	0.00677	0.00919	0.000265	0.007973	0.001025	-0.000697	0.001721
							(2.2891*)	(-2.6802**)	(4.3035**)
VMA(1,50)	962	801	0.00687	0.01024	0.000094	0.008586	0.000610	-0.000526	0.001137
							(1.5007)	(-1.6954)	(2.7679**)
VMA(1,150)	926	737	0.00686	0.00937	0.000179	0.008071	0.000396	-0.000093	0.000489
							(0.6550)	(-0.7625)	(1.2275)
VMA(1,200)	1016	597	0.00651	0.00998	0.000270	0.007973	0.000447	-0.000031	0.000479
							(0.5546)	(-0.7891)	(1.1639)
VMA(5,150)	920	743	0.00693	0.00928	0.000179	0.008071	0.000509	-0.000229	0.000738
							(0.9942)	(-1.1462)	(1.8536)
VMA(2,200)	1014	599	0.00675	0.00969	0.000270	0.007973	0.000396	0.000057	0.000338
							(0.3931)	(-0.5574)	(0.8233)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 4.5: Empirical Result of Jakarta Composite Index, Indonesia from Jan 1985 to Dec 1999

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	2172	1688	0.01793	0.01536	0.000580	0.01701	0.002583	-0.001998	0.004581
							(4.3904**)	(-5.1929**)	(8.2994**)
AR(1,150)	2299	1461	0.01726	0.01680	0.000618	0.01723	0.002421	-0.002218	0.004639
							(3.9522**)	(-5.3408**)	(8.0485**)
AR(1,200)	2223	1487	0.01796	0.01589	0.000622	0.01734	0.002676	-0.002450	0.005126
							(4.4168**)	(-5.7701**)	(8.8225**)
VMA(1,50)	2228	1633	0.01805	0.01524	0.000579	0.01701	0.002086	-0.001476	0.003562
							(3.3292**)	(-4.0939**)	(6.4287**)
VMA(1,150)	2410	1351	0.01707	0.01745	0.000618	0.01723	0.001186	-0.000396	0.001582
							(1.2646)	(-1.8557)	(2.7027**)
VMA(1,200)	2323	1388	0.01744	0.01712	0.000621	0.01734	0.001284	-0.000489	0.001772
							(1.4451)	(-2.0337*)	(3.0131**)
VMA(5,150)	2412	1349	0.01742	0.01681	0.000618	0.01723	0.001278	-0.000563	0.001841
							(1.4694)	(-2.1595*)	(3.1433**)
VMA(2,200)	2315	1396	0.01747	0.01707	0.000621	0.01734	0.001253	-0.000427	0.001680
							(1.3758)	(-1.9245)	(2.8584**)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 4.6: Empirical Result of Jakarta Composite Index, Indonesia from Jan 2000 to Dec 2006

Trading Rule	N(Buy)	N(Sell)	σ(Buy)	σ(Sell)	Mean Return	σ	Buy	Sell	Buy-Sell
AR(1,50)	1036	726	0.01132	0.01504	0.000613	0.01302	0.001477	-0.000620	0.002097
							(1.6946)	(-2.1467*)	(3.3268**)
AR(1,150)	1027	635	0.01155	0.01469	0.000757	0.01294	0.002043	-0.001324	0.003367
							(2.5042*)	(-3.4457**)	(5.1531**)
AR(1,200)	1036	576	0.01150	0.01457	0.000884	0.01276	0.001962	-0.001055	0.003017
							(2.1208*)	(-3.1290**)	(4.5473**)
VMA(1,50)	1055	708	0.01139	0.01504	0.000623	0.01303	0.001569	-0.000787	0.002356
							(1.8657)	(-2.4322*)	(3.7222**)
VMA(1,150)	1078	585	0.01209	0.01436	0.000756	0.01294	0.000995	0.000315	0.000680
							(0.4725)	(-0.7083)	(1.0228)
VMA(1,200)	1113	500	0.01214	0.01402	0.000881	0.01276	0.001180	0.000214	0.000966
							(0.6019)	(-1.0200)	(1.4054)
VMA(5,150)	1072	591	0.01205	0.01436	0.000756	0.01294	0.001290	-0.000214	0.001504
							(1.0548)	(-1.5648)	(2.2690*)
VMA(2,200)	1111	502	0.01213	0.01404	0.000881	0.01276	0.001106	0.000382	0.000724
							(0.4528)	(-0.7644)	(1.0547)

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.

Table 5.0: t-statistics used for evaluate the difference buy-sell return before and after year 2000

t-statistic	**Stock Indices**		
Trading Rule	Jakarta	Kuala Lumpur	Straits Times
AR(1,50)	2.4371*	1.9694*	2.6449*
AR(1,150)	1.3071	0.7702	3.0466**
AR(1,200)	2.1450*	1.1537	2.9162**
VMA(1,50)	1.2067	0.9421	1.7889
VMA(1,150)	0.9513	0.8477	0.1332
VMA(1,200)	0.9427	0.9323	-0.2720
VMA(5,150)	0.4346	0.7662	0.0195
VMA(2,200)	1.0752	0.8638	-0.5966

Note: *(**) indicates that the return is significant at the 5% (1%) respectively.