



Market Efficiency Based on Unconventional Technical Trading Strategies in Malaysian Stock Market

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ABSTRACT

This study examines the efficiency of Malaysian stock market based on the effectiveness of unconventional technical trading strategies which combine buy recommendation of securities experts with sell signals from 10 different technical strategies (simple moving average, moving average envelopes, Bollinger bands, momentum, commodity channel index, relative strength index, stochastic, Williams percentage range, moving average convergence divergence oscillator and shooting star). We collect 1,665 buy recommendations involving 173 shares over a 3-year period starting January 1, 2013 until December 31, 2015. To ensure each buy recommendation is matched with the technical strategy's sell signals, the period is extended until March 31, 2016. Results of Jensen's alpha show that 6 out of 10 technical trading rules are significant in generating risk-adjusted net abnormal returns, suggesting Malaysian stock market is still inefficient in the weak form. This conclusion is supported with results of unit root tests on daily returns of the 173 shares over the same study period.

Keywords: Stock Market Efficiency, Technical Trading Strategy, Malaysian Stock Market

JEL Classifications: L11, O16, P45

1. INTRODUCTION

Interest on market efficiency seems to show a certain uptrend in recent years. Probably due to the drastic advancement in technology, a lot of studies found evidence that suggests stock markets are not efficient even in the weak form. The consistent attention on market efficiency is partly attributed to its role in influencing investment evaluation and therefore activities in the stock markets. According to Fama (1970), a market is efficient when the asset price quickly and fully reflects all relevant and related information. Generally, this definition implies that in an efficient market, investors will not be able to make abnormal returns by trading on any of the information. In other words, since all information have been instantly and fully reflected in asset prices, this information cannot give any advantages to investors, in their attempts to forecast the future prices. In an efficient market, information is generated in a random fashion such that movement in asset prices are unpredictable (Samuelson, 1965).

As a general rule, investors will only buy assets when prices are low and sell them when prices increase (Andreassen, 1988). Theoretically, investors should buy stocks that are undervalued (market price is less than intrinsic value) and a sell is appropriate when the stock prices are high and/or expected to fall soon. Identifying undervalued stocks are achieved through fundamental analyses. A technical analysis meanwhile is used to time the market; detecting the trading signals (i.e., buy or sell) to act on those undervalued stocks. While a fundamental analysis relies on accounting variables and various other factors, a technical analysis generates trends from historical prices and trading volumes. Pring (1991) describes a technical analysis as an art to identify the trend in price movement at the early stages and its posture remains until contrastive evidence is identified. Three philosophies are important in technical analysis; market action discounts everything, price moves in trends, and history repeats itself (Murphy, 1999). In technical analysis, the reasons for movements in stock price are not a concern because price

movements are reflected in shifts in the supply and demand in the market.

If the efficient market hypothesis (EMH) holds in a market, fundamental and technical analyses are of no use as all information must have already been incorporated in the stock price. In such a condition, investors can only generate profits by diversifying his/her portfolio and taking a long position to realize capital gain through the actual growth of the company. However, to date, no market has achieved an absolute, strong form market efficiency. A few factors contributed to the frictions in the market, one of which is advancement in technology that has caused geographical borders irrelevant in the portfolio investment world. The information technology has allowed investors to have an access to information quickly and at insignificant costs. Technological advancements also allow designs of sophisticated technical analysis software which is capable of capturing real-time information and generating technical strategies in a mini-second speed. In the context of Malaysian equity market, the bulk of evidence from previous researches (e.g., Aumeboonsuke, 2012; Guidi and Gupta, 2012; Jarrett, 2010; Kashif et al., 2010; Nwachukwu and Shitta, 2015; Seth and Sharma, 2015; Tham et al., 2012) show that this market is still inefficient in the weak form. Therefore, this study is of the opinion that it would also be practically more meaningful if its efficiency in the weak form is re-examined based on the viability of technical analysis in generating abnormal returns in the more recent period i.e., from 1st January 2013 and 31st March 2016 using 10 technical trading strategies. For robustness, this study also employs another common test of weak-form market efficiency i.e., random walk hypothesis using augmented dickey-fuller (ADF) and Phillips-Perron (PP) unit root tests.

The remainder of this article is organized as follows. The next section reviews the relevant literature, followed by a section describing the data, sample and statistical tests employed. Section 4 reports and presents the results of the study. Finally, the conclusion and implications of study are presented in section 5.

2. LITERATURE REVIEW

In describing market efficiency hypothesis, Fama (1970) proposes three forms of market efficiency and each form represents the types of information being reflected in price. The weak form efficient market is where stock prices reflect basic market information specifically, past price and volume of transaction. If a market is efficient in the weak form, this market information cannot be used for predicting the future price movement of stocks. In the semi strong efficiency, information that are reflected in the price of stocks include also publicly available information such as earnings, dividends, stock split announcements, new product developments, accounting changes, management changes, and analyst report. Lastly, the strong form market efficiency is the most stringent as stock prices should already reflect all information, either public or non-public. Non-public information is restricted to certain groups such as corporate insiders and specialists on the exchanges. It also includes information sought privately through research and analyses as those done by institutional investors. In general, since in an efficient market asset prices quickly and fully

reflect all available and relevant information, no investors can earn abnormal profits by trading on the information.

Several conditions are necessary for a market to reach an efficient level; a large number of active investors who are rational and profit oriented, information is widely available or can be accessed at immaterial costs, information is generated in a random fashion in that most investors do not have the ability to predict it, and investors react quickly and fully to the new information such that stock prices adjust accordingly. In essence, these conditions suggest that efficiency level should be improving with the maturity and advancements of a market and its participants. In the context of Malaysian stock market, Bursa Malaysia has been in establishment since 1930. To date, Malaysia is still an emerging market, but for that reason Bursa Malaysia offers as a great setting for testing the effectiveness of technical analyses. As documented by many studies (e.g., Afego, 2012; Ananzeh, 2014; Gupta and Basu, 2007; Jeboisho, 2014; Stanculescu and Mitrica, 2012), emerging markets tend to be inefficient. This notion is consistent with Asal (2000) who explains that an emerging market is typically labelled as having low liquidity, thin trading, poor quality of information disclosures, inadequate accounting regulations, access to unreliable information and considerable volatility. Investors in emerging markets also normally act irrationally and may not always display risk aversion (Benartzi and Thaler, 1995). They are more sensitive to losses than gains, which makes them more loss averse. Dabbs et al. (1991) state that investors may put too much faith in their own forecasts and that leads to bias into their actions. According to Schatzberg and Reiber (1992), investors in emerging markets do not respond instantaneously to information. The delayed responses are due to the lack of resources to analyse the information and trading is more normally executed following actions of the informed investors.

Indeed, there are a number of recent studies whose results concur with those descriptions of Malaysian market. Among those studies are Chan and Azmin (2016), Tham et al. (2012) and Lai et al. (2007) who have documented evidence supporting the effectiveness of technical analysis in Malaysian market. These evidences indicate that there are only a small group of investors who have access to valuable information that are useful to exploit the market and generate abnormal profits consistently. This finding should invite concerns of various stakeholders because market inefficiency can create a damaging impact on the sustainability of Bursa Malaysia and its listed companies.

Empirically, numerous studies (e.g., Aumeboonsuke, 2012; Guidi and Gupta, 2012; Jarrett, 2010; Kashif et al., 2010; Lingaraja et al., 2014; Nwachukwu and Shitta, 2015; Qaiser and Kasim, 2009; Seth and Sharma, 2015; Wang et al., 2014; Wong, 2011) have been carried out to address the issue of market efficiency and thus far, the results are still inconclusive. One stream of these studies examines the behaviour of the stock market prices mainly by examining whether the prices (or returns) follow the random walk hypothesis or are serially correlated. The other stream examines the effectiveness of technical analysis in generating abnormal returns on stocks. Studies in the first stream includes that by Qaiser and Kasim (2009) which finds the Malaysian stock market is a

nonlinear series with a unit root and indicates that price movement in the Malaysian market cannot be predicted using historical stock prices. Similar finding of non-stationary and efficiency in a weak form for Malaysian stock market is also reported by Wong (2011) in Malaysia and 4 other ASEAN countries (Indonesia, Philippines, Thailand and Singapore) by using univariate unit root tests.

Another study (Lingaraja et al., 2014) investigates the efficiency of stock market and volatility behaviour of eight Asian emerging market indices and the results of the autocorrelation test is more lenient toward inefficient markets. However, results of the unit root test show that four of these markets (India, Indonesia, Malaysia and Philippines) exhibit highly random distribution, evidence for an efficient market. More mixed results are found in a later study (Wang et al., 2014) which examines seven Asian stock markets including Malaysia. Although the Lagrange Multiplier unit roots test shows that all markets exhibit mean reversion process, the stationary test shows that only prices of stocks in Thailand is mean-reverting while the those of the other markets including Malaysia are non-stationary when a level term is included in the model.

Other studies conducted in the Malaysian stock market however tend to find evidence supporting market inefficiency including that of Kashif et al. (2010). The study investigates weak form of market efficiency in 14 countries in the Asia Pacific region including Malaysia and indicate that all of those markets are not efficient in the weak form. Another study by Guidi and Gupta (2012) also concludes that the Malaysian market is not weak form efficient, as the case for Indonesia, the Philippines and Vietnam markets while Singapore and Thailand are efficient. Aumeboonsuke (2012) demonstrates that six ASEAN equity markets including Malaysia are not efficient in the weak form. Similar finding is reported by Nwachukwu and Shitta (2015) who find that Malaysian market is not weak form efficient in a study that examines 24 emerging and 9 industrial stock market indices around the world. Seth and Sharma (2015) examine the informational efficiency and integration in 13 selected Asian markets simultaneously, including Malaysia and the US stock markets while considering the impact of the recent financial crisis. The results show that these markets do not follow the normal distribution and are therefore inefficient in the weak form. Jarrett (2010) tests the EMH through the daily variations in four small Pacific-basin markets which consist of Singapore, Malaysia, Korea and Indonesia. His results suggest that these four markets have predictable properties in their short-term changes; indicating that weak form EMH does not hold in these markets.

An important implication of an efficient market in the weak form is that technical analysis will no longer relevant in stock trading. The reason being, technical analysis is totally dependent on the patterns of historical prices and volume. Empirically, this practical investment implication suggests that the effectiveness of technical analysis in generating abnormal returns is a direct test of weak form market efficiency. This approach has also been adopted to test the efficiency of the Malaysian stock market, such as in the study by Tharavanij et al. (2015). They examine the profitability of technical trading rules in five Southeast Asian stock markets including Malaysia with five common technical trading rules (relative strength index [RSI], stochastic, moving average convergence

divergence [MACD], directional movement indicator and on balance volume). The findings show that most technical trading strategies could not earn statistically significant returns, especially after deducting the transactions costs, except for the Thailand stock market. Similar results are reported by Yu et al. (2013) in five Southeast Asian stock markets including Malaysia. Specifically, the t results show that variable moving average (VMA), fixed moving average (FMA) and trading range break technical trading rules can forecast stock price movements in all countries without transaction costs (TC). However, incorporation of TC eliminates the profits in all countries except Thailand. While the results from Tharavanij et al. (2015) and Yu et al. (2013) suggest that Malaysian stock market is efficient in the weak form, Siti et al. (2014) find the opposite. Focussing on only the viability of industry momentum strategy in Malaysia stock, their results show that the Malaysian market is not weak form efficient, as past prices can be utilized to generate abnormal profits using this momentum strategy.

Tham et al. (2012) investigate the advantages of technical analysis in reducing risk and generating profits and greater returns than a passive strategy. Their results show that without TC, 12 out of 13 trading systems studied produce significantly positive gross returns. However, if the TC (0.44% and 0.84%) are considered, only 9 and 4 out of 13 technical trading systems produce significantly positive returns. These results indicate that Malaysian stock market is weak form inefficient for the period studied. Another study Lai et al. (2007) finds that FMA and VMA rules can generate significantly positive returns, even in the presence of trading costs. Both trading rules generate significantly higher returns than the unconditional mean return of the buy-and-hold strategy. Recently, Chan and Azmin (2016) test on KLCI the profitability of nine technical trading indicators, namely C+, C±1, MA5, MA10, MA50, RSI, M, %K and %D and enhanced them by the using artificial neural networks (ANN). The results show that two out of three trading rules using ANNs perform better than the buy-and-hold strategy. Lento (2014) investigates the profitability of MACO, FR, TRBO and BB after TC in five Asian equity markets including Malaysia and find that MACO are effective in generating profits while other rules are ineffective.

The viability of technical analysis indicators could be attributed to the sophistication in the technology or system that supports it. This argument can be supported with the effectiveness of technical trading strategies in foreign stock markets. Leung and Chong (2003) have suggested that moving average envelopes (MAE) are suitable for short term investment while BB performs better for long-term investment in G7 and 4 Asian Tigers markets. They conclude that MAE fares better than BB because the technical trading rule is designed for short term investment purpose. However, the more recent study by Fang et al. (2014) finds that BB generates superior returns before 1983 in 14 major stock markets but its viability is gradually declining. Besides BB and MAE, another study by Chong and Ng (2008) finds that RSI and MACD rules are able outperform the buy-and-hold strategy in London Stock Exchange FT30. Meanwhile, Nor and Wickremasinghe (2014) find the opposite result in that MACD provides a poor results but the RSI shows the profit potential in certain period such as the non-trending period in Australian stock market. Chong et al.

(2010) study the profitability of four trading rules (simple moving average [SMA], RSI, MACD and momentum) in comparing the stock market efficiency of BRIC countries. They find that these trading rules outperform the passive buy-and-hold strategy in India and Russia markets; while most of the trading rules fail to outperform the buy-and-hold in Brazil. For China market, the results are mixed because besides SMA₅₀, RSI₁₄ and MACD, other trading rules are not able to outperform the buy-and-hold strategy. Lastly, Maitah et al. (2016) examine the effectiveness of composite channel index (CCI) in commodities markets and find that this trading rule is able to generate positive returns in both coffee and cocoa markets.

Overall, results of previous studies are lenient toward suggesting that the Malaysian stock market is still inefficient in the weak form given evidence on the predictability of stock price movements and profitability of technical analysis. This is notwithstanding the fact few studies (e.g., Yu et al., 2013; Tharavanij et al., 2015) support the EMH in this market. This conclusion is supported with results of studies about the non-randomness or serial correlations of the time series stock returns in the previous studies. Intuitively, the findings from these previous studies mean investors in this market still have ample opportunities to make abnormal returns from stock trading provided that they are equipped with know-how and skills to use the technical analysis indicators.

3. METHODOLOGY

The dynamic nature of technology allows technical analysis to be constantly relevant among stock market investors. However, that does not in any way disqualify the importance of fundamental analysis in investment decision. In practice, most successful technical investors rely on fundamental analysis to create the universe of potential or undervalued stocks. This study employs the unconventional way of testing technical analysis by combining it with buy (signals) based on the recommendation of investment experts. This approach is consistent with the arguments by Mayo (2011) who categorizes investment advisory opinion (analyst's recommendations) as one of the technical indicator. While Mayo (2011) suggests this approach be taken as contrarian opinion, this study considers it as momentum view in this study; accepting and following the buy recommendations given by securities analysts. In this study, the buy recommendations are provided by security houses that are registered with Bursa Malaysia. Although this approach departs from the conventional way of testing weak form efficiency which rely completely on the buy and sell signals of the respective trading strategies, it offers few benefits. First, it ensures unbiased investment outcomes since all technical rules tested will be subjected to the same buy decisions. Second, it can be easily put into practice since the buy recommendations are publicly available by Bursa Malaysia. Third, it inculcates informed and less risky investment since these buy recommendations are produced by professionals or experts in security valuations that they may be considered with a high degree of confidence. Finally, from a methodological perspective, it conveniently creates a large pool of sample of stocks with buy recommendations to test the technical trading rules on the sell points.

For the study period that extends from 1 January 2013 until 31 December 2015, there are altogether 1687 buy recommendations produced by 11 security firms and involve 182 common stocks. Each buy recommendation is then religiously matched against sell signals that are detected using each of the 10 technical trading strategies selected in this study (SMA, MAE, Bollinger bands, momentum, CCI, RSI, stochastic (K%D), WPR, MACD oscillator, and shooting star). To allow ample time to detect the sell signals for each buy recommendation, this study period is extended until 31 March 2016. Any buy recommendation left unmatched with sell signals will be subjected to a force selling. These sell signals are generated using ChartNexus, one of the contemporary technical analysis software in ASEAN region. The 10 technical trading strategies are selected because they are among the most popular yet simple rules to adopt. Due to certain factors like double listing with different codes or change of stock names, 9 common stocks cannot be detected in the ChartNexus. Therefore, our final sample is limited to 1665 buy recommendations, involving 173 counters.

In this study, the effectiveness of technical trading strategies is assessed based on their ability to generate abnormal returns. The steps begin by estimating the return (R_i) of each i^{th} buy recommendation as follows: (i.e., assuming that no dividend is paid during the investment period).

$$R_{i,T} = \frac{(P_{i,s,T} - P_{i,b})}{P_{i,b}} \times 100 \quad (1)$$

where, $R_{i,T}$ is the total stock return for each of i^{th} transaction, $P_{i,b}$ and $P_{i,s}$ are the stock prices on the date of the buy recommendation (b) of a particular stock and the date of the sell signal (s) of the T^{th} technical trading strategy. The same formula is used to estimate the return on the market portfolio (proxied using the FBM KLCI index) over the same period of the i,T transaction. Meanwhile, the nominal monthly return of the 3-month treasury bill (T-bill), adjusted daily is used as a proxy for the risk-free rate of return. Two excess return (ER) series are estimated as presented below:

$$ER_{i,T} = R_{i,T} - R_{f,T} \quad (2)$$

$$ER_{i,T} = R_{i,T} - R_{M,T} \quad (3)$$

where $ER_{i,T}$ is the excess return for the technical trading strategy T , $R_{f,T}$ is the risk-free rate of return (T-bill) and $R_{M,T}$ is the market portfolio return (KLCI) for the same i,T transaction. Next, TC are also incorporated to estimate the net ER series as follows:

$$NER_{i,t} = R_{i,t} - R_{f,t} - TC_i \quad (4)$$

$$NER_{i,t} = R_{i,t} - R_{M,t} - TC_i \quad (5)$$

This study assumes a transaction cost of 0.42% to be more consistent with the rate charged by major securities firms¹.

1 For details of transaction costs, visit this website <http://klse.i3investor.com/jsp/hti/brokers.jsp>.

The final step involves two tests to statistically evaluate the effectiveness of a particular technical trading strategy in generating abnormal returns. The first test is one sample t-test on the ER of each technical trading strategy against zero (H_0 : ER [gross or net] of the T^{th} technical trading strategy is not significantly different from zero). The second test is the Jensen's alpha regression test which directly examines whether or not the risk-adjusted ER of the T^{th} strategy is abnormal, that is, it outperforms return on the market portfolio. As an application of the CAPM, Jensen's alpha regression can be represented as follows:

$$ER_{i,T} = (R_{i,T} - R_{f,T}) = \alpha + \beta_i (R_{M,T} - R_{f,T}) + \varepsilon \quad (6)$$

Where α is the Jensen's alpha which measures the risk-adjusted performance of the stock relative to the market portfolio, ε is the error term, while the other variables are as defined in Equations 2 and 3. Note that only variables in Equations 2 and 3 are used in Jensen's alpha test because R_M is already explicitly considered in this model. A positive (negative) Jensen's alpha indicates that the technical trading strategy has produced risk-adjusted returns that outperform (underperform) the market. Statistically, the over (under) performance is consistent if the t-statistics of the respective alpha is higher than the critical value of at least at 10% significance level.

For robustness, this study finally employs another method to test weak-form efficiency i.e., random walk hypothesis using two unit root tests on the respective 173 stocks. The first test is ADF test which is one of the unit root tests to test the stationarity of the time series data or randomness of the stock prices. The following models illustrate the ADF regression model:

$$\Delta Y_t = a + \gamma Y_{t-1} + \sum_{j=1}^p (\delta_j \Delta t - j) + e_t \quad (7)$$

$$\Delta Y_t = \alpha + \beta_t + \gamma Y_{t-1} + \sum_{j=1}^p (\delta_j \Delta t - j) + e_t \quad (8)$$

where, t is the time index, α is the intercept, β is the coefficient on the time trend, γ is the coefficient of process root, p is the lag order of the first differences autoregressive process, e_t is an independent identically distributed residual term. The difference between the two regression models is the added element β_t which is the linear time trend. The null hypothesis in this test is H_0 = stock prices (returns) are non-stationary or follow a random walk.

The second test is PP test which is adopted to address the heteroscedasticity in the error term as an alternative test to the ADF test. In other words, PP test has improved the Dickey-Fuller test by considering the autocorrelation in the error terms using the Newey-West standard error. PP test however depends on the asymptotic theory which requires a large sample to run the test.

$$\Delta Y_{t-1} = \alpha_0 + \gamma Y_{t-1} + e_t \quad (9)$$

Definition of variables and hypothesis of PP are similar to that of the ADF test.

4. RESULT AND DISCUSSION

Table 1 summarizes the returns or performances of 10 selected technical trading strategies that have been tested in this study. As explained earlier, each of the 1665 buy recommendations that are collected during the study period (1st January 2013 until 31st December 2015) is matched with a sell signal from each of the 10 selected technical trading strategies (SMA, MAE, Bollinger bands, momentum, CCI, RSI, stochastic (K%D), WPR, MACD oscillator, and shooting star). This matching process is completed by allowing around a 90-day period for detecting a sell signal and that requires extending the study period until 31 March 2016. By this date, any remaining buy recommendation will be liquidated (force selling). Among the 10 technical trading strategies, Bollinger bands appears as the best trading strategy by producing 72% profitable sell signals, while SMA performs poorly with only around 44% profitable sell signals. This finding indicates that investors who make their investment based on these buy recommendations shall find Bollinger bands as the most reliable strategies and SMA the least. Yet, SMA proponents are not in a total disadvantage because as reported in Table 1, this trading strategy performs second best in term of average returns (i.e., 2.87%). On this criterion, shooting star ranks top with 3.26% while CCI reports the lowest average report (0.02%). The results also show that all technical trading strategies produce positive average returns. In a per annum equivalent ($R\% \times 365/N(D)$) basis, these trading strategies as reported in Table 2 are capable of producing 0.185% (CCI) to 35.07% per annum (momentum). Note that each trading strategy is different in term of frequency of signal occurrences. For instance, MAE takes the longest time to produce a sell signal (251 days) while a sell signal from momentum strategy appears on average in about 16 days.

Table 2 also presents summary of the ER and net excess returns (NER) by trading strategies. There are 8 strategies that produce returns adjusted for market conditions ($R_i - R_M$) that are significantly different from zero. This finding suggests that these 8 strategies are more likely to generate higher returns to the investors, than if they are adopting a passive strategy by tracking the market index. There are 6 trading strategies with returns adjusted of risk-free rate ($R_i - R_f$) that are significantly different from zero and this finding indicates that the investors are rewarded by taking the risks (as opposed to assuming R_f in risk-free security) of actively trading the stocks using technical strategies. After taking TC into account ($R_i - T_C$), apparently average returns of two strategies (CCI and RSI) turn negative. Of the other 8 strategies that remain positive, returns of MAE, stochastic and WPR are simply too small (<1%) and become insignificant.

The most right of Table 2 shows that four trading strategies (MAE, RSI, stochastic and WPR) are apparently no longer effective while one strategy (CCI) is to be avoided altogether given the consistent evidence that it is leading to significant losses. That is, the NER prove that these strategies are not worth the risks as all of their returns now turn negative. Annualized, three trading strategies come out to perform exceptionally well, namely MACD, momentum and SMA with each producing net ER of 20.08%, 22.39%, and 20.43% per annum, respectively. Bollinger bands

Table 1: Profiles and raw returns of 10 selected technical trading strategies

Trading strategies	N (D)	N+ve (%)	R_i (%)	Min (%)	Max (%)	SD	Skew	Kurt
Bollinger bands	44	1202 (72)	2.07	-63.04	470.00	16.61	15.18	399.78
CCI	40	1007 (60)	0.02	-64.49	81.13	9.41	-0.73	15.67
MACD	32	835 (50)	2.42	-45.68	177.78	10.78	5.56	73.06
MAE	251	935 (56)	0.49	-170.00	169.44	22.37	0.04	5.83
Momentum	16	849 (51)	1.53	-47.46	116.67	8.82	5.98	67.60
RSI	60	1064 (64)	0.38	-160.00	94.34	13.48	-1.96	21.04
SMA	38	734 (44)	2.87	-54.32	470.00	18.26	12.52	276.51
Shooting star	73	908 (55)	3.26	-60.49	188.89	16.55	3.28	26.67
Stochastic	29	1062 (64)	0.49	-65.94	70.00	8.43	-1.26	15.99
WPR	30	1063 (64)	0.47	-65.94	70.00	8.28	-1.18	16.31

N (D): Number of days from date of buy to date of sell, SMA: Simple moving average, MA: Moving average envelopes, RSI: Relative strength index, CCI: Composite channel index, WPR: William percentage range, and N+ve (%): Number of sell signal of the respective technical trading strategy that produces positive returns, MACD: Moving average convergence divergence. Number of transactions for each technical trading strategy is 1665

Table 2: Excess and net excess returns of 10 selected technical trading strategies

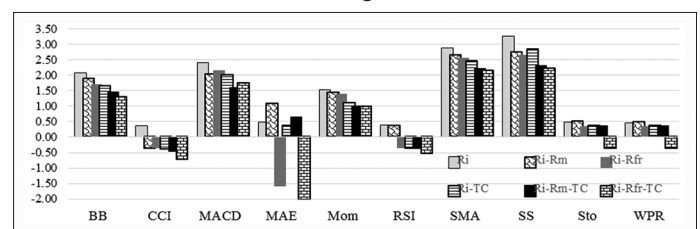
Strategies	R_i	AR_i	R_m	AR_m	$R_i - R_m$	$R_i - R_f$	$R_i - T_C$	NER_i	$ANER_i$
Bollinger bands	2.07	17.13	0.20	1.62	1.88***	1.71***	1.65***	1.29***	10.63
CCI	0.02	0.18	0.06	0.58	-0.04	-0.31	-0.40**	-0.73***	-6.67
MACD	2.42	27.97	0.40	4.62	2.02***	2.16***	2.00***	1.74**	20.08
MAE	0.49	0.72	-0.59	-0.85	1.08**	-1.59***	0.07	-2.01***	-2.93
Momentum	1.53	35.07	0.10	2.27	1.43***	1.40***	1.11***	0.98***	22.39
RSI	0.38	2.31	0.12	0.70	0.27	-0.12	-0.04	-0.54	-3.27
SMA	2.87	27.48	0.23	2.24	2.64***	2.56***	2.96***	2.14***	20.43
Shooting star	3.26	16.19	0.52	2.56	2.74***	2.65***	2.45***	2.23***	11.07
Stochastic	0.49	6.16	-0.03	-0.31	0.51***	0.25	0.07	-0.17	-2.19
WPR	0.47	5.66	-0.02	-0.20	0.49***	0.22	0.05	-0.21	-2.41

A: Annualized return= $R_i \times (365/N(D))$, $NER_i = R_i - R_f - T_C$, SMA: Simple moving average, MAE: Moving average envelopes, RSI: Relative strength index, CCI: Composite channel index, WPR: William percentage range, MACD: Moving average convergence divergence. Number of transactions for each technical trading strategy is 1655. ***, ** and * indicate significant at 1%, 5%, and 10% level, respectively

and shooting stars provide reasonably satisfactory NER of 10.63% and 11.07% per annum, respective. Momentum strategy turns out the most profitable or effective at a relatively low standard deviation of around 8.82, indicating smaller variations during the transaction periods as shown in Table 1. Overall, after taking TC into considerations, only 5 trading strategies remain effective in producing abnormal profits.

Recall that in this study, we assume that investors religiously adopt the 10 technical trading strategies in that they will always sell their holdings whenever a signal is detected. Figure 1 illustrated the relative performance of the selected technical trading strategies based on various return series. Overall, the bars show that majority of these strategies are capable of generating positive returns except CCI and in some cases RSI. In other words, CCI and RSI are not viable trading strategies since they fail to generate abnormal returns during this study period.

Next, Table 3 presents summary of Jensen's alpha test results, which indicate the performance of the 10 technical trading strategies after taking into consideration their respective risks. First, the results show that 9 strategies consistently outperform the market (alpha values significant at 10% level). After incorporating the TC, returns of six trading strategies remain significant. The strategies that survive the actual trading effect test are Bollinger bands, MACD, MAE, momentum, SMA, and shooting star. Again, the result of Jensen's alpha also indicates that CCI is a definite trading strategy to be avoided. The coefficients of market risk premium ($R_M - R_f$) are consistently significant at 0.01 level. This

Figure 1: Relative performance of 10 selected technical trading strategies

finding indicates that market condition has a significant influence on the returns (and therefore effectiveness) of the strategies. Intuitively the beta values suggest that a unit movement in the market index (KLICI) would trigger at least 1.2 times as large effect on returns of technical trading strategies. Investors should reckon that this impact has a high tendency to work both ways, in upward and downward market movements.

The effectiveness of these technical trading strategies is indeed consistent with results documented in previous studies, in particular momentum (Siti et al., 2014). Similarly, the poor performance of RSI and stochastic have also been documented before (Tharavanij et al., 2015). Our finding on RSI however contradicts that of Chan and Azmin (2016) whereas MACD and BB are ineffective in Tharavanij et al. (2015) and Lento (2014). In terms of the effect of TC, our results prove that these technical trading strategies are still effective in generating abnormal returns and these results are consistent with several previous studies (Lai et al., 2007; Lento, 2014) and contradict few others (Tharavanij

et al., 2015; Yu et al., 2013) which indicate TC eliminate the returns of trading strategies.

In the context of the present study, the results showing effectiveness of the technical trading strategies imply that the Malaysian stock market is still inefficient in the weak form. However, since this study tests the technical trading strategies in an unconventional way, a precautionary step is taken by running ADF and PP unit root tests to ensure accuracy of the level of market efficiency being referred to. Briefly, this study runs ADF and PP tests to examine the presence of a unit root in the daily returns of the 173 stocks (both with no trend and with trend) that are given a buy recommendation in the original sample (1,665 buys). The results as reported in Table 4 almost consistently reject the null hypotheses of non-stationary or a random walk. In short, the non-random movements of the daily prices of the 173 studied stocks lend a strong support for our conclusion that during the study period, the Malaysian stock market is inefficient in the weak form and therefore, explain the effectiveness of technical trading strategies.

5. CONCLUSION AND IMPLICATIONS

This study tests the weak form efficiency of Malaysian stock market based on the effectiveness of technical trading strategies in generating abnormal returns from investments that are made based on analysts' buy recommendations, i.e., those suggested by 11 securities firms that are registered with Bursa Malaysia. The study period that spans from 1st January 2013 until 31st December 2015 provides a sample consists of 1,665 buy recommendations involving of 173 counters. ChartNexus, one

of the most popular technical analysis software is employed to detect the sell signals from 10 selected technical trading strategies which are SMA, MAE, Bollinger bands, momentum, commodity channel index, RSI, stochastic (K%D), Williams percentage range, MACD oscillator and shooting star. To detect sell signals for each buy recommendation, the study extends the period until 31st March 2016.

From the one sample t-tests, all return series before TC are significant at least at 0.10 level except both return series of CCI and RSI and one return series of stochastic and WPR trading strategies. After the TC are considered, one of return series of MAE and both return series of RSI, stochastic and WPR are insignificant while CCI's turn significantly negative. Results from Jensen's alpha test confirm the results from the t tests as alpha values of all except CCI strategies significantly outperform the market. After considering TC, 6 strategies remain significant in producing higher net returns than the market. The only different between results of the t-test and Jensen's alpha is that involving RSI which remains significantly positive in the latter test. With 6 out of 10 technical trading strategies prove to produce abnormal risk-adjusted returns, this study resorts to stationary tests (ADF and PP) to draw a more reliable conclusion which has a practical implication. The tests produce results which reject a random walk hypothesis in almost 100% of the 173 selected stock returns at 0.01 significant level. This result is strong evidence that the daily prices of the 173 selected stocks do not move randomly and therefore, with certain technical analyses they can be predicted to move in certain ways. Overall, we conclude that Malaysian stock market is still inefficient in the weak form. This study is indeed consistent with some of the previous ones such as Kashif et al. (2010), Guidi and Gupta (2012), Siti et al. (2014), Aumeboonsuke (2012), Nwachukwu and Shitta (2015), Seth and Sharma (2015) and Jarrett (2010) which also conclude that that Malaysian stock market are not efficient. At the same time, results of this study add new evidence from the most recent period regarding the effectiveness of technical trading strategies in Malaysian stock market to the existing literature (Chan and Azmin, 2016; Chan and Hong, 2014; Lai et al., 2007).

Market inefficiency in the weak form implies that prices of stocks listed on Bursa Malaysia do not move randomly and therefore, can be predicted with the help of certain technical trading strategies. As far results of this study are concerned, the viable technical trading strategies are particularly Bollinger bands, MACD, MAE, momentum, SMA and shooting star. This finding implies that investors with sufficient investment knowledge specifically on technical analysis have advantages to exploit the market to

Table 3: Jensen's alpha of 10 selected technical trading strategies

Trading strategies	Excess returns		Net excess returns	
	Alpha	Beta	Alpha	Beta
Bollinger bands	1.9625***	1.4874***	1.5425***	1.4874***
CCI	0.0530	1.3617***	-0.3669*	1.3617***
MACD	1.9855***	1.2375***	1.5655***	1.2375***
MAE	3.4454***	1.8847***	3.0254***	1.8847***
Momentum	1.4363***	1.2371***	1.0163***	1.2371***
RSI	0.5315*	1.6896***	0.1115	1.6896***
SMA	2.6905***	1.6132***	2.2705***	1.6132***
Shooting star	2.7921***	1.5389***	2.3721***	1.5389***
Stochastic	0.5929***	1.3065***	0.1729	1.3065***
WPR	0.5695***	1.2974***	0.1495	1.2974***

***, ** and * indicate significant at 1%, 5%, and 10% level, respectively. SMA: Simple moving average, MAE: Moving average envelopes, RSI: Relative strength index, CCI: Composite channel index, WPR: William percentage range, MACD: Moving average convergence divergence

Table 4: Summary of ADF and PP tests

Level of significant	ADF				PP			
	No trend		With trend		No trend		With trend	
	Prob.*	Percentage	Prob.*	Percentage	Prob.*	Percentage	Prob.*	Percentage
1%	169	98.69	171	98.84	173	100.00	173	100
5%	3	1.73	1	0.58	0	0	0	0
10%	1	0.58	0	0.00	0	0	0	0
Total	173	100%	172	99.42	173	100	173	100

ADF: Augmented dickey fuller, PP: Phillip-Perron

generate abnormal risk-adjusted profit. This study shows that technical trading strategies are still effective in detecting the sell signals for a reasonably good timing to exit the market. At the same time, this finding also suggests that the authority of Malaysian stock market should be more selective in formulating the market policies or rules to provide a sustainable environment for all listed companies. For instance, the regulation for foreign investors' participation may need to be more restrictive because inefficient market is more prone to exploitation. It is widely known that foreign investors apply more advance technology which enables them access to and to analyze related information with great speed, at trivial costs. Bursa Malaysia also must continue to promote for more active participants of stock market through programs and platforms like Bursa Marketplace and Bursa Young Investors Club which develop investment awareness, knowledge and skills to analyze information.

For investors, institutional or retail, the results of this study should increase their confidence on the viability of technical analysis to make investment decision. Investors could also benefit from the buy recommendation issued in Bursa Malaysia website since these recommendations have been proven efficient in producing abnormal returns, with some skills of technical analysis. Especially for Muslim investors, assuming the buy recommendations produced by securities experts who are registered with the Bursa Malaysia may be considered a reasonably safe approach to keep the speculative element of market timing trading to a minimum level. Future studies addressing the conformity of technical trading strategies with Islamic investment principles are of great importance.

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REFERENCES

- Afego, P. (2012), Weak form efficiency of the Nigerian stock market: An empirical analysis (1984-2009). *International Journal of Economics and Financial Issues*, 2(3), 340-347.
- Ananzeh, I.E.N. (2014), Testing the weak form of efficient market hypothesis: Empirical evidence from Jordan. *International Business and Management*, 9(2), 119-123.
- Andreassen, P.B. (1988), Explaining the price-volume relationship: The difference between price changes and changing prices. *Organizational Behaviour and Human Decision Processes*, 41(3), 371-389.
- Asal, M. (2000), Are There Trends Towards Efficiency for the Egyptian Stock Market? Available from: <http://www.citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.6.370&rep=rep1&type=pdf>.
- Aumeboonsuke, V. (2012), Weak form efficiency of six equity exchanges in Asean. *European Journal of Scientific Research*, 84(4), 532-538.
- Benartzi, S., Thaler, R.H. (1995), Myopic loss aversion and the equity premium puzzle. *The Quarterly Journal of Economics*, 110(1), 73-92.
- Chan, J.P.M., Azmin, A.A. (2016), Using neural networks to enhance technical trading rule returns: A case with KLCI. *Athens Journal of Business and Economics*, 2(1), 63-72.
- Chan, J.P.M., Hong, J.J. (2014), The usefulness of a new technical indicator, rate of change-alpha (ROC- α) on stock markets: A study of Malaysian top capitalization stocks. *Journal of Emerging Issues in Economics, Finance and Banking*, 3(3), 1110-1124.
- Chong, T.T.L., Cheng, S.H.S., Wong, E.N.Y. (2010), A comparison of stock market efficiency of the BRIC countries. *Technology and Investment*, 1, 235-238.
- Chong, T.T.L., Ng, W.K. (2008), Technical analysis and the London stock exchange: Testing the MACD and RSI rules using the FT30. *Applied Economics Letters*, 15, 1111-1114.
- Dabbs, R.E., Smith, K.L., Brocato, J. (1991), Tests on the rationality of professional business forecasters with changing forecast horizons. *Quarterly Journal of Business and Economics*, 30(2), 28-50.
- Fama, E.F. (1970), Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383-417.
- Fang, J., Jacobsen, B., Qin, Y. (2014), Popularity versus profitability: Evidence from Bollinger Bands. DOI: 10.2139/ssrn.2484322.
- Guidi, F., Gupta, R. (2012), Market efficiency in the ASEAN region: Evidence from multivariate and cointegration tests. *Applied Financial Economics*, 23(4), 265-274.
- Gupta, R., Basu, P.K. (2007), Weak form efficiency in Indian stock markets. *International Business and Economics Research Journal*, 6(3), 57-64.
- Jarrett, J.E. (2010), Efficient market hypothesis and daily variation in small pacific-basin stock markets. *Management Research Review*, 33(12), 1128-1139.
- Jeboisho, C.E. (2014), Testing the Weak form of Efficient Market Hypothesis at Nairobi Stock Exchange. (Postgraduate Diploma in Actuarial Science), The University of Nairobi.
- Kashif, H., Muhammad, T.S., Syed, Z.A.S., Rana, S.I.A. (2010), Testing the weak form of efficient market hypothesis: Empirical evidence from Asia-pacific markets. *International Research Journal of Finance and Economics*, 58, 121-133.
- Lai, M.M., Guru, B.K., Fauzias, M.N. (2007), An examination of the random walk model and technical trading rules in the Malaysian stock market. *Malaysian Accounting Review*, 6(2), 99-124.
- Lento, C. (2014), The effectiveness of technical trading models in Asian equity markets around the financial crisis. In: Gregoriou, G.N., Lee, D., editors. *Handbook of Asian Finance: REITs, Trading and Fund Performance*. Ch. 14. Amsterdam: Academic Press.
- Leung, J.M.J., Chong, T.T.L. (2003), An empirical comparison of moving average envelopes and bollinger bands. *Applied Economics Letters*, 10(6), 339-341.
- Lingaraja, K., Selvam, M., Vasanth, V. (2014), The stock market efficiency of emerging markets: Evidence from Asian region. *Asian Social Science*, 10(19), 158-168.
- Maitah, M., Prochazka, P., Cermak, M., Sredl, K. (2016), Commodity channel index: Evaluation of trading rule of agricultural commodities. *International Journal of Economics and Financial Issues*, 6(1), 176-178.
- Mayo, H.B. (2011), *Introduction to Investments*. Canada: Cengage Learning.
- Murphy, J.J. (1999), *Technical Analysis of the Financial Markets*. United States of America: New York Institute of Finance.
- Nor, S.M., Wickremasinghe, G. (2014), The profitability of MACD and RSI trading rules in the Australian stock market. *Investment Management and Financial Innovations*, 11(4), 194-199.
- Nwachukwu, J.C., Shitta, O. (2015), Testing the weak-form efficiency of stock markets: A comparative study of emerging and industrialised economies. *International Journal of Emerging Markets*, 10(3), 409-426.
- Pring, M.J. (1991), *Technical Analysis: Explained*. New York: McGraw-Hill.

- Qaiser, M., Kasim, M. (2009), Is Malaysian stock market efficient? Evidence from threshold unit root tests. *Economic Bulletin*, 29(2), 1359-1370.
- Samuelson, P.A. (1965), Proof that properly anticipated prices fluctuate randomly. *Industrial Management Review*, 6(2), 41-49.
- Schatzberg, J.D., Reiber, R.R. (1992), Extreme negative information and the market adjustment process: The case of corporate bankruptcy. *Quarterly Journal of Business and Economics*, 31(2), 3-21.
- Seth, N., Sharma, A.K. (2015), International stock market efficiency and integration: Evidences from Asian and US markets. *Journal of Advances in Management Research*, 12(2), 88-106.
- Siti, M.E., Nur, H.N.A., Karmila, H.K. (2014), Industry momentum strategy in Malaysian stock market. *International Journal of Business and Social Science*, 5(11), 194-202.
- Stanculescu, A., Mitrica, E. (2012), Testing weak form informational efficiency on the Romanian capital market. *Theoretical and Applied Economics*, 19(9), 29-36.
- Tham, F.K.H., Noor, A.A., Lau, W.Y. (2012), Technical trading systems as crystal balls in reducing risk: The Malaysian stock market. *International Business Management*, 6(2), 140-146.
- Tharavanij, P., Siraprasiri, V., Rajchamaha, K. (2015), Performance of technical trading rules: Evidence from Southeast Asian stock markets. *Springerplus*, 4, 552.
- Wang, J., Zhang, D.X., Zhang, J. (2014), Mean reversion in stock prices of seven Asian stock markets: Unit root test and stationary test with Fourier functions. *International Review of Economics and Finance*, 37, 157-164.
- Wong, Y.D. (2011), Efficient Market Hypothesis: Evidence from Asean-5 Countries. (Bachelor Degree). Malaysia: Universiti Malaysia Sarawak, Faculty Economics and Business.
- Yu, H., Nartea, G.V., Christopher, G., Yao, L.J. (2013), Predictive ability and profitability of simple technical trading rules: Recent evidence from Southeast Asian stock markets. *International Review of Economics and Finance*, 25, 356-371.