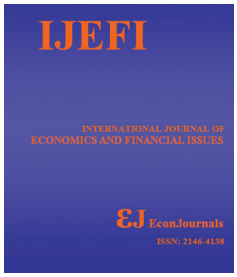

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Modified Moving-average Crossover Trading Strategy: Evidence in Malaysia Equity Market

Afiruddin Tapa[1]*, Soh Chuen Yean[2], Shahrul Nizam Ahmad[2]

[1]School of Economic, Finance and Banking, Collage of Business, Universiti Utara Malaysia, Malaysia, [2]School of Economic, Finance and Banking, Collage of Business, Universiti Utara Malaysia, Malaysia, [3]School of Economic, Finance and Banking, Collage of Business, Universiti Utara, Malaysia.*Email: afiruddin@uum.edu.my

ABSTRACT

This study examined the profitability of technical analysis using moving-average (MA) crossover strategy compared with the conventional simple buy-and-hold strategy, using Malaysian equity market. We investigates the performance of the original MA strategy and a modified MA crossover strategy with additional trading rules such as entry rule, exit rule, holding rule, and stop-loss rule. The results are consistent to previous studies that strongly support MA crossover trading strategies. The result suggests that all combinations of short-MA and long-MA periods of the original MA crossover strategy and majority combinations of short-MA and long-MA of the modified MA crossover strategy outperform market benchmark with higher risk-adjusted return. In addition, the 1-period short-MA demonstrates the best return in both original and modified MA crossover strategy; better still the modified strategy outperforms the original strategy with lower frequency of trades which could largely reduce transaction costs and with lower return distribution variability.

Keywords: Technical Analysis, Moving-average Crossover, Trading Strategies
JEL Classifications: G1, G12

1. INTRODUCTION

Among many other technical trading strategies, the moving-average (MA) crossover trading strategy is commonly known as the most popular trend-following strategies and favorite tool among market practitioners, due to its simplicity in smoothing out market noise and able to identify changes in market trend. For many years, financial practitioners have been using MA crossover trading rules for market timing in deciding when to buy or to sell securities and attempt to profit from the financial market in earning above-average benchmark return and even outperform market benchmark.

Previous studies have found that investment and trading based on the strategies of MA crossover has been able to generate higher return than the conventional simple buy-and-hold strategy, when transaction cost is excluded (Brock et al., 1992; Neely, 2002; Wilcox and Crittenden, 2009; Faber, 2007; Zhu and Zhou, 2009).

Technical analysis has been applied for over a century by market practitioners, as a market-timing strategy. The first study on technical indicators on stock price time-series appeared in the 1930s explains correlation analysis. Until the 1960s, the development of "random walk" and "efficient market hypothesis (EMH)" framework suggesting that technical analysis at its weak form of efficient market, cannot earn above-average market return (excess return/alpha return) and disprove the value of analyzing historical prices to forecast future price movement in the market, refute trading rules and systems based on past prices. In other words, the use of technical analysis provides little to no value in examining past prices, as prices follows a random walk (there are randomness in prices) and there is no pattern in price movements.

Many studies inclined to proof that technical analysis does not outperform the conventional simple buy-and-hold passive strategy when transaction costs are included (Fama and Blume, 1966; Ready, 1997; Bessembinder and Chan, 1998). Also, there are no

superior advantages in using market-timing strategies (Sullivan et al., 2003; Bauer and Dahlquist, 2012).

However, there are several motivations for investors using technical analysis in their investment decision-making. One reason is that prices may not completely and rapidly reflect all available information in the market (i.e., prices may react slowly towards new information). This signifies information inefficiency in the market. In the efficient market theory, information inefficiency can occur when market is other than strong-form (i.e., weak form and semi-strong form) which allows investors to earn excess return (alpha return). Another reason is technical analysis believes that market prices are largely determined by the trading activities that is unrelated to a rational analysis approach of underlying fundamental information. Therefore, technical trading strategies attempt to identify price patterns in trading activity on a timely basis that could be exploited for profit opportunities.

The core belief of technical analysis is direction of future security prices can be predicted by using technical indicators derived from past historical prices. Among the most common presupposition is that security prices move in trends. So, the most widely used market-timing strategy is the trend-following strategy, where it attempts to follow the trend and ride on it.

The most popular strategy of trend-following strategy for market-timing is the MA crossover strategy. Among various technical indicators, the MAs predominantly show predictive power in the stock market where it matches or exceeds of those macroeconomic variables (Neely et al., 2013). The use of MAs as market timing tool in making investment decision whether to buy, hold, or sell, is an active investment strategy that attempts to outperform the simple buy-and-hold passive strategy.

Numerous studies have found evidence in favor to the MA crossover strategy (Brock et al, 1992; LeBaron, 1999; Lo et al., 2000; Neely, 2002; Wilcox and Crittenden, 2009; Faber, 2007; Zhu and Zhou, 2009). They have found that using MA crossover strategy does provide profitability and earn above-average market return as compared to the simple buy-and-hold strategy, excluding transaction costs. Furthermore, simple technical trading strategy can generate comparable returns as compared to investing strategy depending on economic and financial fundamentals (Olszewski, 2001).

In this study, we examined the trend-following strategies of the original and modified (with additional trading rules) MA crossover strategy could outperform the simple buy-and hold passive strategy using the evidence from Malaysia equity market. Taking this further, we want to test whether the modified MA crossover strategy with additional trading rules could enhance the trading performance on top of the original strategy.

2. LITERATURE REVIEW

Technical analysis practitioners believe that data on past price and volume provide important and useful information in forecasting future price movements in the financial market.

Schwager (1995) discovers that many fund managers and top traders using TA. Also, Covel (2011) quotes examples of successful large hedge funds that extensively use TA without having fundamental knowledge about the market. Academics have long been skeptical regarding the practicality of TA, despite the popularity and adoption by market practitioners. Several reasons for academics doubt on the usefulness of TA are: (1) Early theoretical studies on random walk and efficient market models disregard excess return and profitability in technical trading (Fama and Blume, 1966; Cowles, 1933). (2) There is no theoretical basis on TA being research; and (3) challenges in demonstrating the true effectiveness on technical trading rules mainly due to bias in data-snooping (Sullivan et al., 2003; Lo and MacKinlay, 1990; Jegadeesh, 2000) where the same data set are frequently being used for model selection and implication. Thus, it is not astonishing that academics have yet to conclude the effectiveness of TA.

Other past studies provide results that are consistent with the market efficiency through empirical testing that future price cannot be predicted by TA. For instance, the benefits of TA in generating excess return is offset when transaction costs are included (Fama and Blume, 1966; Ready, 1997; Bessembinder H and Chan, 1998). Even though with the contrary opinion in EMH, TA is still being studied extensively by many researchers and market practitioners. Here, we can see that there are two philosophies that are contradictory with each other, the random walk efficient market theory and technical analysis. If practitioners' practice of TA is based on hard fact, then it seems that the markets are inefficient. Otherwise, if the markets are efficient, then it appears that the financial community is probably wasting a huge amount of resources on TA.

Hypothetically, incomplete fundamental information probably is a major factor investor use TA. Brown and Jennings (1989) demonstrate that rational investors can make profit by establishing expectations from historical prices. According to Blume et al. (1994) confirmed that traders who utilize market statistics perform better than those who do not. It is in the circumstances of incomplete information; investors face model uncertainty even though stock returns are fairly predictable. Several researchers examine different technical trading rules and provide consistent result that TA providing information beyond those that have already reflected in market price (Brock et al., 1992; Lo et al., 2000). For example, Blume et al. (1994) show that if prices do not react instantly to new information, volume may provide information that is not available in the market.

Among many other studies (Brock et al., 1992; LeBaron, 1999; Neely, 2002) show that using MA signals provides profitability and significant gain greater than stock.

2.1. Problem Statement

Given that the widespread classical literature of finance on random walk and efficient market invalidate the use of technical analysis in forecasting future price and profitability of above-average market return, on contrary, while numerous recent studies demonstrate that technical analysis and trading rules that provide buy-sell signals generate better risk-adjusted performance than simple-buy-and-hold strategy, with limited portfolio drawdown risk.

However, many top traders, professional fund managers, and commodity trading advisors use technical analysis and technical trading systems (Schwager, 1995; Covel, 2011). Brorsen and Townsend (1998) studied the persistence in performance level of managed futures and found that managers' skill and their reliance on different trading systems to make investment decisions have a positive effect on trading performance persistence.

Also, as evident in the bear markets that happened in the 2000s (Dot Com bubble and 2008 global financial crisis) that resulted in a massive drawdown in buy-and-hold investors' portfolio when market indices plunged substantially. Therefore, it would be gratifying to know how the MA crossover trend-following strategy and additional trading rules could limit this downside risk while enhancing upside portfolio return.

As the simple buy-and-hold strategy is a passive investment management strategy, once investors buy into a portfolio of securities, he/she would not be making adjustment or rebalancing his/her portfolio regardless of what happens to the market or changes in the portfolio value. In the event when there are profits on the securities, profits are not taken and the position may be held until the profits diminished; or when there are losses on securities, losses are held too long. Also, for whatever known or unknown reasons that negatively affect the securities' fundamental, the price of securities are highly expected to be trending down (Chen et al., 2007), and thus result in increasing portfolio losses if losses are not cut. These demonstrate the disadvantages and problems of the simple buy-and-hold strategy.

Nevertheless, there are several problems with the original MA crossover strategy. Firstly, as the method of MA is a trend-following in nature, it would only perform significantly well when there is trend in market prices; however it perform poorly when there is no trend during sideway market where there is increased frequency of less profitable buy-sell signals at a ranged bound price that could incur high transaction cost.

We investigated whether the use of technical analysis and technical trading rules can provide better performance than simple buy-and-hold strategy in Malaysia equity markets. We wanted to examine whether additional rules add value and perform better than the classical MA crossover strategy. The research objectives of this research as follows:

i. To evaluate whether technical trading rules, using MA crossover strategy, outperform simple buy-and-hold strategy.
ii. To investigate whether which combination of MA crossover provide the best performance.

3. RESEARCH METHODOLOGIES

3.1. Sample Data

Based on secondary data on all securities historical prices will be collected from the ChartNexus charting software. The data series used in this study is the FBMKLCI index from first trading day in 2000 to the last trading day in 2014, a collection of 15-years of daily date, to back-test the classical and modified MA crossover trading strategy.

3.2. Simple MA

Computing the averages of recent prices is most likely the most common way for smoothing prices and filtering out "noise" or insignificant market fluctuation and movement.

Moving average, MA (n)=Sum of n closing price/n

Where,

n=The number of time periods in moving average

A trading signal is shown to enter or exit a trade. To enter a trade, a Long Position (Buy order) is executed; when an exit signal is shown, a Short Position (Sell order) is executed to close (liquidate) their positions.

3.3. Original MA Crossover System

The original classical MA crossover rule is purely based on only entry point and exit point from the MA crossover of short period MA and long period MA. There is no stop-loss rule for cutting losses. Entry Point; Entry point is the open (Buy/Long) position when entry signal is shown at the signal day's closing price. Exit Point; Exit point is the close (Sell/Short/Liquidate) position when exit signal is shown at the signal day's closing price.

3.4. Modified MA Crossover System

The modified MA crossover rule is based on the original classical MA crossover rule with some additional trading rules and criteria added with the intention to enhance its risk-adjusted return. Trading rules and criteria such as stop-loss, minimum holding period, no entry on narrow-range day, entry on white candlestick day, etc.

4. RESULT AND FINDINGS

4.1. Simple Buy-and-hold Strategy

Table 1 shows the trading performance analysis for the simple buy-and-hold strategy across the 15-year period (2000-2014) in the FBMKLCI.

The benchmark return, the simple buy-and-hold strategy generates a total return of 111.21%. Its average monthly return is 0.42% with a standard deviation of 4.41%, therefore the risk-adjusted return (Sharpe ratio) is 0.09 (i.e., for every unit of risk taken, the average monthly return will increase by 0.09%).

Table 1: Rading performance analysis for the simple buy-and-hold strategy

Total number of months	180
Average of profit per month (%)	0.0522
Average of loss per month (%)	−0.0364
Reward-to-risk ratio	1.4352
Strategy return	1.1121
Portfolio average return (geometric return)	0.0042
Standard deviation of return	0.0041
Sharp ratio	0.0944
Skewness	−0.2841
Kurtosis	1.1743

The strategy has a maximum drawdown (maximum loss) of −15.22% during October-2008; and a maximum upside gain of 13.55% during April 2009.

The return distribution is quite symmetrical (skewness of −0.28) but with flatter and thinner tail (negative kurtosis of 1.17, platykurtic). This shows that the central mean is lower and broader, and its tails are thinner and shorter. Returns following this distribution have less frequency of extreme fluctuations from the mean which makes the investment using this simple buy-and-hold strategy less risky.

4.2. The Original MA Crossover Strategy

All of the 1-period MA_{short} of the original MA crossover strategies have generated higher total return (strategy return) as well as higher risk-adjusted strategy return as seen in the higher sharpe ratio (Table 2), compared to the simple buy-and-hold strategy (Sharpe ratio = 0.09), As the 1-period MA_{short} generate higher return among other short period (i.e., 10-period, 20-period, 50 period, and 100-period) in the MA crossover, MA (1,10) being the highest, followed by MA (1,20), (1,50), (1,100), and (1,200).

Besides that, the reward-to-risk ratio is higher than the simple buy-and-hold strategy, which means, in the long-run, following the MA crossover strategy, would have a positive mathematical expectancy of higher average profit per trade against lower average loss per trade, and the net-payoff is positive, on average. This also signifies that the risk for employing the MA crossover strategy is actually less risky in the long-run, given that transaction cost is not included.

As the increase of MA_{long} from 10 to 200-period, the frequency of trades has greatly reduced. The two short-period MA crossover (e.g., MA (1,10) shows the most trading frequency as compared to one short period MA with one longer period MA crossover (e.g., MA (1,200)), as the former strategy generates frequent trading signals than the latter. This is because of the smoothing effect of MA, as increase in the number of period for smoothing, the MA line would be flat across time, trading signals reduced. Although the former generates frequent trading signals with small average return per trade and small return volatility, however in the long-run, the strategy generates larger total strategy return than the latter strategy that has less frequent trading signal, with large average return per trade and large return volatility.

The entire MA crossover returns are positively skewed to the right, except for MA (50,200) and (100,200) which is quite symmetrical.

Also, many of the MA crossover periods have excess kurtosis (kurtosis >3, leptokurtic) where its central mean is taller and sharper with longer and fatter tails. This shows that the return distribution has clustered around the mean, nevertheless the fat tail comes from outlier events indicating extreme value of return observations are highly expected to take place.

4.3. The Modified MA Crossover Strategy (Modified MA with Additional Rules)

Similarly, the modified MA crossover strategy has the similar rule as the original MA crossovers strategy, with additional trading rules of stricter entry rule, holding period rule, exit rule, and stop-loss rule as described in detail in the previous Chapter 3.

All of the modified MA crossover strategies (for MA_{short} 1-period) have generated higher total strategy return, higher risk-adjusted strategy return, and higher reward-to-risk ratio as compared to the simple buy-and-hold. All are positively skewed, and are leptokurtic; except for MA (1,200) is platykurtic (Table 3).

Likewise, as increasing the number of period in long-period MA smoothing, numbers of trade reduced, trade signals generated are lesser, and total return are lower too. Here, the return for MA (1,10) is the highest and as the long-period MA increases, total return are decreasing as seen in MA (1,200).

Table 2: Trading performance analysis for the MA_{short} 1-period original MA crossover strategy

Strategy type	MA (1,10)	MA (1,20)	MA (1,50)	MA (1,100)	MA (1,200)
Total number of trades	224	144	79	44	39
Number of winning trades	100	67	27	21	16
Number of losing trades	124	77	52	23	23
% of winning trades	45	47	34	48	41
% of losing trades	55	53	66	52	59
Average of profit per trade (%)	3.22	3.60	7.84	8.45	9.09
Average of loss per trade (%)	−0.81	−0.94	−0.99	−1.46	−0.71
Minimum loss (%)	−0.03	−0.05	−0.12	−0.16	−0.11
Maximum loss (%)	−5.66	−7.39	−3.72	−3.55	−1.91
Minimum gain (%)	0.02	0.14	14	0.07	0.02
Maximum gain (%)	16.42	20.05	42.01	41.14	30.59
Reward-to risk ratio	3.99	3.84	7.90	5.78	12.74
Total strategy return (%)	726.47	381.79	312.85	247.02	220.19
Geometric mean return (%)	0.95	1.10	1.81	2.87	3.03
Standard deviation of return (%)	3.05	3.75	7.14	9.94	8.14
Sharpe ratio	0.31	0.29	0.25	0.29	0.37
Skewness	2.24	2.48	3.44	2.85	2.40
Kurtosis	6.00	8.11	14.04	7.87	5.12

MA: Moving-average

Table 3: Trading performance analysis for the MA_{short} 1-period modified MA crossover strategy

Strategy type	B&H	MA (1,10)	MA (1,20)	MA (1,50)	MA (1,100)	MA (1,200)
Total number of trades	180	169	114	63	44	28
Number of winning trades	106	92	61	28	21	16
Number of losing trades	74	77	53	35	23	12
% of winning trades	59	54	54	44	48	57
% of losing trades	14	46	46	56	42	43
Average of profit per trade (%)	3.27	3.54	3.88	7.71	8.45	9.24
Average of loss per trade (%)	−3.43	−1.24	−1.53	−1.42	−1.46	−1.01
Minimum loss (%)	−0.05	−0.31	−0.02	−0.12	−0.16	−0.11
Maximum loss (%)	−15.22	−5.66	−7.39	−4.93	−3.55	−3.29
Minimum gain (%)	0.07	0.03	0.30	0.14	0.07	0.02
Maximum gain (%)	13.55	16.42	20.05	42.01	41.14	30.59
Reward-to risk ratio	0.95	2.85	2.53	5.41	5.78	9.11
Total strategy return (%)	111.21	791.28	325.48	336.36	247.02	241.14
Geometric mean return (%)	4.16	1.30	1.28	2.37	2.87	4.48
Standard deviation of return (%)	4.41	3.55	4.27	7.97	9.94	9.35
Sharpe ratio	0.09	0.37	0.30	0.30	0.29	0.48
Skewness	−0.28	1.73	1.95	2.91	2.85	1.81
Kurtosis	1.17	3.57	5.10	10.08	7.84	2.35

MA: Moving-average

5. CONCLUSION

The original MA crossover strategy outperforms the conventional simple buy-and-hold strategy, this is due to higher strategy return, higher risk-adjusted return (higher sharpe ratio) and minimal drawdown. While the modified MA crossover strategy show mixed result. The additional rule for the modified MA crossover strategy do not show consistent result across all period of MA crossover, i.e., some outperform the original MA crossover strategy while some underperform, and some even underperform the simple buy-and-hold strategy. Among the modified MA crossover strategy that outperform are MA (1,10), (1,50), (1,200), (10,100), and (20,100); these result show higher risk-adjusted return and lower kurtosis as compared to the original MA crossover strategy, which signifies higher return with lower return variability. Contrary to the opinion of efficient market theorem stating that usage of historical prices and volume in technical analysis unable to outperform market benchmark. However, in this study, we have affirm previous researches that supports the proposition of employing trend-following strategies in enhancing investment returns.

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