Effectiveness of Investment Strategies Based on Technical Indicators: Evidence from Vietnamese Stock Markets

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ABSTRACT
This paper, with a purpose to explore market inefficiencies, aims to investigating the effectiveness of investment strategies using 3 most popular technical indicators (MA, MACD, and RSI) taking into account market conditions, with and without trading costs and transaction fees. In order to test the performance of the technical analysis, secondary data were taken from 140 stocks listed on Ho Chi Minh stock exchange market for the investment period from 01/01/2009 to 01/01/2012. This study concluded that technical indicators could maximize returns during up-trend period and minimize the lost when the market declines. Using active strategy based on technical indicators - especially leading indicator like RSI - was recommended for active investors in up-trend market. With this approach, the study enhanced conclusions that could be applicable for both efficient and inefficient market conditions, which is suitable for a young and dynamic market like Vietnam.
1. Introduction

Within stock market, there are two approaches for stock price evolution analysis. In one hand it is the fundamental analysis, which takes into account future prospects of firms through accounting and financial information of the company beside other data about firms’ operations. Fundamental analysis usually aims to developing company value. The technical analysis stands in the other hand. This kind of analysis will try to forecast future stock trend through technical indicators. In order to develop an automated system to stock market prediction and analysis, the most common solution is to turn to technical analysis, as information needed is limited to stock price history of the value to be studied. While fundamental analysis requires a deeper training and wider data set which include a lot of hard measuring.

As a study of Pring (1980) shows that technical approach to investment is essentially a reflection of the idea that the stock market moves in trends which are determined by changing attitudes of investors to a variety of economic, monetary, political and psychological forces. The art of technical analysis is to identify changes in such trends at an early stage and to maintain an investment posture until a reversal of that trend is indicated. By studying the nature of previous market turning points, it is possible to develop some characteristics which can help identify major market tops and bottoms. Technical analysis is therefore based on the assumption that the history will repeat, it means that people will continue to make the same mistakes that they made in the past.

Refer to this conflict between fundamental analyst and technical analyst, many studies had been conducted. Some have found results consistent with the practitioner’s view by providing evidence that technical analysis can predict price movements or by developing models of market in which investors benefit from conditioning of historical information. For example, Sahli N. Nefli (1991), Brock, Lakonishok, and LeBaron (1992), Neely, Christopher, Weller, and Dittmar (1997), and Salih N. Nefli and Polinaco (1984) cited by Sewell (2008) tests different trading rules and find evidence consistent that technical analysis provide incremental information beyond that already incorporated into the current price. In theory, Sorensen (1984) and Brown and Jennings (1989) examine settings in which privately informed investors use past prices to determine whether their information has been revealed to the market or to learn about the private signals of other traders, respectively. Similarly, Blume, Lawrence, Easley, and O’Hara (1994) demonstrate that volume may provide relevant information if prices do not react immediately to new information. Furthermore, there is a
growing literature examining the possibility that common biases in human judgment lead to market inefficiencies.

Meanwhile, according to Murphy (1999), technical analysts believe that investors collectively repeat the behavior of the investors that preceded them. To a technician, the emotions in the market may be irrational, but they exist. Because investor behavior repeats itself so often, technicians believe that recognizable (and predictable) price patterns will develop on a chart.

Technical analysis provides analyst a series of indicators as a main tool in analyzing stock movement. According to Achelis (1997), an indicator is a mathematical calculation that is applied to security’s price and/or volume fields. Price data includes any combination of the open, high, low or close over a period of time. Some indicators might use only the closing prices, while others incorporate volume and open interest into their formulas. Indicators use those price data to produce some specific points or lines. Those results could be used to anticipate changes in price.

Most empirical studies of technical analysis, include E. Fama and Blume (1966), conclude that technical analysis is not useful for improving returns. In contrast, a more recent study demonstrates that a relatively simple set of technical trading rules possess significant forecast power for changes in markets for the long sample period. This paper will test the performance of technical analysis by using a set of trading rules which are based on some popular technical indicators in Vietnam market in a recent period of time.

1.2 Research Objectives

This study aims at exploring the effectiveness of investment strategies which are based on technical indicators, namely MACD (Moving Average Convergence and Divergence), RSI (Relative Strength Index) and MA (Moving Average) in comparison with passive buy and hold strategy.

1.3 Research Significance

(i) This research brings a better understanding of using technical analysis and indicators in Ho Chi Minh stock exchange market and also helps to get deeper understanding about some specific aspects and characteristics of the market, and of course this could be a good guideline for stock investment.

(ii) The study helps investors to understand stock behavior, factors that affect return, and then identifying investment opportunity for active trading method. Investors could learn to
understand why stocks tend to act in their ways; hence, learn how to meddle with them, and might predict whether their stocks would be having generated return or not.

(iii) The results of this research can be use as reference for the functional agencies to make trading decision and also provides concepts and discussion, enriching more knowledge about Vietnam stock exchange market as well as applications of some technical strategy for Vietnamese investors.

2. Literature Review

Active strategy: In this study, active strategy will be applied using technical indicators which are MA, MACD and RSI. Specific trading rules will be set up based on those three technical indicators. Stocks will be traded actively over investment period using trading signals which are stated by those three technical indicators by following trading rules strictly.

Passive Strategy: This research considers the passive buy and hold strategy as the benchmark to evaluate the performance of active strategy. The indexing strategy is not concerned in this research. In this paper, passive strategy will be understood as buy and hold strategy, which means that portfolios follow passive buy and hold strategy will make only 1 buy decision at the beginning and 1 sell decision at the end of investment period.

Technical Analysis: Technical analysis is the study of prices, with charts being the primary tool. The technical approach to investment is essentially a reflection of the idea that prices move in trends which are determined by the changing attitudes of investors toward a variety of economic monetary, political and psychological forces… Since the technical approach is based on the theory that the price is a reflection of mass psychology (“the crowd”) in action, it attempts to forecast future price movement on the assumption that crowd psychology moves between panic, fear and pessimism on one hand and confidence, excessive optimism, and greed on the other (Pring, 1980). A fundamental principle of technical analysis is that a market's price reflects all relevant information, so their analysis looks at the history of a security's trading pattern rather than external drivers such as economic, fundamental and news events. Therefore, price action tends to repeat itself due to investors collectively tending toward patterned behavior – hence technical analysis focuses on identifiable trends and conditions.

Technical Indicators: Technical indicators are distinguished by the fact that they do not analyze any part of the fundamental business, like earnings, revenue and profit margins. Technical indicators are used most extensively by active traders in the market, as they are
designed primarily for analyzing short-term price movements and making trading decisions, picking stocks, buying and selling decisions. To a long-term investor, most technical indicators are of little value, as they do nothing to shed light on the underlying business (Caginalp & Laurent, 1998).

+ **Moving average convergence divergence (MACD):** a technical analysis indicator created by Gerald Appel in the late 1970s, has become one of the most popular of technical tools, used by short- and longer-term investors in the stock, bond, and other investment markets. According to Appel (1999), technical analysis is about the best stock-market timing tools. Appel smoothed out the noise of shorter-term price fluctuations by moving average so as to more readily be able to identify and define significant underlying trends.

+ **Relative Strength Index (RSI):** The Relative Strength Index, introduced by Wilder (1988), is one of the most well-known momentum oscillator systems. Momentum oscillator techniques derive their name from the fact that trading signals are obtained from values which “oscillate” above and below a neutral point, usually given a zero value. In a simple form, the momentum oscillator compares today’s price with the price of n-days ago (Wilder, 1988).

+ **Dual Moving Average Crossover (MA):** Moving average based trading systems are the simplest and most popular trend-following systems among practitioners (Lui and Mole (1998) cited by Sewell (2008)). According to Sahli N. Nefli (1991), the (dual) moving average method is one of the few technical trading procedures that is statistically well defined. When the short-term trend rises above or below the long-term trend, the Dual Moving Average Crossover system generates trading signals. In this study, the moving average indicator will be defined as the dual cross of moving average 200 day (slow line) and the moving average 30 day (fast line).

**Previous Researches on Technical Analysis:** Numerous empirical studies have tested the profitability of various technical trading systems, and many of them included implications about market efficiency. According to Park and Irwin (2004), more than 130 empirical studies have examined the profitability of technical trading rules over the last four decades. For example, Brock et al. (1992) found support for technical trading rules on the Dow Jones Index. Following their study, the interest in testing the profitability of technical trading rules has grown considerably. Several authors have presented supportive evidence in emerging markets.

The research of Ben, Rochester & Jared (2006) cited that Chaudhur and Wu (2003) find that the technical trading rules could earn high profit since the random walk hypothesis might not
work in many emerging markets. Parisi and Vasquez (2000) show huge profits to technical trading rules in the Chilean stock market. Bessembinder and Chan (1998) find that the profit of technical trading rules could be exceed the transaction costs in the emerging markets of Malaysia, Thailand, and Taiwan. Ito (1999) also tests technical trading rules and finds profitability beyond transaction costs in Indonesian, Mexican and Taiwanese equity indices. Finally, Ratner and Leal (1999) conduct a test in markets of India, Korea, Malaysia, Philippines, Taiwan, Thailand, Argentina, Brazil, Chile, and Mexico, and find some evidence of profit from technical trading rules in Taiwan and Thailand markets.

Neely, Christopher, Weller, and Dittmar (1997) cited in their research that "Osler and Chang (1995) construct a computer algorithm to identify head and shoulders pattern, and look at the returns to this rule in several currencies over the period 1973-1994. With bootstrap methodology they find evidence of significant profits for the mark and yen, but not for the pound sterling, Canadian dollar, French franc or Swiss franc”.

Blanco, Sagi, Soltero, and Hidalgo (2004) test an application of technical trading rules on Moving Average Convergence Divergence (MACD) from 2000 to 2005 of Dow Jones Industrial Average (DJIA) and compare it with passive buy and hold strategy at the same period of time. They prove that parameters of technical indicators can be improved with Evolutionary Algorithms.

In Vietnam, Sang (2010) did a test and concluded that technical analysis earns more return but also more profit. These studies provide a strong confirmation for using technical analysis, especially in Vietnam stock exchange market. Furthermore, these studies also state the different between indicators during the test. For example, Sang found that the results of RSI and MACD are significantly different for the same portfolio.

Hung, H. Nguyen, & Yang Zhaojun (2013) conduct a paper considering whether the moving average rules can forecast stock price movements and outperform a simple buy-and-hold strategy over the period from July 2000 to March 2011 on Vietnamese data. Hung and Yang concluded that the technical trading rules examined have strongly predictive ability in term of Vietnamese data. The rules have greater forecasting power for Vietnamese than those for some other Asian markets. The profitability of short-term technical trading rules is better than that of longer-term ones. This study also confirms that the (1,10,0) rule, (1,20,0) rule, and (1,50,0) rule are determined to be very effective in Vietnamese stock market because they allow investors to make a large excess returns before trading cost. Specially, Hung proves that the technical trading rules are profitable, even after adjusting for trading costs.
3. Data and Methodology

3.1. Study Population and Data Collection

The collected data are daily prices which include open price, close price, highest price, and lowest price on daily basis and trade volumes of each stock in 3 years from 01/01/2009 to 01/01/2012. During those years, the market was experienced 3 different trends. Stocks which do not satisfy this time length will be excluded. So, there are 140 stocks included in the test.

Data was collected from website www.vndirect.com.vn for the period of 3-year form 01/01/2009 to 01/01/2012 (including 749 daily price observations). “buy” and “sell” signals are identified on the historical price graph according to the collected data to calculate the return for each strategy. Returns of each stock will be calculated and gathered into groups. All of the factors that might affect to the return of trading stocks (such as dividend, interest, T+3 rules …etc.) will be taken into account as inefficient market aspects.

3.2. Trading Rules

For active strategy, stocks are traded actively over time, “buy” and “sell” decisions are made continuously overtime based on “sell” and “buy” signals of technical indicators (meaning MACD, RSI, and MA). Each indicator has its own principles. In order to ensure the validity of the test, trading rules are stipulated in advance for each indicator and applied strictly during the whole investment period.

If the indicator states a “buy” signal or “sell” signal, then “buy” decision or “sell” decision will be made with the price of the transaction dates. Each trading cycle begins with the “buy” decision and end with the “sell” decision. So, there is no short-selling transaction during the tested period. In case there are more than one “sell” signal is seen, only the first “sell” signal that follows the “buy” signal is taken into account, the following “sell” signals will be skipped until we have the next “buy” signal. Similarly, for the last “buy” signal toward the end of the investment period, and there is no “sell” signal before the end of the investment period (it means this trading cycle is not closed yet), then the stocks will be sold at the price of the last trading day of the investment period to close this trading cycle to ensure the validity of the test. If the trading signals lead to the conflict with rule T+3, all of trading decision must wait until the assets are transferred. By the law, the trading action will be done in the next day.

For MACD, the “buy” signal occurs when the MACD line raise above the signal line (9-day period) and the “sell” signal occurs when the MACD line fell below the signal line. A very similar method could be used for MA. The “buy” signal occur when MA (30 days) line cross
over the MA (120 days) line and “sell” signal occur when MA (30 days) line cross under the MA (120 days) line. Besides, RSI indicator use timeframe 14-day period, the “buy” signal occurs when the RSI line fell below 30 and the “sell” signal occurs when the RSI line raise above 70.

3.3. The Measurement of Market Efficiency Aspects

To ensure the feasibility of the research, all of transactions were assumed to be done by an account in May-Bank Kim Eng Securities Company. So, transaction fees will be calculated based on policy of this company. According to transaction fee table quoted on the official website of May-Bank Kim Eng Securities Company, the transaction fee for total transaction value under VND 100 million/due is 0.35% total transaction value. Hence, the returns are calculated automatically including capital gain (or loss) from buy and sell stocks and dividend received (if any).

According to the Article 1 of Circular No. 12/8/2009 dated 160/2009/TB-BTC of the Ministry of Finance guides income tax exemption in 2009 by Resolution No. 32/2009/QH12 dated 19.06.2009 of the National Association that individual transferable securities are exempt from personal income tax from 01/01/2009 to end on 31/12/2009. Since 01/01/2010, personal income from transfer of securities shall pay personal income tax as stipulated in the Law on Personal Income Tax and Circular No. 84/2008/TB-BTC dated 30/9/2008 of the Ministry of Finance guiding perform the Circular No. 100/2008/ND-CP dated 09/08/2008 of the Government regulating in details some articles of the Law on Personal Income Tax and 42/TBCT-Dispatch on 02/01/2009 Ministry of Finance guides income tax deduction for stock transfer. The personal tax applied for share ownership transferring is 0.1% on sell price or 20% on capital gain for one trading cycle. In this research, 0.1% on sell price personal tax is applied.

The gain or loss of each transaction is calculated by the following formula:

\[ G = \frac{S - B + D}{B} \times 100\% \]

Where:

- G – Gain (loss) per transaction (%)
- S = (Close price of the stock at the time the “sell” action is done) – (the transaction fee and personal tax)
- \( B = \) (Close price of the stock at the time the “buy” action is done) + (the transaction fee)
- \( D \) – dividend received relate to the trading cycle (if any)

Whenever the capital take break in the account (means the investors hold cash instead of stocks), they got interest on that cash. In Vietnam market, each securities company signed a contract with the bank; the investors will get the interest at rate for Non-Term Deposit Balance from that bank. In this research, all trading actions are done by the account opened at Kim Eng May Bank Securities Company. So, the interest rate for Non-Term Deposit Balance of Eximbank will be applied. It is 3.6% p.a, equivalent to 0.01% per day. So, returns of each stock for the whole investment period are calculated as the following formula:

\[
R = \sum G + (N - n) \times R
\]

Where
- \( R \) – Average daily gain (loss) for the whole investment period (%)
- \( G \) – Gain (loss) per transaction (%)
- \( N \) – 730 days
- \( n \) – Total non-trading days in investment period
- \( R \) – 0.01%

4. Research Results and Discussion

The figure below will show the return of stocks in three years from 2009 to 2012. This figure illustrated the domination in average return of technical indicators over passive strategy. The average returns of stocks during three years were 174%, 58%, 42% and 3% corresponding to RSI, MACD, MA and passive strategy. Besides, standard deviation of MACD, MA, and passive strategy were almost the same around 90% while the standard deviation of RSI indicator peaked into nearly 240%.

![Figure 1](image-url)

**Figure 1**
Average Return & Standard Deviation of data without inefficiency aspects from 2009 to 2012
As figure below, during down-trend and sideway market stage, technical indicator (include RSI, MACD and MA) showed no big differences compared to passive trading method. The mean of stock returns during those two market stages from both technical indicators and passive trading method fluctuated around 0. The situation was much better in up-trend market stage, as the figure below, RSI indicator gained a significant higher average return compared to passive trading method and the other two indicators. RSI got around 180% of average return while MACD and passive trading method stood around 80% of average return. MA indicator only got nearly 40% on average return during this up-trend period.

![Box Plot of Return in all three market trends](image)

**Figure 2**
Box Plot of Return in all three market trends

4.1 T-Test Two Sample for Mean

As the table below, all three technical indicators confirm the significant different in average return in the comparison with passive strategy. Besides, there is no significant different in average return between MACD and MA since those two indicators were built on almost the same basic while RSI indicator confirm a significant different in the comparison with the other two technical indicators.
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*Sig: Significant Different No: No significant different*

In overall, the technical indicators brought back a significant different average return compared to passive trading method. During sideway and down-trend period, the T-Test results compared means of stock return between technical indicators and passive trading method show a significant different results. During up-trend period, only RSI and MA indicator show a significant different result while T-Test did not confirm that for MACD indicator. Among technical indicators, when the market has formed a trend, the results of those three indicators will be significant different. But when the market falls in a sideway situation, the result between those three indicators will not confirm any significant different. Besides, data with inefficiency aspects (such as trading fees, dividend, taxes) still keeps the same T-Test results compared to the T-Test results of data without inefficiency aspects. All results from data with and without market inefficiency aspects have no significant differences.

When the market has formed its trend (either up-trend or down-trend) the return from technical indicators will be differently. Otherwise, the differences will not be considered significantly. Especially, RSI indicator tends to get higher return but higher risk too. The average return and standard deviation of RSI indicator were much higher than the other indicators. The reason could come from the nature of this indicator. RSI is a leading indicator while MACD and MA have more characteristics of a lagging indicator.

As in the finding, the profit from “MA” indicator and “MACD” indicator was lower than “RSI” indicator. The profit of active trading strategy using these technical indicators comes from the fluctuation of stock prices. But these technical indicators were formed by different factors and they got some different characteristics. “MA” indicator is a lagging indicator which normally state trading signal later than leading indicator like “RSI” while “MACD” stand in the middle. So, in a sideways movement of stock prices, these 3 technical indicators
are almost the same. So when the market has been confirmed, the different between lagging and leading technical indicators will be significant. Leading indicator like RSI will have the tendency to move forward the market and promise higher return (if the market going up) and higher level of risk. Lagging indicators tend to react a little bit later then the market since the data of those kinds of indicator has been formed from the moving average. Thus, lagging indicator might miss some potential opportunities by its late react.

The word “lagging” in “lagging indicator” could be understood as “slower”. The “MA” indicator in this study might represent for all of lagging technical indicators. These indicators almost got the same movement which is slower than the average market. So, some opportunities might be missed cause of this late trading signal. In contrast, leading indicator like “RSI” usually states trading signal before the average market. Thanks for this fast respond leading indicator could take a lot of opportunities but also cause noises - means false trading signal. Trading signal of technical indicator might be false sometimes cause of quick change in stock price trend.

According to the data, technical indicator returns dominate passive trading method. In the up-trend market, this is obvious to see. In sideways and down-trend market, the returns of technical indicators still higher than passive trading method but all of the returns were very low around zero. In the aspect of risk taking, “RSI” indicator was a special case compared to the others. This indicator sometimes brought back a lot of return but, of course, the threat high risk comes along with that. For example, during the uptrend period, the return RSI indicator was more than 3 times of the others. But the standard deviation of this group was more than 5 times of the others.

Transaction fees could be a concern for investors who follow active trading strategy. Transaction costs are important to investors because they are one of the key determinants of net returns. Transaction costs diminish returns, and over time, high transaction costs can mean thousands of dollars lost from not just the costs themselves but because the costs reduce the amount of capital available to invest. The number of transaction cost move together with the number of transaction that we made. Since the transaction fees are calculated according to the value of that transaction. Besides, active strategy trades stocks actively overtime and then, the number of transaction would be a lot higher. Otherwise, the data shows that inefficiency aspects such as trading fees, dividend and taxes did not affect much on the results.
5. Conclusion and Recommendation

This study serves the purpose of investigating the effectiveness of investment strategies using 3 technical indicators against passive trading method with the data of 140 stocks in Ho Chi Minh stock exchange market in 3-years period from 01/01/2009 to 01/01/2012. In overall, technical indicators could maximize the returns during up-trend period and minimize the lost when the market declines. But minimizing the lost does not mean that it performs well. The returns during sideways and down-trend market of technical indicator were nearly zero.

There were a significant different between technical indicators and passive trading method in sideways and down-trend market while only RSI indicator stated a significant better result in up-trend market. Return from “MA” indicator was a little bit lower than “MACD” or “RSI” indicator but it also faces lower level of risk. “RSI” indicator raise higher return but it needs to bear a very higher level of risk. Furthermore, the effect of inefficiency aspects like dividend, trading cost, and taxes on final return was not high. The results with and without inefficiency aspects were almost the.

Investors should consider to use technical indicators to get more return when the market perform well but they should not invest much in stock market during crisis time even with the support from technical indicators. When the up-trend market is confirmed, this study strongly recommends investors to use RSI indicator to increase the profit.

Investors’ risk tolerance is a very important factor to choose a specific technical indicator since there are some differences between their risk and return. Leading indicators could bring back higher return but the risk comes along. Using lagging indicators only get almost the same result with passive trading method. This type of technical indicators might not a good choice for active investors. Besides, market inefficiency aspects such as transaction cost and taxes did not affect much on the return, investors don’t need to pay attention on those aspects.

6. Limitation

Due to the limit of time length of the investment period, only 3-year data of stock trading might not reflect all of market characteristics. The selection of time horizontal might affect to the return stocks. Choosing a specific time length might reflect only the trend which the market followed during that time only. Capital firm size effect and liquidity effect must be conducted in further study so that the comparison between the performances of active strategies and passive strategy can be carried out more efficiently. Also, further research must have some comparison between markets in order to get a bigger overview.
References


