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技術分析與市場效率性—以日本、台灣及中國股票市場為例

TECHNICAL ANALYSIS AND MARKET EFFICIENCY - EVIDENCE ON JAPAN, TAIWAN AND CHINA MARKETS

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技術分析與市場效率性—

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準碩士推薦函

本校企業管理學系管理科學碩士班研究生＿＿瑪拉＿＿君在本系
修業 1.5 年，已經完成本系碩士班規定之修業課程及論文研究之訓練。

1、在修業課程方面：＿＿＿瑪拉＿＿君已修滿＿39＿學分，其中必修科
　　目：研究方法、決策專題、管理科學、經營專題等科目，成績及格
　　(請查閱碩士班歷年成績)。

2、在論文研究方面：＿＿瑪拉＿＿君在學期間已完成下列論文：

　　(1)碩士論文：技術分析與市場效率性—以日本、台灣及中國股票
　　　　市場為例

　　(2)研討會論文：技術指標的操作績效分析—以日本、台灣和中國
　　　　股票市場為例

　　本人認為＿瑪拉＿君已完成南華大學企業管理學系管理科學碩士
班之碩士養成教育，符合訓練水準，並具備本校碩士學位考試之申請資
格，特向碩士資格審查小組推薦其初稿，名稱：技術分析與市場效率性—
以日本、台灣及中國股票市場為例，以參加碩士論文口試。

指導教授：＿＿＿＿＿＿＿ 簽章

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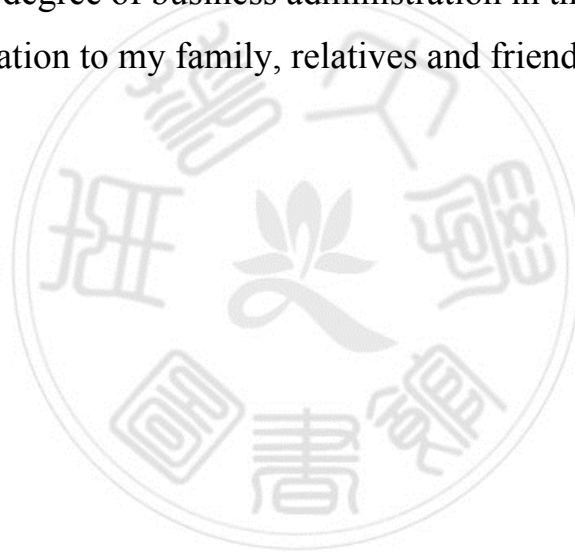
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ABSTRACT

Main purpose of this study focuses on examining market efficiency of stock in Asian countries by empirically evaluating the performances of popular technical analysis indicators. Technical analysis indices, will be employed to be used are SMA, EMA, WMA, MACD and RSI. In this study, we also try to determine which method provide more useful information in making the profitable trading rule for 3 main markets of Asia stock markets, Japan, Taiwan and China. The examination covered the following by 3 main questions:

This study test whether technical analysis is useful or not in 3 Asian markets? Which market is more efficiency according to evaluated performance of technical analysis indicators.

Which indices is more significant return in these markets?

What parameter combination should we use? (short-term and long-term horizon)?

The purpose of this study is to provide useful information for potential investors in Japan, Taiwan and China stock market. Though these 3 markets are famous Asia stock markets, however, they are categoried into different level of efficiency markets, for example Japanese stock market is mature market due to its

well marke stucture and trading cost, Taiwanese stock market is old emerging market within high growth rate and Chinese market is new emerging market that is growing quickly recently. Furthermore, comparing to three different Asian stock markets which are various of each other that become more interesting for us.
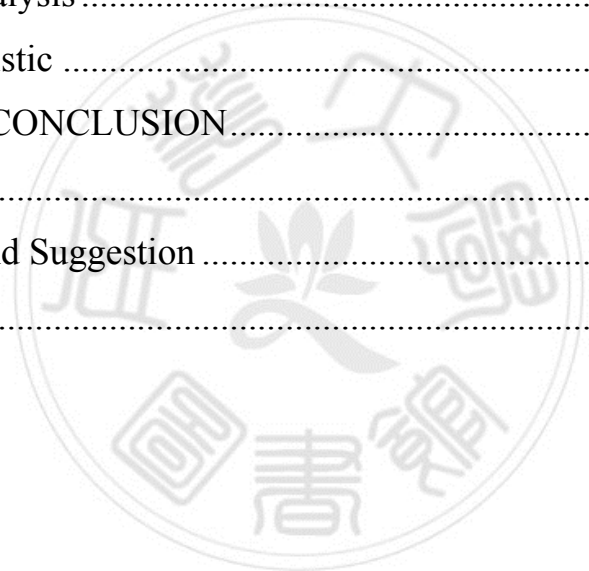
Key words: Asian Stock Markets (ASM), Technical Analysis (TA), Technical Analysis Indicator (TAI), Market Efficiency (ME) and Trading Performance (TP)

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CHAPTER ONE
INTRODUCTION

1.1 Background

The aims of this paper is going to survey the market efficienccy for 3 Asian markets by assessing empirically the trading performance of using the popular technical analysis indicators, namely SMA, EMA, WMA, MACD and RSI. There are three methods for measuring the rapidity of information transmassion to identify the market efficiency. Firstly, it takes a look at how much and for how long prices go amiss from real value. The second is to quantify how rapidly and totally prices conform to reflect new data. The third is to measure whether a few financial investors in business sectors reliably acquire higher returns than other people who presented to similar amount of risk. Technical Analysis is made up out of a wide assortment of reasonable investment strategies which utilize past exchanging information to attempt and estimate future value and in this way attempt to make abnormal exchanging benefits. However, collides with the hypothesize of the current stock market worldview, the Efficient Market Hypothesis (EMH), that expresses that even on account of a weak in efficient market, as identified by Fama (1970), past data is joined into the present value development, along these lines it can't be utilized to produce larger than typical returns for the risk type the investors opens themself to.

The EMH presents three increasingly stringent definitions of efficiency, based on what information market prices reflect. Market efficiency is including three 3 forms:

Weak form – Stock prices incorporate all historical information into current prices; future stock prices cannot be forecasted based on an analysis of past stock prices.

Semi strong form – Stock prices join all publicly accessible data (historical and current); there won't be a postponed reaction to data disclosures.

Strong form – Stock prices incorporate all information – private as well as public, prices will respond when new data is produced, instead of when it is publicly disclosed.

The another purpose of this study is to suppose an application that seeks to somewhat supplant those experts to help a investors or an organization of investment to reach a critical benefit on purchasing and offering (exchanging). We should acknowledge that the recorded information identified with markets and stocks gives fitness signals about the market future execution in order to apply such methodology. This preface composes the premise of technical analysis that essentially seeks to examine the stocks previous execution to assess investment at the current time.

In the most recent decade, Asian markets have turned into the important part of component of international portfolio, which helps the fund managers to diversify the portfolio's risk efficiently (Johnson and Soenen, 2002; Narayan , 2014). Without a doubt over 15 years the Asian monetary emergency, Asian countries are showing expanding significance on the world financial stage, and in this manner more studies in the writing have inspected the incorporation of Asia's rising securities exchanges.

For the Asia market, 3 main markets, Japan, Taiwan, and China represent respectively the rapid growing market in different time horizons. Japan is the first emerging market in Asia, Taiwan demonstrates the dramatic growth in last decade,

and China grows rapidly recently and becomes the leading market in the world. This study evidence the information ability of technical indices for the purpose of providing the useful information to the potential investors, furthermore the empirical result can be used to examine their market efficiency.

The most significant occasion for China's financial system in the 1990s was the initiation and development of China's stock market. Two local stock exchanges (SHSE and SZSE) were set up in 1990 and developed very quickly for most of the 1990s. There are 2489 listed organizations in the local business sectors and more than 219 million stockholders have opened exchanges in the SSE and SZSE. There are 1552 securities investment asset as well, presenting to resources of CNY 2.9307 trillion.

Taiwan securities exchange has been developing quickly as of late and attracts big foreign investments. Further, a portfolio of securities has been incorporated into MSCI index since 1996. Hence, Taiwan securities exchange is one of good example for the emerging market.

Mature market Asia incorporates Japan, Australia, New Zealand, and Singapore. Numerous researchers are interested with whether Japanese financial markets are mature enough to be portrayed as objective. The Tokyo Stock Exchanges is the fourth biggest stock exchange in the world by market capitalization, and additionally the second biggest securities exchange in Asia, with 2292 recorded organizations.

The aim of this article is trying to evaluate the trading performance of the trading rules which is designed using the technical analysis methods. 3 Asia markets are nominated as the empirical markets China, Taiwan, and Japan, due to they represent the newly emerging market, near developed market, and developed

market respectively for testing whether they will demonstrate the different level of efficiency in markets.

1.2 Motivation

The strategies used are to analysis the future price of securities for making the investment strategy can be divided into two famous categories: fundamental analysis and technical analysis. Fundamental analysis is used to evaluate the true value of the stock price in the long run using the fundamental data including the financial statement of stock company and industry condition, in brief, it examines the qualities of an organization in order to assess its value. However, technical analysis takes a totally distinctive strategy; it couldn't care less one piece about the "value" of an organization or a commodity. Technicians are just focused in the price movement in the business sector. In general, fundamental is considered as a long-term technique, while technical is utilized more for short-term techniques.

In economics of a financial business sector, the connection of the stock's price change (return) and the exchange volume is an exceptionally attention-getting subject. There are numerous surveys about the price–volume relation, exchanging cost and exchanging volume. For the most part, Stock price is more interesting than stock value for all of investors. That's why we examined the short term dynamic reason of relation that exist set of international stock market indexes with a focus on Asian markets.

An advantage of the technical analysis is its straightforwardness, which can make it simple for investors to comprehend the given results. Technical analysis is adopted a lot of indicators. We select to evaluate more useful three technical

trading rules including MA, MACD and RSI using observations on stock price indices for Japan, China, and Taiwan.

In order to reach the purpose, the rest of the content is organized as takes after: chapter 2 points of market efficiency, technical analysis and technical indicator in empirical research by previous researchers. Chapter 3 shows with more noteworthy detail the research methodology adopted. Chapter 4 presents the empirical results, when the last chapter is held for conclusions.

CHAPTER TWO
LITERATURE REVIEW

2.1 Market Efficiency

All of analysts are more interested in informational efficiency of financial markets. Informational efficiency concerns to the tendency for prices in a market to quickly and completely join new, significant information. Effectiveness additionally can incorporate allocation efficiency and operational efficiency, however informational efficiency is more important due to it is more essential. Market efficiency concerns to the level to which stock prices and different securities prices present all available, important data. Market efficiency was created in 1970 by financial analyst Eugene Fama, whose theory of efficient market hypothesis (EMH) expressed it is impractical for an investor to outperform the market since all accessible information is now incorporated with every single stock prices. Investors who concur with this announcement tend to purchase index funds that track general market execution and are defenders of passive portfolio administration.

Investors have to just expect to get an ordinary rate of return because information id concerned in prices instantly. Knowledge of information when this is discharged does an investor no great. The price alters before the investor has moment to trade on it.

Companies have to hope to get reasonable value for stocks that they sell. Reasonable means the price they get from issuing stocks is the present value. Consequently, important financing benefits that emerge from fooling investors are inaccessible in efficient capital markets.

2.1.1 The Different Types of Efficiency

We accepted that the market reacts quickly to all accessible information. In fact, cconvinced information might influence stock prices more rapidly than other information. To organize different types of reaction rates, analysts isolate data into various types. Usually, the most widely recognized system distinguishes three types: Information about past prices, publicly available information, and all information. The diverse types of efficiency are assessed by the impact of these three informations.

(a) The Weak Form

To image a trading strategy that suggests buying a stock after it has increase three days in row and suggests selling a stock after it has decrease three days in a row. This procedure uses information based just on past prices. It doesn't use whatever other information, for example, profit, forecast, merger announcements, or cash supply figures. Accordingly, the previous strategy would not have the capacity to produce benefits if weak from efficiency holds. Sometimes, weak form efficiency is shown by mathematically as:

$P_t = P_{t-1} + \text{Expected return} + \text{Random error}_t$

Equation expresses that the price today is equal to the total of the last price plus the expected return for the stock plus a random error occurring over the interim. The last price could have occurred yesterday, a week ago, or a month ago, contingent upon the examining interim. The expected return is a component of stock's risk and would be founded on the models of risk and return. The random segment is because of new information about the stock. It could be either positive or negative and has a desire of zero. The random segment in any period is irrelative to the random segment in any past period.

The weakest kind of efficiency is weak form efficiency is that we would anticipate that a stock market to show that past period price data is the most straightforward kind of data around a stock to get. If it was available to make uncommon benefits essentially by discovering designs in movements of stock price, everybody would do it, and any benefits would abondon in the struggle.

(b) The Semi-Strong Form

If efficiency of weak form is more controversial are the two stronger kinds of efficiency, semi-strong and strong form efficiency. If price incorporate all publicly accessible information, including information, for example, publishing accounting statements for the company, and also past period price information, a market is semi-strong form efficient

The information set of past prices is a subset of the data set of publicly accessible information, which in turn is all information subset. Consequently, strong shape form efficiency predicts semi-strong form efficiency, also semi-strong form efficiency predicts weak form efficiency. The difference between semi-strong efficiency and strong form efficiency is that semi-strong form efficiency demands not just that the market be efficient with respect to past period price information, however that the majority of the information available to people in general be reflected in prices.

(c) Strong Form

The efficiency of strong form that is relevant to the estimation of the stock and that is known to no less than one investor is, in reality, completely organized into the stock price. A stringent devotee to strong form efficiency ought refuse that an insider who knew whether a minig operation of firm had struck gold could

benefit from that information. Such an believer of the strong form efficient market hypothesis may contend that when the insider attempted to exchange on his security data, the market would perceive what was occurring, and the price would rise up before he can buy any stock. Then again, devotees to strong form efficiency contend that there are no secret, and when the gold is found, the secret gets out.

One cause to hope that financial markets are weak form efficient that is not expensive and simple to discover designs in stock prices. Any individual who can program a PC and understands a bit of measurements can research for such examples. It makes sense that if there were such examples, individuals would discover and exploit them, in the process making them to disappear.

Efficiency of semi-strong form, however, suggests more refined investors than does weak form efficiency. An investor should be talented at financial aspects and statistics and saturated with the peculiarities of individual businesses and organizations. Moreover, to procure and use such skills includes talent, capacity, and time. In the language of the business analyst, such an exertion is expensive, and the capacity to be effective at it is probably in scarce supply.

Concerning efficiency of strong form, this is simply further not far off than efficiency of semi-strong form. It is hard to trust that the market is efficient to the point that somebody with significant inside data can't prosper from it.

2.2 Technical Analysis

In spite of the way that chartists have a solid trust in their anticipating capacities, in the scholarly community it stays problematic whether technical trading underlying the trends or patterns in past period prices has any numerically critical anticipating skill and whether it can gainfully be abused after adjusting for

exchange risk and cost. Cowles (1933) began by investigating the week by week anticipating results of surely understood professional agencies, for example, financial administrations and fire insurance agencies, sample period during January 1928 to June 1932. The capacity of choosing a particular security that ought to accomplish best returns, and also the capacity of anticipating the development of the stock market is concentrated on. Besides, Cowles (1933) considered the 26-year (in the period December 1903 until his demise in December 1929) estimating record of William Peter Hamilton During this period Hamilton composed 255 articles in the Wall Street Journal which introduced forecast for stock markets in view of the Dow Theory. While Cowles (1933, 1944) concentrated on testing advices, analysts, different scholastics concentrated on time serious behavior. Kendall (1953), Roberts (1959) and Working (1934), found at arrangement of speculative prices, for example, British indexes of industrial stock prices, American commodity prices of cotton and wheat and the Dow Jones Industrial Average (DJIA), that progressive price changes are independent linearly, as measured by autocorrelation, and that these series might be very much characterized by random walks.

Leenders and Theil (1965) research the dependence of the ratio of stocks that decline, remain or advance unchanged among progressive days for 450 securities exchanged in the period November 1959 into October 1963 at the Amsterdam Stock Exchange. They got that there is extensive positive dependence in progressive estimations of stocks declining, remaining and advancing unchanged at the Amsterdam Stock Exchange. It is reasoned that if securities advanced yesterday, they will likely likewise advance today. Fama (1965) imitates the Leenders and Theil test for the NYSE. As opposed to the results of Leenders and Theil (1965), Fama (1965) finds that the extents of stocks declining and advancing

today on the NYSE don't give much help in foreseeing the extents declining and advancing tomorrow. Fama (1965) infers that this disagreement in results can be brought on by economic elements that are one of a kind to the Amsterdam Exchange.

In this paper, we evaluate whether changes in Asian stock market indices can be anticipated by some simple forms of technical analysis. While most early empirical assessments of technical trading rules, involving Fama and Blume (1966) and Jensen and Benington (1970), appreciated that the rules are not valuable, later investigations of both American equity market (Brock et al., 1992) and the currency markets (e,g. Sweeney, 1986) have reported that some technical trading rules have non-trifling ability to predict price changes. In the event that the Asian stock markets are in truth generally inefficient, technical analysis might have the capacity to exploit the inefficiencies. We exam whether the technical trading rules assessed by Brock et al. (1992) likewise have forecast control for price changes in Asian Stock markets.

In order to identify a monetary asset or portfolio the objective must choose the most potential resources inside the market to lowest losses and highest returns. There are a few approaches to execute a acceptable assessment of the market to choose potential gainful stocks. In this research, an immaculate technical analysis (Murphy, 1999) technique was utilized. A technical analysis trusts that market activity must be specific, the securities prices and the volume of exchanges incorporate all the fundamentals that can influence price of market; economic, political or mental. The connected methodologies fundamentad on technical analysis regularly epitomize an arrangement of technical indicator which attempt to give a future viewpoint of market improvement as indicated by what is obvious on price charts.

There are 3 standards base on technical analysis. First, all information is progressively marked down in the prices. Over the market instrument the trusts, expectations, believes and dreams of all stpckholder are reflected in the prices. A analyst of technical analysis contends that the best guide you could have is the market itself and there are no compelling reason to investigate fundamental data. Second, technical analysis expects that prices change in downward, upward or sideways trends. Consequently most of technical exchanging techniques are usually trend-following instruments. The third suspicion is that history rehashes itself. Under equivalent situations stockholders will respond similar managing to price trends that could be perceived in the information.

While most early empirical examinations of technical trading rules (Fama and Blume,1966 and Jensen and Benington ,1970), presumed that the rules are not helpful, later investigations of both American equity markets (Brock, 1992) and the currency markets (Sweeney, 1986) have archived that some technical trading rules have non-insignificant ability to forecast price changes. On the off chance that the Asian stock markets are truth be told generally wasteful, technical analysis might have the capacity to exploit the inefficiencies. We test whether the technical trading rules assessed by Brock et al. (1992) likewise have forecast power for price changes in Asian Stock markets.

2.2.1 Trading Strategy
(a) Moving Average Strategy

Moving average (MA) is the most ordinarily utilized and most common typical examined technical trading strategies. MA are redesigned averages of past prices recursively. They yield understanding in the hidden trend of a price period,

furthermore disentangle a generally volatile series. We use the equation in this study.

$$MA_t^n = \frac{1}{n} \sum_{j=0}^{n-1} p_{t-j}$$

Where MA_t^n is the moving average of the last *n* observed prices at *t* time. Short (long) horizon movements could be distinguished by selecting *n* small (large). The bigger n, the slower the MA alters and the more the unpredictability is disentangled.

Moving averages are a key in the munitions of tools of technical analysts exchanging and their estates and viability have been considered in numerous past scholastic surveys some of that we examine underneath. Brock et al. (1992) test some straightforward technical trading rules and partner them with the estates of stock returns when LeBarron (1999) analyzes the benefit of technical trading rules and foreign exchange interference and Neely (1997) gives a survey of technical analysis in foreign trade markets and. Neely and Weller (2011) give encourage exchange on Neely's prior paper. Lo (2000) have a thorough survey of technical analysis, which incorporates the utilize of moving averages, where they attempt to support some basic statistical establishments to trading rules of technical analysis. Recently, Okunev and White (2003), Nicolau (2007), Faber (2009), Friesen (2009), Harris and Yilmaz (2009), and Zhu and Zhou (2009) have intriguing hypothesis and functions that depend on moving average rules. Okunev and White (2003) look at the efficiency type of moving average rules, and the purposes for it, in currency markets. Nicolau (2007) and Zhu and Zhou (2009) create extended time standards that are utilized to clarify different parts of conduct of moving averages; the last study is especially attractive as it demonstrates to enhance a moving

average way for asset appropriation. Similar fundamental instinct, with the function however without the method of theory, based on the study of Faber (2009) that is referred with the utilization of moving average as 'market timing' instruments. His principle concern, from a practitioner's viewpoint, is whether a straightforward, moving average of 200 day, price cross-over pattern could be utilized to evade huge drawdowns and pitfalls of the purchase and sell strategy and in this manner be utilized as a part of an advantage designation structure.

Friesen (2009) examine senses and clarifications behind trading rule efficiency, show how positive price strategiess collect and manage to certain autocorrelation structure including confirmation bias. At last, Harris and Yilmaz (2009) look at whether a continuous methodology can be utilized benefit as a part of outside trade exchanging, by contrasting moving average rules and the utilization of the Hodrick-Prescott (1990) kernel and filter smoothing. There are numerous more scholastic researchers on the utilization and efficiency of trading rules, though the beyond short list is for the most part pointed on a few papers that utilized smoothing techniques for trading.

(b) Moving Average Convergence Divergence (MACD) Strategy

The Moving Average Convergence Divergence methodology has been utilized before as a part of worldwide literature for considering market efficiency, in spite of the fact that not like as regularly as it ought to be suggested by its prominence among stockholders. For instance Bodas-Sagi (2009) utilized hereditary development parameter improvement and contrasted the MACD performances and the purchase and sell strategy for the Dow Jones Industrial Average Index. They understood that it executes so superior to anything the benchmark, in spite of the fact that the performances were not adapted for trading

risk and cost. Armour (2010) tried two rules of technical analysis, involving the standard that is the MACD (12, 26, 9) one, on 20 years of information of the Irish Stock Market Main Index and got that the rule of MACD failed to meet expectations the purchase-and-sell benchmark. Even so, the second rule that is a simple moving average one, beat the benchmark, they achieved that the moving average strategy can discard some uncertainty the efficiency of the Irish securities exchange. Chen (2011) tested six technical trading rules, involving a MACD-based one, on day by day information of the Danish securities exchange indices and understood that all the buy-sell contrasts under exchanging rules of either two or three indicator blends were positive significant t-statistics to don't accept the Efficient Market Hypothesis, in this way presuming which technical analysis had strong prescient power in the market and can perceive repeating patterns of price on account of the Danish stock index. Doukas and Abbay (2012) inspected four indicators of technical analysis, involving the standard momentum of MACD(12,26) rule, in current exchanging by individual currency investors and understood that technical analysis is related with performance negatively , in this way reasoning that currency traders that utilized this sort of technical analysis rules experience the ill effects of decreased execution. Chen and Metghalchi (2012) then examined 32 models base on the different parameter combinations of 6 indicators, involving the MACD, on the Brazilian stock market indices from 1996 to 2011 period and created that applying an assortment of exchanging rules with single, twofold and triple indicators did not provide the prescient influence of technical analysis, so determining that the stock market of Brazil was weak form efficient. Metghalchi (2012) tested the prescient force of 66 trading system of technical analysis in which they including some rules of MACD for the securities exchange of Taiwan from 1990 to 2010. They understood that most of the rules had prescient

power in the market, despite the fact that they didn't demonstrated that the rules can be utilized to create financial profit. Du Plessis (2013) analyzed the MACD strategy effectiveness versus the purchase and sell one for the South African Stock Market and understood that the strategy of benchmark investment is more effective than the MACD one in the market.

There numerous papers in which MACD's exhibitions are assessed and endings viewing market efficiency are drawn from it, yet none is more intricate than this in regards to the diversification of examined market and the volume of examined information period.

(c) Relative Strength Index (RSI) Strategy

Created J. Welles Wilder, the Relative Strength Index (RSI) is a momentum oscillator that measures the change and speed of price movement. RSI oscillates around zero and 100. Generally, and as per Wilder, RSI is considered overbought when over 70 and oversold when underneath 30. Signals can likewise be produced by searching for divergences, disappointment swings and centerline crossovers. RSI can be utilized to recognize the general trend.

RSI is a greatly famous momentum indicator that has been included in various articles, books and interviews throughout the years. Specifically, Constance Brown's book, Technical Analysis for the Trading Professional, highlights the idea of bull market and bear market ranges for RSI. Andrew Cardwell, Brown's RSI, presented positive and negative inversions for RSI. Moreover, Cardwell turned the idea of difference, truly and allegorically, on its head.

The momentum oscillators can be great technical analysis tools for the traders who comprehends its trademark; yet, there are three issues met in building up a

significant oscillator. Firstly, the design of the oscillator might not be right. For instance, using a ten-day oscillator, expect that ten days prior the price moved utmost down from the previous day. Presently, expect that the price shut the equal as yesterday. If we then subtract the price ten days prior from the price of today, we will get an inaccurately high price for the oscillator today. One, in this way, needs to smooth out or hose the oscillator (Wilder, 1978). Besides, it is an issue with the scale utilized for the "y" axis. How high will be high, and how low will be low? The scale will likewise change with every asset evaluated. Subsequently, one need a shared factor to apply for all assets by Wilder (1978). Thirdly, one will have an issue of keeping up with gigantic amount of data, particularly when one focus on a few assets in the meantime. The answer for these three issues was Wilder (1978) Relative Strength Index.

(d) Graphs and Evaluation of RSI Strategy

The RSI is a technical analysis oscillator that extents between zero and 100, making it possible to evaluate buy (sell) signals or divergence when the benefit is overbought (sell) and oversold (buy). The technical instrument was developed by Wilder (1978). He considered overbought signals 25 when over 70 and oversold when underneath 30. The RSI is zero when the normal pick up equivalents zero. Accepting a 14-period RSI like Wilder 1978, a zero RSI result implies prices moved lower every one of the 14 days. There were no increases to measure. The inverse happens when the RSI is 100. In the center, we have the 50s line, and this is the mean of the RSI and has substantiated itself as a resistance or support line. In any case, this line speaks to the balance of the RSI and is situated in the middle of the two picked extreme areas, 30 and 70. Numerous financial traders treat RSI crossing above and beneath the 50 level as buying and selling signals individually.

To sum up, one can utilize the Relative Strength Index, as overbought or oversould and momentum indicator. Wilder (1978) proposed using 30 as a sign of buy and 70 as a sign of an sell signal, over a 14-day period. However Wilder (1978) recommend those particular levels, this has been addressed and balanced in modern research (Murphy, 1999), (Pring M. J., 2002), (Achelis, 1995), (Chong and Ng, 2008), (Lindner and Muller , 2004). At the point when utilizing RSI as a momentum indicator, one needs to do the opposite, sell when 30, and buy when 70. Some of these papers utilize 80/30, 70/20 and 80/20 as upper and lower levels. This is up to the traders or researchers or himself.

2.2.2 Technical Indicator

The all of the technical analysis has it out spring in trend or momentum analysis. Althougt, in the last 30-40 years, a numerous of new technical models has developed.

A technical indicator comprises in a equation that is commonly employed to stock's volumes and prices. A new kind of indicators that both measure and figure volume and price, additionally such things as trends, money flow, momentum and volatility. The performance values are plotted and after that analyzed with a specific end goal to attempt a viewpoint on value expansion. All the more particularly, a technical indicator goes to catch the conduct and investment psychology in order to figure out whether a indice is under or exaggerated. The technical indicators are utilized as a part of two diverse courses: Either to confirm an upward or downward price movement or to form particular buy and sell signals. And also, we have two kinds of technical indicators: Lagging and leading. A lagging indicator measures the security after it has already took after a specific pattern or trend. It can, in this way, be utilized to confirm patterns. A leading

indicator measures the security before the price begin to take after a specific trend or pattern. They are in this manner used to anticipate future changes. Therefore, we have two kinds of indicator construction: Those who falls in a limited range and those that don't. A main pointer measures the security before the value begin to take after a specific example or pattern. They are in this manner used to anticipate future changes. The ones that are limited within a range are called oscillators – these are the most widely recognized kind of indicators (Tsinaslanidis and Zapranis, 2016). Oscillators have a range, for instance between zero and 100 and signal periods where the security is overbought when close to 100 and oversold when almost zero. The most well-known approaches to compute buy and sell signals through an indicator is divergence and crossovers. The most widely recognized divergence indicator is the money flow index (MFI). The indicators introduced further is notable indicators that are generally utilized in previous literature to infer trading signals. A short presentation of the indicators will be displayed alongside clarifying graphs. A crossover happens when a security shows with the given indicator. This is valuable when estimating future price movements. At the point when the security moves the other way than a indicator, index or related resources one can take at divergence. This is commonly used to help financial traders timing their position. Some traders and investors use indicators to anticipate the future price direction.

There are too many indicators being used today, with new indicator being made each week. Technical analysis programming programs accompany many indicators built in, and even permit clients to make their own. Given the measure of hype that is connected with indicators, picking an indicator to take after can be an daunting task. Indeed, even with the introduction of several new indicators, just a chosen few truly offer an alternate perspective and are deserving of attention.

For some odd reason, the indicators that justify the most attention are those that have been around the longest time and have stood the time test.

CHAPTER THREE
RESEARCH METHODOLOGY

Having found that there have been not many study for comparing the efficiency for the different markets recently, especially to test whether these markets support the hypothesis of weak efficient market using the technical index which we decided to undertake one. We have selected 3 markets indices from Taiwan, Japan and China markets. We use closing trade prices of indices for 2 years (covering from May 20th of 2014 to May 20th of 2016) from TEJ (Taiwan Economic Journal).

3.1 Research framework

We decided on the following research framework to undertake this study:
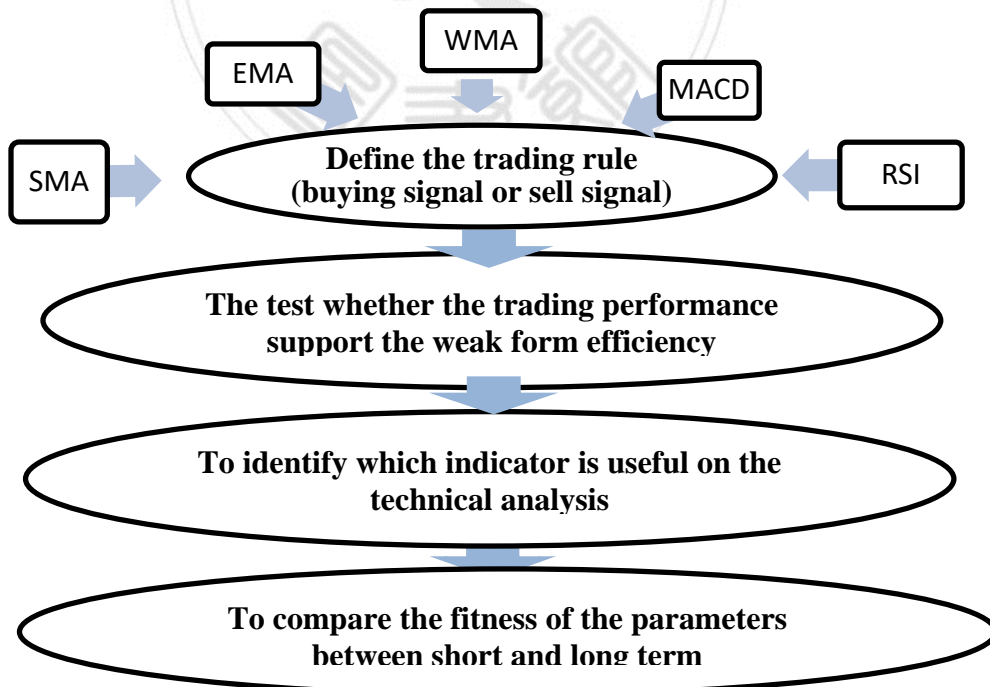
Figure 3.1 Research Framework

3.2 Hypothesis Testing

3.2.1 The Efficient Market Hypothesis

The efficient market hypothesis states that all around sorted out capital markets, for example, NYSE, are effective markets, at least as practical matter.

If a market is efficient, then there is a vital suggestion for market participants: The quickness of information transformation is too fast to earn the abnormal return even the trader has the inside information. It implies that all investments in an efficient market are zero Net Present Value (NPV) investments. The reason is not difficult. If prices are neither too low nor high, then the contrast between the market investment value and its cost is zero, it implies that the price reflect its actual value or its actual cost; henceforth, the NPV is zero. Accordint to a result, in an efficient market, investors get exactly what they for when they buy securities, and firms receive exactly what their stocks are worth when they sell them.

Because most studies believe that the emerging markets are not as efficient as the mature market due to the majority of investors are individuals in there. This study tries to compare 3 markets within different level in efficiency for comparing whether the mature market, that says Japan, perform well than other 2 emerging markets as well as Taiwan should be dominant than China in efficiency. Using the technical trading performance, this study provide the evidence to define whether Chinese stock market (new emerging market), Taiwanese stock market (old emerging market) and Japanese stock market (mature market) satisfy the hypothesis of weak form efficient markets.. Hypothesis test is used in these Asian stock markets. And t-test is employed to test whether the null hypothesis H would be rejected in statistic at significance level of 5%.

Hypothesis - 1

H_0: The Japanese stock market satisfy weak efficient market

H_1: The Japanese stock market cannot satisfy weak efficient market

    Hypothesis - 2

H_0: The China stock market satisfy weak efficient market

H_1: The China stock market cannot satisfy weak efficient market

    Hypothesis - 3

H_0: The Taiwanese stock market satisfy weak efficient market

H_1: The Taiwanese stock market cannot satisfy weak efficient market

3.2.2 Hypothesis of Parameter Combinations

Next, this study further investigate what is the fit parameter while using these technical index This manages to development being adopted in order to identify the parameter combination that maximizes a predisposed measurement of return on past exchanging information. This article examine whether evaluate abnormal return by technical indices, namely SMA, EMA, WMA, MACD and RSI. Each indicator is examined for short and long term combination. For the moving average price indices (such as SMA, EMA, WMA, and MACD), the compositions for shorter and longer periods are critical and important, 3 different compositions are employed in this study, those are (5, 10), (10, 20), and (5, 20), it respectively represents the composition for shorter and longer periods. And then we make the hypothesis 4 to hypothesis 15 illustrated as below. Furthermore, the other technical index, such as RSI, 3 parameters which are 5, 10, 15 days are used respectively to test the fitness of RSI, such the demonstrated by hypothesis 16 to 18.

    Hypothesis – 4

H0: The method of EMA using combination of 5:10 days can earn abnormal return

H1: The method of EMA using combination of 5:10 days cannot earn abnormal return

Hypothesis – 5

H0: The method of EMA using combination of 10:20 days can earn abnormal return

H1: The method of EMA using combination of 10:20 days cannot earn abnormal return

Hypothesis – 6

H0: The method of EMA using combination of 5:20 days can earn abnormal return

H1: The method of EMA using combination of 5:20 days cannot earn abnormal return

Hypothesis – 7

H0: The method of SMA using combination of 5:10 days can earn abnormal return

H1: The method of SMA using combination of 5:10 days cannot earn abnormal return

Hypothesis – 8

H0: The method of SMA using combination of 10:20 days can earn abnormal return

H1: The method of SMA using combination of 10:20 days cannot earn abnormal return

Hypothesis – 9

H0: The method of SMA using combination of 5:20 days can earn abnormal return

H1: The method of SMA using combination of 5:20 days cannot earn abnormal return

Hypothesis – 10

H0: The method of WMA using combination of 5:10 days can earn abnormal
   return

H1: The method of WMA using combination of 5:10 days cannot earn abnormal
   return

   Hypothesis – 11

H0: The method of WMA using combination of 10:20 days can earn abnormal
   return

H1: The method of WMA using combination of 10:20 days cannot earn abnormal
   return

   Hypothesis – 12

H0: The method of WMA using combination of 5:20 days can earn abnormal
   return

H1: The method of WMA using combination of 5:20 days cannot earn abnormal
   return

   Hypothesis – 13

H0: The method of MACD using combination of 5:10 days can earn abnormal
   return

H1: The method of MACD using combination of 5:10 days cannot earn abnormal
   return

   Hypothesis – 14

H0: The method of MACD using combination of 10:20 days can earn abnormal
   return

H1: The method of MACD using combination of 10:20 days cannot earn abnormal
   return

   Hypothesis – 15

H0: The method of MACD using combination of 5:20 days can earn abnormal
    return

H1: The method of MACD using combination of 5:20 days cannot earn abnormal
    return

    Hypothesis – 16

H0: The parameter of RSI for 5 days can earn abnormal return

H1: The parameter of RSI for 5 days cannot earn abnormal return

    Hypothesis – 17

H0: The parameter of RSI for 10 days can earn abnormal return

H1: The parameter of RSI for 10 days cannot earn abnormal return

    Hypothesis – 18

H0: The parameter of RSI for 15 days can earn abnormal return n

H1: The parameter of RSI for 15 days cannot earn abnormal return

3.3 Proposed Technical Indicators

This paper makes a contribution on the Asian areas for a daily system of four
stock price indexes.

3.3.1 Moving Average (MA)

A generally used indicator in technical analysis that smooth out price activity
by sifting through the "noise" from random price vacillations. MA is a trend-
following or lagging indicator since it depends on past prices. The most widely
recognized utilizations of MAs are to distinguish the trend direction and to decide
support and resistance levels. For instance, it is regularly used in technical analysis
of financial related information, similar to stock price, returns or trading volumes.
It is additionally used in economics to analyze GDP, employment or other
macroeconomic time arrangement. Scientifically, a moving average is a kind of

convolution thus it can be seen as a case of a low-pass filter used as a part of signal processing.

A moving average is an observation average from some consecution time periods. To evaluate a sequence of moving average, we evaluate progressive averages of a given number of consecution observations. The target basic the MA method is to smooth out seasonal variety in the information. This technical analysis method is planned to give a decision rule concerning the proper investment position.

The method includes a comparison of the latest market price or index with the long moving average of the price or index vector. If the present price is higher by a specific buying filter than the long moving average, a long investment position ought to be adopted, and on the other hand, if the present price is lower by a specific selling filter than the moving average, a short position ought to be adopted. In another variation of the method, the present price or index can be supplanted with a short moving average, so that the method use includes the comparison of the short moving average with the long one.

This description of the moving average method is general, and permits a high level of parameter-value adaptability. This likewise brings up an issue concerning the best or most fitting MA method version. For instance, how long are to be incorporated into the average? What number of averages ought to be used to get a signal? What price ought to be used while calculating the average (open, close, low, high average)? Which average ought to be used (weighted, direct and logarithmic); what is the measure of the optimal filter?

The moving average strategy is a "driven" strategy; it takes after the trends that are creating in the market. The purpose of the strategy is to signal or define another trend that's creating in the market, or to signal the old trend end. The

strategy endeavors to anticipate the future conduct of the market in a way unique in relation to that a chart analysis implies to do. The moving average is a "smoothing" system, and it encourages the distinguishing description of a trend. In the meantime, the moving average lingers behind what is occurring in the market. The shorter the moving average, the fewer it lingers, and it follows the market all the more nearly. A long moving average, interestingly, is lesser sensitive to market vacillations and it lingers behind the market more than a short MA does. It ought hence be exciting to compare about long and short moving averages in view of their predictive power.

There are three kinds of moving averages: simple, weighted and exponential. The simple moving average gives equal with weight to every one of the perceptions of the average. Critics of the simple moving average contend that more prominent weight ought to be given to later observations. The weighted moving average attempts to take care of the equal-weight issue of the simple moving average. For a MA of n observations, the main observation is multiplied by n, the last observation is multiplied by one, and the aggregate sum is divided by n (n+1)/2, so that the later observations are given a more prominent weight in the average. Both the simple and the weighted moving averages share the issue of barring observations which drop out of the average considered range. This issue is solved by the exponential moving average, which considers all the current observations in the database. Furthermore, the exponential moving average, similar to the weighted moving average, additionally gives more prominent weights to later observations. It ought to be underlined, however, that the contrasts between the three kinds of averages noted here don't really suggest that one kind of moving averages is better upon the other.

(a) Simple Moving Average (SMA)

In finance, a simple moving average (SMA) is the equivalent weighting mean of the past n data. In any case, in science and designing the mean is typically taken from an equivalent number of data on either side of a central value. This guarantees varieties in the mean are adjusted to the varieties in the data as opposed to being moved in time. A case of a simple equally weighted running mean for a n-day test of closing price is the mean of the past n days' closing prices. If those prices are $p_M, p_{M-1}, \cdots, p_{M-(n-1)}$ then the formula is,

$$SMA = \frac{p_M + p_{M-1} + \cdots p_{M-(n-1)}}{n} = \frac{1}{n} \sum_{i=0}^{n-1} p_{M-i}$$

(b) Exponential Moving Average (EMA)

An exponentially weighted moving average (EWMA) is a sort of infinite impulse reaction filter that applies weighting elements which diminish exponentially. The weighting for each more seasoned datum diminishes exponentially, failing to reach zero.

The EMA for a period Y may be examined recursively:

$S_1 = Y_1$

for $t > 1$, $S_t = \alpha * Y_t + (1 - \alpha) * S_{t-1}$

Where:

The coefficient α represents the level of weighting drop, a constant smoothing element between 0 and 1. A higher α discounts past observations faster.

Y_t is the value at a time period t.

S_t is the value of the EMA at t any time period.

(c) Weighted Moving Average (WMA)

A weighted average is any average that has increasing variables to give diverse weights to information at various positions in the example window. Scientifically, the moving average is the convolution of the datum focuses with a settled weighting capacity.

In technical analysis of financial information, a WMA has the particular significance of weights that reduction in arithmetical movement. In an *n*-day WMA the most recent day has weight *n*, the second latest *n* − 1, etc., down to one.

$$WMA_M = \frac{np_M + (n-1)p_{M-1} + \cdots + 2p_{(M-n+2)} + p_{(M-n+1)}}{n + (n-1) + \cdots + 2 + 1}$$

The denominator is a triangle number equivalent to $\frac{n(n+1)}{2}$. In the more broad case the denominator will always be the entirely of the individual weights.

3.3.2 Moving Average Convergence Divergence (MACD)

MACD indicator is created by Gerald Appel (1979). Technical Analysis is made up out of a wide assortment of down to earth venture techniques that utilization part exchanging information to attempt and anticipate price of puture conduct and along these lines attempt to make anomalous trading profits. The key formulation of the MACD is:

MACD (n_1, n_2)=MA(S_t,n_1)-MA(S_t,n_2)

Where MA(S, n) is a Moving Average evaluated for the period S over a n-length window, n_1 is the length of window for the primary moving average and n_2 is the length of window for the second moving average. As it could be obviously be examined, the MACD is a basic decration of two MAs, with the first being expected of being a short-horizon average and the second one a long-horizon

average, so n_1<n_2 is the essential principle situation. Beginning from this, the analysis is basic: the larger the MACD, the more the price has increased over the last n_1 informations when contrasted and the last n_2 information thus the more powerful the uphill trend has been. Besides, a little negative MACD shows that the price has dropped over the last n_1 informations when contrasted and the last n_2 informations thus the more powerful the downhill trend has been.

3.3.3 The Relative Strength Index (RSI)

RSI is a technical momentum indicator that analyzes the greatness of late picks up to recent losses trying to decide overbought and oversold states of an asset. It is figured using the accompanying equation:

RSI = 100 - 100/(1 + RS*)

*Where RS = Average of x days' up closing gain / Average of x days' down closing losses.

The neutral zone is portrayed due to the demand strength is basically the same as the strength of supply, so the RSI does not show any characterized trend. In any case, when the RSI moves far from the neutral or central zone and goes towards as far as possible, demonstrates the strength did by the request is bigger than the one carried out by the supply, along these lines, in any moment this purchase strength can become a supply strength and extinguish, dropping the RSI. At the point when this situation takes place it is said that the benefit is "overbuy" and is an selling signal. Actually, if the RSI is near to the inferior (zero percent) we comprehend that the benefits are oversell, which would show a good buying situation.

Standardly, the RSI developed to nine days (RSI9) is employed, which implies the posting calculation of the last nine sessions is considered.

Wilder (1978) created that the most exact value for value N to evaluate the best RSI is 14 due to it was half of the lunar cycle. Nonetheless, depend on the market, different factors and the company, the value 14 is not generally the best value to evaluate the RSI.

With observe to the neutral limits, buying and selling zones the most regular thing is to check some symmetric level lines in the RSI graphic in regards to the center (for instance: 50 ± 20) and consider that the RSI leaves the neutral zone and drops to the buying zone (from zero to thirty) or rise to the selling zone (from seventy to hundred) when it beats these limits. In this study a more advances system is used in the application of the RSI that depends on the concept of volatility bands, and gives the RSI an adaptive capacity instead of the distinctive possible trends of the prices. The goal is to substitute static lines of overbuy/oversell, customarily set at 30/70, by dynamic bands that adjust to the later behavior of the price.

3.3.4 T-Test

Test to survey the statistical signifiance of the distinction between two example implies for a single dependent variable. The *t* test is an special instance of ANOVA for two levels or groups of a treatment varaible.

In the equation, *t* value of variables as simply computed, measures the significance of the incomplete correlation of the variable reflected in the regression coefficient. Thusly, it demonstrates whether the analysts can certainly say, with an expressed level of error, that the coefficient is not equivalent to zero.

The *t* value is also particularly useful in the stepwise procedure in helping to determine whether any variable should be dropped from the equation once another independnt variable has been added. The calculated level of significance is compared to the therehold level set by the researcher for dropping the variable.

If the t-value is larger enough, it implies the abnormal return is significant different from zero, thus the null hypothesis of H_0 is reject at significant level of α%, in which α% is usually defined as 1%, 5%, and 10%. On the other hand, if the t-value is insignificant, it implied we do not get strong evidence to reject H_0.

3.4 Trading Strategy

3.4.1 For MA strategy

The moving average is a one of the most common used indicators as a part of exchanging strategies. Two of the most famous and easiest such strategies depend on a cross-over of price and on cross-over of moving averages. The first strategy exams a "buy" signal when the price of the funds crosses over the moving average while the second strategy exams a "buy" signal when a quickier moving average crosses over a slower moving average; "sell" signals are identified the other way.

If MA t_1 > MA t_2, it is named as golden cross in which $MA_{t1}(MA_{t2})$ is the moving average price for shorter (longer) time horizon t1 (t2), it means the momentum for recent prices' movement is bullish and it also suggests that is a good time to long a position. On the other hand, if MAt_1 < MAt_2, it is named as death cross in practice and suggest that is better to short a position since the price movement is bearish. In this study, 3 compositions for (t1, t2) are (5, 10) (10, 20) and (5, 20), in which composition of (5, 10) and (10, 20) are recognized as shorter and longer term compositions respectively, and (5,20) is defined as middle term composition. MA calculated by following formula:

$$MA_j = \sum_{i=1}^{j} \frac{P_i}{j}$$

Where MA_j is the average price for the lastly j observations. For forming the momentum trading strategy, MA_{t1} and MA_{t2} which are denoted as the shorter and longer price trends respectively will be compared. In this study there are 3 compositions for (t1, t2), they are (5,10) , (10,20) and (5,20).

3.4.2 For MACD strategy

If   DIF t_1 > MACD t_2

                           DIF t_2 > MACD t_3

                           DIF t_1 > MACD t_3 => where the time which the buying signal otherwise selling signal.

Where, DIF t_1= difference between MA t_1 and MA t_2

   DIF t_2= difference between MA t_2 and MA t_3

   DIF t_3= difference between MA t_1 and MA t_3

$$MACD_t = \left(1 - \frac{2}{1+n}\right) * MACD_{t-1} + \frac{2}{1+n} * DIF_{t-1}$$

3.4.3 For RSI strategy

One kind of useful indicator is RSI. According by our result, you will examine that the RSI is used on a 5, 10 and 15-day timeframe, measured on a scale 0-100, with 3 compositions of upper and lower bound are employed in this study, which are high and low levels marked at 70 and 30, 80 and 20 and 90 and 10 in Japan, Taiwan and China stock index, respectively.

The analysis made by the trading system is basic. It takes the value given by the RSI indicator and contrasts it and two kind of extreme values.

If the RSI value is higher than 70 the solution that the trading system will return is a sell signal. This value could be adapted and in some cases the value will be set to 80, 90 instead of 70.

If the RSI value is lower than 30 the solution that the trading system will return is a buy signal. This value could be adapted and in some cases the value will be set to 20, 10 instead of 30.

Initially, Wilder proposes setting the values of lower and better extremes to 30 and 70. However, it is normal that analysts observe the tendency of the indicator, we will need to consider the values 80 & 20 and 90 & 10 to move buy and sell signals.

3.5 Measurement Scale

In this section, 2 major measurements are employed by this study. Firstly the trading performance of Technical Analysis are illustrated by using average return and correct ratio. Secondly, the t-test statistics are used to test whether theses abnornal return using technical analysis is significant in statistic. The operational definitions of each section are described as follows:

3.5.1 For Technical analysis
(a) Average Return

In this study, if conducted trades brings the positive return, that implies there is abnormal returns using the technical analysis. We found average returns of trades in specific period time on the technical analysis result. The equation is:

Average return$=(R_1+R_2+R_3+\ldots+R_n)/n$

Where, R_1- The trading return at time t=1

n – number of observations of returns¸ it ususally is the number of the signals appear   in the sample period.

(b) Annual Return

Since the data recurrence is daily, in this way the annual return which is annulized return of day by day return utilizing the following formulation are likewise shown in this study. Annual return is the invesment return gives over a period time, communicated as a time-weighted annual percentage rate. Sources of returns can involve returns of capital, capital appreciation and dividends. The rate of annual return is measured against the underlying measure of the investment. The annual return communicates the stock's increase in value over an assigned period of time. In order to examine an annual return, we use following formula:

Annual return= Average return *365 days

(c) Number of Signal

According to the technical trading rule, there are 2 types of signals, one is the buying signal, the other is the selling signal. This study will count the number of signal to demonstrate the sensitive of the technical analysis index. However, not all signals will catch correctly the time point to trade positions, thus it is need to tell which signal is correct or incorrect.

(d) Correct signal

Accroding to the technical trading rule, there are 2 types of signals, one is the buying signal, the other is the selling signal. If the return is positive (negative) followed the buying (selling) signal, it implied the signal is correct, otherwise it is incorrect. In this study, we will count the number of the correct signals over the obervating period to examine the trading performance of technical analysis index.

(e) Correct ratio

Ratio between correct signal and number of signal is correct ratio.

Correct ratio=correct signals/number of signals

(f) Skewness

Skewness is a measure of symmetry, or all the more accurately, the absence of symmetry. A dispersion, or data set, is symmetric if it appears to be identical to one side and right of the middle point.

Negative values for the skewness demonstrate information that are skewed left and positive values for the skewness show information that are skewed right. By skewed left, we imply that the left tail is long in respect to the correct tail. Also, skewed right implies that the correct tail is long with respect to one side tail.

Skewness = 3(mean - median) / Standard Deviation. = 3(X –Me) / S

In which, X, Me, and S is the mean, median, and standard deviation of the trading return respectively.

Thus, the SK can be used to tell the frequency of trading performance. If the SK<0 (SK>0), it implies the negative (positive) return of the trading performance can be observed than the postive (negative) return during the sample period.

(g) Kurtosis

Kurtosis is a measure of whether the data are light tailed or heavy tailed relative to an ordinary dissemination. That is, data sets with high kurtosis have a tendency to have heavy tails, or outliers. Data sets with low kurtosis have a tendency to have light tails, or absence of outliers. A uniform appropriation would be the extreme case. Thus, positive kurtosis shows an "heavy tailed" dispersion and negative kurtosis demonstrates a "light tailed" appropriation.

$$kurtosis = \frac{\sum_{i=1}^{n}(R_i - \bar{R})^4/n}{S^4}$$

Where R_i – Return on *i* period time

        R – Average return

        n – Number of return

        S - Standard deviation

3.5.2 For the T-test statistic

To test whether the trading return is significant in statistic or not, t –test is employed to explore the significance of the return. To buid the t-statistic, the standard deviation of trading performance should be calculated first. The following section will demonstrate how to calculate the standard deviation which is usually defined the risk of the trading performance.

(a) Average return

In this study, if conducted trades brings the positive return, that implies there is abnormal returns using the technical analysis. We found average returns of trades in specific period time on the technical analysis result. The equation is:

    Average return=$(R_1+R_2+R_3+\ldots+R_n)/n$

Where, R_1- The trading return at time t=1

    n – Number of observations of returns，it ususally is the number of the signals appear in the sample period.

(b) Standard deviation

Analyst and traders use various metrics to assess the relative risk of potential investments and volatility, but the most widely recognized metric is standard

deviation. In trading, standard deviation is used as an indicator of market volatility and risk. The more eccentric the price action and the greater the risk, the wider the range. Range-bound securities, or those that don't stray a long way from their means, are not viewed as a great risk since it can be accepted with relative certainly that they keep on behaving similarly. Consequently if the standard deviaiton is bigger, it inferred the price return is more volatie. In another words, if A stock that has an expansive trading range and tends to spike, turn around all of a sudden or gap, is much riskier, the standard deviation is bigger too. Altough, risk is not really awful. The riskier the stock, the more prominent potential for payout as well as loss. As a rule, the vast majority of the traders don't like risk, it implies the are risk averters, therefore if the trading performance with higher standard deviation, it infers the trading ought to bring the higer expected return, else it is not a well trading performance.

Here are the a formula, explained at Standard Deviation:

$$S = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (R_i - \overline{R})^2}$$

Where, R- return of indices

R- Average return

n- Number of returns

(c) Number of signals

Number of signal is examined all returns number in specific period time in the market.

(d) t-value

The *t*-value measures the size of the difference relative to the variation in sample data. On the another word, *t*-value is basically the evaluated distinction represented in units of standard error. The greater the size of *t* (it can be either positive or negative), the more noteworthy the confirmation against the null hypothesis that there is no significant. The closer *t* is to 0, the more likely there isn't a significant difference. Formulation of *t*- value is:

$$t = \frac{\bar{R}}{\left(\dfrac{S}{\sqrt{n}}\right)}$$

Where, R- Average return

S - Standard deviation

n – Number of returns

3.6 Data Analysis Procedures

In order to test the hypotheses, this study used Micorsoft Excel software as major tools to help us analyze the collected data. To test the hypotheses, the following data analysis methods are adopted.

CHAPTER FOUR
EMPIRICAL RESULT

4.1 Technical analysis

As below Table 1 shown, four statistics for the daily returns of empirical data of China and Taiwan emerging markets and Japan mature market indices are demonstrated including mean, standard deviation, skewness, and kurtosis during the empirical period from 20th May 2014 to 20th May 2016. During the study period, the index of Taiwan stock earned average return   (-0.0152), followed by Japan (0.0409) and China (0.0911). However this study just focus on the Asian stock markets in our study, each countries economy is different. In which China and Taiwan thought be categorized as emerging markets, they are considered Finance centers in Asian. Specially, Economic of China are super rapidly increasing followed by high stock returns. Contribute to their well-designed market trading rules and lower trading costs, a lot of investors prefer to trade there. This might be an explanation for these market efficiencies. Japanese stock market is also one of the important market which is first mature market in Asia. Although in mature market perform the low risk for investor, but emerging markets it indeed provides the high risk. It provides more good opportunity for investor to gain in emerging market than mature market. Investor believes that they can earn high profit from emerging market.

In terms of market risk is measured by the standard deviation of daily returns, one sample stock market is namely stock of Shanghai assumed the highest risk value (2.0583), and Stock of Taiwan is lowest for risk value (0.8954). The result is consistent with real market that usually shows the emerging market is much

risky but profitable rather than matured markets .However, in Table 4.1, Taiwan market is lower risky than Japan's though the former is emergent market.

Negative values for the skewness indicate return of Taiwan and China that are skewed to left which are consitent with most of markets, however the values of skewness indicate return for Japan that is positive means it skewed to right. Kurtosis of Japan and China are larger than 3, it means their return distributions are thick tailed distributions which is consistent with most of markets.

Table 4.1 Basic Statistical Analysis for the Japan, Taiwan and China Index

	SB24 Tokyo Topix Stock Index	SB01 TSE Weight.Stock.Index (Taiwan)	SB66 Shanghai Synthesis Index
Average return	0,0409	-0,0152	0,0911
Standard Deviation	1,4093	0,8954	2,0583
Skewness	0,1221	-0,3639	-1,0179
Kurtosis	4,6252	2,7873	3,2095

Period: 20 May 2014 – 20 May 2016
Data Source: This Study Summarized

Table 4.2, 4.3 and 4.4 respectively show the empirical results to Moving Average indices including SMA, WMA and EMA strategies in Japan, Taiwan and China stock index and price return are used to do the technical analysis. Also 3 combinations of short-long term trading days are considered in this study, they are (5,10) , (5,20), and (10,20). It presents returns of the SMA, WMA and EMA for combination of 5&10 days in the short-term, the SMA, WMA and EMA for combination of 10&20 days in the long-term, and in the mid-term the SMA, WMA and EMA for combination of 5&20 days for Buyer and Seller.

Two measures are used to exaimne the trading performance of these technical - average trading return and correct ratios. According to the Table 2 which

demonstrates the trading result for Japan market, we can compare trading performance of daily return for SMA, WMA and EMA using different time horizons combinations of 5&10 days, 10&20 days and 5&20 days. Highest daily return is observed to WMA for 10&20 days combination for purchaser. Also correct ratios of WMA are better than other strategy and highest correct ratio is WMA for 10&20 days combination for both buying signal and selling signal. It implies WMA is dominant to other average price methods for Japan market. Furthermore, long horizon is better than short horizon for purchaser in Japan stock market. Also MA strategy that buying signals are better than selling signals.

Table 4.2 Return with Moving Average Strategy (including SMA, WMA and EMA) of Tokyo Stock Index

		SMA 5_10		SMA 10_20		SMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Simple Moving Average	0,04%	-0,01%	-0,08%	-0,19%	0,04%	-0,02%
Annually Return		13,95%	-5,47%	-29,26%	-69,22%	12,94%	-5,47%
Correct signal		158	79	152	82	152	79
Number of signal		295	184	286	191	305	204
Correct ratio		54%	43%	53%	43%	50%	39%
		WMA 5_10		WMA 10_20		WMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Weighted Moving Average	0,07%	0,03%	0,31%	0,38%	0,06%	0,02%
Annually Return		24,88%	11,47%	112,41%	137,73%	20,29%	5,93%
Correct signal		161	85	179	114	158	85
Number of signal		292	187	281	196	305	204
Correct ratio		55%	45%	64%	58%	52%	42%
		EMA 5_10		EMA 10_20		EMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Exponential Moving Average	0,05%	0,00%	0,01%	-0,05%	0,02%	-0,05%
Annually Return		17,72%	0,30%	5,35%	-18,44%	6,40%	-16,48%
Correct signal		161	85	166	76	165	76
Number of signal		292	187	306	171	321	188
Correct ratio		55,14%	45%	54%	44%	51%	40%

Period: 20 May 2014 – 20 May 2016
Data Source: This Study Summarized

The trading performance of moving average indices to Taiwan is shown in Table 4.3. It shows the WMA is better than other 2 methods for both buying signal and selling signal while daily return is refered as the measurect as well as the correct ratio. Brievely, the highest performance of return and correct ratio is WMA for 10&20 days combination in Taiwan stock market. Also MA strategy that buying signals are better than selling signals except SMA for 10&20 days combination.

Table 4.3 Return with Moving Average Strategy (including SMA,WMA and EMA) of Taiwan Stock Index

		SMA 5_10		SMA 10_20		SMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Simple Moving Average	0,00%	0,04%	-0,04%	0,01%	0,00%	0,04%
Annually Return		-0,46%	14,84%	-13,86%	3,56%	-1,76%	15,43%
Correct signal		127	124	117	118	118	123
Number of signal		244	238	472	236	232	240
Correct ratio		52%	52%	25%	50%	51%	51%
		WMA 5_10		WMA 10_20		WMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Weighted Moving Average	0,00%	0,05%	0,02%	0,07%	0,01%	0,06%
Annually Return		1,70%	16,90%	7,90%	25,33%	3,05%	20,28%
Correct signal		126	125	120	121	117	120
Number of signal		242	240	236	236	234	238
Correct ratio		52%	52%	51%	51%	50%	50%
		EMA 5_10		EMA 10_20		EMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Exponential Moving Average	0,00%	0,04%	0,01%	0,06%	-0,02%	0,02%
Annually Return		0,14%	15,33%	3,93%	22,01%	-8,33%	9,11%
Correct signal		122	121	123	118	119	118
Number of signal		242	240	242	230	238	234
Correct ratio		50%	50%	51%	51%	50%	50%

Period: 20 May 2014 – 20 May 2016
Data Source: This Study Summarized

According to Table 4.4 which is the comparison reuslt for China market. Accoridng to the daily trading return, we can found the EMA is better than other 2 methods for both buying signal and selling signal. Highest daily return is EMA for 10&20 days combination for purchaser. All of correct ratios have same performance for WMA strategy. Long-term analysis is better than short-term analysis for purchaser in China stock market. Also MA strategy that buying signals are better than selling signals.

Table 4.4 Return with Moving Average Strategy (including SMA, WMA and EMA) of China Stock Index

		SMA 5_10		SMA 10_20		SMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Simple Moving Average	0,13%	-0,03%	0,10%	-0,07%	0,10%	-0,07%
Annually Return		45,89%	-11,00%	36,09%	-24,55%	35,60%	-26,17%
Correct signal		172	77	184	67	180	73
Number of signal		300	182	318	154	308	164
Correct ratio		57%	42%	58%	44%	58%	45%
		WMA 5_10		WMA 10_20		WMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Weighted Moving Average	0,14%	0,00%	0,11%	-0,05%	0,17%	0,05%
Annually Return		52,40%	-1,40%	39,57%	-19,22%	60,64%	19,88%
Correct signal		173	82	178	75	183	78
Number of signal		296	186	304	168	306	166
Correct ratio		58%	44%	59%	45%	60%	47%
		EMA 5_10		EMA 10_20		EMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Exponential Moving Average	0,19%	0,09%	0,23%	0,19%	0,20%	0,12%
Annually Return		67,86%	32,96%	82,66%	67,71%	71,54%	42,03%
Correct signal		189	80	189	76	186	78
Number of signal		314	168	314	158	309	163
Correct ratio		60%	48%	60%	48%	60%	48%

Period: 20 May 2014 – 20 May 2016
Data Source: This Study Summarized

In general, result of Moving averages technical analysis include SMA, EMA and WMA show us highest daily return is observed to WMA for 10&20 days combination for purchaser in both Japan and Taiwan stock market. Also correct ratios of WMA are better than other strategy and highest correct ratio is WMA for 10&20 days combination for both buying signal and selling signal. It implies WMA is dominant to other average price methods for Japan Taiwan market.

In China stock market, we can found the EMA is better than other 2 methods for both buying signal and selling signal. Highest daily return is EMA for 10&20 days combination for purchaser.

However WMA indicator is more useful in both Japan and Taiwan markets and EMA indicator is more useful in China market respectively, still return of MA10&20 days combinations is better than the other combinations for 3 Asian markets. We are suggesting the Moving average technical analyze long-term horizon for investors to buy and sell a stock in 3 Asian markets.

One kind of useful indicator which is employed in this study is RSI. As below Table 4.5 shown which is the trading result of using RSI for these 3 empirical markets. 3 different timeframes of RSI are used to be timming signal which are 5, 10 and 15-day for testing whether the shorter or longer horizon will be better to be the timming signal. Since RSI is the index between the scale of 0-100, the upper bound provide the the selling signal due to the market is too hot but the lower bound is the buying signal due to the market is too cold. Also 3 compositions of upper and lower bound are considered in this study, which are 70 to 30, 80 to 20 and 90 to 10 for high to low levels marked respectively.

In Japan stock market, highest performance is 70&30 bound for 5 days simulation of RSI strategy that has good performance with annually return is 38.36 % and correct ratio is 52%.

Highest performance is 80&20 bound for 5 days simulation of RSI strategy in Taiwan stock market. Because this simulation can involve good performance both of annual return and correct ratio. However, annual return is 1306.74% and correct ratio is 100% for 80&20 bound with 15 days simulation, correct signal is only one that is not enough number.

Most of result of RSI strategy is not good in China stock market. For China stock index, 80&20 bound for 10 days simulation of RSI strategy is better than others.

Also most results of RSI strategy with 90&10 bounds are 0%. Because upper bound and lower bound is too high and too low, no signal area is very large.
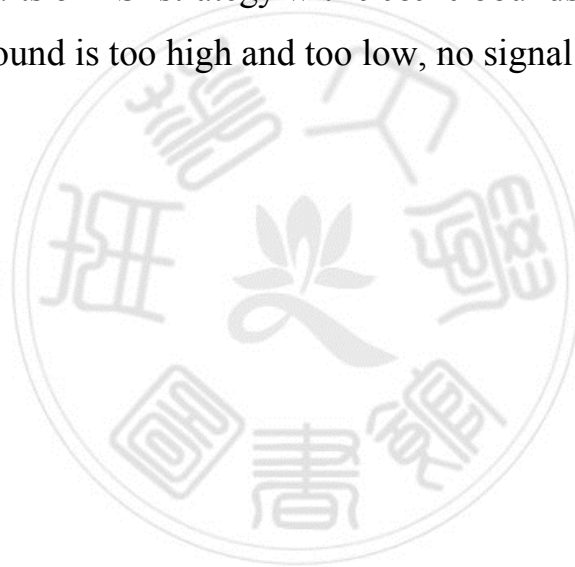
Table 4.5 Return with RSI Strategy of Japan, Taiwan and China Stock Index

		Simulation - 5 days			Simulation - 10 days			Simulation - 15 days		
		70	80	90	70	80	90	70	80	90
		30	20	10	30	20	10	30	20	10
Average Return		0,04%	0,10%	0,04%	0,01%	0,12%	-0,09%	-0,09%	0,02%	0,12%
Annually Return	SB24 Tokyo Topix Stock Index (Japan)	14,51%	38,36%	15,16%	0,44%	42,58%	-34,03%	-32,34%	5,95%	43,40%
Correct signal		99	57	36	24	7	4	127	83	48
Number of signal		191	109	66	55	16	11	306	190	107
Correct ratio		52%	52%	54%	44%	44%	36%	41%	44%	45%
		Simulation - 5 days			Simulation - 10 days			Simulation - 15 days		
		70	80	90	70	80	90	70	80	90
		30	20	10	30	20	10	30	20	10
Average Return		-0,03%	0,04%	-0,09%	-0,06%	-0,02%	0%	-0,08%	3,58%	0%
Annually Return	SB01 TSE Weight.Stock.Index (Taiwan)	-10,06%	14,96%	-34,78%	-22,62%	-8,55%	0%	-27,77%	1306,74%	0%
Correct signal		90	42	20	29	3	0	16	1	0
Number of signal		184	82	43	62	7	0	31	1	0
Correct ratio		49%	51%	46%	47%	43%	0%	52%	100%	0%
		Simulation - 5 days			Simulation - 10 days			Simulation - 15 days		
		70	80	90	70	80	90	70	80	90
		30	20	10	30	20	10	30	20	10
Average Return		-0,19%	-0,09%	-0,08%	-0,10%	0,22%	-0,41%	-0,39%	-1,07%	0%
Annually Return	SB66 Shanghai Synthesis Index (China)	-67,80%	-34,79%	-28,33%	-38,45%	79,06%	-150,43%	-144,36%	-392,11%	0%
Correct signal		120	71	36	55	7	2	21	2	0
Number of signal		237	134	68	111	17	8	49	8	0
Correct ratio		50%	53%	53%	49%	41%	25%	43%	25%	0%

Period: 20 May 2014 – 20 May 2016
Data Source: This Study Summarized

One of the simplest and most reliable indicators is Moving Average Convergence/Divergence (MACD) which consider the informations of daily high and low price level. It implied it brings more price momentum information than other technical indices. Table 6 shows the empirical result of Momentum effect examination with MACD strategy and price return are used to do the technical analysis. Also 3 combinations of short-long term trading days are considered in this study, they are (5,10) , (5,20), (10,20).

Generally, most of average returns of MACD strategy are positive that referring the comparison of MA, MACD and RSI, we can found the EMA is better than other 2 strategies for both buying signal and selling signal.

According to the Table 4.6 which demonstrate the trading retuls of using MACD, the correct ratio and daily return of the DIF and MACD for 5&10 days combination is better than other combinations in Japan and Taiwan stock market for purchaser. In China stock market, the correct ratio and daily return of the DIF and MACD for 5&10 days combination is better than other combinations. However, annual return of buying signal is very high and selling signal is too low for 5&10 combination in Chinese stock market because maybe price change of Chinese stock market is very dramatically fast. Also MACD strategy that buying signals are better than selling signals.

Table 4.6 Return with MACD Strategy of Japan, Taiwan and China Stock Index

		MA 5:10		MA 10:20		MA 5:20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	SB24 Tokyo Topix Stock Index (Japan)	0,06%	0,07%	0,03%	-0,05%	0,06%	0,02%
Annually Return		23,47%	23,77%	10,80%	-19,12%	22,31%	6,13%
Correct signal		90	56	95	46	99	49
Number of signal		361	311	408	302	384	312
Correct ratio		25%	18%	23%	15%	26%	16%
		MA 5:10		MA 10:20		MA 5:20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	SB01 TSE Weight.Stock.Index (Taiwan)	0,01%	0,08%	-0,03%	0,07%	-0,04%	-0,08%
Annually Return		0,01%	28,06%	-10,63%	25,90%	-16,09%	-29,62%
Correct signal		72	74	65	77	65	67
Number of signal		334	342	322	345	331	346
Correct ratio		22%	22%	20%	22%	20%	19%
		MA 5:10		MA 10:20		MA 5:20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	SB66 Shanghai Synthesis Index (China)	0,16%	0,21%	0,34%	-0,35%	0,29%	0,20%
Annually Return		60,42%	76,96%	123,22%	-128,61%	106,78%	74,36%
Correct signal		110	52	112	36	117	47
Number of signal		378	298	391	294	377	288
Correct ratio		29%	17%	29%	12%	31%	16%

Period: 20 May 2014 – 20 May 2016
Data Source: This Study Summarized

This paper also contributes to the important topic of market efficiency, in the context of the currency market. If the market is weak efficient or more effecint than weak efficiency, we should find no profitability for the technical analysis. On the other hand, if profitability exists, that is evidence to conclude that the market is not efficient. It is also possible, and perhaps quite likely, that market, being an aggregate of its participants, behaves just like an individual participant, or a human being, in that it takes time for the market to absorb and adapt to information, and therefore become more efficient than before, but this process of learning never

ends. The outcome of this study should shed light on this interesting hypothesis, and contribute to the discussion on market efficiency.

According to Table 4.2-4.6, in China stock market, the market is not supported to Efficient Market Hypothesis. However, it provides the opportunity for investors to earn the abnormal return if they can adopt the well-designed strategy using the moving price technical analysis. Taiwan stock market is more efficiency than China and Japan stock market. Thus, Null Hypotheis-3 (H0: The Taiwanese stock market satisfy weak efficient market) is supported. However, previous researchers suggess that fundamental analysis is more useful for mature market as well as Japan stock market. In our empirical result, we can see to adopt technical analysis in mature market. We reject Null Hypothesis-1 (H0: The Japanese stock market satisfy weak efficient market).

4.2 T-TEST Statistic

To test whether the trading return is significant in statistic or not, T–test is employed to explore the significance of the abnormal return. To buid the t-statistic, the standard deviation of trading performance should be calculated first. The following section will demonstrate how to calculate the standard deviation which is usually defined the risk of the trading performance.

The t-value measures the size of the difference relative to the variation in sample data. On the another word, t-value is basically the evaluated distinction represented in units of standard error. The greater the size of t (it can be either positive or negative), the more noteworthy the confirmation against the null hypothesis that there is no significant difference. The closer t is to 0, the more likely there isn't a significant difference.

According to Table 4.7, t value of the WMA for 10&20 days combinations are higher than 1.96 for either buying signal (5.1544) and selling signal (2.8715) in Japan stock market. It means the abnormal return of WMA for 10&20 days combination is significantly different from zero at significant level of 5%, it implied that the trader can earn abnormal return using technical indices in Japan stock market.The significant trading return can be observed both for buying signal than for selling signal. That means WMA is worked for timming the buying and selling time point. Otherwise, return data of MAs for all days combinations are less than critical value (1.28). It implies that moving average indicators of technical analysis are not useful in Japan stock market. Generally, all MAs standard deviations for 10&20 days combinations are higher than other which means technical analysis performance of long term horizon is more risky in Japan stock market.

We believed that in most of the investors are individuals, who are prefer to stand in the long position. The return of MA10&20 days combinations is better than the other combinations for purchaser. We are suggesting the Moving average technical analyze long-term combination for investors to buy a stock in Japan market.

Table 4.7 T-Test with Moving Average Strategy (including SMA, WMA and EMA) of Tokyo Stock Index

		SMA 5_10		SMA 10_20		SMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Simple Moving Average	0,0382	-0,0149	-0,0801	-0,1896	0,0354	-0,0149
Stdev		1,0646	1,8532	1,1361	1,7787	1,0793	1,8532
Number of signal		295	184	282	187	285	184
T - value		0,6164	-0,1096	-1,1847	-1,4578	0,5544	-0,1096
		WMA 5_10		WMA 10_20		WMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Weighted Moving Average	0,0681	0,03143	0,3079	0,3773	0,055598	0,0162
Stdev		1,0102	1,8890	0,9944	1,8208	1,032361	1,8936
Number of signal		292	187	277	192	285	184
T - value		1,1531	0,2275	5,1544**	2,8715**	0,909184	0,1163
		EMA 5_10		EMA 10_20		EMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Exponential Moving Average	0,0486	0,0008	0,0146	-0,0505	0,017521	-0,0451
Stdev		0,9943	1,9033	0,9196	2,0604	0,999918	1,9871
Number of signal		292	187	302	167	301	168
T - value		0,8345	0,0058	0,2767	-0,3168	0,304002	-0,2945

Note: ** t>1.96, * t>1.64, +t>1.28
Data Source: This Study Summarized

Table 4.8 describes that empirical result of T-test examination. 3 combinations of short-long term trading days are considered in this study, they are (5,10) , (5,20), (10,20). It presents the log and discrete returns of the MA5 versus MA10 days combination in the short-term, the MA10 & MA20 days combination in the long-term, and in the mid-term the MA5 & MA20 days combination for Buyer and Seller. *t* value of MAs for all days combinations are less than critical value (1.28, 1.64 and 1.96) in Taiwan stock market. It implies that Taiwan stock market is efficient market. According to the Hypotheis 3, H_0 (The Taiwanese stock market satisfy weak efficient market) is non-rejected. In addition, result of standard deviation by MAs technical indicators for all days combinations (5&10,

10&20, 5&20) suggest that selling signal is riskier than buying signal to trade indices for traders.

Table 4.8 T-Test with Moving Average Strategy (including SMA, WMA and EMA) of Taiwan Stock Index

		SMA 5_10		SMA 10_20		SMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Simple Moving Average	-0,0013	0,0407	-0,0380	0,0098	-0,0048	0,0423
Stdev		0,8075	0,9896	0,7885	1,0182	0,8123	0,9963
Number of signal		244	238	236	236	232	240
T - value		-0,0246	0,6339	-0,7401	0,1473	-0,0905	0,6575
		WMA 5_10		WMA 10_20		WMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Weighted Moving Average	0,0046	0,0463	0,0216	0,0694	0,0083	0,0556
Stdev		0,7326	1,0452	0,7926	1,0131	0,7883	1,0159
Number of signal		242	240	236	236	234	238
T - value		0,0987	0,6863	0,4195	1,0522	0,1620	0,8436
		EMA 5_10		EMA 10_20		EMA 5_20	
		Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	Exponential Moving Average	0,0004	0,0420	0,0108	0,0603	-0,0116	0,0249
Stdev		0,7791	1,0109	0,7342	1,0642	0,7412	1,0421
Number of signal		242	240	242	230	237	234
T - value		0,0075	0,6436	0,2279	0,8595	-0,2406	0,3662

Note: ** t>1.96, * t>1.64, +t>1.28
Data Source: This Study Summarized

According to Table 4.9, t value of SMAs result for short and long combinations are less than critical value (1.28). It implies that simple moving average indicator of technical analysis is not useful in China stock market. t value of the WMA for 5&20 days combination for buying signal is higher than 1.64 that is supported at significant level of 10%. t value of the WMA for 5&10 days combination for buying signal is higher than 1.28 that is supported at significant

level of 20%. The performance of WMA for 5&20 days and 5&10 days combinations are implied that can earn abnormal return in China stock market.

For result of EMA, all t values of EMA for 3 different kinds days combinations (5&10, 10&20, 5&20) are higher than 1.96 that is supported at significant level of 5% for buying signal, lead by EMA 10&20 combination (2.3520). Thus, EMA indicator is must useful in China stock market. Therefore, t value is stronger significant for buying signal than for selling signal. In addition, result of standard deviation by MAs technical indicators for all days combinations (5&10, 10&20, 5&20) suggest that selling signal is riskier than buying signal to trade indices for traders.

In general, t value of the WMA for 10&20 days combinations are higher than 1.96 for either buying signal and selling signal in Japan stock market. It means the abnormal return of WMA for 10&20 days combination is significantly different from zero at significant level of 5%, it implied that the trader can earn abnormal return using technical indices in Japan stock market. According to performance of t statsitic in Taiwan stock market, However there are no significnce number, t value of the EMA for 10&20 days combinations are better than others for either buying signal and selling signal. Using EMA indicator is superior fitness for short and long term horizon in China market. That means EMA is worked for timming the buying and selling time point in China market.

Table 4.9 T-Test with Moving Average strategy (including SMA, WMA and EMA) of China stock index

		SMA 5_10		SMA 10_20		SMA 5_20	
	Simple Moving Average	Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return		0,1257	-0,0301	0,0989	-0,0673	0,0975	-0,0717
Stdev		1,7126	2,5751	1,9725	2,3433	1,8646	2,4845
Number of signal		300	182	318	154	308	164
T - value		1,2716	-0,1579	0,8939	-0,3562	0,9181	-0,3695
		WMA 5_10		WMA 10_20		WMA 5_20	
	Weighted Moving Average	Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return		0,1436	-0,0038	0,1084	-0,0526	0,1661	0,0545
Stdev		1,7804	2,4833	1,8570	2,4815	1,7211	2,6571
Number of signal		296	186	304	168	306	166
T - value		1,3873[+]	-0,0210	1,0178	-0,2750	1,6887*	0,2641
		EMA 5_10		EMA 10_20		EMA 5_20	
	Exponential Moving Average	Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return		0,1859	0,0903	0,2265	0,1855	0,1960	0,1151
Stdev		1,6762	2,6700	1,7061	2,7001	1,7483	2,6314
Number of signal		314	168	314	158	309	163
T - value		1,9655**	0,4384	2,3520**	0,8635	1,9707**	0,5586

Note: ** t>1.96, * t>1.64, [+]t>1.28
Data Source: This Study Summarized

Table 4.10 presents that empirical result of T-test examination. 3 combinations of short-long term trading days are considered in this study, they are (5,10) , (5,20), (10,20). It presents the log and discrete returns of the MA5 versus MA10 days combination in the short-term, the MA10&20 days combination in the long-term, and in the mid-term the MA5&20 days combination for Buyer and Seller. In table 10, There are no significance number in Japan, Taiwan and China stock market. Thus, following by Hypothesis 16, 17 and 18, H0 is rejected. The parameter of RSI for 5, 10 and 15 days can not earn abnormal return in 3 Asian countries markets.

Table 4.10 T-Test with RSI Strategy of Japan, Taiwan and China Stock Index

		Simulation - 5 days			Simulation - 10 days			Simulation - 15 days		
		70	80	90	70	80	90	70	80	90
		30	20	10	30	20	10	30	20	10
Average Return	SB24 Tokyo Topix Stock Index (Japan)	0,0472	0,1189	0,0666	-0,0024	0,0845	-0,0936	-0,0886	0,0163	0,1189
Stdev		1,5719	1,5810	1,3042	1,4633	1,2348	0,3749	1,4365	1,3101	1,0144
Number of signal		195	112	69	60	19	12	290	174	91
T - value		0,4189	0,7956	0,4245	-0,0125	0,2981	-0,8646	-1,0505	0,1640	1,1183
		Simulation - 5 days			Simulation - 10 days			Simulation - 15 days		
		70	80	90	70	80	90	70	80	90
		30	20	10	30	20	10	30	20	10
Average Return	SB01 TSE Weight.Stock.Index (Taiwan)	-0,0261	0,0388	-0,0963	-0,0751	-0,0234	-	-0,0608	-	-
Stdev		0,9490	1,0056	1,1719	1,0775	2,5364	-	1,3782	-	-
Number of signal		186	83	44	69	7	-	34	-	-
T - value		-0,3745	0,3516	-0,5451	-0,5786	-0,0244	-	-0,2573	-	-
		Simulation - 5 days			Simulation - 10 days			Simulation - 15 days		
		70	80	90	70	80	90	70	80	90
		30	20	10	30	20	10	30	20	10
Average Return	SB66 Shanghai Synthesis Index (China)	-0,1882	-0,0953	-0,0776	-0,1053	0,2166	-0,4122	-0,3955	-1,0743	-
Stdev		2,0575	2,0699	1,8853	2,2061	2,5437	2,9803	1,7219	2,9879	-
Number of signal		238	134	68	111	17	8	49	8	-
T - value		-1,4114	-0,5331	-0,3396	-0,5031	0,3511	-0,3912	-1,6078	-1,0169	-

Note: ** t>1.96, * t>1.64, +t>1.28

Data Source: This Study Summarized

According to Table 4.11, t value of the MACD for 5&20 and 10&20 days combinations are higher than 1.96 for buying signal (2.4920) and (2.9617) in China stock market, it implied that performance of MACD for 5&20 and 10&20 days combination are supported at significant level of 5%. t value of the MACD for 5&10 days combination is higher than 1.28 for buying signal (1,2928) in China stock market, it implied that performance of MACD for 5&10 days combination is supported at significant level of 20%. Therefore, t value is stronger significant for buying signal than for selling signal.

T value of MACD performance for all days combinations are less than critical value (1.28) in Japan and Taiwan stock markets. It implies that MACD indicators of technical analysis are not useful in Japan and Taiwan stock markets. Generally, all MACDs standard deviations for 10&20 days combinations are higher than other which means technical analysis performance of long term horizon is more riskier in 3 Asian stock markets.

Table 4.11 T-Test with MACD Strategy of Japan, Taiwan and China Stock Index

SB24 Tokyo Topix Stock Index (Japan)

	MA 5:10		MA 10:20		MA 5:20	
	Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	0,0643	0,0651	0,0296	-0,0524	0,0611	0,0168
Stdev	0,9497	2,1039	0,8649	2,2161	1,0042	2,2336
Number of signal	168	118	171	102	177	105
T - value	0,8778	0,3364	0,4473	-0,2387	0,8097	0,0771

SB01 TSE Weight.Stock.Index

	MA 5:10		MA 10:20		MA 5:20	
	Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	0,0000	0,0769	-0,0291	0,0710	-0,0441	-0,0812
Stdev	0,7950	1,0802	0,7362	1,0789	0,7703	1,0649
Number of signal	140	148	127	150	126	141
T - value	0,0004	0,8660	-0,4458	0,8055	-0,6425	-0,9050

SB66 Shanghai Synthesis Index

	MA 5:10		MA 10:20		MA 5:20	
	Buy signal	Sell signal	Buy signal	Sell signal	Buy signal	Sell signal
Average Return	0,1720	0,2109	0,3376	-0,3524	0,2925	0,2037
Stdev	1,7954	3,0136	1,5208	3,0501	1,5924	2,8810
Number of signal	182	104	178	81	184	95
T - value	1,2928[+]	0,7136	2,9617**	-1,0397	2,4920**	0,6892

Note: ** t>1.96, * t>1.64, [+]t>1.28

Data Source: This Study Summarized

CHAPTER FIVE
CONCLUSION

5.1 Conclusion

The purpose of this study is to provide useful information for potential investors in Japan, Taiwan and China stock market. Though these 3 markets are famous Asia stock markets, however, they are categoried into different level of efficiency markets, for example Japanese stock market is mature market due to its well marke stucture and trading cost, Taiwanese stock market is old emerging market within high growth rate and Chinese market is new emerging market that is growing quickly recently. The emerging markets refer countries that have progressed towards modern to industrialize but have not yet achieved the financial maturity and stability of developed nations. These nations are experiencing rapid growth but there is continuing risk of financial and political instability. Emerging countries, such as China, have some of the highest economic growth rates in the world. Also more than half the population of the Asia lives in China. It shows that following the good demographic dividend in China, there is a very good potential opportunity in the future for investors. Taiwanese stock market had historically set several limitations on foreign investment however it still bring potential good market structure for attracting investors. As the result, the foreign investment increased dramatically recent year and the government gradually adopted a more flexible attitude. It first allowed the domestic investment trust companies to solicit overseas capital for investing in domestic stock market in 1983. Then, it permitted Qualified Foreign Institutional Investor (QFII) to directly invest in Taiwan's stock market in 1991. These 2 emerging markets have the sample characteristic, that is

there is a lot of individual investors relative to mature market. In emerging market the behavior of individual investors is quite different with the institution investor', thus it is rational to expect that the market price behavior would not be the similar with matured markets, such as Japan stock market. Furthermore, comparing to three different Asian stock markets which are various of each other that become more interesting for us.

We collected data which is daily stock indices of 3 Asian stock exchanges, such as SB24 Tokyo Topix Stock Index (Japan), SB01 TSE Weight.Stock.Index (Taiwan) and SB66 Shanghai Synthesis Index (China).

Table 5.1 Comparison of Results

	Japan	Taiwan	China
Which market is more efficiency according to evaluated performance of technical analysis indicators?	Inefficient	Efficient	Inefficient
Which indices is more significant return in these markets?	Significant	Insignificant	Significant
Which indicator is more useful?	WMA	WMA	EMA, MACD
What parameter combination should we use? (short-term and long-term horizon)?	10&20	10&20	10&20

Data Source: This Study Summarized

Previous researchers examined in mature market perform the low risk for investor, but emerging markets it indeed provides the high risk. It acquires more good opportunity for investor to gain in emerging market than mature market. Investors believe that fundamental analysis is more useful for mature market than technical analysis. However, our study provides opposite result to evidence that most annually return of Japanese stock market is not low and technical analysis is not useless for Tokyo stock index. It implied that the market efficiency is not so well as the mature market should be. However, the old emerging market, Taiwan

stock market, investor hopes that they can earn high profit from emerging market. However, for Taiwanese emerging market, most of annually returns are lower than other 2 countries. And selling signals are usually better than buying signals for Taiwan stock index. According to our result, RSI strategy is not useful in Taiwan stock market.It shows that technical indices usually can not bring the usuful timming information to earn the abnormal return.

As for the China market, it is consistent with the original inference which infers that the technical indices is useful to be the timming index. China's economy is increasing rapidly which is the one of the highest economic growth rates in the Asia. As a highlighted in annual return of China stock index, it presents that different results which are a very high and low depends on the analysis strategy in the result. It illustrates that Chinese stock index is very sensitive and volatile to the price change. In addition, information flow about stock price was changed very quickly. Thus, short horizon analysis can be better in China stock market.

On the other hand, this study also provides the evidence to support that the parameters used to calculate the technical indices should be adjusted. According to our empirical result, different markets and different index will have their proper parameter to be used.

Table 5.2 Hypothesis Results

H1	H_0: The Japanese stock market satisfy weak efficient market	H_1: The Japanese stock market cannot satisfy weak efficient market	H_1 is supported H_0 is rejected
H2	H_0: The China stock market satisfy weak efficient market	H_1: The China stock market cannot satisfy weak efficient market	H_1 is supported H_0 is rejected
H3	H_0: The Taiwanese stock market satisfy weak efficient market	H_1: The Taiwanese stock market cannot satisfy weak efficient market	H_0 is supported H_1 is rejected
H4	H_0: The method of EMA using combination of 5:10 days can earn abnormal return	H_1: The method of EMA using combination of 5:10 days cannot earn abnormal return	H_0 is supported H_1 is rejected

	H0	H1	Result
H5	H0: The method of EMA using combination of 10:20 days can earn abnormal return	H1: The method of EMA using combination of 10:20 days cannot earn abnormal return	H_0 is supported H_1 is rejected
H6	H0: The method of EMA using combination of 5:20 days can earn abnormal return	H1: The method of EMA using combination of 5:20 days cannot earn abnormal return	H_0 is supported H_1 is rejected
H7	H0: The method of SMA using combination of 5:10 days can earn abnormal return	H1: The method of SMA using combination of 5:10 days cannot earn abnormal return	H_1 is supported H_0 is rejected
H8	H0: The method of SMA using combination of 10:20 days can earn abnormal return	H1: The method of SMA using combination of 10:20 days cannot earn abnormal return	H_1 is supported H_0 is rejected
H9	H0: The method of SMA using combination of 5:20 days can earn abnormal return	H1: The method of SMA using combination of 5:20 days cannot earn abnormal return	H_1 is supported H_0 is rejected
H10	H0: The method of WMA using combination of 5:10 days can earn abnormal return	H1: T The method of WMA using combination of 5:10 days cannot earn abnormal return	H_0 is supported H1 is rejected
H11	H0: The method of WMA using combination of 10:20 days can earn abnormal return	H1: The method of WMA using combination of 10:20 days cannot earn abnormal return	H_0 is supported H_1 is rejected
H12	H0: The method of WMA using combination of 5:20 days can earn abnormal return	H1: The method of WMA using combination of 5:20 days cannot earn abnormal return	H0 is supported H1 is rejected
H13	H0: The method of MACD using combination of 5:10 days can earn abnormal return	H1: The method of MACD using combination of 5:10 days cannot earn abnormal return	H0 is supported H1 is rejected
H14	H0: The method of MACD using combination of:10:20 days can earn abnormal return	H1: The method of MACD using combination of 10:20 days cannot earn abnormal return	H0 is supported H1 is rejected
H15	H0: The method of MACD using combination of 5:20 days can earn abnormal return	H1: The method of MACD using combination of 5:20 days cannot earn abnormal return	H0 is supported H1 is rejected
H16	H0: The parameter of RSI for 5 days can earn abnormal return	H1: The parameter of RSI for 5 days cannot earn abnormal return	H1 is supported H0 is rejected
H17	H0: The parameter of RSI for 10 days can earn abnormal return	H1: The parameter of RSI for 10 days cannot earn abnormal return	H1 is supported H0 is rejected
H18	H0: The parameter of RSI for 15 days can earn abnormal return n	H1: The parameter of RSI for 15 days cannot earn abnormal return	H1 is supported H0 is rejected

Data Source: This Study Summarized

5.2 Limitation and Suggestion

The study just covered the short term period 2 years for technical analysis. Thus, in order test the market efficiency and performance of technical analysis, this paper just chosen three countries of Asian markets. The scope of this study can also be extended to choose more other Asian countries and the long term period that for these changing patterns of the average returns.

Previous reserchers suggess that if you want to get correct answer from your result, you can just use only less than three indicators that's you can more focus on performance of technical analysis deeply. Besides that, some study suggest that it should incorporate the filter mechanism to filter the trading noise but it is ignored by this study. We infer that can provide more robust result if it consider the filter mechanism.

Furthermore we used a simple method named t-test for the technical analysis. There are other more complicated tools and methods to examine the returns of stock market index. Using these easy tools, technical anlysis not enough can be found in Asia emerging markets. We suggess other students do more deeply with more complicated methodology into this topic. With more research it is probable to either find high return or more strongly disprove the hypotheses.

References

Abbey, B. S. & Doukas, J. A. (2012). Is Technical Analysis Profitable for Individual Currency Traders?. *Journal of Portfolio Management*, 39(1), 142.

Achelis, S. B. (1995). *Technical analysis from A to Z*. Chicago: Probus Publishing.

Appel, G. (1979). *The Moving average convergence divergence trading method*, Signalert Corp, 150 Great Neck Rd, Great Neck, NY 11021

Armour, J., Lofton, M., Oyenekan, O. & Metghalchi, M. (2010). *Efficient market hypothesis and technical analysis: The Irish stock index*. International Handbook of Academic Research and Teaching, 71.

Bodas-Sagi, D., Fernández, P., Hidalgo, J. I., Soltero, F. & Risco-Martín, J. (2009). Multiobjective Optimization of Technical Market Indicators. In Paper Presented at the Proceedings of the 11th Annual Conference on Genetic and Evolutionary Computation (GECCO), Montreal, Canada.

Brock, W., Lakonishok, J. & LeBaron, B. (1992). Simple Technical Trading Rules and The Stochastic Properties of Stock Returns, *Journal of Finance*, 47

Brown, D. & Jennings, R (1989): On Technical Analysis, *Review of Financial Studies*, 527-551.

Chen, C. P. & Metghalchi, M. (2012). Weak-Form Market Efficiency: Evidence from the Brazilian Stock Market. *International Journal of Economics and Finance*, 4(7), 22.

Chen, C. P., Metghalchi, M. & Gomez, X. G. (2011). Technical Analysis of the Danish Stock Market, 181.

Chong , T. L. T. & Ng, W. K. (2008). Technical Analysis and the London Stock Exchange: Testing the MACD and RSI Rules Using the FT30. *Applied Economics Letters*, 1111-1114.

Du Plessis, A. W. (2013). The Effectiveness of a Technical Analysis Strategy Versus a Buy-and-Hold Strategy on the FTSE/JSE Top 40 Index Shares of the JSE Ltd: the Case of the Moving Average Convergence Divergence Indicator.

Faber, M. (2009). A Quantitative Approach to Tactical Asset Allocation, update on SSRN, Previously Published in 2007 at the *Journal of Wealth Management*.

Fama, E. F. (1965). Tomorrow on the New York Stock Exchange, *Journal of Business,* 38, 285-299.

Fama, E. F. & Blume, M. (1966). Filter Rules and Stock Market Trading, *Journal Of Business, 39*.

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work, *Journal of Finance, 25*, pp. 383–417.

Fama, E. F. (1991). Efficient Capital Markets: II, *Journal of Finance, 46,* pp. 1575–1617.

Férnandez-Blanco, P., Bodas-Sagi, D. & Hidalgo, J. I. (2008). Technical Market Indicators Optimization Using Evolutionary Algorithms. In Paper Presented at the Proceedings of the 10th Annual Conference on Genetic and Evolutionary Computation (GECCO), Atlanta, USA.

Friesen, G., Weller, P. & Dunham, L (2009). Price Trends and Patterns in Technical Analysis: A Theoretical and Empirical Examination, *Journal of Banking and Finance*, 33, 1089-1100.

Harris, R. & Yilmaz, F (2009). A Momentum Trading Strategy Based on the Low Frequency Component of the Exchange Rate, *Journal of Banking and Finance*, 33, 1575-1585.

Hodrick, R. & Prescott, E (1997): Post-War US Business Cycles: An Empirical Investigation, *Journal of Money, Credit and Banking*, 29, 1–16.

Hunter, J. S. (1986). The Exponentially Weighted Moving Average. *Journal of Quality Technology*, 18(4), 203-209.

Jensen, M. & Benington, G. (1970). Random Walks and Technical Theories: Some Additional Evidence, *Journal of Finance,* 25.

Johnson, R. & Soenen, L. (2002). Asian Economic Integration and Stock Market Co-Movement. *Journal of Finance*. 25 (1)

LeBaron, B. (1999). Technical Trading Rule Profitability and Foreign Exchange Intervention, *Journal of International Economics*, 49, 125-143.

Leenders, C. T. & Theil, H. (1965). Tomorrow on the Amsterdam Stock Exchange, *Journal of Business,* 38, 277-284.

Lindner , W. & Muller , T. (2004). Das Grosse Buch der Technischen Indikatoren. TM Borsenverlag.

Mamaysky, A. Lo, H. & Wang, J (2000). Foundations of Technical Analysis: Computational Algorithms, Statistical Inference, and Empirical Implementation, *The Journal of Finance*, 55, 1705-1765.

Metghalchi, M., Chang, Y. H. & Garza-Gomez, X. (2012). Technical Analysis of the Taiwanese Stock Market. *International Journal of Economics and Finance*, 4(1), 90-102.

Murphy, J. J. (1999). Technical Analysis of the Financial Markets: A Comprehensive Guide to Trading Methods and Applications: Prentice Hall Press.

Narayan, S., Sriananthakumar, S. & Islam, S. Z. (2014). Stock Market Integration of Emerging Asian Economies: Patterns and Causes. *Econnomic Model*, 39.

Neely C. J. (1997). Technical Analysis in the Foreign Exchange Market: A Layman's Guide, Review September/October 1997, Federal Bank of St. Louis, 23-38.

Neely C. J. & Weller P. A. (2011). Technical Analysis in the Foreign Exchange Market, Working Paper, Federal Reserve of St. Louis.

Nicolau. J. (2007). A Discrete and a Continuous-time Model Based on a Technical Trading Rule, *Journal of Financial Econometrics*, 5, 266-284.

Okunev, J. & White, D. (2003). Do Momentum-Based Strategies Still Work in Foreign Currency Markets?. *Journal of Financial and Quantitative Analysis*, 38, 425-447.

Pring, M. J. (2002). Technical analysis explained: The Successful Investor's Guide to Spotting Investment Trends and Turning Points.

Sweeney, R. (1986). Beating the Foreign Exchange Market, *Journal of Finance* 41(61), 163-182

Wilder, J. W. Jr. (1978). *New concepts in technical trading systems*. Greensboro, NC. Hunter Publishing Company.

Zhu, Y. & Zhou, G (2009). Technical Analysis: An Asset Allocation Perspective on the Use of Moving Averages, *Journal of Financial Economics*, 92, 519-544.