

Compare Buy and Hold Strategy with Technical Indicators Strategy on Index Trading with Empirical Studies

LAI, Ping-fu (Brian)¹ & LUI Tsz-hin²

Abstract

This is a quantitative research on the validity of two common trading strategies. One of it is buy and hold strategy. Another one is long and short strategy trading by the signal generated by technical indicators. The aim of this research is to find out the appropriate strategy. Besides, combination of technical indicators is tested in order to find out any difference in performance. Also, this research wants to find out the market different on these strategies. This study is useful for investor to determine his strategy. This study is rare in academic research. The method in this research is back test historical data of nine stock markets. Use statistic analysis to find out any significance different in mean/median of the profit generated by two strategies. It found that buy and hold strategy is better than long and short strategy.

Keywords: Stochastic Oscillator, Average Directional Index, EMH, Exponential Moving Average, MACD, Capital Flow, Lead-Lag Relation, Stock Market

1. Introduction

This paper aims to find out if any extra profit can gain from investing on index by individual or combination of technical indicators compare with buy and hold strategy. In academic field, some researchers attributed the extra profit gain by technical indicators strategy is due to extra risk. Some of them proved that the price is random walk. Efficient market hypotheses (EMH) are dominated in the academic field for many years. One of its model suggested that investors cannot make extra profit by trading according to historical data. This paper can indirectly provide knowledge concerned with the EMH. If trading according to the technical indicator signal can provide extra profit than buy and hold strategy, it proves indirectly that market is inefficient and cannot be classified in any model of EMH. In practical, a lot of traders still use conventional technical analysis (TA) to make trading decision. Besides, newspapers and some investing adviser often use technical indicators as a tool for their investment advice. Indeed, ordinary investor only wants to know the validity of technical indicators. However, academic article compare such strategy with simple buy and hold strategy is rare. This paper want to compare the different of profit by using buy and hold (B&H) strategy against Long and Short (L&S) strategy according to technical indicators. Simple find out the performance of any technical analysis is useless if not compare with bench mark. This research use B&H strategy as benchmark is similar to compare the performance of TA to the performance of market. If the difference between these two strategies is significant, investors should choose the better strategy. This paper is important for investors to choose appropriate investment strategy. Firstly, the purpose of this study was to determine which strategy is better. Secondly, this research want to find out if performance of strategies same in all major market or especially useful in certain market. Finally, this research wants to find out if use of combine signal of indicators has any different when compare with use single indicator. This paper investigates the index of major stock markets. The performance of such index will undergo back test. Such index includes S&P500(SP), Dow Jones Industrial Average(DJ), NASDAQ composite(NA), FTSE 100(FT), DAX(DA), CAC 40(CA), Nikkei 225(NI), Hang Seng (HS) and Shanghai composite index(SS).

¹Associate Professor, College of Global Talents, Beijing Institute of Technology, Zhuhai, China

²Researcher, ABRS International Consultancy, Hong Kong

Such indexes cover all the major market in United States, Europe and Asia. Three commonly used technical indicators will be used to make trading decisions. They are Moving Average Convergence-Divergence (MACD), Average Directional Index (ADX) and Stochastic Oscillator (SO). Besides, trading decision on combination of the above indicators will also be back tested. The returns by using such strategies will be used to compare with buy and hold strategy of same period. The rest of the study is structured as follow: First, the literature on EMH and technical analysis will be reviewed. Secondly, the sampling and research method will describe. The result will discuss in following part. Finally, general result, limitation, implication, possible explanation and suggestion for further study are mentioned.

2. Literature Review

The EMH is an important hypothesis in finance research in past twenty years. It is developed by Professor Eugene Fama in the early 1960. Recently, he also shared the 2013 Nobel Prize with other two researchers in Economic Sciences. This hypothesis contradicts the principle of technical analysis. Hence, EMH is discussed in the following part as background knowledge. This hypothesis states that stock prices already represent all the information that affect the prices, investors cannot gain extra profit by this information. EMH states that it is not possible to gain extra profit by predict stock price as prices change according to information that cannot be predicted. In other word, the price of market fully represent available information is called efficient (Fama, 1970). Some researchers point out that the market is weak form. Roberts (1965) and Osborne (1959) thought that US stocks prices did not follow pattern. It means that the US stocks price cannot be predicted by technical analysis. Moreover, Osborne (1959) Granger and Morgenstern (1963) and Fama (1965) failed to found any pattern of US stocks price too. In addition, Fama and Blume (1966) found that if use very small filters; it may produce extra profit than buy-and-hold strategy. However, the transaction cost makes it unprofitable.

On the other hand, some of researches suggest the market is not weak form. That means that the market is not effective. Levy (1967) found that invest on momentum can gain profit. Moreover, Merton (1980) stated that variance change can be figure out from historical information. Furthermore, French (1980) found a weekend patterns in US stocks. In addition, Keim (1983) found a January effect in US stocks. Also, Gultekin and Gultekin (1983) and Jaffe and Westerfield (1985) found seasonal patterns in international markets. Furthermore, Debondt and Thaler (1985) and Lehmann (1990) found reversal effect in US stocks. Jegadeesh and Titman (1993) found momentum effect. Generally, all the above researches show that one can gain extra profit by making investment according to historical information.

Another form of the EMT is semi-strong form. A market is called semi strong form when prices reflected all the public available information. In other words, investors cannot gain extra profit by take a position according to public information. Public available information includes historical prices and all market available information. Some research support the efficiency of semi strong form market. Fama (1969) found that investors cannot get extra return by the stock splits public information. Post and van Vliet (2004) thought that market efficiency is high. However, other researchers found that the market is not efficient. Jaffe (1974) found out that insiders can gain return from open information of insider trading. Besides, Ball (1978), Bernard and Seyhun (1995) also found that it need certain time for public to react to profit making information. Moreover, Basu (1978) found that invest on small (P/E) ratios stocks can gain extra return.

The last form of EMT is called strong form when prices reflect all the public and insider information. Investors cannot gain extra profit by investment according to this information. A lot of researches show that it is incorrect. Investors that have unexecuted limit orders can use this information to gain return (Niederhoffer and Osborne, 1966). Furthermore, Scholes (1969) pointed out that private information about a company is available to people working in that company. In addition, Jaffe (1974) and Seyhun (1986) claimed that insiders can gain extra return. Also, Kiyamaz (2002) found that in Turkish stocks extra profit can found in the price change of stocks before public announcement. The validity of EMT is not conclusive. The evidences on weak form and semi strong form are not always supportive. Besides, a lot of researches shown that strong form effective market is not appropriate. The validity of EMT affects the usefulness of technical analysis. If market is either weak form, semi-strong or strong form, technical analysis is not useful. The predicting power of technical analysis should be due to statistical error and/or bias. This paper want to find out the performance of technical indicators compare with buy and hold strategy. If any form of EMH did correct, use of technical indicators to invest on index should not gain any extra benefit from buy and hold strategy. In contrary, if use of any technical indicators provides significant benefit, it means that weak form EMH do not hold.

“Technical analysis” is too general that it is difficult to define. They have common character of analysis based on linear time series modeling of historical data (Black & Scholes, 1973). It is believed that historical price will reflect the trends of price in future. That is contradicting to the weak form efficient market theory. Murphy (2000) suggested that trends can be divided to three categories: uptrend, downtrend and sideways trend. The trend is changing according to the economic, political and psychological attitudes of investors. As a result, it affects the decision of investors. However, there are over hundred or even thousands of technical indicators used by traders all over the world, it is not appropriate to draw conclusion on the validity of technical analysis if only a few methods are scrutinized. A research showed that at least 90 percent of the chief foreign exchange dealers take reference on technical analysis before making trading decision (Taylor and Allen, 1992). Besides, a lot of investors in Germany use technical analysis during trading (Menkhoff, 1998). As a consequence, the performance of technical analysis affects a lot of investors. Such performance will discuss in the following sections.

The result found in efficiency of technical analysis is controversy. Some research showed that technical analysis is useful. Technical analysis can make extra profit on the Dow Jones Industrial Average Index (Brock, Lakonishok and LeBaron, 1992). Besides, it is anticipated that 35% of all trading in NYSE is initiated by program trading (Bray, 2002). The trading decision should be initiated by historical data. Neely et al. (1997) and LeBaron (1999) proved net profit by using moving average rules. Similarly, Blume et al. (1994) found that combine the volume and price to make trading decision can gain extra benefit. In addition, Antoniou et al. (1997) also proved that price and volume can predict the future trend in market of Istanbul. Besides, Chan et al. (2000) found that momentum strategies provided profit on international stock index trading. Also, Bessembinder and Chan (1995) found that trading strategy is useful in index return in Asian Stock Markets. Los (2001) found that Asian stock market easily affect by the moving price. Ratner and Leal (1999) also found that moving average rules can gain extra profit in Taiwan and Thailand. However, transactions costs generate by huge amount of trading by technical trading rules reduce the profit (Coutts and Chen, 2000). Besides, Hsu and Kuan (2005) found that simple technical analysis can gain significant profit in market that mainly composed of new companies (Hsu and Kuan, 2005). Change signal of simple moving average rule to nonlinear models successes to provide good predictive power on Dow Jones Average during 1897 to 1988 (Gency, 1998). Also, Jegadeesh (1990) also found that invest according to momentum technical analysis can gain extra profit on industry stocks. In addition, the performance of stock have tendency to continue its strong or weak performance over period of 3 months to whole year (Jegadeesh and Titman, 1993). A research found that 52-week highs combine with momentum analysis can gain extra profit on America stocks investment (George and Hwang, 2004). Also, use volume as investment signal provide good prediction power (Blume and Easley, 1994). Alexander (1964) suggested that some technical analysis give profit. Theil and Leenders (1965) found that the stock price of Amsterdam Stock Exchange has pattern. They suggested that the price continue to move up and down according to performance of previous day. Moreover, Ratner and Leal (1999) suggested that using moving average in emerging market has some predictive power.

The mechanism of technical analysis is that people think that the observed trend will continue itself. When a trend is showed, it can be detected by technical indicator. Investors can take their position according to the technical indicator. An investor can maintain his investment position until technical analysis show the trend has changed (Pring, 1991).

On the other hand, some researches claimed that technical analysis is useless. Moving average trading rule suggests buy when price moves above a particular moving average and sell when the price below that average. It failed to provide net gain by using this method in Dow Jones (Brock et al., 1992). Alsi, Fama and Blume (1966) suggested that technical analysis in Dow-Jones Industrial Average cannot provided excess returns if transaction costs are involved in calculation. Bachelier (1900) suggest that price changes are independent from each transaction, and price variation should have normal distributions. Moreover, people familiar with chart analysis cannot find out the different between real chart and random generate chart (Siegel, 1998). Similarly, Arditti (1978) found same observation as Siegel. Also, head-and-shoulders chart pattern analysis cannot provide any predictive power on investment. Investors seem follow random signal on this kind of analysis (Osler, 1998). Moreover, a hedge fund called “Long Term Capital Management” (LTCM) collapsed in 1998. This fund was invested according to mathematical model. It implied that price analysis may not work. In addition, some people argue that the popular of TI is not possible if it is not valid. It may explain by that investors want to decrease uncertainty and stress. This character of human has mentioned by Scott Armstrong (1980). Besides, an early research suggest that forecast of stock market is not accurate (Cowles, 1933). It seems that the validity of technical analysis is not conclusive in different research. This research tries to test the validity of some indicators. The technical indicators will describe in the following section.

There are many tools for technical analysis. It includes bar charts, point-and-figure charts, candlestick charts and many other methods. Besides, some technical indicators are used, such as Moving Average Convergence-Divergence (MACD), Average Directional Index (ADX), Stochastic Oscillator (SO) and many other indicators. Indeed, there are too many technical analysis tools that cannot be described here. However, it is obvious that such tools can divide by two groups. One group has the characteristic that the buy and sale signal is defined by analyst's experience, personal preference and experience. In other words, it is subjective. Bar chart, point-and-figure chart and candlestick chart belongs to this group. For example the trend lines draw by bar chart depends on the time horizon. Different analyst can draw different implications on same data or charts. The pattern and shapes of candlestick chart cannot define precisely. On the other hand, there are many quantitative indicators developed in recent years. This group includes technical indicators such as MACD, ADX and SO. This group of indicators has well defined mathematic definition. The buy and sale signal of such indicators are much objective. Different analysts should draw same buy or sale decision according to the indicators. Technical analysis by such quantitative indicators can prevent bias from psychological fault by human perception. It also prevents decision affected by public opinions. For example, 77% of suggestions from analysts are buying (Groth, 1979).

This essay does not intends to discuss subjective technical analysis tool. It is because define the buy and sale signal is subjective. It is not possible for different person to take same decision on same graph. Proving of validity of such tools is not possible. Although, some research claimed that it can define some subjective technical analysis tool. Since this research is not going to investigate subjective technical analysis tool, such discussion is stopped here. Thus, this essay concentrates on find out the validity of some popular technical indicators. They are MACD, ADX and SO. Moving Average Convergence-Divergence (MACD) is developed by Gerald Appel. MACD composed of two lines and a histogram. It can be use to identify strength, direction, momentum and duration.

12-26 day MACD = EMA (12 day) – EMA (26 day) = Short term moving average – Long term moving average

Signal line = EMA(9day)

MACD Histogram: MACD line – Signal line

EMA stand for Exponential Moving Average.

N-day smoothing constant = $2 / (N + 1)$

N-day EMA = Previous N-day EMA + N-day smoothing constant * (Closing price - Previous N-day EMA)

The first N-day EMA can use simple average as reference.

The histogram is positive if MACD line large than signal line and vice versa. Normally, the number of dayson MACD line and signal are set as 12,26,9 respectively. However, such setting can be change to adjust the sensitivity. The sensitivity of MACD can increase by use smaller short term moving average and larger long term moving average, such as MACD (5, 35, and 5). In this research, normal setting MACD (12, 26, and 5) is used. The MACD lines are moving up and down among the zero lines. When 12-day EMA is larger than 26-day EMA, MACD is positive. It means that upward momentum is increasing and vice versa. When MACD line is going above the signal line, the stock price is forecast to increase and vice versa. The number of signals depends on the volatility of that stock. MACD cannot be use to compare momentum between different stocks. It is because the value of MACD depends on the price size of individual stock. Other price size independent momentum should be used.

MACD can give signal in three situations:

1. MACD line crosses the signal line- buy when MACD line larger than signal line and vice versa.
2. MACD line crosses zero – above zero means stock price trends upward and vice versa.
3. Positive and negative histogram – small histogram imply change of trend or the current trend weaker and vice versa. Positive histogram means a buy signal and vice versa.

Average Directional Index (ADX)

ADX (Average Directional Index) is developed by Welles Wilder. It can identify the trend and strength. It composed of Minus Directional Indicator (-DI) and Plus Directional Indicator (+DI) that can identify trend direction.

$$+DI = \frac{+DM}{TR}$$

$$-DI = \frac{-DM}{TR}$$

+ DM = absolute value of (Today's High – Yesterday's high)

- DM = absolute value of (Today's low- Yesterday's low)

(The definition “-DM” and “+DM” are a description of direction of movement. It is not treated as positive or negative value in the equation.)

True Range (TR) = Maximum value of either the following combination within 14 days

Today's High- Today's Low

Today's high- Yesterday's Close

Yesterday's Close- Today's Low

+ DI, - DI can be calculated by above numbers.

$$DX = \frac{|(+DI) - (-DI)|}{(+DI) + (-DI)} \times 100$$

DX=Directional movement index

In order to make the directional indicator (DI) more accurate and smooth, 14 days data is used.

$$+DI_{14} = \frac{+DM_{14}}{TR_{14}}$$

$$-DI_{14} = \frac{-DM_{14}}{TR_{14}}$$

Today's +DM₁₄ = Previous +DM₁₄ - $\frac{\text{Previous } +DM_{14}}{14}$ + Today's +DM₁

Today's -DM₁₄ = Previous -DM₁₄ - $\frac{\text{Previous } -DM_{14}}{14}$ + Today's -DM₁

Today's TR₁₄ = Previous TR₁₄ - $\frac{\text{Previous } TR_{14}}{14}$ + Today's TR₁

$$DX_{14} = \frac{|(+DI_{14}) - (-DI_{14})|}{(+DI_{14}) + (-DI_{14})} \times 100$$

$$ADX_{14} = \frac{14 \text{ days } DX_{14}}{14}$$

$$\text{Today's } ADX_{14} = \frac{\text{Previous } ADX_{14} \times 13 + DX_{14} \text{ Today}}{14}$$

When +DI₁₄ larger than -DI₁₄, it means a buy signal and vice versa. Besides, ADX can determine if there are obvious trend in such signals. Some traders use ADX₁₄ equal to 20 as the basic requirement on these indicators. It means that when ADX₁₄ equal or below 20, traders ignores the signal generated by ADX. Same filter is used in this research. This research assume the previous signal is valid until the next reverse signal with ADX₁₄ large than 20 is given.

Stochastic Oscillator(SO)

SO(Stochastic Oscillator) is developed by George C. Lane. It is a momentum indicator.

%K = (Current Close- Lowest Low) / (Highest High- Lowest Low)* 100

%D= 3-day (Simple moving average) SMA of %K

Lowest Low= Lowest Low for look- back period (14 periods for default)

Highest High= highest high for the look-back period (14 periods for default)

The periods use can be days, weeks or months.

There are two kinds of oscillator depends on the smoothing technique used. Those are:

1. Fast Stochastic Oscillator

Fast %K= %K

Fast %D= 3-period SMA of Fast %K

2. Slow Stochastic Oscillator

Slow %K=Fast %D = Fast %K smoothed with 3-period SMA

Slow %D= 3-period SMA slow %K

For both fast and slow SO, when %K larger than %D imply a buy signal and vice versa.

Slow SO give less false signal, this research use slow stochastic oscillator in calculation.

The following section will state the research question and hypotheses clearly.

3. Research Methods

This research wants to find out if investors trading index according to technical indicators can gain profit compare with buy and hold strategy. The technical indicators investigated are MACD, ADX and SO. Besides, this research wants to find out what the combine decisions of two or more technical indicators affect the validity. Indexes

from nine major markets are investigated in this research.

This includes S&P500(SP), Dow Jones Industrial Average(DJ), Nasdaq composite(NA), FTSE 100(FT), DAX(DA), CAC 40(CA), Nikkei 225(NI), Hang Seng(HS) and Shanghai composite index(SS). Daily data investigated samples from 1-1-1999 to 1-8-2012. Weekly and monthly data concerned samples from 1-1-1993 to 1-8-2012. All the sample data is collected by server of <http://finance.yahoo.com/> and <http://markets.wsj.com/>. These nine market indexes are the major indexes in United States, Europe and Asia. They are also reported by media in television, newspaper and economic journal as a reference to the economic market of their corresponding area. The research method is back testing of historical data of index. The return of buy and hold strategy and long and short strategy according to technical indicator signal is compared. This research due with the simple buy and sell signal imply by the three indicators only. Neutral position is not considered in this research. According to the strategy, investor either buys (long) or sells (short) the index. Holding cash is not considered in this research. When a buy or sell signal is found after closing of market, this research assume that investor use this strategy can buy or sell the index at the closing price in next trading day. Investor hold that position until an opposite signal was indicated by technical indicator.

Some assumptions are made for the above data.

1. Trading signal is available after closing of relevant period (day, week or month). It is not possible for trader to buy or sell on the closing index at the end of that period. It assumes investors can buy or sale at the closing price on next trading period.
2. Brokerage, slippage and taxes are ignored while calculations.
3. Close price is adjusted for dividends and splits.
4. Cash return is not considered.

The assumption 1 is very important to prevent look-ahead bias (Haugen,1999). This bias occurs when someone undergo back test use technical analysis involves closing price. If a signal generate, and he assume that he can trading according to the closing price. Indeed, he can only trade on the price in the opening of next trading period. However, sometimes investors cannot trade on the opening price during a volatile market. Thus, the research uses the closing price of next date as trading price for conservative. This research wants to find out if there are any different on profit between buy and hold strategy and trading according to technical indicators. Besides, the combine effect of technical indicators will also be scrutinized. Firstly, raw market historical price is input to computer. Then, the signal if technical indicator is calculated. Normally, use +1 as buy signal and -1 as sell signal. When first signal found, the closing price of next period is recorded (P1). When a second signal found, similarly, the closing price of next period is recorded (P2). The profit gain by B&H strategy is P2-P1. The profit gain by L&S strategy is the first signal sign multiple the profit gain by B&H. During the investment period, a lot of sample pairs of profit gain by B&H or L&S provided. This data is use to undergo statistic test in following section. Only samples have df more or equal to 30 are tested. Samples that have f less than 30 are not considered in this research.

4. Empirical Results and Interpretations

Generally, daily and weekly samples provided enough sample pairs to undergo statistic test. However, monthly samples failed to provide enough sample pairs for meaningful statistic test in most cases. Only the samples concerned with SO in monthly samples provided enough samples to undergo statistic test. There are too many samples in this research; reader is recommended to read the note for the abbreviation of samples at the end of table before reading the result. Besides, sometimes the word sample pair is used. Sample pair means the sample come from same source with different strategies.

Daily data

The empirical results are depicted in table 1. Generally, 35 sample pairs show valid significance out of 63 samples pairs in daily data. All sample pairs shows that the median of B&H strategy is larger than L&S strategy. Effect size r of all samples is less than 0.3 means that the effect is low. Since all the daily data cannot pass normality test, the significance of mean values are not know. However, the general trend can also be considered. DA, DJ, FT, HS and SP markets show that the mean of B&H strategy is larger than L&S strategy. This is same as compare the different in median.

However, 6 sample pairs in SS market, 3 sample pairs in NA market and 3 sample pairs in CA market show the opposite relationship. Standard deviation of mean value in all samples is large. It range from the minimum 7 times of its corresponding mean in sample DJDASXLS ($M=-68.956$ $SD=510.763$) to the maximum 300 times of its

corresponding mean in sample CADMXXBH ($M = -0.599$ $SD = 186.364$). The average standard deviation to mean ratio is 186.

This means that some samples have extreme large value. All samples show positive skewness in L&S strategy. Almost all samples of B&H strategy show negative skewness except FTDMAXBH (Skewness=0.428), FTDASXBH (Skewness=0.140), HSMXXBH (Skewness=0.662), SSDMXXBH (Skewness=2.218), SSDAXXBH (Skewness=1.316), SSDMAXBH (Skewness=0.219) and SSDMSXBH (Skewness=2.334). Almost all samples show kurtosis large than 1 range from minimum CADASXBH (Kurtosis=1.210) to maximum SPDMASLS (Kurtosis=22.434). Some samples show kurtosis less than one, which are CADMAXBH (Kurtosis=0.446), CADMAXLS (Kurtosis=0.315), CADASXLS (Kurtosis=0.941), DJDMAXBH (Kurtosis=-0.518) and DJDMAXLS (Kurtosis=-0.189).

When consider market characteristic, all the 7 sample pairs show significant different in HS market. There are 6 sample pairs out of 7 show significant different in DA market. On the contrary, only 1 sample pairs in NI and SS show significant different. TI characteristic of sample is described in the following paragraph. Use MACD as investment strategy show significance low median in CA, DA, DJ, FT, HS, NA and SP market. Besides, the different in median of profit is not significance in NI and SS market. Use ADX as investment as investment strategy show significance low median in DA, DJ, FT, HS and SP market. Besides, the different in median of profit in other market is not significance. SO shows significance low median in all markets.

Weekly data

The empirical results are depicted in table 2. There are only 58 sample pairs that have df more than 30. There is only 20 sample pairs providing significance difference. All the sample pairs that show significant difference have larger median of B&H strategy. Effect size r of most samples is less than 0.3 means that the effect on different on median is low. Some exception are found in sample DJWMASBH (effect size $r = 0.38$), SPWASXBH (effect size $r = 0.307$) and SPWASBH (effect size $r = 0.365$). Effect size is more than 0.3 means medium effect.

Some of weekly data pass normality test, which has been discussed on section 5.2. Apart from that, the mean value of profit gain should be considered. T-test cannot be used to find out the significance. The general trend of means of profit gain by the two strategies shows clear market difference. Such general trend is not likely occurred solely by chance. In the market DJ, FT, NA and SP, all the mean profit of B&H strategy is larger than L&S strategy. On the contrary, in the market NI, all the samples shows that mean value of L&H strategy is larger than B&H strategy. In the market CA, DA and SS, only one exception sample pairs show mean profit of B&H strategy larger than L&S strategy. They are samples CAWSXXBH, CAWSXXLS, DAWSXXBH, DAWSXXLS, SSWSXXBH and SSWSXXLS. The performance of HS market is not consistence. It shows that 3 sample pairs have mean value of B&H strategy lower than LS strategy. Those are samples HSMXXBH, HSMXXLS, HSWXXBH, HSWXXLS, HSWMSXBH and HSWMSXLS. Other samples of HS market show the opposite trend.

Standard deviation of mean value in all samples is large. It range from the minimum 3 times of its corresponding mean in sample SSWMASLS ($M = 223.629$ $SD = 694.047$) to the maximum 131 times of its corresponding mean in sample FTWMXXLS ($M = 2.691$ $SD = 352.474$). The average standard deviation to mean ratio is 15.075. This means that the samples have extreme long tail. There are 10 samples of B&H strategy show positive skewness and other 48 samples show negative skewness. There are 4 samples in L&S show negative skewness and other 54 samples show positive skewness. Samples show negative skewness are HSWAXXLS (Skewness=-0.141), NAWASXLS (Skewness=-0.894), NAWMAXLS (Skewness=-0.293), and SSWSXXLS (Skewness=-0.300). Almost all samples of B&H strategy show kurtosis more than 1 except sample HSWAXXBH (kurtosis=0.476) and sample HSWMAXBH (Skewness=0.000). Other samples show kurtosis large than 1 ranged from minimum DJWMXXBH (Kurtosis = 1.117) to maximum SSWMXXBH (Kurtosis=26.143). There are 10 samples of L&S strategy show kurtosis less than 1. Other samples show kurtosis large than 1 ranged from minimum DJWMSXLS (Kurtosis = 1.102) to maximum SSWMXXLS (Kurtosis=24.119). When consider market characteristic, all the 7 sample pairs show significant different in NA market. There are 6 sample pairs out of 7 show significant different in SP market. NI, HS and SS market do not show any significant different in median. Other markets show 1 or 2 samples pairs significance. MACD as L&S investment strategy show significance low median in NA and SP markets. Other markets do not show significance difference in median by any strategy. ADX as L&S investment strategy show significance low median in NA and SP markets. The use of SO as L&S investment strategy shows significant low median in CA, DA, FT, NA and SP markets.

Monthly data

The empirical results are depicted in table 3. There are only 9 sample pairs that have n more than 30. There are only 3 sample pairs providing significance difference.

All the samples concerned with the SO technical indicator. All the sample pairs that show significant difference have larger median of B&H strategy. Effect size r of most samples is less than 0.1 means that the effect on different on median is small. All the monthly sample pairs cannot pass normality test. Thus, the significance of mean different cannot be found by t -test. All the mean values of profit gain from B&H strategy are greater than that from L&S strategy with two exceptions. They are CA and NI market. Standard deviations of mean value in all samples are large. It range from the minimum 5.8 times of its corresponding mean in sample NIMSXXLS ($M=315.646$ $SD=1839.732$) to 74 times in sample SSMSXXLS ($M=6.707$ $SD=501.026$). The average standard deviation to mean ratio is 19.87. Majority of samples of B&H strategy show negative skewness except sample DAMSXXBH (Skewness=0.077). All the samples of L&S strategy show positive skewness.

5. Conclusion and Implications

This paper aims to find out that if there are any different on profit by the two investment strategy. The two strategies are buy and hold strategy and long and short strategy according to the signal generated by technical indicators. This research not only compares the performance of three common technical indicators, it also compares the performance of the combine effect of such indicators. Another objective of this research is to find out if there are any markets different by using TI. Besides, this paper covers 9 major stock markets in the world. It is the first study that investigates in such wide market range. The result of this paper is practically useful for investors to decide which investment strategy is appropriate. However, all the research result is based on historical data, it may not reflect the performance of markets in the future. If consider the mean without consider the significance. Daily samples have consistent result. It shows that L&S cannot gain extra profit than B&H. However, the performance of weekly samples is mixed. If someone uses L&S strategy to invest in NI index, it provides consistent profit. It is consistent in any TI or combination of TI. However, as t -test is not feasible in such samples. This observation cannot exclude the possibility of chance. Other markets shows L&S perform better in some samples, such markets are CA, DA, SS and NI. Likewise, this information cannot rule out the possibility that such deviations are solely due to chance. Moreover, all of them have small effect. The samples of long and short strategies mainly show positive skewness. On the contrary, samples of buy and hold strategies mainly show negative skewness. It means that most data of L&S strategy is less than B&H strategy.

The mean profit of daily data shows that B&H strategy is better. Besides, the mean profit of weekly data agrees with daily data on DJ, FT, NA and SP markets only. However, the mean profits of L&S are larger than B&H strategy in NI, CA, DA and SS markets. The performance of SS can be explained by research suggests that new stock market is easily affected by TI (Eui Jung, Eduardo and Benjamin, 2004). SS market is new market relatively. Besides, Los (2001) found that Asian stock market easily affect by the moving price. However, the performance of CA and DA market cannot be explained by this research.

The performance of mean profit of NI in weekly data is special. All the L&S strategy according to any indicators provide profit in certain value. It may explained by the long term declining market price of NI market. In other word, use any TI on weekly data can gain profit more the B&H strategy. However, it may due to the B&H strategy lose profit with the bearish Japan market. As a result, any strategy that provided short signal can outperform the B&H strategy in NI market in the past fifteen years. Use of TI does not give extra benefit in median comparison. On the contrary, it shows significance loss in some cases.

This research finds that most profit gain by investment strategies are not normal distributed. Use of daily data to L&S cannot gain extra profit compare with B&H strategies. However, use of weekly data can gain some profit in certain market. Unfortunately, such implication cannot be proved by t -test due to normal distribution restriction. The samples of profit gain or loss seems affect seriously by outlier. It is support by the large kurtosis and large standard deviation. Investor should watch carefully on the outlier cases, which affect the resultant profit. This research provides some statistic information compare the B&H strategy and L&S strategy. If solely look into the statistical data, L&S strategy cannot provides extra benefit. However, if consider the mean value of samples of weekly data, L&S strategy can provides some benefit in NI, CA, DA and SS. It implies that investors can consider using TI to invest in such markets. This research implies that stock market is not weak form. Use historical data cannot provide extra profit to investors.

This research investigate the technical indicators MACD, ADX and SO only. Indeed, there are a lot of technical indicators need to test. Besides, Ashby’s Law of Requisite Variety (Ashby, 1963), suggest that the solution of problem should has same degree of complexity. It means that if technical indicator can show the trend of complex change of stock market, it should have similar complexity. A research conducts by Hsu and Kuan (2005) shows that complex rules have greater ratio to gain significance profit than simple rules. Their research covered four stock market indexes: Dow Jones, S&P 500, NASDAQ, and Russell 2000. However, when the effect of data mining is compensated, the significance diminished in Dow Jones and S&P 500 Index. Clearly, further research should consider other complex technical indicators. This research excludes the transaction cost. The transaction cost of daily sample is huge. Alexander (1961) found that transaction cost decrease the profit of technical analysis.

Table 1 Mann-Whitney Test and Explore data (Daily)

Mann-Whitney Test		Explore data											Hypot-hesis
Samples	n	Mean Rank	Mann-Whitney U	Z	Asymp. <i>p</i> (2-tailed)	Median (<i>Mdn</i>)	Effect size <i>r</i>	Mean (<i>M</i>)	Std. Deviation (<i>SD</i>)	Std. Error (<i>SE</i>)	Skewness	Kurtosis	
CADMXXB H	321	344.39	44172.500	-3.127	.002*	17.420	0.123	-599	185.364	10.346	-.449	3.377	H1(null) rejected
CADMXXLS	321	298.61				-33.370		-7.544	185.203	10.337	1.097	3.575	
CADAXXB H	102	107.08	4734.5	-1.109	.267	7.130	0.078	1.335	285.564	28.275	-.370	1.747	H2(null) cannot rejected
CADAXXLS	102	97.92				-34.280		14.754	285.180	28.237	1.119	1.508	
CADSXXBH	891	942.89	351149.500	-4.216	.000*	7.610	0.1	-.412	113.130	3.790	-.429	3.772	H3(null) rejected
CADSXXLS	891	840.11				-17.280		-3.99	113.041	3.787	1.318	3.975	
CADMAXB H	74	75.61	2655.500	.316	.752	22.020	0.026	2.810	348.222	40.480	-.085	.446	H4(null) cannot rejected
CADMAXLS	74	73.39				-53.650		18.860	347.715	40.421	.567	.315	
CADMSXBH	283	308.12	33077.000	-3.582	.000*	16.030	0.151	-.679	200.172	11.899	-.521	4.496	H5(null) rejected
CADMSXLS	283	258.88				-50.310		-13.142	199.735	11.873	1.434	4.925	
CADASXBH	86	89.77	3416.500	-.862	.389	44.535	0.066	2.418	322.240	34.748	-.509	1.210	H6(null) cannot rejected
CADASXLS	86	83.23				-55.580		20.669	321.581	34.677	.972	.941	
CADMASBH	105	112.70	4757.00	-1.716	.086	13.530	0.118	-2.782	293.657	28.658	-.951	2.009	H7(null) cannot rejected
CADMASLS	105	98.30				-32.760		2.238	293.657	28.658	1.045	2.013	
DADMXXB H	292	306.17	38641.00	-1.958	.050*	23.350	0.081	7.906	261.600	15.309	-.713	4.676	H1(null) rejected
DADMXXLS	292	278.83				-45.735		1.103	261.720	15.316	1.449	4.556	
DADAXXB H	130	146.76	6336.000	-3.487	.000*	36.375	0.216	22.918	453.744	39.796	-1.309	10.778	H2(null) rejected
DADAXXLS	130	114.24				-43.090		-27.416	453.505	39.775	2.595	11.176	
DADSXXBH	876	914.73	350198.500	-3.163	.002*	11.905	0.076	3.037	159.707	5.396	-.666	4.856	H3(null) rejected
DADSXXLS	876	838.27				-21.40		2.143	159.707	5.396	1.324	4.732	

DADMAXB H	100	111.51	3899.000	- 2.690	.007*	5 112.4 45	0.19	30.938	537.400	53.740	-7.68	7.939	H4(null) rejected	
DADMAXLS	100	89.49				- 124.8 70		-15.880	538.060	53.806	2.319	8.002		
DADMSXB H	256	268.62	29666.000	- 1.853	.064	33.17 0	0.08 2	9.018	282.176	17.636	-.880	4.595	H5(null) cannot rejected	be
DADMSXLS	256	244.38				- 59.96		5.139	282.272	17.642	1.486	4.364		
DADASXBH	116	132.33	4891.500	- 3.593	.000*	72.40 0	0.23 6	25.451	474.465	44.053	-	10.080	H6(null) rejected	
DADASXLS	116	100.67				- 100.1 90		-27.414	474.358	44.043	1.251 2.617	10.437		
DADMASB H	127	144.86	5859.500	- 3.766	.000*	73.60 0	0.23 6	20.498	463.061	41.090	-	11.914	H7(null) rejected	
DADMASLS	127	110.14				- 92.23		-13.778	463.320	41.113	1.706 2.920	11.936		
DJDMXXBH	285	305.69	34858.000	- 2.927	.003*	35.25 0	0.12 3	13.595	361.003	21.384	-	5.584	H1(null) rejected	
DJDMXXLS	285	265.31				- 82.92 0		-6.516	361.189	21.395	1.030 1.746	5.546		
DJDAXXBH	149	163.58	9002.500	- 2.821	.005*	17.07 0	0.16 3	26.084	476.471	39.034	-.696	5.050	H2(null) rejected	
DJDAXXLS	149	135.42				- 149.8 60		-58.385	473.578	38.797	1.663	5.856		
DJDSXXBH	878	933.88	336819.000	- 4.577	.000*	11.98 0	0.10 9	4.460	225.137	7.598	-.668	7.740	H3(null) rejected	
DJDSXXLS	878	823.12				- 42.76 0		-9.477	224.989	7.593	1.639	7.985		
DJDMAXBH	110	118.84	5132.500	- 1.944	.052	12.18 0	0.13 1	34.026	537.577	51.256	-.112	-.518	H4(null) cannot rejected	be
DJDMAXLS	110	102.16				- 192.3 75		-86.896	531.547	50.681	.567	-.189		
DJDMSXBH	269	288.83	30980.000	- 2.885	.004*	46.86 0	0.12 4	14.403	368.289	22.455	-	5.328	H5(null) rejected	
DJDMSXLS	269	250.17				- 104.2 20		-8.257	368.486	22.467	1.050 1.733	5.308		
DJDASXBH	138	151.72	7697.500	- 2.752	.006*	15.44 5	0.16 6	29.124	514.604	43.806	-.497	4.023	H6(null) rejected	
DJDASXLS	138	125.28				- 151.9 80		-68.956	510.763	43.479	1.579	4.903		
DJDMASBH	125	130.68	7165.500	- 1.132	.258	24.60 0	0.07 2	29.827	527.097	47.145	-	4.776	H7(null) cannot rejected	be
DJDMASLS	125	120.32				- 27.72 0		17.874	527.634	47.193	1.156	4.310		
FTDMXXB H	299	322.47	37832.500	- 3.251	.001*	9.900 0	0.13 3	.207	187.614	10.850	-.830	4.637	H1(null) rejected	
FTDMXXLS	299	276.53				- 34.50 0		-6.878	187.476	10.842	1.686	4.897		
FTDAXXBH	127	137.53	6791.000	- 2.175	.030*	20.70 0	0.13 6	.829	237.379	21.064	-.134	3.547	H2(null) rejected	
FTDAXXLS	127	117.47				- 43.50 0		-17.252	236.748	21.008	1.374	3.996		
FTDSXXBH	844	889.29	318364.500	- 3.775	.000*	8.600 0	0.09 2	.0363	118.008	4.062	-.515	4.040	H3(null) rejected	
FTDSXXLS	844	799.71				- 21.85 0		-2.032	117.979	4.061	1.302	4.132		
FTDMAXB H	97	103.25	4146.500	- 1.427	.154	- 3.800	0.10 2	-1.609	284.681	28.905	.428	2.913	H4(null) cannot	be

FTDMAXLS	97	91.75				-			-33.929	282.633	28.697	.978	3.476	rejected	
						59.60									
						0									
FTDMSXBH	267	288.30	30093.000	-	.002*	11.50	0.13	.232		194.219	11.886	-.994	4.015	H5(null)	
				3.115		0	5							rejected	
FTDMSXLS	267	246.70				-			-7.519	194.072	11.877	1.579	4.271		
						43.60									
						0									
FTDASXBH	105	111.92	4838.500	-	.126	22.90	0.10	1.003		262.240	25.592	.140	3.893	H6(null)	be
				1.531		0	6							cannot	
						0								rejected	
FTDASXLS	105	99.08				-			-6.05	262.178	25.586	1.445	4.038		
						34.30									
						0									
FTDMASBH	115	123.72	5667.500	-	.061	-	0.12	-1.357		245.918	22.932	-.919	2.915	H7(null)	be
				1.873		1.800	4							cannot	
						0								rejected	
FTDMASLS	115	107.28				-			-13.717	245.543	22.897	.865	3.154		
						34.40									
						0									
HSMXXBH	266	279.58	31897.500	-	.050*	34.03	0.08	47.110		986.301	60.474	.662	8.007	H1(null)	
				1.963		0	5							rejected	
HSMXXLS	266	253.42				-			18.831	987.247	60.532	1.830	7.962		
						125.7									
						85									
HSDAXXBH	157	174.02	9731.500	-	.001*	40.50	0.18	73.176		1270.75	101.417	-.821	9.586	H2(null)	
				3.224		0	2			1				rejected	
HSDAXXLS	157	140.98				-			-	1268.13	101.208	1.902	10.143		
						178.6				3					
						40				109.41					
						4				4					
HSDSXXBH	839	875.45	321801.000	-	.002*	26.91	0.07	15.014		543.943	18.779	-.313	6.021	H3(null)	
				3.039		0	4							rejected	
HSDSXXLS	839	803.55				-			6.005	544.117	18.785	1.142	5.928		
						57.04									
						0									
HSDMAXB	101	111.68	4072.000	-	.013*	45.08	0.17	116.24		1556.63	154.891	-.903	5.211	H4(null)	
H				2.476		0	4			2				rejected	
HSDMAXLS	101	91.32				-				1551.74	154.404	1.449	5.650		
						303.8				1					
						30				8					
HSDMSXBH	234	247.03	24445.500	-	.045*	86.40	0.09	55.068		1083.69	70.843	-.260	10.964	H5(null)	
				2.005		5	3			0				rejected	
HSDMSXLS	234	221.97				-			43.303	1084.22	70.878	2.235	10.525		
						146.1				5					
						15									
HSDASXBH	127	140.36	6431.500	-	.005*	51.70	0.17	90.461		1391.00	123.432	-.658	7.116	H6(null)	
				2.789		0	5			8				rejected	
HSDASXLS	127	114.64				-			-82.976	1391.48	123.474	1.668	7.340		
						211.9				1					
						00									
HSDMASBH	117	127.91	5627.000	-	.019*	75.80	0.15	100.34		1392.77	128.762	-	14.588	H7(null)	
				2.352		0	4			4		2.324		rejected	
HSDMASLS	117	107.09				-			68.311	1394.73	128.943	2.618	13.286		
						124.8				2					
						70									
NADMXXB	311	333.30	41581.500	-	.002*	9.130	0.12	2.592		145.878	8.272	-	8.240	H1(null)	
H				3.025			1					1.313		rejected	
NADMXXLS	311	289.70				-			-3.595	145.861	8.271	1.145	8.265		
						21.11									
NADAXXB	142	147.74	9338.500	-	.283	7.515	0.06	9.254		203.186	17.051	-.875	7.886	H2(null)	be
H				1.074			4							cannot	
						0								rejected	
NADAXXLS	142	137.26				-			22.540	202.137	16.963	1.884	7.018		
						5.685									
NADSXXBH	913	973.78	361751.000	-	.000*	4.450	0.11	1.010		79.528	2.632	-	19.687	H3(null)	
				4.885			4					1.468		rejected	
NADSXXLS	913	853.22				-			-2.064	79.498	2.631	2.450	19.888		
						11.42									
						0									
NADMAXB	102	105.21	4925.500	-	.512	8.105	0.04	12.283		242.055	23.967	-.320	2.958	H4(null)	be
H							6							cannot	
						0								rejected	
NADMAXLS	102	99.79				-			8.968	242.206	23.982	.671	2.780		

NADMSXB H	271	292.23	31101.500	- 3.082	.002*	16.82 5 13.14	0.13	2.975	146.331	8.889	-	6.816	H5(null) rejected	
NADMSXLS	271	250.77				0	2	-2.814	146.331	8.889	1.130	6.821		
NADASXBH	130	139.86	7233.000	- 2.007	.045*	22.83 0 14.06	0.12	9.637	215.835	18.930	-	7.239	H6(null) rejected	
NADASXLS	130	121.14				5	4	12.299	215.698	18.918	1.029	6.70		
NADMASB H	123	129.21	6862.000	- 1.259	.208	- 20.85 0 12.38	0.08	10.579	247.386	22.306	-	5.864	H7(null) cannot rejected	be
NADMASLS	123	117.79				0		27.872	246.021	22.183	1.327	5.145		
NIDMXXBH	257	268.41	30221.500	- 1.665	.096	6.250 12.04	0.07	-21.362	577.733	36.038	-	4.219	H1(null) cannot rejected	be
NIDMXXLS	257	246.59				0		26.991	577.509	36.024	1.666	4.065		
NIDAXXBH	127	134.74	7145.500	- 1.570	.116	- 102.9 40 28.60	0.09	-38.667	856.105	75.967	-	11.851	H2(null) cannot rejected	be
NIDAXXLS	127	120.26				0		-21.354	856.713	76.021	2.374	12.443		
NIDSXXBH	840	880.22	319438.500	- 3.356	.001*	142.2 80 21.54	0.08	-4.210	331.534	11.439	-.770	3.587	H3(null) rejected	
NIDSXXLS	840	800.78				0	2	-4.388	331.534	11.439	1.263	3.693		
NIDMAXBH	97	101.64	4303.000	- 1.027	.305	64.24 0 118.4	0.07	-50.626	906.597	92.051	-.589	1.915	H4(null) cannot rejected	be
NIDMAXLS	97	93.36				00	4	-62.250	905.868	91.977	1.249	2.417		
NIDMSXBH	245	256.04	27431.000	- 1.647	.100	- 337.5 80 21.87	0.07	-22.408	581.270	37.136	-	3.751	H5(null) cannot rejected	be
NIDMSXLS	245	234.96				0	4	23.082	581.239	37.134	1.584	3.665		
NIDASXBH	117	124.38	6039.000	- 1.556	.120	110.2 40 93.17	0.10	-41.972	898.788	83.093	-	8.785	H6(null) cannot rejected	be
NIDASXLS	117	110.62				0	2	-46.104	898.594	83.075	2.074	9.570		
NIDMASBH	115	122.00	5865.500	- 1.481	.139	218.9 80 - 24.16	0.09	-40.990	870.280	81.154	-	10.337	H7(null) cannot rejected	be
NIDMASLS	115	109.00				0	8	-51.216	869.357	81.068	2.322	11.392		
SPDMXXBH	299	323.37	37564.000	- 3.378	.001*	212.5 60 1.000	0.13	.582	41.085	2.376	-	9.055	H1(null) rejected	
SPDMXXLS	299	257.63				8		-3.238	40.964	2.369	1.560	9.731		
SPDAXXBH	134	149.01	7033.500	- 3.065	.002*	11.67 8.805	0.18	1.710	61.375	5.302	-	15.495	H2(null) rejected	
SPDAXXLS	134	119.99				7		-3.170	61.317	5.297	2.539	15.876		
SPDSXXBH	916	978.31	362912.000	- 5.001	.000*	- 14.51 0 1.840	0.11	.216	25.120	.830	-.359	3.217	H3(null) rejected	
SPDSXXLS	916	854.69				7		-2.060	25059.8 27	828	.984	3.573		
SPDMAXBH	102	109.61	4477.000	-1.72	.085	5.570 6.535	0.12	1.770	68.939	6.826	-	11.664	H4(null) cannot rejected	be
											2.185			

SPDMAXLS	102	95.39				-			-2.360	68.929	6.825	2.433	11.789		
						17.83									
						5									
SPDMSXBH	265	288.27	29079.000	-	.001*	1.050	0.14	.656	44.539	2.736	-	7.998	H5(null)		
				3.423								1.631	rejected		
SPDMSXLS	265	242.73				-			-2.844	44.457	2.731	2.067	8.499		
						12.45									
						0									
SPDASXBH	122	136.24	5766.000	-	.002*	8.735	0.19	1.878	65.786	5.956	-	13.148	H6(null)		
				3.040								2.109	rejected		
SPDASXLS	122	108.76				-			-4.130	65.676	5.946	2.732	13.690		
						15.01									
						0									
SPDMASBH	127	137.93	6740.500	-	.024	3.820	0.14	1.425	66.478	5.899	-	21.926	H7(null)		
				2.262								3.087	cannot		be
													rejected		
SPDMASLS	127	117.07				-			-3.432	66.411	5.893	3.208	22.434		
						7.530									
						0									
SSDMXXBH	263	265.78	33984.500	-	.731	-	0.01	3.034	187.228	11.545	2.218	14.411	H1(null)		
				-3.44		5.700							cannot		be
													rejected		
SSDMXXLS	263	261.22				-			16.844	186.482	11.499	2.417	13.902		
						17.81									
						0									
SSDAXXBH	149	149.78	11058.500	-	.955	1.380	0.00	5.409	252.053	20.649	1.316	17.002	H2(null)		
				-0.56									cannot		be
													rejected		
SSDAXXLS	149	149.22				-			27.675	250.576	20.528	2.616	16.336		
						2.890									
						0									
SSDSXXBH	869	904.36	347290.500	-	.004*	2.280	0.06	1.276	85.901	2.914	-	11.678	H3(null)		
				2.895								1.154	rejected		
SSDSXXLS	869	834.64				-			-3.319	85.931	2.915	1.414	11.625		
						3.310									
						0									
SSDMAXBH	97	98.82	4576.000	-	.742	7.370	0.02	8.645	291.723	29.620	.219	6.477	H4(null)		
				-3.29									cannot		be
													rejected		
SSDMAXLS	97	96.18				-			27.669	290.522	29.498	1.590	5.980		
						29.05									
						0									
SSDMSXBH	235	237.43	27160.000	-	.759	-	0.01	3.395	199.991	13.046	2.334	14.109	H5(null)		
				-3.07		7.110							cannot		be
													rejected		
SSDMSXLS	235	233.57				-			19.189	199.102	12.988	2.501	13.548		
						19.61									
						0									
SSDASXBH	123	123.61	7550.500	-	.980	4.070	0.00	6.553	250.413	22.579	-2.04	6.547	H6(null)		
				-0.25									cannot		be
													rejected		
SSDASXLS	123	123.39				-			24.457	249.293	22.478	1.087	6.201		
						5.220									
						0									
SSDMASBH	123	130.03	6761.000	-	.150	4.090	0.09	7.634	284.971	25.695	-	12.458	H7(null)		
				1.440								1.759	cannot		be
													rejected		
SSDMASLS	123	116.97				-			20.737	284.317	25.636	2.719	11.557		
						20.66									
						0									

Table 2 Mann-Whitney Test and Explore data (Weekly)

Mann-Whitney Test				Explore data										Hypothesis
Samples	n	Mean Rank	Mann-Whitney U	Z	Asymp. p (2-tailed)	Median (Mdn)	Effect size r	Mean (M)	Std. Deviation (SD)	Std. Error (SE)	Skewness	Kurtosis		
CAWMXXBH	70	71.92	2350.500	-4.15	.678	68.110	0.035	25.753	416.824	49.820	-4.10	1.601	H1(null) cannot be rejected	
CAWMXXLS	70	69.08				-30.015		54.599	413.996	49.482	.648	1.170		
CAWAXXBH	41	45.95	658.000	-	.091	120.270	0.187	42.546	745.234	116.386	-2.953	11.288	H2(null) cannot be rejected	
				1.693										
CAWAXXLS	41	37.05				-85.300		99.666	739.625	115.510	2.685	9.263		
CAWSXXBH	257	280.84	27025.500	-	.000*	30.260	0.157	7.169	236.813	14.772	-1.002	4.524	H3(null) rejected	
				3.563										
CAWSXXLS	257	234.16				-50.700		-11.634	236.637	14.761	1.058	4.625		

FTWMSXLS	72	67.15						-85.300	19.233	387.574	45.676	1.303	2.131	rejected	
FTWASXBH	33	37.68	406.500	-	.077			233.800	0.218	95.327	553.299	96.317	-1.569	3.218	H6(null) cannot be rejected
				1.770											
FTWASXLS	33	29.32						-84.800		37.472	560.417	97.556	1.220	1.532	
FTWASBHS	41	48.35	559.500	-	.009*			143.600	0.288	74.841	459.066	71.694	-1.656	3.822	H7(null) rejected
				2.606											
FTWASLS	41	34.65						-		-65.876	460.474	71.914	1.420	3.495	
								129.300							
HSMXXBH	69	70.68	2299.000	-	.347	.729		283.200	0.03	216.719	2221.025	267.380	-.035	5.226	H1(null) cannot be rejected
HSMXXLS	69	68.32						100.400		398.187	2195.391	264.294	1.577	4.244	
HSWAXXBH	41	43.73	749.000	-	.849	.396		467.510	0.094	364.521	2040.131	318.615	-.755	.476	H2(null) cannot be rejected
HSWAXXLS	41	39.27						-		112.620	2066.935	322.801	-.141	-.046	
								219.200							
HSWSXXBH	247	258.62	27757.000	-	.083			92.920	0.078	72.196	1174.348	74.722	-.474	6.892	H3(null) cannot be rejected
				1.732											
HSWSXXLS	247	236.38						-		108.015	1171.582	74.546	1.057	6.441	
								109.000							
HSWMAXBH	35	38.36	512.500	-	.240			874.950	0.14	425.013	2255.908	381.318	-.851	.000	H4(null) cannot be rejected
				1.175											
HSWMAXLS	35	32.63						-53.590		-	2293.368	387.650	.032	-.658	
										122.772					
HSWMSXBH	65	66.89	2022.000	-	.421	.673		283.200	0.037	230.055	2248.709	278.918	-.037	5.287	H5(null) cannot be rejected
HSWMSXLS	65	64.11						100.400		402.290	2223.925	275.844	1.590	4.282	
HSWASXBH	37	39.57	608.000	-	.827	.408		611.540	0.096	383.983	1945.736	319.877	-.886	.561	H6(null) cannot be rejected
HSWASXLS	37	35.43						158.010		224.232	1971.235	324.069	.122	-.266	
HSWASBHS	45	50.58	784.000	-	.065			562.200	0.194	385.686	1981.785	295.427	-1.615	3.897	H7(null) cannot be rejected
				1.844											
HSWASLS	45	40.42						-		92.053	2017.653	300.774	1.192	2.114	
								175.530							
NAWMXXBH	81	90.82	2525.500	-	.011*			30.420	0.199	29.612	297.045	33.005	-1.194	6.855	H1(null) rejected
				2.529											
NAWMXXLS	81	72.18						-33.290		-9.563	298.377	33.153	1.427	6.435	
NAWAXXBH	53	60.64	1026.000	-	.017*			60.630	0.232	40.116	412.025	56.596	1.362	10.896	H2(null) rejected
				2.392											
NAWAXXLS	53	46.36						-40.380		7.294	413.947	56.860	2.284	11.086	
NAWSXXBH	250	268.96	26636.000	-	.004*			15.825	0.128	9.655	160.897	10.176	-1.184	10.073	H3(null) rejected
				2.856											
NAWSXXLS	250	232.04						-15.395		4.234	161.134	10.191	1.664	9.550	
NAWMAXBH	43	50.81	610.000	-	.007*			89.130	0.293	49.446	402.266	61.345	-.507	2.311	H4(null) rejected
				2.717											
NAWMAXLS	43	36.19						-89.130		-	386.489	58.939	-.293	1.982	
										120.846					
NAWMSXBH	71	80.28	1897.000	-	.011*			35.220	0.213	33.783	333.086	39.530	-2.008	11.320	H5(null) rejected
				2.544											
NAWMSXLS	71	62.72						-47.770		-9.691	334.678	39.719	2.109	10.520	
NAWASXBH	52	60.69	926.000	-	.006*			71.870	0.272	57.834	394.483	54.705	.200	4.903	H6(null) rejected
				2.770											
NAWASXLS	52	44.31						-43.830		-65.166	393.315	54.543	-.894	4.448	
NAWASBHS	49	57.40	813.500	-	.006*			67.190	0.278	43.005	457.009	65.287	-.859	7.269	H7(null) rejected
				2.750											
NAWASLS	49	41.60						-67.190		-74.250	452.900	64.700	.902	7.811	
NIWMXXBH	78	76.69	2900.500	-	.502	.616		-20.645	0.04	-	1415.943	160.324	.145	1.817	H1(null) cannot be rejected
										115.080					
NIWMXXLS	78	80.31						-		199.718	1406.378	159.241	1.144	1.130	
								204.275							
NIWAXXBH	42	42.25	871.500	-	.094	.925		29.445	0.01	-	2165.805	334.191	-.093	1.668	H2(null) cannot be rejected
										197.113					
NIWAXXLS	42	42.75						-		162.568	2168.741	334.644	1.035	1.354	
								310.940							

NIWSXXBH	253	258.27	30797.500	-.734	.463	-33.140	0.033	-30.141	848.822	53.365	-.196	2.325	H3(null) cannot be rejected
NIWSXXLS	253	248.73				-147.900		47.109	848.059	53.317	.832	2.174	
NIWMSXBH	68	67.40	2237.000	-.326	.744	-20.645	0.028	-132.003	1540.095	186.764	-.109	1.548	H5(null) cannot be rejected
NIWMSXLS	68	69.60				-204.275		264.985	1522.605	184.643	1.144	.814	
NIWASXBH	40	41.00	780.000	-.192	.847	-1.105	0.021	-206.970	2202.375	348.226	-.071	1.576	H6(null) cannot be rejected
NIWASXLS	40	40.00				-306.500		103.688	2209.838	349.406	1.075	1.363	
NIWMASBH	30	26.72	336.500	-1.678	.093	-343.500	0.217	-293.469	2079.379	379.641	-.168	1.502	H7(null) cannot be rejected
NIWMASLS	30	34.28				232.390		612.734	2006.122	366.266	.806	.714	
SPWMXXBH	93	105.08	3247.500	-2.934	.003*	12.080	0.215	10.617	81.171	8.417	-.676	4.913	H1(null) rejected
SPWMXXLS	93	81.92				-12.080		-3.270	81.797	8.482	1.706	4.691	
SPWAXXBH	40	47.35	526.000	-2.637	.008*	33.165	0.295	24.826	117.036	18.505	-1.481	4.586	H2(null) rejected
SPWAXXLS	40	33.65				-26.560		-2.961	119.667	18.921	1.192	3.063	
SPWSXXBH	255	281.27	25942.000	-3.949	.000*	7.200	0.175	4.042	47.411	2.969	-.900	2.956	H3(null) rejected
SPWSXXLS	255	229.73				-7.790		-2.769	47.507	2.975	.690	2.787	
SPWMAXBH	32	37.38	356.000	-2.095	.036	38.290	0.262	31.032	136.132	24.065	-1.331	2.714	H4(null) cannot be rejected
SPWMAXLS	32	27.63				-33.730		-6.565	139.572	24.673	.971	1.428	
SPWMSXBH	71	79.28	1968.000	-2.254	.024*	18.700	0.189	13.907	89.772	10.654	-1.074	4.126	H5(null) rejected
SPWMSXLS	71	63.72				-12.250		1.692	90.842	10.781	1.476	3.149	
SPWASXBH	35	41.74	394.000	-2.567	.010*	44.490	0.307	20.345	127.243	21.508	-2.152	5.830	H6(null) rejected
SPWASXLS	35	29.26				-32.020		2.178	128.888	21.786	1.773	3.940	
SPWMASBH	40	48.98	461.000	-3.262	.001*	40.140	0.365	17.617	136.661	21.608	-2.643	9.566	H7(null) rejected
SPWMASLS	40	32.03				-37.255		-13.358	137.154	21.686	2.602	9.065	
SSWMXXBH	72	72.82	2569.000	-.092	.927	12.360	0.008	19.487	533.071	62.823	-2.678	26.143	H1(null) cannot be rejected
SSWMXXLS	72	72.18				-2.720		96.859	524.441	61.806	4.277	24.119	
SSWAXXBH	44	44.43	965.000	-0.025	.980	-12.535	0.003	34.359	607.168	91.534	2.314	18.705	H2(null) cannot be rejected
SSWAXXLS	44	44.57				-14.980		109.270	598.027	90.156	3.923	17.331	
SSWSXXBH	214	219.73	21779.000	-.875	.382	3.380	0.042	6.351	196.698	13.446	.080	3.241	H3(null) cannot be rejected
SSWSXXLS	214	209.27				-9.900		-6.004	196.713	13.447	-.300	3.214	
SSWMSXBH	62	62.20	1903.500	-.092	.926	7.360	0.008	20.994	588.118	74.691	-2.187	20.649	H5(null) cannot be rejected
SSWMSXLS	62	62.80				-6.595		101.434	579.543	73.602	3.490	18.932	
SSWASXBH	38	38.22	711.500	-.109	.913	-39.945	0.013	38.839	657.083	106.593	2.107	15.690	H6(null) cannot be rejected
SSWASXLS	38	38.78				-10.505		129.682	645.007	104.634	3.548	14.308	
SSWMASBH	30	28.72	396.500	-.791	.429	-56.880	0.102	50.394	728.570	133.018	1.961	13.230	H7(null) cannot be rejected
SSWMASLS	30	32.28				22.545		223.629	694.047	126.715	3.322	11.884	

Table 3 Mann-Whitney Test and Explore data (Monthly)

Mann-Whitney Test						Explore data						Hypothesis	
Samples	n	Mean Rank	Mann-Whitney U	Z	Asymp. p (2-tailed)	Median (<i>Mdn</i>)	Effect size r	Mean (<i>M</i>)	Std. Deviation (<i>SD</i>)	Std. Error (<i>SE</i>)	Skewness		Kurtosis
CAMSXXBH	56	57.89	1490.000	-4.54	.650	83.535	0.004	27.264	442.009	59.066	-.422	.069	H3(null) cannot be rejected
CAMSXXLS	56	55.11				-74.955		55.519	439.308	58.705	.563	-.352	
DAMSXXBH	66	72.52	1780.500	-1.809	.070	138.025	0.014	82.023	671.890	82.704	.077	1.816	H3(null) cannot be rejected
DAMSXXLS	66	60.48				-138.025		22.483	676.578	83.281	1.110	1.650	
DJMSXXBH	61	68.60	1427.50	-2.217	.027*	226.190	0.018	162.517	780.845	99.977	-1.342	4.938	H3(null) rejected
DJMSXXLS	61	54.40				-155.120		-13.441	797.739	102.140	1.268	3.532	
FTMSXXBH	60	66.50	1440.000	-1.890	.059	179.400	0.016	50.907	413.038	53.323	-.013	1.317	H3(null) cannot be rejected
FTMSXXLS	60	54.50				-127.150		-59.337	411.892	53.175	.932	1.899	
HMSMXXBH	59	63.58	1499.500	-1.297	.195	440.550	0.011	235.622	2275.217	296.208	-.055	3.207	H3(null) cannot be rejected
HMSMXXLS	59	55.42				-504.710		171.240	2281.070	296.970	1.490	2.672	
NAMSXXBH	65	73.41	1596.500	-2.403	.016*	43.020	0.018	37.663	305.713	37.919	-.977	5.825	H3(null) rejected
NAMSXXLS	65	57.56				-34.040		14.302	307.720	38.168	1.240	4.932	
NIMSXXBH	51	50.46	1247.500	-3.55	.723	24.590	0.003	-159.674	1860.164	260.475	-.611	2.537	H3(null) cannot be rejected
NIMSXXLS	51	52.54				-246.130		315.646	1839.732	257.614	1.408	1.839	
SPMSXXBH	63	70.75	1528.000	-2.227	.026*	19.670	0.018	15.634	92.715	11.681	-.613	1.834	H3(null) rejected
SPMSXXLS	63	56.25				-22.530		-3.114	93.993	11.842	1.249	1.499	
SSMSXXBH	58	60.94	1540.500	-7.81	.435	-14.775	0.007	14.240	500.867	65.767	-1.592	13.413	H3(null) cannot be rejected
SSMSXXLS	58	56.06				-50.590		6.707	501.026	65.788	2.012	13.087	

References

- Alexander, S. S. (1961). Price Movements in Speculative Markets: Trends or Random Walks, *Industrial Management Review*, Vol. 2, pp.7-26.
- Alexander, S.S. (1964). Price movements in speculative markets: Trends or random walks, *Industrial Management Review* Vol. 5, pp.25-46.
- Antoniou, A., Ergul, N., Holmes, P., and Priestley, R. (1997). Technical analysis, trading volume and market efficiency: evidence from an emerging market. *Applied Financial Economics*, Vol. 7, pp. 361-365.
- Arditti F. D. (1978). Can Analysts Distinguish Between Real and Randomly generated Stock Prices?, *Financial Analysts Journal*, Vol. 34-6, pp. 70.
- Armstrong J.S. (1980). The Seer-Sucker Theory: The Value of Experts in Forecasting, *Technology Review*, June/July, pp. 16-24.
- Ashby, W. R. (1963). *Introduction to Cybernetics* New York: John Wiley & Sons.
- Bachelier, L. (1900). *Theorie de la Speculation* Paris : Gauthier-Villars.
- Ball,R. (1978). Anomalies in Relationships between Securities Yields and Yield-Surrogates, *Journal of Financial Economics*, Vol. 6, pp.103-126.
- Basu, S. (1977). Investment Performance of Common Stocks in Relationship to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis, *Journal of Finance*, Vol. 32, pp.663-682.
- Bernard, V. L. and H. N. Seyhun. (1995). Does Post-Earnings-Announcement Drift in Stock Prices Reflect a Market Inefficiency? A Stochastic Dominance Approach, *Review of Quantitative Finance and Accounting*, Vol.9 (1), pp.17-34.

- Bessembinder, H. & K. Chan (1995). The profitability of technical trading rules in the Asian stock market. *Pacific-Basin Finance Journal*, 3, 257-284.
- Black, Fischer, and Scholes, Myron S. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy*, Vol. 81, No. 3, pp. 637-654
- Blume, L. D., Easley, D., and O' Hara, M. (1994). Market statistics and technical analysis: the role of volume. *Journal of Finance*, Vol. 69, pp. 153-181.
- Bray, C. (2002). Program trading made up 35% of big board volume. *Wall Street Journal*, 3,C3.
- Brock, W., J. Lakonishok, and LeBaron, B. (1992). Simple technical trading rules and the stochastic properties of stock returns. *Journal of Finance*, 48(5), pp.1731-1764.
- Chan, K., Hameed, A., and Tong, W. (2000). Profitability of Momentum Strategies in the International Equity Market. *Journal of Financial and Quantitative Analysis*, Vol. 35, pp. 153-172.
- Cohen, J. & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd ed.). New York: Erlbaum.
- Coutts, J.A. and Cheng, K.C. (2000). Trading rules and stock returns: Some preliminary short-run evidence from the Hang Seng 1985-1997. *Applied Financial Economics*. 10, pp. 579-586.
- Cowles, A. (1933). Can Stock Market Forecasters Forecast? *Econometrica*, Vol. 1, pp. 309-324.
- DeBondt, W. F. M. and R. Thaler. (1985). Does the Stock Market Overreact?, *Journal of Finance*, Vol 40, pp.793-805.
- Eui Jung, C., Eduardo J. A. L. and Benjamin M.T. (2004). Testing for Predictability in Emerging Equity Markets, *Emerging Markets Review*, Vol. 5:3, pp. 295-316.
- Fama, E. (1965). The Behavior of Stock Market Prices, *Journal of Business*, Vol. 38 (1), pp.34-105.
- Fama, E. (1970). Efficient Capital Markets: A Review of Theory an Empirical Work. *Journal of Finance*, Vol 25, Issue 2, Papers and Proceedings of the Twenty-Eighth Annual Meeting of the American Finance Association New York, N.Y. pp. 383-417.
- Fama, E., L. Fisher, M. Jensen and R. Roll.(1969). The Adjustment of Stock Prices to New Information, *International Economic Review*, Vol. 10 (1), pp.1-21.
- Fama, E. & M. Blume (1966). Filter Tests and Stock Market Trading, *Journal of Business*, Vol. 39, pp. 226-241.
- French, K. (1980). Stock Returns and the Weekend Effect, *Journal of Financial Economics*, Vol. 8, pp.55-pp.69.
- Gency R. (1998). The Predictability of Security Returns with Simple Technical Trading Rules, *Journal of Empirical Finance*, Vol.5, pp.347-pp.349.
- George, T. J. and Hwang, C. Y. (2004). The 52-Week High and Momentum Investing, *Journal of Finance*, Vol. 59-5, pp.2145-2184.
- Granger, D. and O. Morgenstern. (1963) Spectral Analysis of New York Stock Market Prices, *Kyklos*, Vol. 16, pp. 1-27.
- Groth, J.C., Lewellen, W. G., Schlarbaum, G. G., and Lease, R. C. (1979). An Analysis of Brokerage House Securities Recommendations. *Financial Analysis Journal*, January/February, pp. 32-40
- Gultekin, M. and S. Gultekin. (1983) Stock Market Seasonality: International Evidence, *Journal of Financial Economics*, Vol. 12 (4), pp. 469-481.
- Hsu P.H. and Kuan C. M. (2005). Reexamining the Profitability of Technical Analysis with Data Snooping Checks, *Journal of Financial Econometrics* Vol. 3, no.4, pp. 606-628.
- Jaffe, J. (1974). Special Information and Insider Trading, *Journal of Business*, Vol. 47, pp.410-428.
- Jaffe, J. and R. Westerfield. (1985). The Weekend Effect in Common Stock Returns; The International Evidence, *Journal of Finance*, Vol. 40 (2), pp. 433-454.
- Jegadeesh N. (1990). Evidence of Predictable Behavior of Security Returns, *Journal of Finance*, Vol. 45, pp.881-898.
- Jegadeesh, N., and S. Titman. (1993) Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, *Journal of Finance*, Vol. 48, pp.65-91.
- Keim, D. B. (1983) Size-related Anomalies and Stock Return Seasonality: Further Empirical Evidence, *Journal of Financial Economics*, Vol. 17, pp.357- 390.
- Kiyamaz, H. (2002). The Stock Market Rumours and Stock Prices: A Test of Price Pressure and the Size Effect in an Emerging Market, *Applied Financial Economics*, Vol.12, pp.469-474.
- LeBaron, B. (1999). Technical Trading Rule Profitability and Foreign Exchange Intervention. *Journal of International Economics*, Vol. 49, pp. 125-143.
- Lehmann, B. (1990). Fads, Martingales and Market Efficiency, *Quarterly Journal of Economics*, Vol. 105, pp.1-28.
- Levy, R. A. (1967). Relative Strength as a Criterion for Investment Selection. *Journal of Finance*, Vol. 22 (4), pp. 595-610.

- Murphy, J.J. (2000). *Technical Analysis of Financial Markets*. New York Institute of Finance.
- Menkhoff, L. (1998). The noise trading approach-questionnaire evidence from foreign exchange, *Journal of International Money and Finance*, Vol. 17, pp.547-pp.564.
- Merton, R. (1980). On Estimating the Expected Return on the Market: An Exploratory Investigation. *Journal of Financial Economics*, Vol. 8 (4), pp.323-pp. 361.
- Neely, C., Weller, P., and Dittmar, R. (1997). Is Technical Analysis in the Foreign Exchange Market Profitable? A Genetic Programming Approach. *Journal of Financial and Quantitative Analysis*, Vol. 32, pp. 405-426.
- Niederhoffer V. and M. F. M. Osborne. "Market Making and Reversal on the Stock Exchange." *Journal of the American Statistical Association*, Vol. 61, pp. 897-916.
- Osborne, M. (1959). Brownian motion in the Stock Market, *Operations Research*. Vol. 7, pp.145-173.
- Osler C. L. (1998). Identifying Noise Traders: The Head and Shoulders Pattern in U. S. Equities, Staff Reports, Federal Reserve Bank of New York, Vol. 42, pp.39.
- Post, G. T. and P. van Vliet.(2004). Downside Risk and Asset Pricing, ERIM working paper.
- Pring, M. J. (1991). *Technical Analysis Explained: The Successful Investor's Guide to Spotting Investment Trends and Turning Points*. Mc-Graw Hill, 3 rd edition.
- Ratner, M. & Leal, R. P. C. (1999). Tests of technical trading strategies in the emerging equity markets of Latin America and Asia. *Journal of Banking & Finance*, Vol. 23, pp. 1887-1905.
- Roberts, H. (1959). Stock Market "Patterns" and Financial Analysis: Methodological Suggestions. *Journal of Finance*, Vol. 44, pp.1-10.
- Seeking α (2008) World Equity Market Declines: -\$25.9 trillion. [Online] Available from <http://seekingalpha.com/article/99256-world-equity-market-declines-25-9-trillion>. [Accessed: 2013-12-28]
- Seyhun, N. (1986). Insiders Profits, Costs of Trading and Market Efficiency, *Journal of Financial Economics*, Vol. 16, pp.189-212.
- Siegel, J.J. (1998). *Stocks for the Long Run*, 2nd ed. New York: McGraw-Hill.
- Taleb, Nassim (2007). *The Black Swan. The Impact of the Highly Improbable*. Random House.
- Talor, M.P., Allen, H. (1992). The use of technical analysis in the foreign exchange market, *Journal of International Money and Finance*, Vol. 11, pp. 304-314.
- Theil, H., Leenders, C. T. (1965). Tomorrow on the Amsterdam Stock Exchange, *Journal of Business*, Vol.38, pp.277-284.