PREDICTING INDEX PRICES USING MOVING AVERAGES

by

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Abstract

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This study is an effort to analyze the predictive capabilities of the moving average indicator as a technical analysis tool. Major stock exchanges of the world are selected which represent the numerous markets of the world and provide a basis for global investment decision making. The data selected as a sample is the adjusted closing prices of major indexes of the United States, London, Tokyo, Hong Kong, Shenzhen and Bombay from July 1997 to July 2013. Regression results are consistent with the weak form of the efficient market hypothesis. Insignificant coefficients and inadequate capability of the models to explain the variability in the index values were found as a result which leads to the conclusion that historical data is ineffective when the change in market index values needs to be determined.

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CHAPTER 1: INTRODUCTION

Purpose of Study

The identification and recognition of a trend in stock prices is crucial to be successful in the investment industry. Investors search for and spend huge amounts of money to gain advantage from indicators designed to give them signals of when to buy and sell financial securities. The Moving Average is the most popular technique among all such indicators. The purpose of this study is to examine whether the moving average indicator is worth the claim by investors and analysts.

The purpose of this tool is to provide a technique for prediction of future security price movements. Regression analysis is performed upon actual market data using closing prices to investigate if indexes can be predicted by past moving averages. A superior return can only be generated if the decision made by the Technical Analysis tool of moving average convergence divergence is accurate. Moving Average Convergence Divergence is a technical analysis indicator used to spot changes in trend of a price. It is elaborately explained in chapter 2. Data from some significant and prominent stock exchanges of the world is used to demonstrate how on a practical level investors and traders can benefit by making informed decisions.

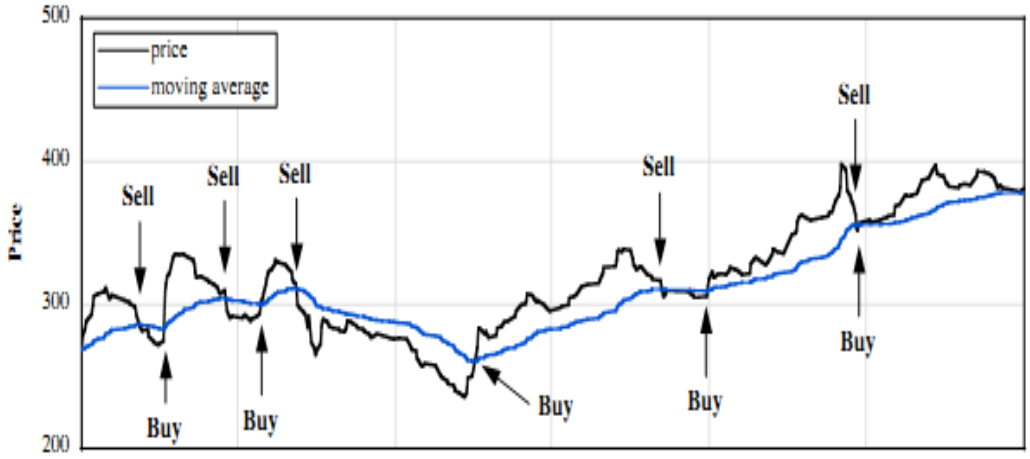
Background

The Technical Analysis approach involves predicting future price movements using past patterns in price, return, volume and other statistics to develop trading rules to exploit recurring and predictable patterns in stock prices to generate abnormal trading profits. This process includes recording market activity in the form of graphics (charts) and deducing the trend that is most likely to occur in the short and long term future from

the available pictured history. In comparison to fundamental analysis which focuses on determining the intrinsic value of the stock price to predict the future price movement, the technical analysis approach advocates the interaction between supply and demand of the stock as the sole determinant of price. Prices are expected to exhibit geometric regularities which allow traders to identify the prevailing trend and to execute a profitable trading strategy.

Moving average trading strategy is based on the systematic buy or sell decisions when the price crosses its average level. Since prices are normally assumed to follow a random walk process, they are either on an uptrend or on a downtrend at a particular point in time. The period of rising prices is called an uptrend whereas the period of falling prices in known as a downtrend. When recent prices are higher than previous prices and rise above their average from below there an uptrend exists and the response should be to buy the financial instrument. When recent prices are lower than previous prices and fall below their average a downtrend exits and the response should be to sell the financial instrument. The moving average trading strategy is profitable if the changes in price level between buy and sell signals is enough to cover the costs involved.

Moving Average Indicator: Buy and Sell chart



Source: http://investorplace.com/2013/07/daily-stock-market-news-time-to-buy-beaten-down-high-yield-stocks/

Research Relevance

The findings of this study will add to the existing empirical evidence on the effectiveness of moving average convergence divergence as a tool by exploring trends in various stock exchanges of the world. The relevance of the moving average can be recognized by the stock's reaction. If the prices react to changes in the moving average then the indicator can be useful in predicting future movements. The significance of the moving average indicator is also evident when compared to other indicators which exhibit immense variation in price movement which makes it difficult to get an idea of the overall trend. By plotting the average price the movement is smoothed out.

Research Limitation

The moving average operates with certain limitations which have certain practical implications and it is hence advisable for traders to evaluate repercussions. The traders should conduct careful analysis due to the possibility of wrong signals when bonus or dividend is paid. Another factor worth consideration is any news of significant nature which may influence the formation of the moving average. Systematic evaluation of such news should be performed to examine the tentative impact on the moving averages.

CHAPTER 2: LITERATURE REVIEW

Technical Analysis

Technical analysis is the technique used to identify and utilize patterns of price history of a stock to indicate the future direction of prices. It can also be described as a method of forecasting through which attempts are made to estimate the future behavior of prices based on past observations.

Technical analysis emerged in Japan during the 18th century and was in the form of candlestick techniques. Technical analysis has evolved and notable progress that emerged was the "Dow Theory" named after Charles Dow which can be considered the ground model for the modern aspect of technical analysis. The theory was a result of a compilation of 255 Wall Street journal editorials composed by Charles Dow in the 19th century. He presented theories on how to trade stocks profitably and highlighted the various movements of the stock market. He stated "The market is always to be considered as having three movements, all going on at the same time. The first is the narrow movement from day to day. The second is the short swing, running from two weeks to a month or more; the third is the main movement, covering at least four years in its duration."(Dow, 1900 cited by William Peter Hamilton 1922, p.30). Despite the wide acceptance and utilization of this theoretical philosophy, it has been questioned by several scholars on various grounds.

Prings (2002, p.2-3) defines technical analysis as a method "To identify a trend reversal at a relatively early stage and ride on that trend until the weight of the evidence shows or proves that the trend has reversed." Whilst Murphy (1999, p.1) defines it "as the

study of market action, primarily through the use of charts, for the purpose of forecasting future price trends."

There exists an overwhelming skepticism among academicians regarding the use of technical analysis. The reasons of misconceptions include:

- Technical analysis in academic finance comprises of several variables which are not measureable. The profitability and credibility of technical analysis is discredited by the Efficient Market Hypothesis theory and the Random Walk theory.
- The theoretical justification of charting techniques is difficult and the academics are unfamiliar with the jargons used to express them.

Principles of Technical Analysis

Three market factors are analyzed by studying price movements on the market through technical analysis: open interest, price and volume. The primary factor is price and alterations in other factors are used to confirm the accuracy of a known price trend. Core postulates of technical analysis include:

- All market actions are discounted in the stock price. This means that any factor that may influence or information (economic, political or psychological) that has potential impact on the price of securities is already incorporated in the price of the stock.
- The basis for all methods of technical analysis is that market prices move in accordance with trends that can be analyzed. This assumption suggests that the price movement due to a trend has two effects. First, the current trend will most likely continue and will not reverse. Second, the current trend will continue until the opposite trend begins.

- The studies of the past are essential for understanding the future as history repeats itself. Studies of market dynamics and technical analysis are related to human psychology and the core characteristics related to the psychological state of the market are depicted through the graphical price models classified previously. The prevailing sentiment in the market (bullish or bearish) can be recognized and if models have been successful in the past there is reason to believe that they will continue to work in the future as they are based on human psychology which remains unchanged over the years.

Types of Technical Analysis

Among the several technical analysis techniques, the traditional two forms that analysts have resorted to are: Indicator method and Charting method. The oldest among the two is Charting which includes graphing the historical data over a period of time specified by the analyst. The analysts use their own judgment to forecast future patterns as there is no defined procedure making this method subjective. Consistency can be observed in the Indicator method as discipline is imposed on the analyst. The analyst in this case is required to conform to mathematical rules to predict future patterns.

The Indicator method is favored by the economists as compared to the Charting method because it removes the subjectivity issue. Technical rules in the equity market that are studied more than others include: Moving Average, Channel and the Filter rule.

- When prices rise (fall) by more than a stated percentage from its most recent low (high) the filter rule suggests a buy (sell) signal.
- A long and short term moving average of historical prices is compared by the moving average rule. If the short term moving average intersects the long term moving

average from below it is a signal to buy whereas if the short term moving average intersects the long term moving average from above it is a signal to sell.

- The channel suggests a buy (sell) the asset when the price increases (decreases) the maximum (minimum) over the previous n days.

Recent innovations in indicators captivated the analysts more than the traditional rules. The newer indicators use mathematical functionality to determine when to buy or sell and include: Rate of Change (ROC), Moving Average Convergence Divergence (MACD), Relative Strength Indicator (RSI) and Exponentially Weighted Moving Average (EWMA).

Moving Average Convergence Divergence (MACD)

Moving Average Convergence Divergence was developed by Gerald Appel in the late seventies and illustrates correlation among two moving averages of price and is utilized to spot changes in the strength, direction, momentum, and duration of a trend in a stock's price. A histogram was added to the MACD in 1986 by Thomas Aspray to anticipate crossovers and demonstrate important changes in the underlying security. The MACD indicator / oscillator comprises of three signals (computed data series) based on previous price data usually the closing price including: the difference (divergence), the MACD line and the signal line (average line). The MACD line is the difference between a fast (short term) moving average and a slow (long term) moving average. It is presented on a chart with the time period on one axis and the signal (average) line. The difference (divergence) among the MACD line and the average line is visible as a bar graph known as the histogram of time series. The fast (short term) moving average responds quickly compared to the slow (long term) moving average to variation in a security’s price. A

comparison of moving averages belonging to different time periods will indicate variation in the trend of a price. Based on moving averages, the MACD is inherently a lagging indicator however it does not lag as much as a crossing indicator of simple moving average because the signal cross is anticipated by observing convergence in advance of the actual crossing. The exhibition of fluctuation in MACD above and below the zero line when the moving averages diverge, converge and cross makes it one of the most simplest and effective momentum oscillators available.

Efficient Market Hypothesis

The general concern of the EMH theory is based on the premise of prices fully reflecting all available information at any point in time. With reference to the theory no excess profits can be generated through trading based on any information because that information would already have been reflected in the price making fundamental and technical analysis obsolete. A review of previous empirical studies suggests that it is impossible to exploit information for predicting future changes in price and the successive changes in price are independent. There is extensive evidence supporting EMH and there are three forms of efficient markets:

Weak form - in this form all historical prices are incorporated in current prices. This means technical analysis does not provide any profitability or predictability. Before the 1970s all tests conducted were centered around evaluating the ability of historical prices to predict future prices but recent studies in this area concentrate on predictive capabilities of interest rates and financial ratios.

Semi Strong form – in this form all previously available public information is included in the prices. Price changes in this market were instant subsequent to new information.

This phenomenon makes technical and fundamental analysis ineffective in this form of market.

Strong form – in this form of market no investor is able to beat the market in any way and cannot take advantage of any superior ability. All information available to private and public groups has been incorporated in the prices. Studies related to this form of market focus on determining if certain groups with advantage of information monopoly are able to gain excess returns.

Three other assumptions are also considered a part of the EMH theory:

- Rational investors are professional economists because they carry out fundamental analysis related to expected return and risk prior to investing.
- Trading activities of irrational investors are random as they result in nullifying each other and market belongs to the rational investors.
- Any deviation in prices from its efficient level will be corrected by market arbitrage. Prices will stay at an efficient level when investors are rational because arbitrage activity will take place when there are imbalances in existing prices.

Random Walk Theory

Random Walk Theory is a stock market theory and is based on the notion that the past movement or direction of a stock price or market cannot be used to predict its future movement. It states that the fluctuations in the price of the stock are independent of each other, have a similar probability distribution and maintain an upward trend over a period of time. Followers of this theory believe that it is not possible to outperform the market without assuming additional risk because stocks follow an unpredictable and random path and the probability of a stock's price in future going up is the same as it going down.

Extensive empirical data exists supporting this theory but there is also evidence and research that contradicts it.

Behavioral Finance

Behavioral Finance studies the impact psychology has on the behavior of individual financial practitioners and effects on the markets. The study of this theory opposes the Efficient Market Hypothesis theory as it explains why and how the market may be considered inefficient. It also helps in explaining the irrational behavior of traders. This new field of study in finance is focused on utilizing concepts of psychology to understand how traders behave in relation to market movement. Loss aversion, overconfidence as well as other biases often leads to investors behaving irrationally and the market consists of both rational and irrational investors. If irrational investors are dominant in a market then the market will shift from its efficient level and this phenomenon will result in trends that are predictable.

CHAPTER 3: METHODOLOGY AND DATA SOURCES

The Model

The research aims at checking whether the major stock exchanges namely S&P500 index (United States), FTSE100 index (London), NIKKEI225 index (Tokyo), Hang Seng Index (Hong Kong), SZSE index (Shenzhen, China) and SENSEX index (Bombay, India) can be predicted by past moving averages. These stock exchanges are selected due to their market capitalization as of December 31, 2012. Monthly data is collected from Yahoo! Finance from July 1997 to July 2013 and regression analysis is performed using the following:

$$\Delta INDEX_{t} = \alpha_1 + \beta_1 INDEX_{t-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta INDEX_{t} = \alpha_2 + \beta_2 SMA_{t-1} + \varepsilon_{2t} \quad (2)$$

where $\Delta INDEX_t = INDEX_t - INDEX_{t-1}$ is the month-t change of the index values, $INDEX_{t-1}$ is the index values at the end of month t-1 and

$$SMA_{t-1} = \frac{1}{2} \times (INDEX_{t-1} + INDEX_{t-2})$$

is a short-term moving average, i.e. a 2-month moving average. The 12-month long-term moving average is defined as:

$$LMA_{t-1} = \frac{1}{12} \times (INDEX_{t-1} + INDEX_{t-2} + \ldots\ldots\ldots + INDEX_{t-12}) \quad (3)$$

and regression analysis is performed using the following:

$$\Delta INDEX_{t} = \alpha_3 + \beta_3 LMA_{t-1} + \varepsilon_{3t} \quad (4)$$

$$\Delta INDEX_t = \alpha_4 + \beta_4(SMA_{t-1} - LMA_{t-1}) + \varepsilon_{4t} \quad (5)$$

The test of moving average oscillator trading rule in (5) will determine the difference between the two moving averages and provide the trader with a positive reading when the short term moving average is above the long term moving average and a negative reading when the short term moving average is below the long term moving average. Oscillators are used to measure momentum which can be the percentage change between current price and a price that occurred specified periods earlier. The oscillator values are observed in comparison with a central value of zero and when the oscillator values cross zero it indicates a change in trend. The market is accelerating away from the long term average when the oscillator movement is significantly away from zero.

For each of the regressions, the estimates of the intercept and the slope are reported to identify the unit change caused by previous month's data and the t-statistics and R^2 values are reported to identify the statistical significance of the coefficients and how well the defined models are able to explain the variation.

Finally, the results will provide the opportunity to conclude whether or not past prices contain significant information for predicting future price changes.

Data

The data set for this research consists of the adjusted closing prices for the indexes from July 1997 to July 2013. The historical prices are available at Yahoo! Finance and the STATA software has been utilized to generate regression results based on the short term and long term moving averages. To investigate the significance of this tool as a predictor of future trend in the S&P500 index, FTSE100 index, NIKKEI225

index, Hang Seng Index, SZSE index and SENSEX index the observations are ranged as time series data. The data is chosen to identify if the results conclude that past prices contain significant information to explain the changes in current prices or not. Since it was not possible to take into account all the stock exchanges, major stock exchanges were selected as an appropriate representation in order to achieve a good reflection.

Methodology

The difference of the index values and their value at month t-1 is generated using STATA and is represented by variables that measure the current level in comparison to the prior level. This determines the strength of change every month and the short term moving average of the index values at month t-1 and at month t-2 is generated similarly to determine the average values of the index over a 2 month period.

Firstly, regression analysis is performed based on the variables that measure the change in the index values and the variable that includes 1 month lagged values. The change variables are then regressed with the short term moving average variables to determine the explanatory power of the model through the R^2 values and the estimated slope values are represented by the coefficients of the one period lagged variable. The t-statistic values and p-values represent the statistical significance of the variables.

Next, the 12 month long term moving average variable is generated by creating 12 lagged variables based on the historical adjusted closing price data. The one period change in index value variable is regressed with the 12 month long term moving average variable and another variable is generated to measure the difference between the short term moving average and long term moving average. Regression analysis is again used to

determine the explanatory capacity of the models as well as the statistical significance of the estimated slope values represented by the coefficients. A 95% confidence level is used to identify the statistical significance of the slope estimates.

CHAPTER 4: RESULTS

Regression summary, Interpretation and Analysis

The slope coefficients are insignificant where the t-statistic values are less than 1.97 which is the critical value for a 95% confidence interval. Regression (4) for the SZSE index has a t-statistic value which is greater than 1.97 and a p-value which is less than 0.05. This indicates that the coefficient is significant and supports Technical Analysis. The positive significant slope coefficient means there is a positive correlation between stock price change and the moving average convergence. When short term moving average is smaller than the long term average there will be a declining pressure on the stock price and vice versa.

Statistically insignificant slope estimates of the short term moving average and the long term moving average suggest that results are not supportive of technical analysis and that past prices do not offer a good explanation for changes in the current prices. The R^2 values are low which indicates that changes in the current prices of the indexes cannot be fully explained by historical prices and the results are consistent with the weak form of efficient market hypothesis.

The values of slope estimates (β coefficients), t-statistic values, P-values, R^2 values and standard errors are summarized below:

4.1.1. FTSE100

$$\Delta FTSE100_t = 218.6485 - 0.03863 FTSE100_{t-1} \quad (1)$$

$$\Delta FTSE100_t = 229.4511 - 0.04053 SMA_{t-1} \quad (2)$$

$$\Delta FTSE100_t = 274.6658 - 0.04992 LMA_{t-1} \quad (3)$$

$$\Delta FTSE100_t = 3.670781 + 0.015516\ (SMA_{t-1} - LMA_{t-1}) \quad (4)$$

FTSE 100	β	t	P value	σ	R^2
1	-0.03863	-1.84	0.068	0.021024	0.0175
2	-0.04053	-1.9	0.059	0.021323	0.0188
3	-0.04992	-2.12	0.035	0.023498	0.0246
4	0.015516	0.36	0.717	0.042788	0.0007

The predicted change in the FTSE 100 index will not be reliable as indicated by the t-statistic value and the p-value. The R^2 value suggests that the prior month's price of the FTSE 100 index does not have a significant impact on the future price. The measurement of change in FTSE 100 based on a two month short term moving average is also not reliable as indicated by the t-statistic and p-values. The R^2 value here similarly suggests weak explanatory power of the two month short term moving average to changes in the FTSE 100 index. The twelve month long term moving average consists of an average price of the past twelve month's values of the FTSE 100 index. The t-statistic value and p-value give contrary results but considering the R^2 value it is evident that the twelve month long term moving average does not provide sufficient explanation for changes in the FTSE 100 index. The difference between the two month short term moving average and the twelve month long term moving average also provides an unreliable estimate as indicated by the p-value which is greater than 0.05, t-statistic value which is less than 1.97 and the R^2 value which states that the difference between the two month short term

moving average and the twelve month long term moving average does not provide sufficient explanation for changes in the FTSE 100.

4.1.2. HSI

$$\Delta HSI_t = 468.284 - 0.0270785 HSI_{t-1} \quad (1)$$

$$\Delta HSI_t = 511.5339 - 0.0290382 SMA_{t-1} \quad (2)$$

$$\Delta HSI_t = 747.7887 - 0.041733 LMA_{t-1} \quad (3)$$

$$\Delta HSI_t = 71.75242 + 0.0076965\ (SMA_{t-1} - LMA_{t-1}) \quad (4)$$

HSI	β	t	P value	σ	R^2
1	-0.02708	-1.52	0.13	0.017805	0.012
2	-0.02904	-1.63	0.105	0.017835	0.0138
3	-0.04173	-2.2	0.029	0.018932	0.0264
4	0.007697	0.19	0.849	0.04041	0.0002

Forecasted change in the HSI index based on prior month's price will not provide a reliable estimate as the slope coefficient is insignificant indicated by the p-value, t-statistic value and the R^2 value. Predicting change in the HSI index based on the two month short term moving average will also not be reliable due to the statistical insignificance of the β coefficient in the model used. The twelve month long term moving average does not offer a reliable estimate of changes in the HSI index due to the weak R^2 value indicating insufficient explanatory power of the model used. The difference

between the twelve month long term moving average and the two month short term moving average also fails to explain changes in the HSI index.

4.1.3. NIKKEI 225

$$\Delta NIKKEI225_t = 476.9902 - 0.0401882 NIKKEI225_{t-1} \quad (1)$$

$$\Delta NIKKEI225_t = 432.0002 - 0.0358471 SMA_{t-1} \quad (2)$$

$$\Delta NIKKEI225_t = 596.8147 - 0.0483348 LMA_{t-1} \quad (3)$$

$$\Delta NIKKEI225_t = -2.868802 + 0.0076965\ (SMA_{t-1} - LMA_{t-1}) \quad (4)$$

NIKKEI 225	β	t	P value	σ	R^2
1	-0.04019	-2.45	0.015	0.01643	0.0305
2	-0.03585	-2.18	0.03	0.016424	0.0246
3	-0.04833	-2.71	0.007	0.017847	0.0394
4	0.053555	1.45	0.15	0.03704	0.0115

The p-values and t-statistic values for the NIKKEI 225 index offer contradictory results as the p-values are less than 0.05 which indicates statistical significance whereas t-statistic values are less than 1.97 which indicates statistical insignificance of the estimates of the slope coefficients. The difference between the two month short term moving average and the twelve month long term moving average used to identify change in the NIKKEI 225 index can be stated as unreliable with certainty due to the statistical insignificance of the coefficient. An observation of the R^2 values reveals greater

explanatory power of the statistical models used in comparison to other indexes but it does not ascertain the reliability of the models used.

4.1.4. SENSEX

$$\Delta SENSEX_t = 118.0092 - 0.0038399 SENSEX_{t-1} \quad (1)$$

$$\Delta SENSEX_t = 125.5493 - 0.0043422 SMA_{t-1} \quad (2)$$

$$\Delta SENSEX_t = 163.0241 - 0.0074262 LMA_{t-1} \quad (3)$$

$$\Delta SENSEX_t = 83.95261 + 0.0167415\ (SMA_{t-1} - LMA_{t-1}) \quad (4)$$

SENSEX	β	t	P value	σ	R^2
1	-0.00384	-0.41	0.684	0.009429	0.0009
2	-0.00434	-0.46	0.648	0.009503	0.0011
3	-0.00743	-0.72	0.475	0.010375	0.0029
4	0.016742	0.41	0.684	0.041056	0.0009

The prices of the SENSEX index cannot be determined reliably by using a model that consists of a slope estimate based on prior month's price. Similarly the two month short term moving average also does not give a reliable value for the SENSEX index. The twelve month long term moving average used to identify the possible price for the SENSEX index does not provide sufficient evidence to conclude it has impact on the changes in the SENSEX index. The difference between the twelve month long term

moving average and the two month short term moving average also cannot be relied upon when estimating the price of the SENSEX index.

4.1.5. SNP 500

$$\Delta SNP500_t = 36.29154 - 0.0268537 SNP500_{t-1} \quad (1)$$

$$\Delta SNP500_t = 44.56292 - 0.0334546 SMA_{t-1} \quad (2)$$

$$\Delta SNP500_t = 65.66814 - 0.0519069 LMA_{t-1} \quad (3)$$

$$\Delta SNP500_t = 2.590297 + 0.0349061\ (SMA_{t-1} - LMA_{t-1}) \quad (4)$$

SNP500	β	t	P value	σ	R^2
1	-0.02685	-1.34	0.183	0.020086	0.0093
2	-0.03345	-1.64	0.102	0.020387	0.014
3	-0.05191	-2.12	0.036	0.024523	0.0244
4	0.034906	0.89	0.375	0.039261	0.0044

Changes in the SNP 500 based on prior month's price will not be accurate as indicated by the insignificance of the slope estimate in the model. The SNP 500 also does not follow any predictive pattern based on a two month short term moving average. Analyzing the result for the twelve month long term moving average as a predictor for change in SNP 500 revealed that the model does not provide statistically significant outcome. Analysis of the difference between the twelve month long term moving average and the two month

short term moving average exposes the weakness in the model to forecast changes in the SNP 500.

4.1.6. SZSE

$$\Delta SZSE_t = 159.4626 - 0.0213038 SZSE_{t-1} \quad (1)$$

$$\Delta SZSE_t = 165.3782 - 0.0220608 SMA_{t-1} \quad (2)$$

$$\Delta SZSE_t = 313.3472 - 0.0434816 LMA_{t-1} \quad (3)$$

$$\Delta SZSE_t = 13.10037 + 0.0734877\ (SMA_{t-1} - LMA_{t-1}) \quad (4)$$

SZSE	β	t	P value	σ	R^2
1	-0.0213	-1.45	0.149	0.014709	0.0109
2	-0.02206	-1.49	0.138	0.014826	0.0116
3	-0.04348	-2.71	0.007	0.016057	0.0394
4	0.073488	2.21	0.028	0.033275	0.0265

The SZSE index, when the difference between the two month short term moving average and the twelve month long term moving average is analyzed offers a significant coefficient but the weak explanatory power of the model represented by the low R^2 value indicates that additional relevant variables will be required to improve the effectiveness of the model. 7.35% of the difference between the two month short term moving average and the twelve month long term moving average contributes towards the positive change in the SZSE index for the selected data period. The one month, two month and the twelve

month models are not statistically significant and are not capable of having a strong impact on change in the SZSE index.

CHAPTER 5: CONCLUSION

The models used to predict change in the FTSE 100 index, HSI index, SENSEX index, SZSE index, SNP 500 index and NIKKEI 225 index for the period July 1997 to July 2013 were not effective and proved that the historical prices were unable to provide an explanation for changes in the indexes. The significant coefficient for the SZSE index when considering the difference between the two month short term moving average and the twelve month long term moving average suggested potential for determining change but additional significant variables are required to generate a higher R^2 value which will enable the model to be used as a successful technical analysis tool. A vital step would be the correctly identify and include adequate variables through conducting further research. Market indexes are influenced by impact of news and shocks that recently occurred and caused an unpredictable change in the indexes during the selected period. Optimism is reduced for shares with a high volume of trade but is more pronounced for large shares that are traded by foreigners in the SZSE index causing a change in the price that is beyond the explanatory capacity of the models used and this is contrary to the efficient market hypothesis. Factors such as regulatory change and human behavior can divert index levels from the results provided by the moving average and hence contribute towards the unreliability of the models. Unlike the developed markets, Chinese stock market is not sufficiently sound in institution, operation and supervision. Players on the ground acts more like speculators than investors. Therefore, the model or the thought of structuring the model that performs well in developed markets, such as the US, Japan, London and so on, would not deliver a reliable answer in emerging and undeveloped markets. Compared to stock markets in the world, where institutional investors are

majority, in China, individual investors account for most of the security holders. This boosts the volatility of the market movement and makes the prediction model perform poorly.

Moving average convergence divergence is unique in that it has lagging elements as well as leading elements. By taking the differences in the moving averages, the Moving average convergence divergence tool incorporates aspects of momentum or leading elements. The difference between the moving averages represents the rate of change. By measuring the rate-of-change, moving average convergence divergence becomes a leading indicator, but still with a bit of lag. With the integration of both moving averages and rate-of-change, moving average convergence divergence has forged a unique spot among oscillators as both a lagging and a leading indicator.

Numerous findings indicate that the random walk hypothesis may strongly be rejected for the Shenzhen market due to autocorrelation and heteroscedasticity. The tests conducted in this study and examination of the random walk hypothesis by using monthly data of major market indexes from July 1997 to July 2013 demonstrate that stock markets behave in a manner which is consistent with the weak form of efficient market hypothesis. Factors such as new competitors, change in demand for product or service in the industry and changes in the managerial structure of the company have the potential to have a significant impact on the future direction of the price. These factors are not accounted for by the moving average tool and extremely volatile prices of certain industries due to influence of current events are also beyond its predictive capacity. Since the moving averages tool may also overlook certain important statistical information such as cyclical patterns, it can be best utilized in conjunction with other tools.

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