Digital Recreation and Game Design for E-Commerce Trading of Taiwan Weighted Index by Using MATLAB and Technical Analysis Skill

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***Abstract*—In this study, a special topic for digital recreation and game design for e-commerce mainly takes MATLAB software as the core, combine the existing software function of stock market, and determine the opportunity to buy or sell by technological analysis of Moving Average (MA) and Moving Average Convergence and Divergence (MACD). This paper investigates the performance of trading strategies identified through computational techniques. Technological analysis relatively lays particular emphasis on the grasp of the investment opportunity. Its definition and judging the criterion will select 'the line of moving average' to carry on research and analysis in this special topic. The main method of this case study, use software and hardware apparatus of the computer, finish the numerical simulation, buy and sell the relevant stock market indexes by using MATLAB software, obtain the correct judged result and to buy or to sell the Taiwan Weighted Index (TWI) in 2010.**

***Index Terms*—Digital recreation, Game design, Stock market operates, Technical analysis, MATLAB, Moving average, MACD, TWI.**

I. Introduction

Digital Recreation and Game Design for E-Commerce Trading of Taiwan Weighted Index is studied by this work, The procedure apply to Taiwan Weighted Index (TWI) to buy and to sell design system by using MATLAB software [1], designing for a kind of investment type for e-commerce using, usually the investment theory is comparative widely used and not easy to control, and technological analysis is by researching and analyzing over the stock market price index tendency, it is easier to control that to determine the opportunity to buy or to sell. The basic assumption prerequisite of technological analysis is: Though space-time change, history recurs, grasp of stock price change, etc. The technical analysis method is to predict the future stock price tendency that can be a correct. technological and method of the investment, the common technological analytical methods have K lines, price amount quantity level, RSI, OBV, MACD, ADL, etc. [2]. Their definition and judging the criterion will select some important factors to carry on research and analysis in this special topic. Technical Analysis (TA) focuses on the identification of price patterns and trends, as well as, the use of mechanical rules to generate valuable economic signals by Sullivan et al. [3]. Cheung and Chinn [4] suggest that TA has been a major constituent of financial practice in foreign exchange markets. Moreover, a number of empirical as well as theoretical studies by Grauwe and Grimaldi [5] during the past three decades suggest that the application of TA in the foreign exchange market can yield substantial excess returns. These findings raise doubts on the validity of the efficient market hypothesis. Olson [6] argues that abnormal profit opportunities arise due to temporary inefficiencies which are in accordance with an evolving market. He further argues that the returns of simple trading rules over recent periods have declined, if not completely disappeared. Technological analysis is according to the studying and judging and buying or selling of the indicator, investors must buying or selling frequently, the result that may fell into short period of time operation, let the transaction cost corrode the rate of returns payment of investment constantly. So, if consider the transaction cost, make the investment according to the technological analysis method, its rate of returns payment can not be too high, but can yet be regarded as small and compensate the great method to earn the money. TWI is bought and sold for the trading of futures, being abbreviated as is a futures contract. The futures contract means both parties agree until one time or a certain particular time to buy and to sell in a certain trading at the price reach in advance. Usually the future contract will only be bought and sold in the exchanged stock market. The futures bought and sold in the exchange market, are usually designated articles (such as the Taiwan Weighted index), and the size of each contract, has already been set up by the exchange market. But according to investor point of view, futures trading field to buy and to sell transparency relatively high, contract price change fallen to rise can cover all at one glance in the area on a large group of interests. Meanwhile, futures contract has another advantage in the field, it is one that hands in and guarantees the deal contract can be fulfilled. This research tries hard to avoid the special influence factor of the personal factor and carry on research with the index changing market. This special topic is by using the MATLAB software to buy and to sell game design program, buying and selling according to every indicator signal set up by the technical analysis system. This study is utilized MATLAB software and the computational analysis results to compare the results for different cases; this research way can also be applied to the true trading market and consulted as the user's training. The trading rules within the family of technical analysis have been mostly designed with parameters adopted from general trader practices such as the choice of durations in the MA methods. On the other hand, optimizing and tuning of the rule are foreshadowed to enhance trading profit ability. The paper is an extension

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work for Hsiao et al. [7], and increasing the MACD technique in this study, from the results can obtain a good comparison with the two different methods for MA and MACD technical analysis skill.

II. Moving Average Rule

The moving average trading rule can be considered as a delayed indicator of price or index variations. The MA rules are able to filter out fluctuations that could reduce risks incurred from trading with market sentiments. Rules are derived by averaging past price records over some durations. Crossing of the traces of two averages with short and long durations are then used to generate buy or sell signals. A. Moving Average and Trading Signals Consider the N-day moving average $M_{t,N}$ given by [1]

$$M_{t,N} = \frac{1}{N} \sum_{j=t-N+1}^{j} P_j \quad (1)$$

where the subscript t denotes the current trading day, P_j is the closing price of a trading day. The closing prices for the previous N days are averaged. With shifts in the current trading day, t, a series of average is obtained and is used to generate trading signals. There are some buying points and selling points in the moving average rule as following:

A. Buying points

1) Moving average fell gradually away from the flat (slope tends to zero), while the average share price below the break from the average (for a more visible stand on the red K bar), this is the buy signal.

2) Although below the average share price below the line, but then back to the average over time, and the moving average rose of the signs are up, this is the buy signal.

3) Stock prices above the average, and average upward slope, but the price trend turned down from the pull-back, this is buying signal.

4) Stock is currently in decline, the average down significantly, if a sudden plunge, and with the average deviation is too large, the rebound can be bought, because the share price is usually close to the moving average line again.

B. Selling point:

1) Moving average rising gradually away from the trend level, while average stock price from the top down below the average, this is the sell signal.

2) Although the rise in share price exceeded the average line, but then returned to below average, and average from a flat or even turn up at the next bend, the sell signal.

3) Shares at an average trend line to go below the line, and the average slope down, stock prices rebounded after weakening again, as a strong sell signal.

4) Stock is rising and walking in the average line, the sudden increase in lead is a deviation is too large, because the share price will again close to the moving average line, so this is the sell signal.

III. MACD Technique

MACD is named Moving Average Convergence and Divergence, the principle is still the use of fast and slow two slip moving average index, calculated from the difference between the two values DIF and DEM, then use the difference and deviation from the Mean (DEM) of the polymer and scattered signs of function, analyzing the stock market or individual stocks to buy or sell opportunity, MACD moving average to remove false signals shortcoming often find out the real price trend direction.

When the stock price at the rally, short-term and medium-term moving average line moving average line will be increasing the gap and becoming larger. If finishing a long time, the gap will shrink, in the decline in short-term moving average will be below the medium-term moving average, below average in the medium term solution, the gap between the decline will be exacerbated with the expansion. The Method of calculating the MACD as

A. Calculate the demand index (Demand Index)

DIt = (Ht + Lt +2 × Ct) ÷ 4

On where, Ht is the highest price, Lt is the lowest price, Ct is the closing price. Closing price generally available to replace the DL.

B. Calculate the index of sliding moving average (EMA)

At first, calculate the smooth fast moving average indicators (12 EMA) and the slow exponential smoothing moving average line (26 EMA), the EACD exponential smoothing moving average algorithms, have increased the last day of trickery.

EMAt = EMAt-1 +[] ×(DIt-EMAt-1)

EMA12 = day before EMA12 × 11 ÷ 13 + today's closing price × 2 ÷ 13

EMA26 = day before EMA26 × 25 ÷ 27 + today's closing price × 2 ÷ 27

C. Calculate the difference from the value (DIF)

(12 EMA) - (26 EMA), in the rally, the 12 EMA on the 26-day EMA, is difference from the value will be more and more increasing. On the contrary, in the fall, the 12 EMA in 26 EMA under the negative difference from the value will increase.

D. Calculate the difference from the average value of DEM (in the past known as the MACD value)

The DIF value is calculated by 9 days exponentially smoothed moving average, and calculated DEM values as

Today DEM (MACD) = day before DEM × 8 ÷ 10 + today DIF × 2 ÷ 10

E. MACD buying and selling signals

MACD Moving Average is based on MA technical index and easier to avoid grasp in the advantages of changing trends, an analysis that stretches way out. The basic principle is to use two different speeds of exponential smoothing moving average to calculate the difference between the two from the state (DIF), and then smoothed moving average of DIF is the MACD line. In short, MACD is the long-term and short-term moving average convergence or divergence of the signs, to be double smoothing, for analyzing the timing of buying and selling stocks and signals.

1) When the DIF, MACD, or BAR is greater than 0,

generally regarded as the bull market (all three of the values are greater than 0, the situation is more obvious). On the other hand when the DIF, MACD, or BAR value is less than 0, can be regarded as the bear market (all three of the values are less than 0, the signal can be regarded as escape).

2) Short term buying, DIF and the MACD are below the horizontal axis, and DIF from bottom to top through the MACD line (that is, synonymous with a breakthrough in the BAR values from the bottom horizontal axis), is a buy signal. Otherwise DIF and MACD are in horizontal axis side, and on down through the DIF from the MACD line (that is synonymous in the BAR values from the top of the consistently break the horizontal axis), is a sell signal.
3) The medium term buying, BAR break the horizontal axis from the bottom up, can be regarded as buy signal, otherwise it is a sell signal.
4) Shares appear in two of three relatively high, but the MACD is not accompanied by the emergence of new high point, which is a sell signal. Otherwise appear in two of three relatively low price, but the MACD is not accompanied by the emergence of new low, the signal to buy.

IV. Technical Contents

Index buying and selling, analyze operation appear a succession of complicated operation too easy to enable people mistake in computation often in TWI, prove again that must spend a large amount of time, the convenience and correct in order to be calculated, use MATLAB software, write procedure can make in operation saving time, the special topic make main range to vary in order to use mathematical operation at project study, develop often like this too, for instance; Asking solving, calculation of probability of linear algebra, multinomial, etc., work out more procedure functions and is helped operation by the user. Daily and important technological analysis is as follows. Rolling average (moving average), it is the most basic trend indicator. As the index price is higher than rolling average, represent the trend in the bull market. As the index price is lower than rolling average, it is a nominal signal to represent in the bear market. Simple and easy rolling average, only generally said average lines, each value has through n closing prices / n recently. A simple or arithmetic, moving average that is calculated by adding the closing price of the security for a number of time periods and then dividing this total by the number of time periods. Short-term averages respond quickly to changes in the price of the underlying, while long-term averages are slow to react. In other words, this is the average stock price over a certain period of time. Moving average trading rules are simple trading rules from the domain of technical analysis. Technical analysis is a method for trying to predict the appropriate time to buy or sell a stock. At the heart of this analysis lies the belief that a security's 'worth' is determined simply by the amount a potential buyer is willing to pay for it and not necessarily by its underlying fundamental value. The moving average trading method is a simple but useful tool for stock trading using. In order to generate a trading signal, they only require the graph of two moving averages of different lengths.

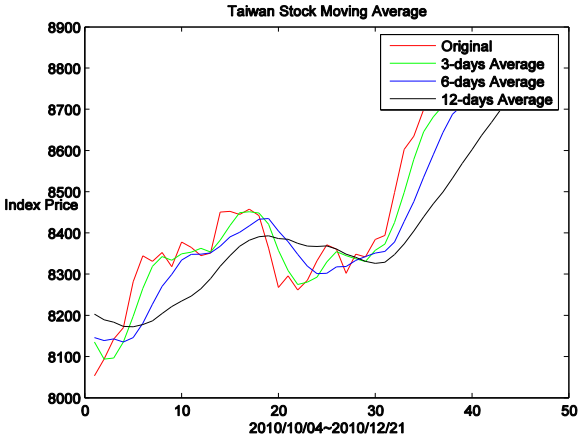

Fig.1. TWI vs. Time for different MA lines

As shown in the figure 1 above, many traders watch for short-term averages to cross above longer-term averages to signal the beginning of an uptrend. As shown by the different color lines, short-term averages act as levels of support when the price experiences a pullback. Support levels become stronger and more significant as the number of time periods used in the calculations increases.

V. Results and Discussions

TABLE I: Buying and Selling Statistical Results in TWI for 2010 (5-10 days MA)

Times	Dates	Buying Index	Selling Index	Results
1	2009/12/07	7775		
2	2009/12/21		7787	+12
3	2009/12/23	7901		-114
4	2010/01/19		8249	+348
5	2010/01/20	8220		-29
6	2010/1/21		8127	-93
7	2010/02/23	7597		-530
8	2010/04/19		7854	+257
9	2010/04/27	8146		+292
10	2010/05/04		7930	-316
11	2010/06/02	7195		-735
12	2010/06/08		7151	-44
13	2010/06/15	7454		+303
14	2010/06/29		7423	-31
15	2010/07/08	7608		+185
16	2010/08/13		7891	+283
17	2010/08/20	7927		+36
18	2010/08/25		7736	-191
19	2010/09/07	7884		+148
20	2010/10/12		8090	+206
21	2010/10/25	8306		+216
22	2010/11/16		8312	+6
23	2010/11/24	8297		-15
24	2010/12/22		8860	+563
			Total	+830

1. This special topic has already finished and attained the goal which was made of the special topic in accordance with this stock trading e-commercial design.

2. This special topic selects 'the line of moving average' to carry on research and analysis according to the stock market of Taiwan. In this study uses software and hardware apparatus of the computer, finish the numerical simulation, buy and sell the relevant stock market indexes, use MATLAB software and technical stock system to analyze that different two cases one by one, the example prove that selects ' the line of rolling average ' of different days to test outside.

3. It was divided into four groups testing to tabulation on the 12-26 days MACD and 5-10 days MA separately for the members of this studying group. Finally, find and make the best result is the test item table I (12-26 days MACD) from the comparison result finally. Until index for about 200 calculate data per one year each contract for 12-26 days can make more than 360,000 Taiwan-dollar at present testing result. We have list two tables in this paper for reader to refer as the appendix.

TABLE 2: BUYING AND SELLING STATISTICAL RESULTS IN TWI FOR 2010 (12-26 DAYS MACD)

Times	Dates	Buying Index	Selling Index	Results
1	2009/12/24	7963		
2	2010/01/19		8249	+286
3	2010/02/23	7597		+652
4	2010/04/19		7854	+257
5	2010/06/03	7360		+494
6	2010/06/30		7329	-31
7	2010/07/06	7548		+219
8	2010/08/12		6626	-919
9	2010/10/05	6958		+332
10	2010/11/15		7029	+71
11	2010/12/01	7270		+241
12	2010/12/27		7552	+282
			Total	+1884

VI. CONCLUSION

In this study, we present a realistic testing about the TWI trading, the method can applied to e-commerce trading, for the purpose to obtain the best beneficial from the trading. We have made the simulation by the MATLAB software with both MA and MACD technical methods. At last, we have obtained following important results.

1. This special topic is consulted MATLAB e-commerce trading analysis designing program and the technological analysis principle is finished.

2. Special topic in this MA technical analysis, finding the best case is 5-10 days in results.

3. The MACD technical analysis is better than the MA method.

4. Although there are many studies in this area, but present method is applied a different ways to solve the problem with a realistic application to Taiwan stock market in the 2010 year trading events, and obtain some important results which can be referenced by many persons in this field.

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