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Offering Automatic Trade Algorithm by Indicators of Iran Stock Exchange

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ABSTRACT: The advanced technology of computer has made a vast revolution in the field of financial markets and trade approach. This technology has made two important and interrelated changes in this area. One is using computer by investors for automat zing trade processes and the other is reconstructing financial markets and furnishing them with system the electronic limit order book. With this kind of order book, there is no need for physical presence in the salon of stock market trades. In this research, the aim is to predict the next day price of shares in Tehran market by using technical analysis (analyzing the market's diagram), math metical rules, trade rules, Geometric devices (trend line), survey devices (indicators) such as Ichimoku cloud indicator and relative strength index (RSI) and also geometrical tools. In doing so, an efficient and profitable algorithm is offered to do the selling and buying processes automatically (with the management of investor). In addition, the total index is accepted in Tehran market as a paradigm to predict the price of shares.

***Keywords*:** algorithmic trades, technical analysis, indicator, automatic trade algorithm, prediction of the price of shares.

INTRODUCTION

Speed and quality of access to financial markets, have encouraged the use of the so called "algorithmic trades". Although the use of algorithmic trades turns back to the early 1970, but it's usage in doing trades has been common with the start of new millennium and improvement of software and hardware system.

By increasing competition in trade environments, financial managers have turned to programmed algorithms. On the two sides of this game, buyer foundation and seller foundations are placed. The buy side or buyers society, are financial management firms whose work is to buy trade services (from seller organization). Seller organization or the sell side refers to the agencies who offer financial services to financial management firms. These services include buying stocks, offering consultation and financial researches investment banks and employers are the main members of this society. Market makers and some riskless investment boxes are also placed in this category. Generally, algorithmic trades can be defined as such: algorithmic trade's means using computer programs for entering trade orders in which one or more algorithms decide to select or implement these orders from different aspects such as, scheduling, price or the volume of orders. Most of the time, entering and implementing the orders are done without human intervention.

A Review of Past Research

Technical analysis emerged with Charles Down and William Hamilton's perspectives and articles (1900-1902). A review of literature on this topic manifests those numerous researchers who worked on this field. Before the systematic constitution of this method of analysis, brown & Jennings (1989) showed the value of technical analysis associated whit signals and prices.

In his research, Sweeny (1988) concluded that depending on the level of transactions expenses, filtering rules (filtering rules and mobile mean rules are the two transactional rules of technical analysis), lead to a more or less profitable result.

Lakonishok and Lebaron (1992) used mobile mean rules and concluded that these rules will also make profitable results.

Lerich and Thomas (1993) and kho (1996) also investigated the mobile mean strategy and concluded that the mentioned strategies are helpful.

Ratner and lill (1993), in some of Asian and Latin American countries, reached to this result that the use of technical analysis methods will lead to profitable results. Menig, Matno and Goro (2010) concluded that mobile mean rules are of more prediction ability and they are able to get more efficiency. Mang and Manzure and chew (2012) proved the better function of mobile mean method and partial power index comparing with selling and maintenance method in Singapore stock exchange.in his research, Amiri (1995),concluded that technical analysis method can be implemented in Tehran stock exchange market to analyze the shares. Khanloo (1996) reached to this result that various methods of technical analysis which were used in the world financial markets, are also applicable to some extent in Iran stock market.

The results of Gholamzade and Norush's research (2000) showed that the process of making annual profit by those Iranian firms which were under investigation was mobile mean method. In predicting shares profitability, Mehrani and Karami (2008) used historical information (both financial and non-financial) to distinguish successful firms from unsuccessful ones. In their research, Ssadeghisharif and sultan Zareii (2011) concluded that technical analysis methods are helpful and profitable for analyzers and investors of Tehran stock exchange market.

MATERIALS AND METHODS

Ichimoku Cloud's Indicator Theory

Ichimoku Cloud is consisted of five lines which have no value separately. We make use of each five line simultaneously to perform decision making. In other works, by using this tool, we would be able to recognize the trend direction, the trend strength and speed in one glance to the market. Now, we explain these five lines separately. Each line has an independent name and function.

1. **Tenkan-Sen**: this line is obtained through the following relation.

Tenkan Line: (Highest High + Lowest Low) / 2 Calculated Over Last 9 Periods).

As a presumption, we can set this line on 9 periods (in daily diagram: 9 days) which is equal to one week and a half.

2. Kijun-Sen: the calculation technique is the same as Tenkan-Sen just with this difference that it is calculated for a 26 day period.

Kijun Line: (Highest High + Lowest Low)/2 Calculated Over Last 26 Periods.

3. Chikou-Span: by using this line, current closing prices are switched backward for a 26 time period.

Chikou Span: (Most Current Closing Price Plotted) 26 Time Periods Back.

4. Senkou Span A: this line is obtained from the following relation.

Senkou Span A: (Tenkan Line + Kijun Line)/2 Plotted 26 Time Periods Ahead.

This is switched ahead for a 26 time period.

5. Senkou Span B: this line is obtained through the following relation

Senkou Span B: (Highest High + Lowest Low) /2 Calculated over Past 52 Time Periods, sent 26 Periods Ahead.

This line is calculated for the past 52 time period which is switched a head for a 26 time period.

For us, the importance of the lines "senkou span A&B" in more than other lines because these two lines constitute the Ichimoku Cloud.

Cloud= Senkou Span A & B

In addition, there are also mobile means (Kijun, Tenka) that when tankan cuts kijun from the below part and situate on the upper part, a signal buy is transmitted and when the contrary occurs, that is, Tenkan cuts Kijun from the above level, and situate in the lower part (below kijan), a signal sell has taken place.

The Indicator Theory of Relative Strength Index (RSI)

The index name of relative strength is a little confusing, because the relative strength index does not compare two different shares; in fact, it investigates the internal strength of shares. The relative strength index is a kinematic fluctuation which measures the speed and change of price movements. The fluctuation range of this indicator is

between “0-100”. The movement of relative strength index of the line toward numbers higher than 70, shows that the movement of market is toward excitation purchase and the movement of this index toward numbers lower than 30, shows that the movement of the market is toward excitation sales. The level 50 is considered the intermediate line for relative strength index and it after, acts as a support line for downward trends or a resistance line for upward trends. Some traders tend to select the intersection 0f relative strength index with “line 50” as the reference. They evaluate passing through these lines as sell or buy warnings.

This indicator measures the raise or reduction of closing prices for a pre-determined period. It has high popularity among traders, and its usage has been progressed significantly. Thus, it is placed in the model of this research. The relation of relative strength index is calculated as follows:

RSI = 100 – (100/1 + RS)

RS = (the average of augments in package price during π day / the average of reductions is
Package price during π day)

π = the number of periods used in the process of calculation.

In this research, we used a standard period of 14 days. To calculate the average of augments, the total averages of price augments during the final 14 days, were summed, then the result were divided on 14 similarly. The average of reductions were calculated (total averages of price reductions during the final 14 days were summed and then they divided on 14). By dividing the result of the above averages, relative strength (RS) was obtained. By substituting the RS value in the relation, the index number of RSI in the first day, is obtained.

Designing the Proposed Trade Algorithm

Indicators are used for clarification of the market’s movement type. According to figure 1, we draw Ichimoku indicator lines for confirmation and subsequently the relative strength index line for announcing movement warnings on the diagram of the market’s past days (the total index diagram), to have a glance at the market. Consequently we will design the sell and buy signals for our algorithm.

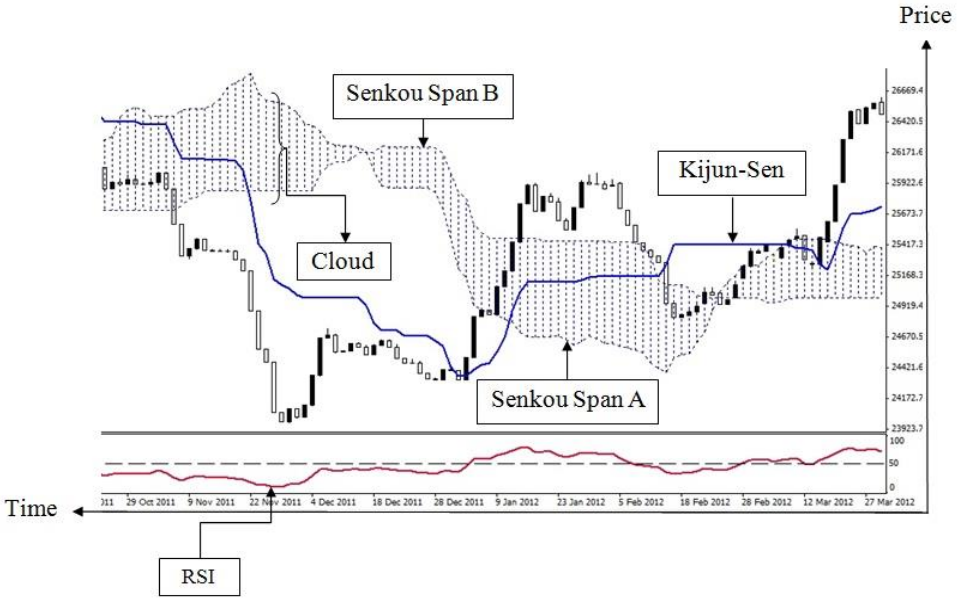

Figure 1. Drawing the indicators line on the total index data

The Proposed Buy Signal

The daily information of close price of each share based on the candle of previous day, sits above the line “kijun-sen” and the line “kijun-sen” sits over the “Ichimuko cloud” indicator and lines of this indicator are calculated in the following range:

Tenkan-Sen= Over Last 9 Periods
Kijun-Sen= Over Last 26 Periods
Senkou Span B= Over Past 52 Time Periods, Sent 26 Periods Ahead
Senkou Span A: (Tenkan Line+Kijun Line)/2 Plotted 26 Time Periods Ahead
Cloud = Senkou Span A & B
The relative strength index (RSI) of indicator is bigger than number 50.

RSI >50
The signal buy is transmitted and the point “stop loss” lies on the line “kijun-sen”.

The proposed Sell Signal

The daily information of close price of each share based on the candle of previous day, lies below the line “kijun-sen” and the line “kijun-sen” lies below the “Ichimuko cloud” indicator and lines of this indicator are calculated in the following range:
Tenkan-Sen = Over Last 9 Periods
Kijun-Sen= Over Last 26 Periods
Senkou Span B= Over Past 52 Time Periods, Sent 26 Periods Ahead
Senkou Span A:(Tenkan Line+Kijun Line)/2 Plotted 26 Time Periods Ahead
Cloud = Senkou Span A & B
The relative strength index (RSI) of indicator is smaller than number 50.
RSI <50
The signal sell is transmitted and the point “stop loss” lies on the line “kijun-sen”.

The Body of Proposed Algorithm

Generally, if we want to investigate the body of proposed algorithm in this research, we had better to look at the body of algorithm in figure 2.

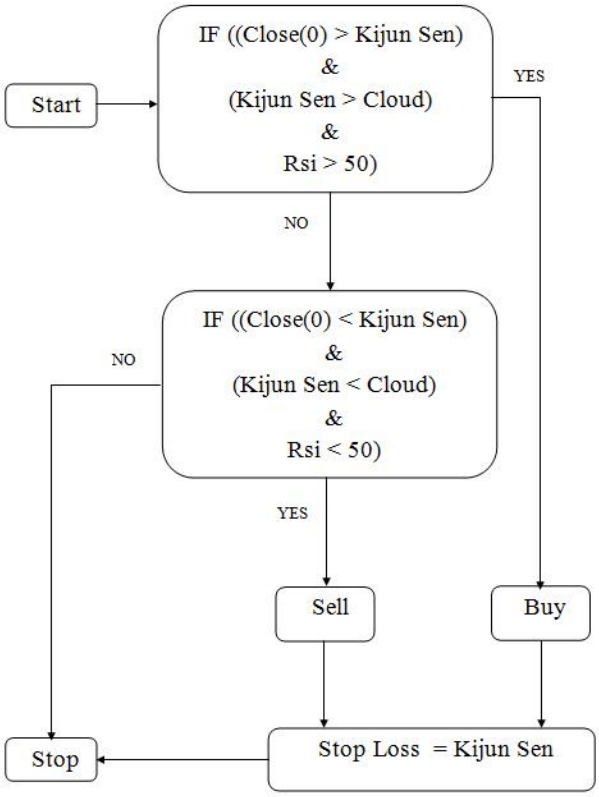

Figure 2. The body of proposed algorithm

Investigating the Profit of Proposed Algorithm

In order to specify the profitability and efficiency of proposed algorithm, we placed the total index information of Iran stock exchange market in “Meta Trader Nordfx” software, because in Iran, software and hardware infrastructures for on-line market are still. In accessible (this information is derived from online formal site of Tehran market with the internet address: www.Irbourse.com). We implemented and modeled the proposed algorithm on this data, then we tested it during a time period of 4 years, from 2010 to 2014. After implementing the algorithm or idiomatically “trading”, we reached to desirable results based on table 1.

Table 1. The output of proposed algorithm parameters

Parameters	Results
Date interval	2010.03.01 - 2014.04.14
Bars In Test	1119
Total Trades	32
Initial Deposit	2147483647.00
Gross Profit	4227663019.84
Gross Loss	-105937906.58
Total Net Profit	4121725113.26
Profit Factor	39.91
Profit Trades	13 (40.63%)
Loss Trades	19 (59.38%)
Largest Profit Trade	1567922510.24
Largest Loss Trade	-21133243.99
Balance	6269208760.26

Investigating the Trade Graph Diagram

As it is observed from the graphical figure 3, the proposed algorithm (after 32 trades in the time interval of 2010-2014), increased the initial capital to a significant level, so, the profitability of this algorithm is confirmed.

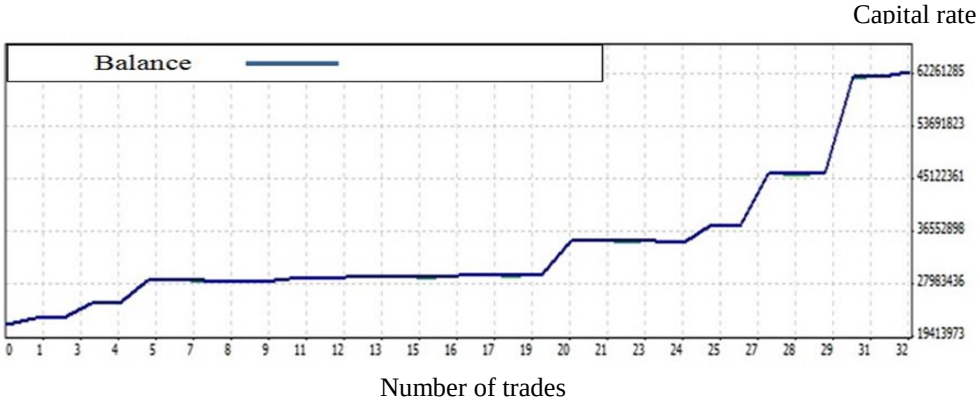

Figure 3. the efficiency diagram of proposed algorithm graph

Investing the Outputs of Trade Algorithm

In this section, the implementation stages of the proposed trade algorithm are observed step by step according to table 2. Where trade time is represented by the parameter “Data”, the type of trade signal during selling or buying with the parameter “Type”, the number of trade with parameter “Order”, the share price with parameter “Price”, the loss limit value with parameter “S/L”, the profit rate with parameter “Profit” and account residual with parameter “Balance”.

Table 2. step by step output of proposed algorithm

Date	Type	Order	Price	S / L	Profit	Balance
2010.03.07	buy	1	12221.3003	0.0000		
2010.05.31	s/l	1	14061.7500	14061.7500	104964647.24	2252448294.24
2010.06.01	buy	2	14109.0003	0.0000		
2010.06.12	s/l	2	14054.3500	14054.3500	-3116815.33	2249331478.92
2010.06.12	buy	3	14060.7435	0.0000		
2010.10.12	s/l	3	18479.5500	18479.5500	252013636.63	2501345115.54
2010.12.18	buy	4	18414.3003	0.0000		
2010.12.19	s/l	4	18227.4000	18227.4000	-10659307.63	2490685807.91
2010.12.22	buy	5	18353.1003	0.0000		
2011.05.01	s/l	5	24780.2000	24780.2000	366550721.44	2857236529.35
2011.05.08	buy	6	25525.1412	0.0000		
2011.05.08	s/l	6	25522.2000	25522.2000	-167742.67	2857068786.68
2011.05.09	buy	7	25752.7003	0.0000		
2011.05.25	s/l	7	25663.1500	25663.1500	-5107232.81	2851961553.87
2011.07.18	sell	8	24348.9000	0.0000		
2011.07.23	s/l	8	24693.5500	24693.5500	-19651623.90	2832309929.97
2011.07.23	sell	9	24691.6887	0.0000		
2011.07.23	s/l	9	24693.5500	24693.5500	-106129.55	2832203800.42

2011.09.03	buy	10	25822.0003	0.0000		
2011.10.15	s/l	10	26742.4500	26742.4500	52495147.13	2884698947.55
2011.10.15	buy	11	26742.9245	0.0000		
2011.10.15	s/l	11	26742.4500	26742.4500	-27061.71	2884671885.84
2011.11.23	sell	12	24881.0000	0.0000		
2012.01.03	s/l	12	24355.4500	24355.4500	29966288.65	2914638174.49
2012.03.04	buy	13	25418.2003	0.0000		
2012.03.04	close	13	25415.0061	0.0000	-182171.78	2914456002.71
2012.03.04	buy	14	25417.9003	0.0000		
2012.03.06	close	14	25307.9000	0.0000	-6273542.26	2908182460.45
2012.03.10	buy	15	25417.4799	0.0000		
2012.03.12	s/l	15	25389.3000	25389.3000	-1607157.24	2906575303.21
2012.03.25	buy	16	26281.9003	0.0000		
2012.05.12	s/l	16	26856.1000	26856.1000	32747801.11	2939323104.33
2012.05.23	buy	17	27091.2003	0.0000		
2012.05.26	s/l	17	26977.7500	26977.7500	-6470302.27	2932852802.06
2012.05.26	buy	18	26978.8079	0.0000		
2012.05.26	s/l	18	26977.7500	26977.7500	-60334.21	2932792467.85
2012.06.30	sell	19	25053.7000	0.0000		
2012.08.25	s/l	19	24461.4000	24461.4000	33772284.21	2966564752.06
2012.09.24	buy	20	27126.6003	0.0000		
2013.01.28	s/l	20	36645.1500	36645.1500	542862457.49	3509427209.55
2013.02.09	buy	21	37527.5821	0.0000		
2013.02.09	s/l	21	37424.9500	37424.9500	-5853319.27	3503573890.28
2013.02.09	buy	22	37527.5822	0.0000		
2013.02.25	s/l	22	37635.9000	37635.9000	6177590.68	3509751480.95
2013.03.02	buy	23	37803.3003	0.0000		
2013.03.02	s/l	23	37635.9000	37635.9000	-9547182.62	3500204298.33
2013.03.16	buy	24	38047.2003	0.0000		
2013.03.17	s/l	24	37676.6500	37676.6500	-21133243.99	3479071054.34
2013.03.18	buy	25	38040.7003	0.0000		
2013.05.19	s/l	25	43021.6000	43021.6000	284070948.43	3763142002.77
2013.05.21	buy	26	43074.1003	0.0000		
2013.05.21	close	26	42841.0000	0.0000	-13294188.43	3749847814.34
2013.05.26	buy	27	43486.2003	0.0000		
2013.09.01	close	27	58561.0000	58476.7000	859746788.51	4609594602.85
2013.09.01	buy	28	58758.1276	0.0000		
2013.09.04	s/l	28	58744.8000	58744.8000	-760099.52	4608834503.34
2013.09.14	buy	29	59233.7729	0.0000		
2013.09.14	s/l	29	59210.4000	59210.4000	-1333004.45	4607501498.89
2013.09.15	buy	30	59223.0973	0.0000		
2014.01.12	s/l	30	86715.0500	86715.0500	1567922510.24	6175424009.13
2014.01.14	buy	31	87112.9003	0.0000		
2014.01.15	close	31	87102.6000	86967.5000	-587446.95	6174836562.18
2014.03.02	sell	32	80105.0000	0.0000		
2014.03.05	close	32	78449.9003	81582.9000	94372198.08	6269208760.26

RESULTS AND DISCUSSION

Generally, the results of this research can be expressed as follows:

- The first finding of this study understands the complexity and procedure of price variations in Tehran stock market.
- By technical analysis, Tehran stock market can achieve an acceptable prediction.
- Optimum exploitation of the indicators “relative strength index (RSI)” and “Ichimoku Cloud” with the mentioned input (entry) variables can result in the best profit and the best consequence for investors.
- Modeling indicators with proposed parameters and consequently achieving the new trade algorithm have brought about a desirable success in predicting the total index.
- By designing an automatic and secure trade algorithm, investors are encouraged to invest their capital in Tehran stock market and consequently flourish the economics of the country.

At present, the best method to predict the price in Tehran stock market by investors and those who expect a profitable transaction (trade) in a short term period, are focusing on variations of past prices in the market.

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