*

-                           -

-                           -

-                           -

(/ /   ,   / /   )

"   "

.

.

/

.

.

Bootstrap

.

Bootstrap   :

.

.

.

"

. [ ]   "

.

.

Bootstrap

.   ...

.   .

.

.

.

.

.

$$SMA_t^n = \frac{1}{n}\sum_{i=0}^{n-1} P_{t-i}$$

.							( )

.							( )

جدول ۱: شاخص‌های میانگین متحرک تست‌شده.

(-)		(-)	
(- -)		(- -)	
(-)		(-)	
(-)		(- -)	
(-)		(-)	
(- -)		(- -)	
(-)		(-)	
(-)		(- -)	
(- -)		(-)	
(-)		(-)	
		(-)	

[ ]

.

[ ]

.

"							"

"							"

.

.

/

/

.

α

(- -)							.							[ ]

%	α							α							( )

.							.

[ ]							%

.

%

.

.							$$\frac{1}{n}\sum_{i=0}^{n-1} P_{t-i} > \frac{1}{m}\sum_{j=0}^{m-1} P_{t-j}$$

.							( )

.							n m

( )

.

.							$m > n$

.

TRB ( )   .

$(msn\ \alpha)$ s

$P_t > P_{\max}^n$ ( )

. P_t t

$P_{\max}^n$ n

.

جدول ۳: باندهای بولینگر تست‌شده.

(s)	
(s -)	
(s)	
(s -)	
(s)	
(s -)	
(s)	
(s -)	

.   ( ) TRB

جدول ۲: حدود حمایت و مقاومت تست‌شده.

(-)	
(- -)	
(-)	
(-)	
(- -)	
(-)	
(-)	
(- -)	

(RSI)

.

.

"   "

TRB .   "   ". RSI

.

(UB)

RSI . (LB)

RSI LB UB

.

.

$UB = MA_n + m\sigma_n$ ( )

. $LB = MA_n - m\sigma_n$ ( )

n MA_n

.

n σ_n n

RSI

.

.   ( )

%

RSI

.

m n

$$RSI = 100 - \frac{100}{(1 + RS)}$$ ( )   .

$$\%D < \%K$$
$$\%D > \%K$$

.

.

$$RS = \frac{Average \ of \ n \ day \ closes \ Up}{Average \ of \ n \ day \ closes \ Down}$$

RS

.

( )

.

.

.

جدول۴: شاخص‌های RSI تست‌شده.

(RSI -)	
(RS I -)	
(RSI -)	
(RSI -)	

جدول ۵: میانگین‌های متحرک همگرایی-واگرایی تست‌شده.

(KD)	
(KD)	
(s KD)	
(s KD)	

$\%D$ $\%K$

$MACD$ -

.

.

.

$MACD$

)

. (

. $MACD$

$MACD$

.

.

$MACD$

$MACD$.

.

.

(   )
$\%K$.

$\%K$. $\%D$

.

$$\%K = \frac{P - L_n}{H_n - L_n}$$ ( )

L_n H_n P
n

$\%D$.

$\%K$

. $\%K$

"   "

$\%K$ $\%D$
$\%D$

$\%K$

.   "   "

(   )
. $\%D$ $\%K$

Random Walk   (   )   (

.

.

. t .

"   " h . t

: t

$$r_t^h = \log(p_{t+h}) - \log(p_t)$$ ( )

.

.
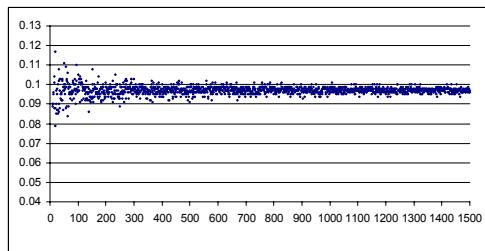
. $t+h$ t h

شکل ۱: نتایج انجام ۱۵۰۰ مرتبه عملیات
$Bootstrapping$ بر روی بازده‌های شرکت نفت بهران.

t

:

$$m_b = E(r_t^h | b_t)$$ ( )

$t+h$ t h

t

$$m_s = E(r_t^h | s_t)$$ ( )

:

( )

$$\left(E\left[(r_t^h - m_b)^2 | b_t \right] \right)^{1/2}, \left(E\left[(r_t^h - m_s)^2 | s_t \right] \right)^{1/2}$$

.

(   )   .

.

.

.

.   ( )   . $Bootstrapping$

.

α

α

.

N $Signal$

N $Switch$.

$\mathrm{Re}\,turn$ $Excel$

Var .

$Fraction >$

$P - value$

$Bootstrap$

(   )   .

. $Bootstrap$

$Excel$

(   )

(   ) $Bootstrap$ $Bootstrap$.

.   . $LISREL$ 8.50

$\mathrm{Re}\,turn$ $Naive$

Var

. $Minitab11$

.   .

.

Anderson-Darling

.   .

.   . $p - Value$

"   "

.

N $Switch$.

.

.   .

-      $B - S$ $Sell$ Buy

-            .   .

.

( )

.

.

$B - S$.

.

.

. . .

% ( )

N Swich

Naive .

Buy - -

. . - - - . -

Naive

- .

جدول ۶: میانگین متحرک های بلندمدت شرکت ایران خودرو.

Iran Khodro		1-50			1-50-0.01			2-50		
	Naïve	Buy	Sell	B-S	Buy	Sell	B-S	Buy	Sell	B-S
N Signal		1297	959		1180	837		1290	966	
N Swich			88			54			80	
Return	0.066259	0.210026	-0.12218	0.332206	0.193461	-0.09978	0.293238	0.189808	-0.09277	0.282581
Fraction>		1	1	1	1	1	1	1	1	1
Var	1.18262	0.492545	0.90168	1.381677	0.492917	0.904417	1.387895	0.48776	0.910387	1.38952
Fraction>			0.038667	0.879333	0	0.042	0.883333	0	0.045333	0.885333

		1-75			2-75			1-100		
	Naïve	Buy	Sell	B-S	Buy	Sell	B-S	Buy	Sell	B-S
N Signal		1279	952		1279	952		1247	959	
N Swich			62			54			56	
Return	0.066259	0.195216	-0.10753	0.302743	0.161084	-0.06167	0.222756	0.18531	-0.0988	0.284114
Fraction>		1	1	1	1	1	1	1	1	1
Var	1.18262	0.495966	0.903353	1.389044	0.532369	0.872362	1.399868	0.49389	0.905505	1.390393
Fraction>			0.041333	0.884667	0	0.023333	0.895333	0	0.042	0.886

		1-100-0.01			2-100			1-150		
	Naïve	Buy	Sell	B-S	Buy	Sell	B-S	Buy	Sell	B-S
N Signal		1203	908		1247	959		1277	879	
N Swich			38			52			64	
Return	0.066259	0.170508	-0.07878	0.249283	0.1486	-0.05107	0.199669	0.141653	-0.07051	0.212161
Fraction>		1	1	1	0.999333	1	1	0.998667	1	1
Var	1.18262	0.49369	0.908099	1.39518	0.539008	0.865659	1.400935	0.55161	0.839858	1.386642
Fraction>			0.042667	0.89	0	0.019333	0.895333	0	0.005333	0.882667

Iran Khodro		2-150			2-150-0.01			5-150		
	Naïve	Buy	Sell	B-S	Buy	Sell	B-S	Buy	Sell	B-S
N Signal		1280	876		1217	814		1278	878	
N Swich			56			30			32	
Return	0.066259	0.118145	-0.03688	0.155029	0.110957	-0.02861	0.139569	0.101173	-0.01183	0.112999
Fraction>		0.982667	1	1	0.962	1	0.998	0.91	0.999333	0.971333
Var	1.18262	0.553508	0.840682	1.392087	0.556166	0.838603	1.393245	0.524892	0.870823	1.395138
Fraction>			0.006	0.887333	0	0.005333	0.888667	0	0.021333	0.89

		1-200			1-200-0.01			2-200		
	Naïve	Buy	Sell	B-S	Buy	Sell	B-S	Buy	Sell	B-S
N Signal		1337	769		1260	651		1335	771	
N Swich			58			28			52	
Return	0.066259	0.088678	-0.07094	0.159621	0.075911	-0.05668	0.132589	0.074819	-0.04653	0.12135
Fraction>		0.800667	1	1	0.655333	1	0.996	0.642667	1	0.986
Var	1.18262	0.504176	0.828168	1.329426	0.50366	0.829355	1.33138	0.502586	0.831059	1.332029
Fraction>			0.002667	0.811333	0	0.002667	0.816	0	0.002667	0.817333

Bootstrap

Naive .

. % *N Switch*

Buy

) . *Sell* .

-

% .

% .

. .

-

-

. .

. - - .

.

B − S .

- .

. - - .

. .

Buy *Buy*

Sell *Sell*

. *Naive* .

. *Naive* *Sell* *Buy*

. *N Switch*

. *B − S* *Naive*

Naive %

. *N Switch*

)

(σ

% .

. *N Switch*

%

.

.

.

.

Sell   *Buy*

MACD   .

Sell *Buy*   MACD   RSI   -

.   *Naive*

.   .

.

.

RSI

RSI   *N Switch*

.   "   "

.   [   ]   .

.

RSI

.

.

.

.

-

.   *N Switch*

.

.

%

.

●

.

.

●

.   .

●   :

                                                                                              ●

.   .

●   ●

.   .

●   ●

                                                          ...

.   ●

●

ARCH

EGARCH   *GARCH*   .

.

مراجع

1- Murphy, J. J. (1999). *Technical Analysis of the Financial Markets*, Prentice Hall Inc Publishing.

2- Alexander, S.S., (1961). "Price movements in speculative markets: trends or random walks." *Industrial Management Review,* Vol. *2*, PP. 7–26.

3- Fama, E.F. and. Blume, M. (1966). "Filter rules and stock market trading profits." *Journal of Business*, Vol. *39*, PP. 226-241.

4- Dryden, M. (1970). "Filter tests of UK share prices." *Applied Economics 1*, PP. 261-275.

5- Cunningham, S. (1973). "The predictability of British stock market prices." *Applied Statistics,* Vol. *22*, PP. 315-231.

6- Rozeff, M.S. (1974). " Money and stock prices, market efficiency and the lag in effect of monetary policy." *Journal of Financial Economics 1*, PP. 245-302.

7- Dann, L.Y., Mayers, D. and Raab, R.J. (1977). "Trading rules, large blacks and the speed of price adjustment." *Journal of Financial Economics,* Vol. *4*, PP. 3-22.

8- Givoly, D. and Lakonishok, J. (1980). "Financial analyst' forecasts of earnings their value to investors." *Journal of Banking and Finance,* Vol. *4*, PP. 221-233.

9- Brock, W., Lakonishok, J. and LeBaron, B. (1992). "Simple technical trading rules and the stochastic properties of stock returns." *Journal of Finance,* Vol. *47*, PP. 1731–1764.

10- Bessembinder, H. and Chan, K. (1995). "The profitability of technical trading rules in the Asian stock markets." *Pacific-Basin Finance Journal,* Vol. *3*, PP. 257-284.

11- Hudson, R., Dempsey, M. and Keasey, K. (1996). "A note on the weak form efficiency of capital markets: The application of simple technical trading rules to UK stock prices - 1935 to 1994.", *Journal of Banking & Finance,* Vol. *20*, PP. 1121-1132.

12- Sullivan, R., Timmermann A. and White H. (1999). "Data-Snooping, technical Trading rule Performance, and Bootstrap." *The Journal of Finance,* Vol.5, PP. 1647-1691.

13- Wong, M. (1997). "Fund management performance, trend-chasing technical analysis and investment horizons: a case study." *Omega, Int. J. Management Science,* Vol. *25*, PP. 57-63.

14- Ratner, M. and 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.

15- Ito, A. (1999). "Profits on technical trading rules and time-varying expected returns: Evidence from Pacific-Basin equity markets." *Pacific-Basin Finance Journal* Vol. *7*, PP. 283–330.

16- Parisi, F. and Vasquez, A. (2000). "Simple technical rules of stock returns: evidence from 1987 to 1998 in Chile." *Emerging Markets Review,* Vol. *1*, PP. 152-164.

17- Gunasekrage, A. and M. Power, D. (2001). "The Profitability of moving average trading rules in South Asian stock markets." *Emerging Markets Review,* Vol. *2*, PP. 17-33.

18- Chang, E. J., Lima, E.J.A. and Tabak, B.M. (2004). "Testing for predictability in emerging equity markets." *Emerging Markets Review,* Vol. 5, PP. 295–316.

19- Ming-Ming, L. and Siok-Hwa, L. (2006). "The profitability of the simple moving averages and trading range breakout in the Asian stock markets." *Journal of Asian Economics,* Vol. *17*, PP. 144–170.

20- Tian, G.G., Wan, H.G. and Guo, M. (2002). "Market efficiency and the returns to simple technical trading rules: new evidence from U.S. equity market and Chinese equity markets." *Asia-Pacific Financial Markets,* Vol. *9*, PP. 241–258.

21- Kwon, K. and Kish, R.J. (2002). "A comparative study of technical trading strategies and return predictability: an extension of Brock, Lakonishok, and LeBaron (1992) using NYSE and NASDAQ indices." *The Quarterly Review of Economics and Finance,* Vol. *42*, PP. 611–631.

22- Cheng, W., Cheung,Y. L. and Yung, H. H. M. (2003). "Profitability of the CRISMA system: from world indices to the Hong Kong stock market." *Asia-Pacific Financial Markets,* Vol. 10, PP. 45–57.

23- Groenewold, N., Tang, S. H. K. and Wu, Y. (2008). "The profitability of regression-based trading rules for the Shanghai stock market." *International Review of Financial Analysis*, Vol. 17, pp. 411-430.

24- Ellis, C. A. and Parbery, S. A. (2005). "Is smarter better? A comparison of adaptive and simple moving average trading strategies." *Research in International Business and Finance,* Vol. 19, PP. 399–411.

25- Day, T. E. and Wang, P. (2002). "Dividends, nonsynchronous prices, and the returns from trading the Dow Jones industrial average." *Journal of Empirical Finance,* Vol. *9*, PP. 431– 454.

26- Lo, A. W., Mamaysky, H. and Wang, J. (2000). "Foundations of technical analysis: computational Algorithms, statistical inference, and empirical implementation." *The Journal of Finance,* Vol. 4, PP. 1705-1765.

27- Dawson, E.R. and Steeley, J.M. (2003). "On the existence of visual technical patterns in the UK stock market." *Journal of Business Finance & Accounting,* Vol. *30*, PP. 263-293.

28- Marshall, B.R. and Cahan, R.H. (2005). "Is technical analysis profitable on a stock market which has characteristics that suggest it may be inefficient?" *Research in International Business and Finance* , Vol. *19*, PP. 384–398.

29- Anderson, J.A. and Faff, R.W. (2008). "Point and figure charting: A computational methodology and trading rule performance in the S&P 500 futures market." *International Review of Financial Analysis*, Vol. 17, No. 1, pp. 198-217.

30- Letamendia, L.N. (2005). "Fitting the control parameters of a genetic algorithm: An application to technical trading systems design." *European Journal of Operational Research*, In Press.

31- Armano, G., Marchesi, M. and Murru, A. (2005). "A hybrid genetic-neural architecture for stock indexes forecasting." *Information Sciences,* Vol. *170*, PP. 3–33.

32- Potvin, J., Soriano, P. and Vallee, M. (2004). "Generating trading rules on the stock markets with genetic programming." *Computers & Operations Research,* Vol. *31*, PP. 1033–1047.

33- Allen, F. and Karjalainen, R. (1999). "Using genetic algorithms to Þnd technical trading rules." *Journal of Financial Economics,* Vol. *51*, PP. 245-271.

34- Neely, C.J. and Weller, P.A. (1999). "Technical trading rules in the European Monetary System." *Journal of International Money and Finance,* Vol. 18, PP. 429-458.

35- Liu, N.K. and Lee, K.K. (1997). "An intelligent business advisor system for stock investment." *Expert System,* Vol. *14*, PP. 129-139.

36- Yao, J. and Tan, C.L. (2000). "A case study on using neural networks to perform technical forecasting of Forex." *Neurocomputing,* Vol. *34*, PP. 79-98.

37- Skouras, S. (2001). "Financial returns and efficiency as seen by an artificial technical analyst." *Journal of Economic Dynamics & Control,* Vol. *25*, PP. 213-244.

38- Lam, M. (2004). "Neural network techniques for financial performance prediction: integrating fundamental and technical analysis." *Decision Support Systems,* Vol. *37*, PP. 567– 581.

39- Liu, J.N.K. and Kwong, R.W.M. (2007). "Automatic extraction and identification of chart patterns towards financial forecast." *Applied Soft Computing*, Vol. *5*, No. 4, PP. 1197– 1208.

40- Mohamadi, S. (2004), Evaluating the technical trading rules in Tehran stock exchange, Faculty of Management's Financial Research in University of Tehran, Vol. 6, No. 17, pp. 47-129

41- Luca, C. (2004). *Technical Analysis Applications*, McGraw-Hill Publishing.

1- Fundamental Analysis
2- Technical Analysis
3- John J Murphy
4- Trading-range Break Out
5- Upper Band
6- Lower Band
7- Relative Strength Index
8- Wilder J. Welles, New Concepts in Technical Trading System, Greensboro, NC: Trend Research, 1978
9- Stochastic
10- Moving Average Convergence-Divergence
11- Gerald Apple
12- Scrambling