

2013 (23)

[118-99]

دراسة سلسلة الأوراق المالية باستخدام ARIMA و ANN و PMRS

**

*

Pattern

ARIMA

(PMRS) Modelling Recognition System

Artificial Neural

(ANN) Networks

2006

Study Series Stocks Exchange by using PMRS , ANN , and ARIMA

Abstract

It is well known that the processes of countries development is the process of planning and setting future plans. This demands the use of advanced statistical styles. So , we have conducted a comparison between three methods,namely;Box Jenkins (ARIMA),and Pattern Modeling Recognition System (PMRS)which is a modern to know the relation between the current values and the previous ones and the Artificial Neural Networks (ANN).These three methods were application on the Iraqi monetary market for the year 2006.The Results showed superiority of artificial neural networks through error criteria used.

/ / *

/ / **

2012/12/20

2012/11/5

(Gilgen,2005) .

Neural Networks

" "

(2003,) (2005,).

.(Singh & McAtackney,1998) .

- 1

(Processing Elements)

[,

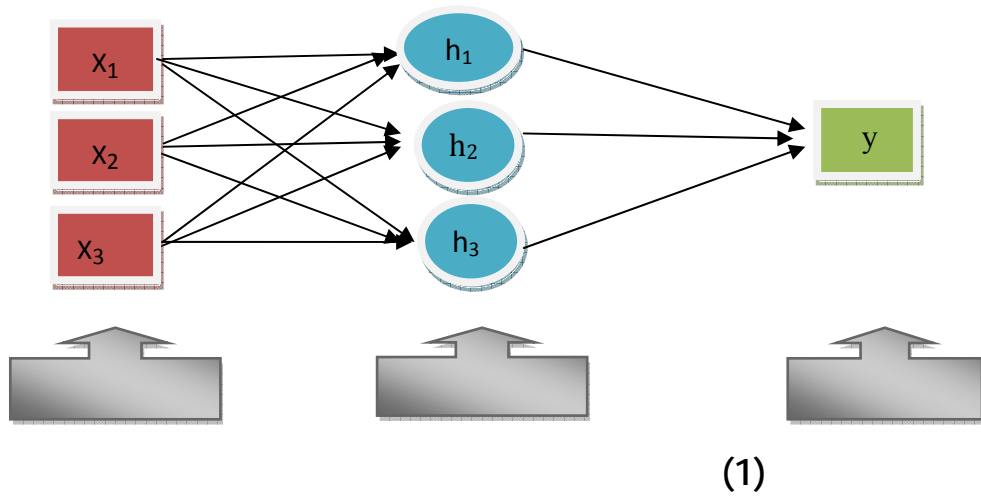
(Electronic Brain

, Biological Computer)

.(2000,)

(weights) (nods) (neurons)
(Neural connections)

: (1)



(2005,) (2003,) .

()

()

()

($X_0=1$)

Bias(b)

$X=(1, X_1, \dots, X_n)$

.(1)

()



Batch Back Propagation Algorithm

:

(Alyuda,2003)(2008,).

Forecasting using neural network

-2

(2006,) :

: -1

: -2

: -3

: ◀

: ◀

: ◀

: - 4

◀

◀

◀

◀

: - 5

Sigmoid

: - 6

- 7
◀

- 8

- 3
Pattern Matching

.(local approximation)

$$Y = \{y_1, y_2, \dots, y_n\}$$

.yn
yj yn
(Singh & McAtackney, 1998) . yj+1

$$\{y_{j-1}, y_j\}$$

$$y = \{y_1, y_2, \dots, y_n\}$$

$$S_i = y_{i+1} - y_i \quad S = (S_1, S_2, \dots, S_{n-1})$$

$$Y \quad 1 \leq i \leq n-1, i$$

$$1, y_{i+1} < y_i \quad 0 :$$

$$y_i$$

$$y_{i+1} = y_i \quad 2, y_{i+1} > y_i$$

$$(1) \quad (0) \quad b \quad B = (b_i, b_{i+1}, \dots, b_{n-1})$$

.(2)

$$(Singh, 1999a) . (b_1, b_2, \dots, b_{n-1}) \quad ()$$

(Singh, 2000b)(Singh, 1999b).

$$.p' = (b_{n-2}, b_{n-1}) \quad k=2 \quad -1$$

$$.p' \quad () \quad (b_1, \dots, b_{n-3}) \quad -2$$

$$.p''=(b_{j-2},b_{j-1})$$

$$Y_{n+1} = f(Y_n, /b_{j-1} - b_{n-2} /, /b_j - b_{n-1} /) \dots\dots(1)$$

$$Y_{n+1}= y_n +B *S_{j+1}$$

$$Y_{n+1} = f(Y_n, /b_{j-1} - b_{n-2} /, /b_j - b_{n-1} /) \dots\dots(2)$$

$$Y_{n+1}= y_n - B *S_{j+1}$$

$$Y_{n+1} = y_n \dots\dots (3)$$

$$B = \frac{1}{K} \sum_{i=1}^k \frac{S_{n-i}}{S_{j-i}} \dots\dots(4)$$

$$S_{j+1} = Y_{j+2} - Y_{j+1}$$

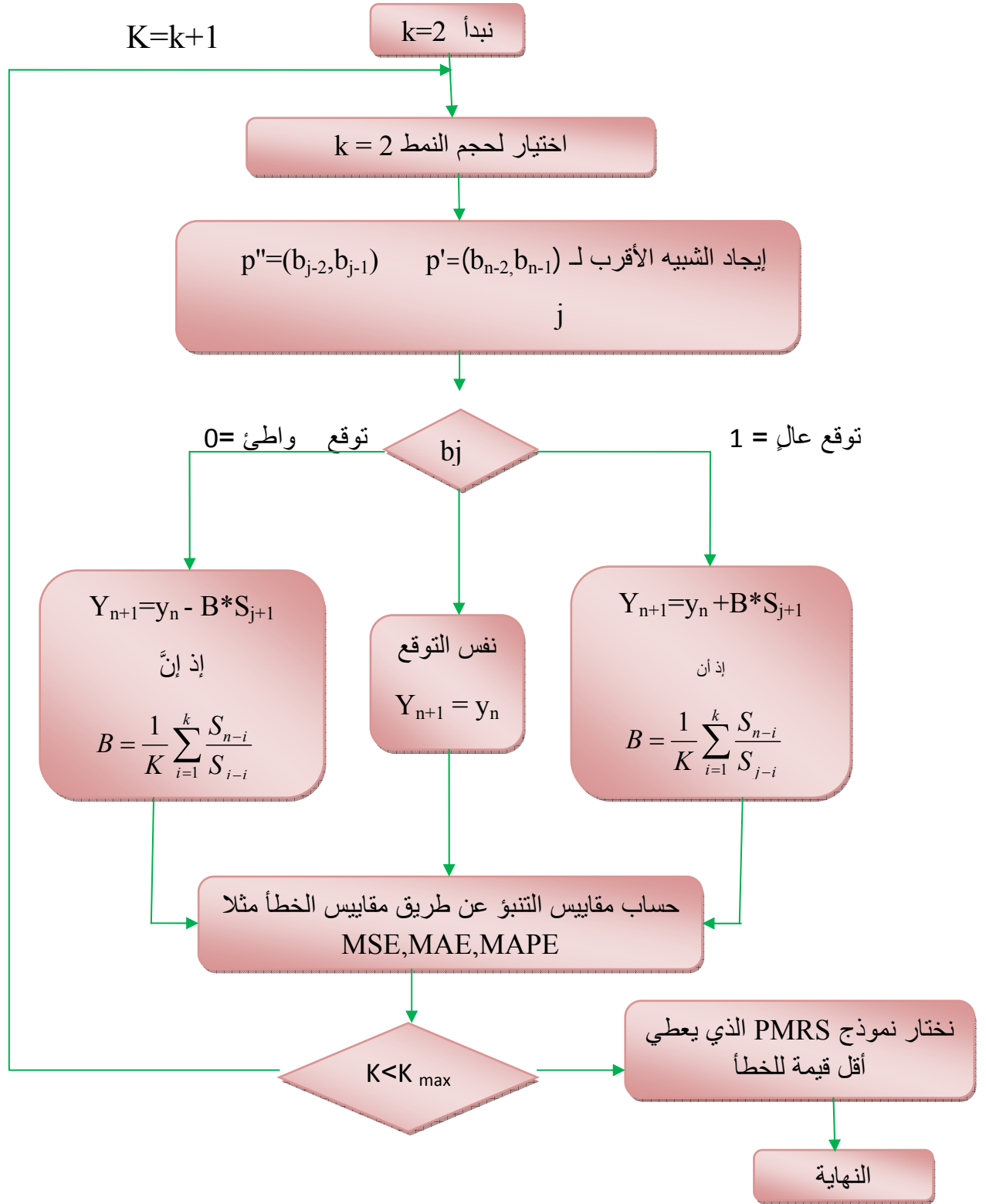
(k=2) -4

(1- 4)

Mean Square Error(MSE) -5

Mean Absolute Percentage Error(MAPE) .

Singh &) .K ,
 .(McAtackney,1998



(PMRS)

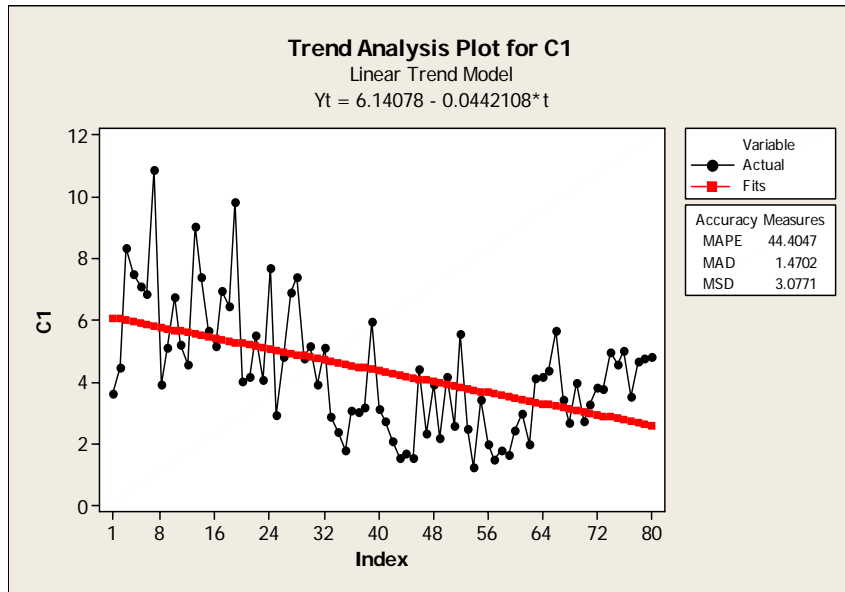
(2)

:

Minitab

2006

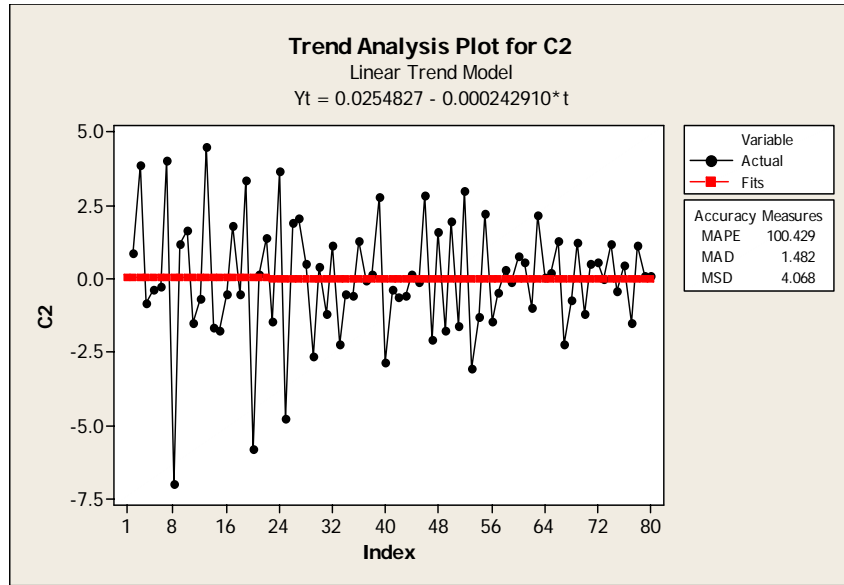
100,000,000



:(3)

.(80 - 1)

(4)



:(4)

ACF

PACF

Integral Moving IMA(1,1) ARIMA(0,1,1)

BIC

AIC

I=1 Average

; MSE

$$z_t = z_{t-1} + a_t - \hat{\theta}_1 a_{t-1}$$

-5

Normal

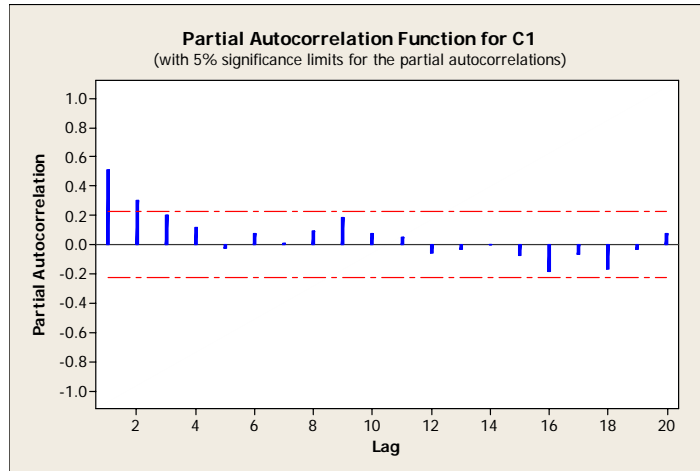
:

AlyudaNeuroIntelligence
(2002-2003)

Real-World Forecasting

Classification

(4)



: (5)

0.01

$E_{Tolerance}$

$N_{pts} = 2$

$N_{Train} = 2000$

$N_{Output} = 1$

$$N_{Hidden} \leq \frac{N_{Train} E_{Tolerance}}{N_{Pts} + N_{Output}}$$

$$N_{Hidden} \leq \frac{2000 \times 0.01}{2 + 1}$$

$$N_{Hidden} \leq 7$$

7

7

(2000)

Number of Retrains=1

(1-7)

()

()

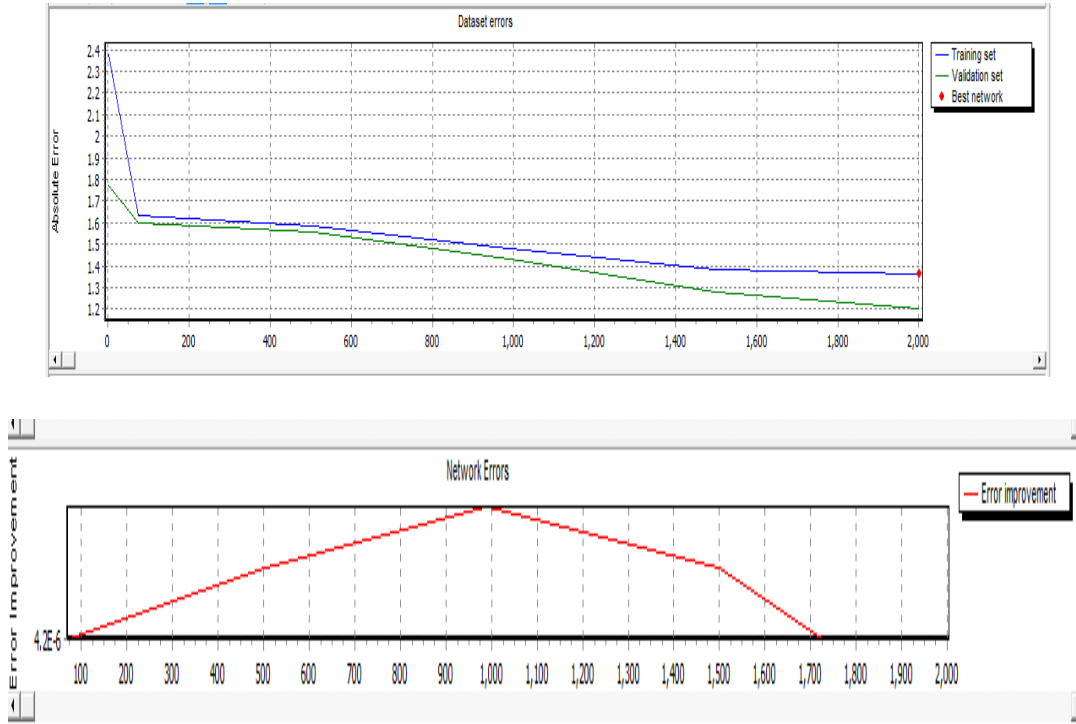
-(1)

Architecture	Weights number	Fitness	Akaike's Criterion(AIC)
2-1-1	5	0.984533	-0.00476
2-2-1	9	0.987825	-0.004592
2-3-1	13	0.991255	-0.005387
2-4-1	17	0.992734	-0.005401
2-5-1	21	0.997033	-0.005663
2-6-1	25	1.000891	-0.00595
2-7-1	29	1.004299*	-0.006268*

الجدول (1): النتائج الإحصائية لمعمارية عدة شبكات عصبية .

[2-7-1]

. AIC



[2-7-1]

: الشكل (6)

.()

(2000)

(Best Network)

- 6

S

B

(2)

	عدد الأسهم المتداولة لقطاع المصارف		
1	3.61233322	1	*
2	4.47239922	1	0.860066
3	8.34361883	0	3.87121961
4	7.49351230	0	-0.85010653
5	7.11831321	0	-0.37519909
6	6.86779324	1	-0.25051997
7	10.90604556	0	4.03825232
8	3.91799760	1	-6.98804796
9	5.12917938	1	1.21118178
10	6.75832431	0	1.62914493
11	5.24392489	0	-1.51439942
12	4.56107574	1	-0.68284915
13	9.07909632	0	4.51802058
14	7.41887832	0	-1.660218
15	5.67572748	0	-1.74315084
16	5.16290791	1	-0.51281957
17	6.98757182	0	1.82466391
18	6.47638951	1	-0.51118231
19	9.83100275	0	3.35461324
20	4.02357060	1	-5.80743215
21	4.16149917	1	0.13792857
22	5.53998112	0	1.37848195
23	4.06324268	1	-1.47673844
24	7.73218266	0	3.66893998
25	2.93693298	1	-0.79524968
26	4.82834228	1	1.8914093
27	6.91430122	1	2.08595894

28	7.43109146	0	0.51679024
29	4.75748196	1	-2.6736095
30	5.16526516	0	0.4077832
31	3.95972971	1	-1.20553545
32	5.10798891	0	1.1482592
33	2.89150450	0	-2.21648441
34	2.37199231	0	-0.51951219
35	1.79638569	1	-0.57560662
36	3.10116509	0	1.3047794
37	3.04955787	1	-0.05160722
38	3.18672236	1	0.13716449
39	5.97731783	0	2.79059547
40	3.12515960	0	-2.85215823
41	2.73508044	0	-0.39007916
42	2.08595545	0	-0.64912499
43	1.53318273	1	-0.55277272
44	1.68968898	0	0.15650625
45	1.55962697	1	-0.13006201
46	4.42650723	0	2.86688026
47	2.33185243	1	-2.0946548
48	3.94591161	0	1.61405918
49	2.19360527	1	-1.75230634
50	4.16361900	0	1.97001373
51	2.57045710	1	-1.5931619
52	5.58534352	0	3.01488642
53	2.50252052	0	-3.082823
54	1.22588679	1	-1.27663373
55	3.43502226	0	2.20913547
56	1.98002553	0	-1.45499673
57	1.48395946	1	-0.49606607
58	1.77629292	0	0.29233346
59	1.67031566	1	-0.10597726
60	2.43303388	1	0.76271822
61	2.97328156	0	0.54024768
62	1.98029757	1	-0.99298399
63	4.13127619	1	2.15097862
64	4.19296992	1	0.06169373
65	4.38648260	1	0.19351268
66	5.66335075	0	1.27686815
67	3.44450208	0	-2.21884867
68	2.70689709	1	-0.73760499
69	3.96460885	0	1.25771176

70	2.76113445	1	-1.20347440
71	3.27925914	1	0.51812469
72	3.83007960	0	0.55082046
73	3.80081589	1	-0.02926371
74	4.98075515	0	1.17993926
75	4.57821502	1	-0.40254013
76	5.03663373	0	0.45841871
77	3.54150708	1	-1.49512665
78	4.66632498	1	1.1248179
79	4.75696644	1	0.09064146
80	4.83868419	*	0.08171775

$$Y_{n+1} = y_n + B * S_{j+1} \quad Y_{n+1} = y_n + B * S_{j+1}$$

()

$$2 \leq K \leq 5$$

8

K=2

K=2

; n = 80

n - :

J=9

; $b_{j+1} \Rightarrow b_{10}=0$

$$S_{j+1} = S_{10} = -1.51439942$$

p'

p'

p''

$$p' = (b_{n-2}, b_{n-1}) \Rightarrow p' = (b_{78}, b_{79}) \Rightarrow p' = (1, 1)$$

J=2

$$p'' = (b_{j-1}, b_j) \Rightarrow p'' = (b_8, b_9) \Rightarrow p'' = (1, 1)$$

(2)

$$\hat{Y}_{n+1} = y_n - B * S_{j+1}$$

B

$$B = \frac{1}{K} \sum_{i=1}^k \frac{S_{n-i}}{S_{j-i}}$$

$$B = \frac{1}{2} \left[\frac{S_{n-1}}{S_{j-1}} + \frac{S_{n-2}}{S_{j-2}} \right] \Rightarrow \frac{1}{2} \left[\frac{S_{79}}{S_8} + \frac{S_{78}}{S_7} \right] \Rightarrow \frac{1}{2} \left[\frac{0.08171775}{1.21118178} + \frac{0.09064146}{-6.98804796} \right]$$

$$B = 0.027249253$$

$$\hat{Y}_{n+1} = y_n - BS_{j+1}$$

$$\hat{Y}_{81} = 4.83868419 - (0.027249253)(-1.51439942)$$

$$\hat{Y} = 4.879950444$$

$$.K=2$$

$$K=5 , K=4 , K=3$$

(MSE)

: (3)

حجم النمط K	رقم الشبيه j	موقع الشبيه j	b _{j+1}	S _{j+1}	B		MSE
k=2	1	j=9	b ₁₀ =0	S ₁₀ =-1.51439942	0.027249253	4.879950444	4.399955471
	2	j=21	b ₂₂ =0	S ₂₂ =-1.47673844	0.288428217	5.264617226	4.95544575
	3	j=26	b ₂₇ =1	S ₂₇ =0.51679024	0.012151172	4.844963797	4.364114158
	4	j=38	b ₃₉ =0	S ₃₉ =-2.85215823	-0.580303533	3.18356669	5.480498971
	5	j=60	b ₆₁ =0	S ₆₁ =-0.99298399	-0.37407572	4.467232989	4.133052119
	6	j=63	b ₆₄ =1	S ₆₄ =0.19351268	-0.026645465	4.833527955	4.352929838
	7	j=65	b ₆₆ =0	S ₆₆ =-2.21884867	0.945751503	6.937163656	10.81152414
	8	j=71	b ₇₂ =0	S ₇₂ =-0.02926371	0.041200912	4.839889882	4.35911956
K=3	1	j=27	b ₂₈ =0	S ₂₈ =-2.6736095	-0.049157114	4.70725726	4.246824662
	2	j=64	b ₆₅ =1	S ₆₅ =1.27686815	0.077981879	4.938256769	4.465125691
K=4	1	j=27	b ₂₈ =0	S ₂₈ =-2.6736095	-0.138745126	4.467733902	4.133169573
	2	j=64	b ₆₅ =1	S ₆₅ =1.27686815	-0.633384516	4.029935675	4.221962209
K=5	1	j=27	b ₂₈ =0	S ₂₈ =-2.6736095	-0.173081396	4.375932125	4.120025385
	2	j=64	b ₆₅ =1	S ₆₅ =1.27686815	-0.386501041	4.34517332	4.119391153*

$$K=5$$

$$Y_{81}$$

$$(3)$$

(MSE)

(j=64)

(MSE)

PMRS و ANN و ARIMA

:(4)

		PMRS	ANN	ARIMA
81	4.38026594	4.34517332	3.125982	4.43908
82	3.44649315	4.358371006	3.291881	4.43908
83	4.47343120	4.34151544	3.491811	4.43908

84	2.26457181	4.343577327	3.577708	4.43908
85	6.67294178	4.350310062	3.644898	4.43908
86	3.32098605	4.351118749	3.682405	4.43908
87	2.32710120	4.35039902	3.708104	4.43908

:(5)

MAE	MSE	MAPE	
1.246312857	2.345585714	40.69042857	بوكس- جينكنز
1.219135714	2.245985714	39.25485714	الأنماط المثيلة
1.210588571*	2.213128571*	32.66514286*	الشبكات العصبية

:

-:

1. () (ANN)

,MSE,MAE,MAPE

2. [2-7-1]

()

(Fitnes) , AIC (2006)

3.

ARIMA(p,d,q)

:

BP -1

BP

Recurrent Neural Network

Perceptron

.BP

-2

Multivariate Time Series

- 1- (2005) " () " -1
- 2- PMRS ANN ARIMA " (2012) () " -2
- 3- " (2008) -3
- 4- " (2006) () -4
- 5- " (2000) 1 4 -5
- 6- "(2003) 6 3 -6

7 - Alyuda , NouroIntelligence .(2003) ,"Neural Network Software"
Web:www.alyuda .com

8-Gilgen.H.(2005)"Univariate Time Series In Geosciences"Institute for
Atmospheric and Climate Science Swiss federal Institute of Technology
(ETH) Zurich University .

9- Singh. S.and McAtackney, P .(1998) . " Dynamic Time-series
Forecasting using Local Press,Approximation" Proc. 10th IEEE
International Conference on Tools with AI, Taiwan, IEEE pp. 392-399

10-Singh, S. (1999a). "A Long Memory Pattern Modelling and
Recognition System for Financial Forecasting", journal Pattern Analysis
and Applications, vol. 2, issue 3, pp. 264-273.

11- Singh .S (2000-b). "Pattern Modelling in Time-Series Forecasting" ,
Cybernetics and Systems-An International Journal, vol. 31, issue 1.

12-Singh.S(1999b) " Noise Impact on time series forecasting using
an Intelligent Pattern Matching Technique" , vol. 32, issue 8,pp.1389-
1398.

2006

:

عدد الأسهم المتداولة لقطاع المصارف	المدة الزمنية
361233322	1
447239922	2
834361883	3
749351230	4
711831321	5
686779324	6
1090604556	7
391799760	8
512917938	9
675832431	10
524392489	11
456107574	12
907909632	13
741887832	14
567572748	15
516290791	16
698757182	17
647638951	18
983100275	19
402357060	20
416149917	21
553998112	22
406324268	23
773218266	24
293693298	25
482834228	26
691430122	27

743109146	28
475748196	29
516526516	30
395972971	31
510798891	32
289150450	33
237199231	34
179638569	35
310116509	36
304955787	37
318672236	38
597731783	39
312515960	40
273508044	41
208595545	42
153318273	43
168968898	44
155962697	45
442650723	46
233185243	47
394591161	48
219360527	49
416361900	50
257045710	51
558534352	52
250252052	53
122588679	54
343502226	55
198002553	56
148395946	57
177629292	58
167031566	59
243303388	60
297328156	61
198029757	62
413127619	63
419296992	64
438648260	65
566335075	66
344450208	67
270689709	68
396460885	69

276113445	70
327925914	71
383007960	72
380081589	73
498075515	74
457821502	75
503663373	76
354150708	77
466632498	78
475696644	79
483868419	80
438026594	81
344649315	82
447343120	83
226457181	84
667294178	85
332098605	86
232710120	87