International Journal of Mathematics and Statistics Studies

Vol.1 No.2, pp.1-11, June 2013

Published by European Centre for Research Training and Development UK (www.ea-journals.org)

MODELING TO ANTICIPATE WORLD PRICE OF EACH OUNCE OF GOLD IN INTERNATIONAL MARKETS

Mohammad Rikhtegar
Business Management, MA Student
Islamic Azad University, at South Tehran Branch
00989363121406

Hamed Asgari
Business Management, MA Student
Islamic Azad University, at South Tehran Branch
00989371028074

Hamid Bagheri
Business Management, MA Student
Islamic Azad University, at South Tehran Branch
00989124784726

Rasoul Ejraee
English Language Teaching, MA Student
Islamic Azad University, at Central Tehran Branch
00989199705954

Hanie kasechi
Business Management, MA Student
Islamic Azad University, at South Tehran Branch
00989126220905

Dr. Mahnaz Rabiei
Economics, Ph.D
Faculty member of Islamic Azad University, at South Tehran Branch
00989121903214

International Journal of Mathematics and Statistics Studies

Vol.1 No.2, pp.1-11, June 2013

Published by European Centre for Research Training and Development UK (www.ea-journals.org)

Abstract: *Any change in sale price may affect customers, distributers and sellers. Anticipating future prices is one of the best ways to face appropriately such these price changes in the market. Time series have wide range of application in various fields such as economy, management and marketing. Time series is a very important tool to analyze a collection of observations which are recorded as daily, weekly, monthly and annually reports. In this paper, the world price of each ounce of gold during 338 continuous months are considered (Average per month) and the target is to assess the behavior of data and to release a suitable model for this data to anticipate world price of each ounce of gold during upcoming months by means of analysis of time series. The first step to analyze time series is to draw data. Next step is to recognize effective parameters on the series (trend, cycle and seasonal) and to remove them from time series and at last to process a static model on time series. We drew autocorrelation function (ACF) and partial autocorrelation function (PACF) for data. Auto-regression model (AR), moving average model (MA) and a combination of AR and MA models (ARIMA, ARMA) were selected as the grade of recognition model and appropriate model. After all stages to analyze time series and creation of remained parameters and after consideration of fitness of represented model, anticipation of world price of gold for each ounce will take place. In this regard, the result of considering the data in this paper produces information for future to make appropriate and profitable decision based on current data. The process is done by means of MINITAB software.*

Keywords : Time Serise,Forecast, ARIMA,ACF, PACF

INTRODUCTION

Nowadays, determination and trend of the how of price fluctuations is one of the most crucial issues being interested by financial economists and analysts and which has been lead to a variety of different views in this matter.(1) The reaction towards the changes of products price is to be one of presence and penetration in the market. Any change in sale price may affect customers, distributers and sellers and that might pave the way for the government's reactions as well. (2). One of the ways for facing appropriately such fluctuations in prices is to anticipate the products prices in the future.

Historically, gold has been considered a "frontier-less currency," that may be traded at any time, virtually under all circumstances. Gold proved to be the most effective way to collect cash during the stock exchange crash in 1987, and once again in 1997 and 1998 during the Asian crisis. In both Gulf wars, the demand for gold increased significantly and hence the need to maintain a small proportion of a portfolio in gold could be invaluable in moments when cash is essential. Its importance lies in reflecting the expectations of the investors, marking the trends and expectations of growth and decline of the world economies (3).

Many derivatives of gold trading in international gold markets are also traded, such as gold futures, gold options, gold forward contracts, and so on (4)(5). Remarkably, since the price of gold varies within a limited range, gold is able to reduce the effect of inflation, control the rise of price and help carry out constrictive monetary policy (Atsalakisa & Valavanisb, 2009).(6)

Time series [3] have variant immeasurable applications in such fields as statistics and engineering; management; weather; marketing as well as economics and etc. it can be found that in the real world there are many instances in different fields in which a collection of daily, weekly, monthly, and annually observations are recorded. Time series are regarded as important tools in analyzing such observations. A time series is a collection of observations which has been organized in a chronological order. To put that in other word is that the time series are defined as the data collection based on an observation of a phenomenon in a period of time. Briefly, the purpose of time series analysis is as, 1. Exploring and identifying the probable model of data, and 2, anticipating the values of time series.

In a time series, first, we recognize the past behavior of the probable model of series which include the data, then we suppose that the data will be having the same behavior and be subordinated by the data fitting model, therefore; we try to anticipate the future values of time series. Meanwhile, the modeling of a description of a behavior of time series, mathematically, includes the following three general stages as, 1. identifying the primary model, 2. estimating the identified model's parameters, and 3. investigating the model[4].(7)

In the study, the modeling of time series is done by Box- Jenkins approach. To analyze the time series, the two following approaches are sought as, 1. the analysis in time range and, 2. the analysis in frequency range. In the present study, we are to make use of the former approach which is described very briefly below: time series analysis on the basis of autocorrelation coefficient is referred to as the analysis in time range. To do so, we are to use autocorrelation function, autocorrelation, and partial autocorrelation for studying the gradual fulfillment of a time series regarding the parameter's patterns.

In the current study, we try to make the whole present correlations in observations out of a model, since the other remaining will be uncorrelated.

Statement of problem and the relevant data

The values of data concerning the world price of each ounce of gold in Dollar during the continuous 338 months i.e., from the early 1985 to the end of February 2013, has been attended (Average per month) to.(8)The purpose is to examine the behavior of data and to release an appropriate model for the study's data and to present world price of each ounce of gold during upcoming months by means of analysis of time series.

1. Granger,C.W.J."Forecasting Stock Market Price: Lesson For Forecaster,"1991
   For further information on reference No. 3
2. Cutter, F. (1931). Marketing Management.
3. Time series
4. Box- Jenkins
5. www.kitco.com
6. Time Series Analysis

METGHODLOGY

Time series analysis:
To draw the data is the first stage in time series analysis and that is done by using the statistical program i.e., Minitab as the figures shows. (9)

Describing behavior of time series:
To determine parameters of the variable in time series, and to remove them for having static data, and finally after having static data, some appropriate models on data go to the data fitness (10). To the figure 1, it is showed that the data have the process and that means the data is not static, therefore; it is needed to make them static, first.

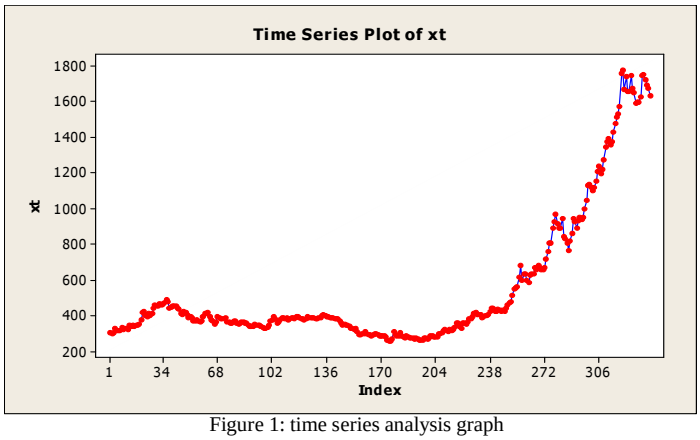
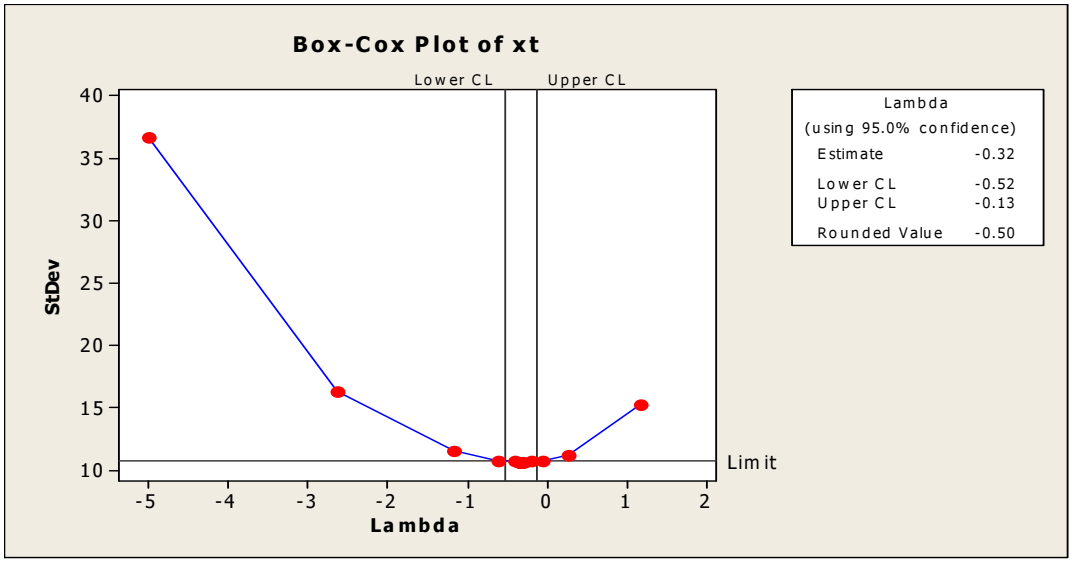


Figure 1: time series analysis graph

A time series might be static in either average or correlation. The proper solution to make a time series static is to differentiate that time series. For that time series which have a sort of non-static variance, say, variance is not static; the suitable resolution might be Box-Cox Transformation. It should be taken into account that non-static variance should first be examined. Where Rounded Value = - 0.50, by using Box-Cox Transformation[3] for creating static data, the following transformation is done on the primary data: w = 1/SQRT (Xt).



To examine static in variance, we first are to draw Time Series Plot for W and ACF[4] .

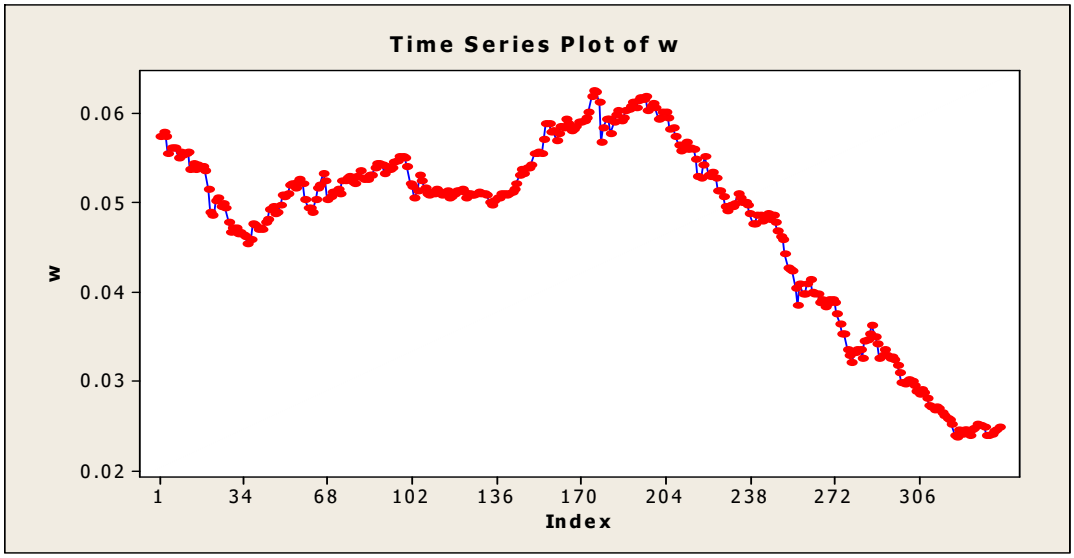


Figure 2: graph time series for variable W

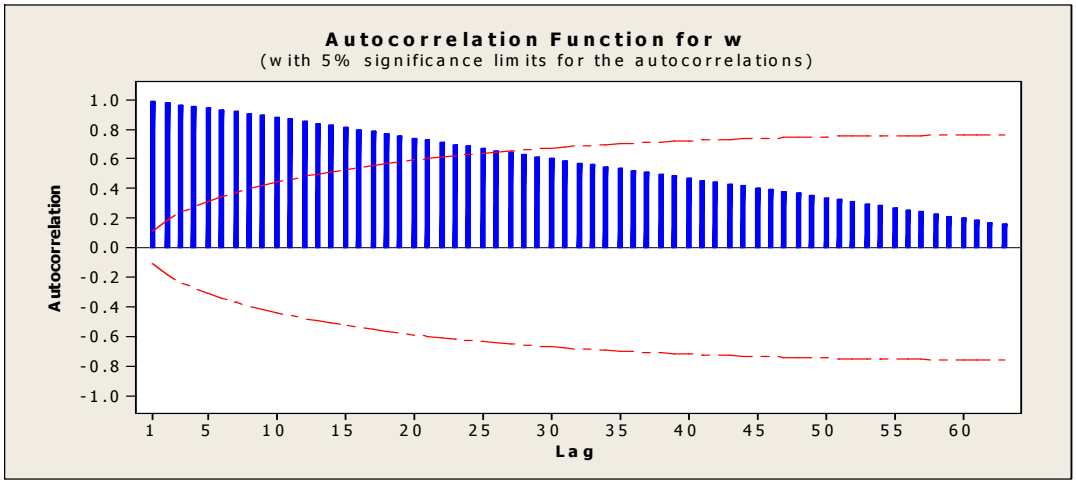


Figure 3: graph ACF for W

1. Javadi Sabbaghian, r and Bagher Sharifi. 2009
2. Chetfield, C. an introduction on time series analysis.
3. Box-Cox Transformation
4. Auto correlation Function

As it shows, the values of autocorrelation function have a slow tendency towards zero. This type of behavior results in non-static in time series average. So it is recommended that we differentiate the time series to meet static. We draw, then, autocorrelation and partial correlation for the differentiated time series as below:

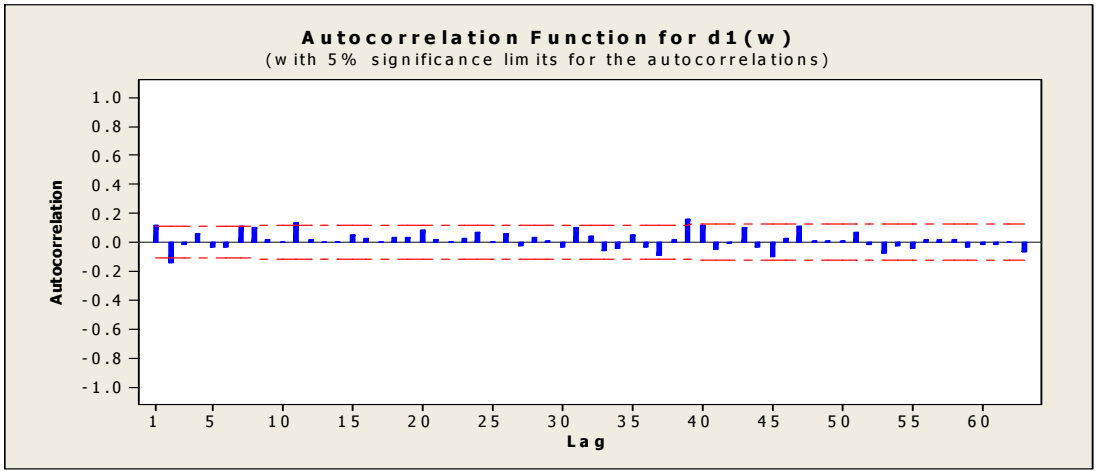


Figure 4: graph ACF for dl(w)

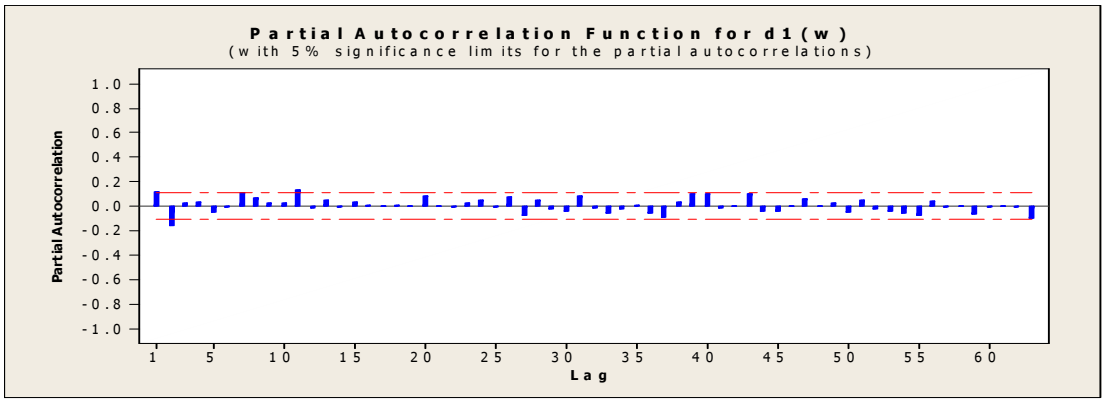


Figure 5: graph PACF for dl(w)

Although there is no seasonal observation in the graphs, we will not utilize seasonal differentiation in next steps.

Determining type and order of the model and examining the statistical models:
Typically, for determining and recognizing type and order of the models ACF[1] and PACF[2] , there ARIMA, ARMA, AR, MA should be chosen, first. The huge usage of these types of models could be referred to as their capacity in making correlation[3] among the present time values and the past time as well as their simplicity in structures.(11)

Examining the types of models
Regarding the obtained ACF and PACF graphs (fig. 4, fig. 5), we try to examine them to release a proper model.

3.3.2. Model fit: Having recognized the experimental model for time series, we estimate parameters of model. Since the P-Value, we are not to accept H_0 of the static statement, therefore; the gained model is : ARIMA[6] or ARI[6](1,2)

$$\phi_\rho(B)\nabla^d W_t = \theta_0 + \theta_q(B)Z_t \Rightarrow \phi_2(B)\nabla\ W = \theta_0 + Z_t$$
$$(1 - 0.1313B + 0.1562B^2)\nabla w_t = -0.00009937 + Z_t$$
$$w_t - 1.1313w_{t-1} + 0.2875w_{t-2} - 0.1562w_{t-3} = -0.00009937 + Z_t \Rightarrow w = 1/\sqrt{x_t}$$

---

1. Auto correlation Function
2. Partial Auto correlation Function
3. Correlation
4. Salas et. Al , (1996)
5. Auto regressive Integrated Moving Average
6. Auto regressive Integrated

Examining the model's being proper:

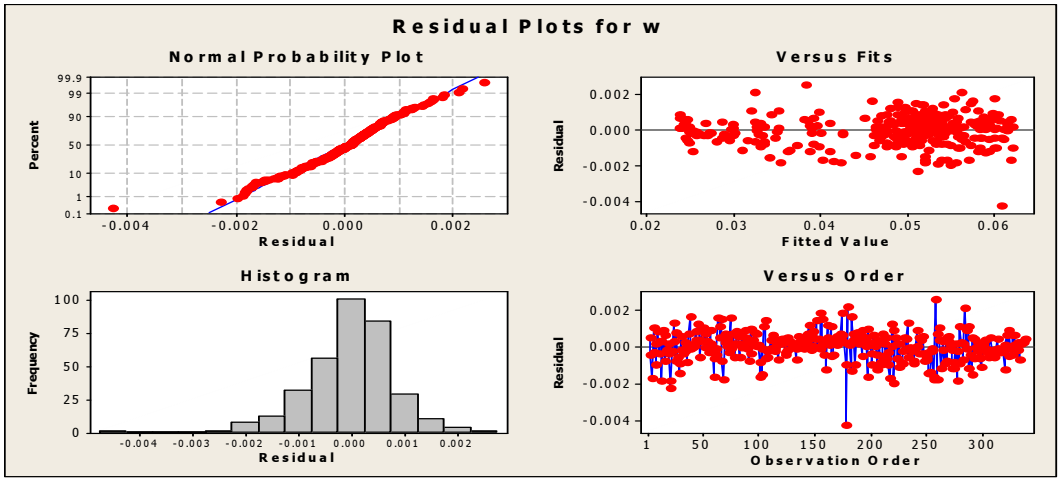


Figure 6: Residuals Plots for W

The Residuals analysis:
We try to use the Residuals analysis of the model fit to examine the model's being proper. If any missing in recognizing the experimental model, the Residuals analysis shows that missing. A) examining the normality of the Residuals: we accept the Residual hypothesis by considering the

normal probability and Residuals histogram[1]. B) examining the hypothesis of the variance of Residual's being static: this hypothesis is accepted regarding the presence of non-constructed in the Residuals versus the fitted values[2]. C) drawing the Residuals graph versus time: by drawing the Residuals versus the Order of data[3] and observing that the Residuals have no specific structure, so we accept the model's being proper. D) examining hypothesis of the residuals independence: based on the gained graphs, we accept this hypothesis.

Fig. 7: ACF of Residual Plots for w

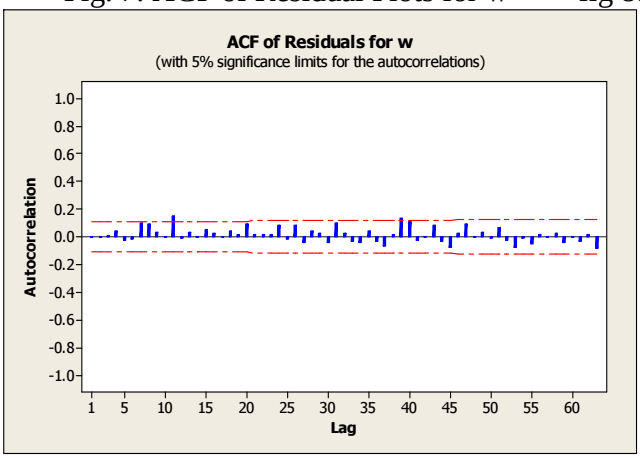
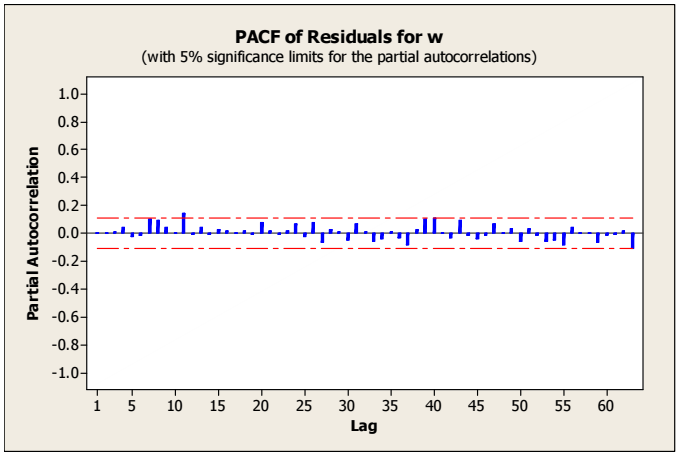


fig 8: PACF of Residual Plots for w



Bert-Manta test.

Based on K2s taken out of Legs and the value of K2 and based on K2 in a significant level of 0.05 and yet based on the P-Value out of Legs all of which are > 0.05, it shows that we reject the H_0 or, say, non-sufficiency model, and then, we accept the very model by considering the confidence level of 0.095. Accepting that hypothesis means that that is a sort of non-correlation for all correlations pertaining to the Residuals, and this shows sufficiency of the model.

1. Normal Probability Plot of the Residuals
   Histogram of the Residuals
2. Residuals versus the Fitted Values
3. Residuals versus the Order of the Data

Choosing model based on AIC criteria[1]:

This model is based on the notion that a model can be chosen, among the other models, if and only if it has the least AIC coefficient.(12). In examining a model's being proper, the over fitting approach[3] is taken into account, and since the extra statistic is significant, so we utilize the AIC criteria for recognizing the suitable model. As it shows, the AIC criteria for the first model is lower, and yet it includes less parameters. So this model is chosen as a suitable model.

Table 1: the AIC value of the models on conditions.

مدل	MS	AIC
(2,1,0)	0.000000649	-4811.77
(0,1,2)	0.00000065	-4811.25
(3,1,1)	0.000000645	-4809.86
(3,1,2)	0.000000647	-4806.81
(2,2,2)	0.000000649	-4807.77

Forecasting:

In this study, we will anticipate the next six stages by using Minitab Software. Since forecasting farther stages are somehow far away from exactness and are not close to reality, we tend to fewer stages which are much probability to reality.

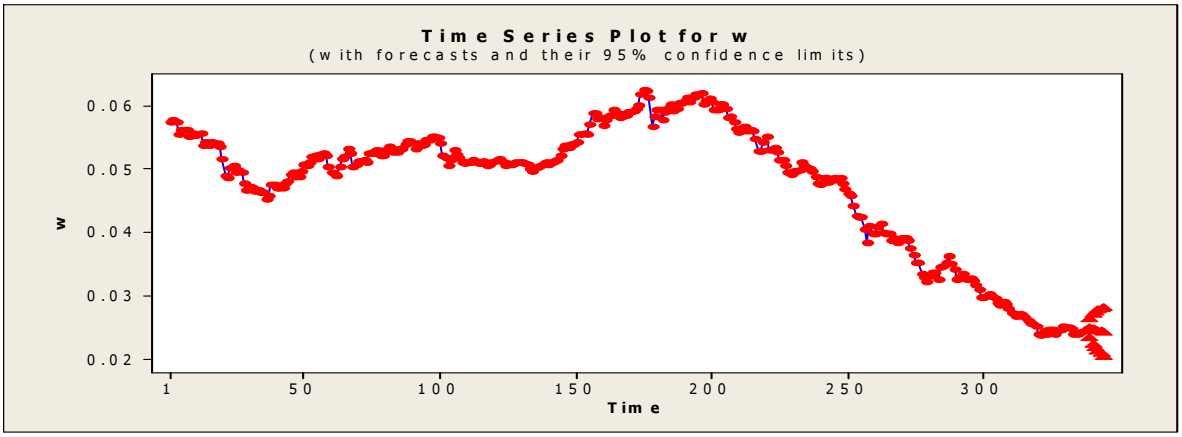
When forecasting the data, the forecast takes place in average, but Confidence Limits has the importance of indicating the majority and minority of each data whether they are good. Therefore, Confidence Limits are much better than the usual forecast. These forecasts are related to the transformed time series. To gain the real time series forecast, we apply the following formula:

$$w_t = 1.1313 w_{t-1} - 0.2875 w_{t-2} + 0.1562 w_{t-3} - 0.00009937 + Z_t \quad \Rightarrow \quad x_t = (1/w_t)^2$$

1. AIC
2. Montgomery, Johnson, and Gardiner. “Forecast and time series analysis”
3. Over Fitting
4. Forecast
5. Confidence Limits

The anticipated values are in the table as below:

Forecast (w)	Forecast (Xt)	Upper (Xt)	Lower (Xt)
0.0247104	1637.723	1868.96	1446.9
0.0245504	1659.139	2035.249	1378.412
0.0244420	1673.888	2145.532	1342.251
0.0243534	1686.09	2240.309	1314.711
0.0242593	1699.196	2336.485	1291.085
0.0241614	1712.994	2433.795	1270.731



CONCLUSION AND SUGGESTIONS

If the forecast lasts for a long time and that is on Confidence Limits, which is important no longer because the pattern may be changed or may some events occur and finally change the process of data moving. 2) the forecast indicated that the increasing trend of one month before reforecast begins has a continuously process. 3) regarding that there are some constituents(a: process or long term tendency, b: rounded changes, c: seasonal changes) which are used for describing behavior of a time series, that would better be recommended the usage of this model to forecast economical issues. 4) making the statistical entry data statistic as one of the conditions for resolving the forecast problems by using time series should be considered. 5) type of the eclectic model(AR, MA, ARMA, and ARIMA) as forecast function and processing in problems is highly focused and that can influence the exactness of output responses.

References

Antonino Parisi, Franco Parisi, David D´ıaz,2007, Forecasting gold price changes: Rolling and recursive neural network models, J. of Multi. Fin. Manag., 18 ,477–487

Atsalakisa, G. S., & Valavanisb, K. P. (2009). Suveying stock market forecasting techniques-

Chetfield, C.(1372) an introduction on “Time Series Analysis”. Translated by: Noroumand, H., A., & Bozorgnia, A. Ferdousi University of Mashhad publications.

Fillip, K. (1931).” Marketing Management”. Translated by: Forouzande, B. Amoukhte publications.

Granger,C.W.J.”Forecasting Stock Market Price: Lesson For Forecaster,” Working Paper; San Diago: University of California, Department of Economics,1991,pp.91-23.

Grudnitski, G., & Osburn, L. (1993). Forecasting S& P and gold futures prices: an application of neural networks. Journal of Futures Markets, 13(6), 631–643.

Javidi Sabbaghian، r and bagher Sharifi ،m.Random Modeling Application in River Flow Simulation and Estimation of Mean Annual River Discharge by Time Series Analysis.2009

Khalozadeh, H., & Khaki, A. Assessing the Forecasting Stock Price and releasing non-Linear Model based on Nerve Network”. Economics Research Journal, 64(43-85), Fall & Winter 1382.

Khorami, M., & Bozorgnia, A. (1386). “Time Series analysis by means of Minitab Software”. Sokhan Gostar publications.

Montgomery, Johnson, & Gardiner. (1373). “Forecast and Time Series Analysis”. By: Fateme, GH., M., T. San’ati University of Amirkabir (polytechnic, Tehran).

Shafieea, S., & Topalb, E. (2010). An overview of global gold market and gold price forecasting. Resources Policy, 35(3), 178–189.

www.kitco.com

Part II: Soft computing methods. Expert Systems with Applications,36(3, Part 2), 5932–5941.

Authors email addresses :

Mohammadrikhtegar@yahoo.com

Hamed.askari@yagoo.com

Hamidbbt@yahoo.com

Rasoulejraee@gmail.com