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MODELLING AND FORECASTING OF POULTRY PRODUCTION IN AL-HILLA DISTRICT IN IRAQ

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Abstract:

In 1970 Jenkins, Box's extensive contributions appeared in the field of time series, where they devised a method with many advantages in analyzing time series in general and mixed models (ARIMA) (especially in terms of prognosis and control, as well as their names in connection with (ARIMA) models in Their popular book, "Time series analysis: forecasting and control".In 1993 the modern researcher speculated that the maize crop was produced in Iraq until 2000, using the Box-Jenkins models.That all the units of animal and poultry production are included in the strategic food channels. The ladder of food security priorities and various countries of the world strive to provide these products to their people through local production or importation in the absence of possibilities for their production as one of the essential commodities that meet the requirements of satisfying the human body's need for protein and one of the most criticalstandards for measuring the development and well-being of peoples. Because of the strategic importance of these commodities and their importance in domestic consumption and other economic activities, and the apparent burden they constitute on the state treasury when importing part of them from foreign markets, he dealt with the theoretical aspect related to time chains, chain components, general trend models, Box Jenkins models and criteria for differentiation between models. Trend models and Box Jenkins models were conducted and then predicted using the best model from among these models.

1- Research importance:

Poultry is considered among the Iraqi consumer basket as in other countries of the world and is considered one of the protein-rich meals and maintains the human body's nutritional balance. The importance of research lies in building the best model used to predict the quantity of production by obtaining the best model among several models that have been studied, namely Traditional models, Boxes and Genghis models, for plans to be put into production.

2- Research Objective:

The research aims to predict production by selecting the best prediction model by comparing the following models: Box - Jenkins - ARIMA, Linear trend model, Quadratic trend model, Exponential growth trend model through the series data represented by the quantity of poultry production.

3- Time Series and Box Jenkins models:

When studying many phenomena related to time, they may be annual periods, as in our research, or quarterly, monthly, weekly, or daily, and so on. Therefore, you know the time series: a group of related observations recorded in successive periods for a phenomenon [4].Time series models are classified according to the number of model variables intoA univariate time series model: a time series model that contains only one variable is called a univariate time series model, and Multivariate time series model [6]:It is the time series model that explicitly uses other variables to describe the behaviour of the time series under study. It is called a multivariate time series model. Time series can be classified into [5]: Discrete-time series: This type of series consists of observations taken for a group of points (t1, t2,…in), usually taken in equal fields. The monthly calendar is an example in which the period between the data is fixed, and this does not necessarily mean that the phenomenon under study takes discrete values. Still, it may be A continuous variable such as height or weight, and Continuous-time series: The observations are continuous in time, and it is not necessary that the phenomenon studied is a continuous variable. The continuous-time series can be converted into discrete by two ways, first by taking samples from the observations from time to time so that these periods are equal. We can obtain a discontinuous time series called (Sampled Series), for example, price chains. The second method is done when the variable is not present at a particular moment, so we can, in this case, combine the values of the phenomenon in equal intervals to obtain a discontinuous time series. An example of this type of series is exports that are measured monthly and rain that is measured daily. But the time series most used in the applied field is the intermittent time series. [7] .

Among the most prominent economic forecasting methods are (ARIMA) Autoregressive-Integrated-Moving Average Models. Box and Jenkins formulated this methodology in 1970, and therefore, it is called (Box-Jenkins) and adopts this method. Methodology on integrating autoregressive A.R. models and M.A. moving averages [2]. (ARIMA) model refers to those that both Box and Jenkins applied to time series, which depend in their formulation on three parts, which are the Autoregressive (A.R.) model it is the self-regression model of degree p, symbolized by [A.R. (p)], can be written as follows: General moving average .][3 $Y_t = \mu + a_1 Y_{t-1} + a_2 Y_{t-2} + ... + a_p Y_{t-p} + u_t$

model: M.A. (q)which is the current value of the time series (Yt) is expressed in terms of the weighted sum of the previous values of errors (ut, ut-1, ..), and the general formula for this model of degree q symbolized by (M.A. (q)) is: -Mixed Autoregressive . $Y_t = \mu + u_t + b_1 u_{t-1} + b_2 u_{t-2} + ... + b_q u_{t-q}$

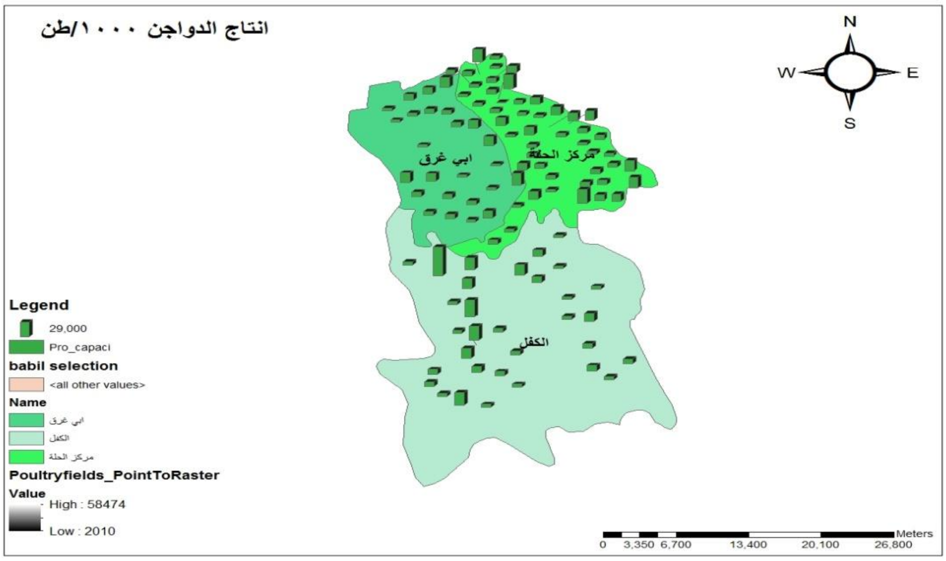
Moving average model (ARMA)In this model the two previous models (A.R. (p), M.A. (q)) are combined to obtain a model that has greater flexibility in representing the time series data. The general formula for the ARMA (p, q) mixed model is: [10]

$$Y_t = \mu + a_1 Y_{t-1} + a_2 Y_{t-2} + ... + a_p Y_{t-p} + u_t + b_1 u_{t-1} + ... + b_q u_{t-q}$$

The general form of the model is (p, d, q) ARIMA, meaning the order of autoregressive (p), the order of differences (d) and the order of the moving medium (q). [8]

4-Data Description

The research data included the information available in the records of the Agricultural Statistics Department in Babylon / the Geographical Parameter Systems Department to obtain data for the research. The general district is as shown on the map below



4-1 Estimate the parameters of the linear trend model

Equation (1-2) will be used in estimating the general linear trend equation, as in the model below

$$Yt = 31578.15 + 547.241 * t$$

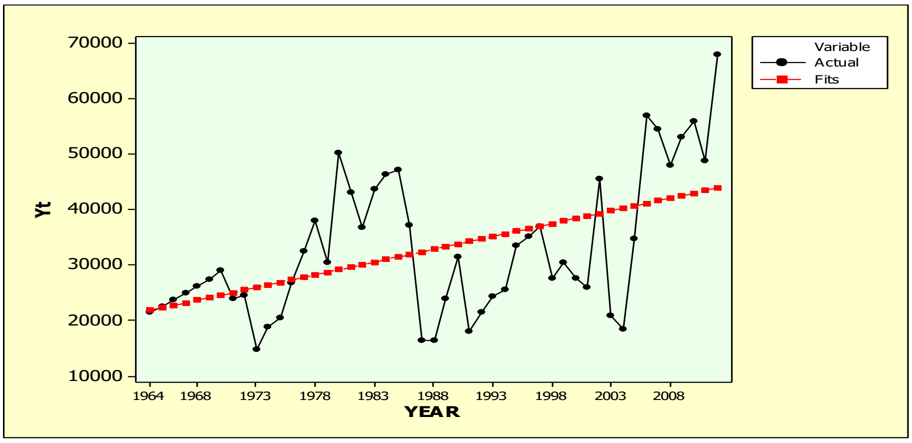
As for the accuracy measures of the model, they were as follows

MAPE 28

MAE 6842

Figure (3-1) shows the plotting of the real data and the linear general trend equation

Figure No. (1) general linear trend equation



4-2 General trend quadratic equation

Equation (2-2) will be used in estimating the general linear trend equation as in the model below

$$Yt = 24678.14 - 457.247 * t + 14.758 * t ** 2$$

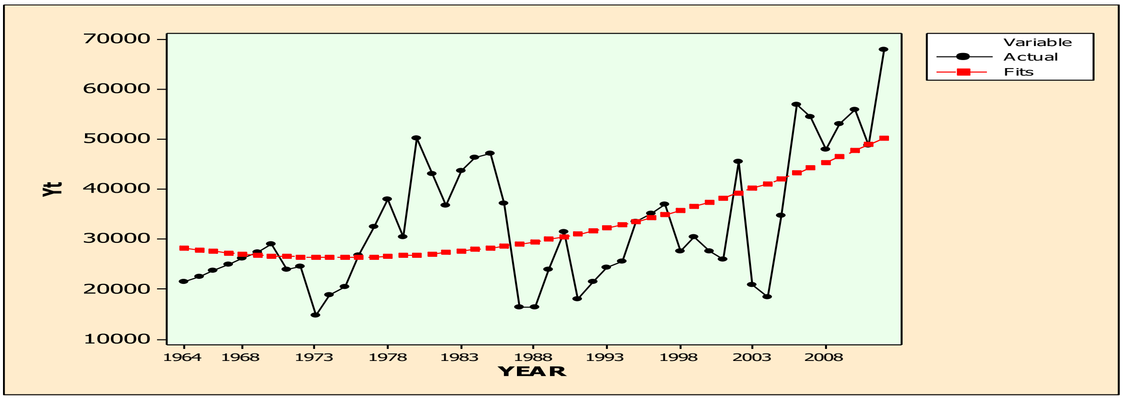
As for the accuracy measures of the model, they were as follows

MAPE 27

MAE 8457

Figure (2-3) shows the plotting of the real data and the general trend quadratic equation

Figure (2-3) represents the trend quadratic equation



1-3Exponential trend equation

Equation (2-3) will be used in estimating the general linear trend equation as in the model below

$$Yt = 23458.12 * (1.10457) ** t$$

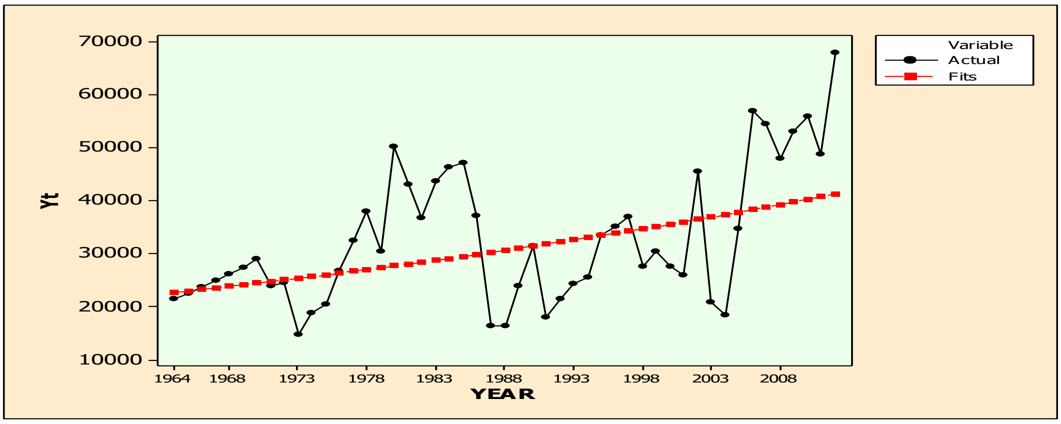
As for the accuracy measures of the model, they were as follows

MAPE 27

MAE 8457

Figure No. (3-3) shows the plotting of real data and the exponential trend equation

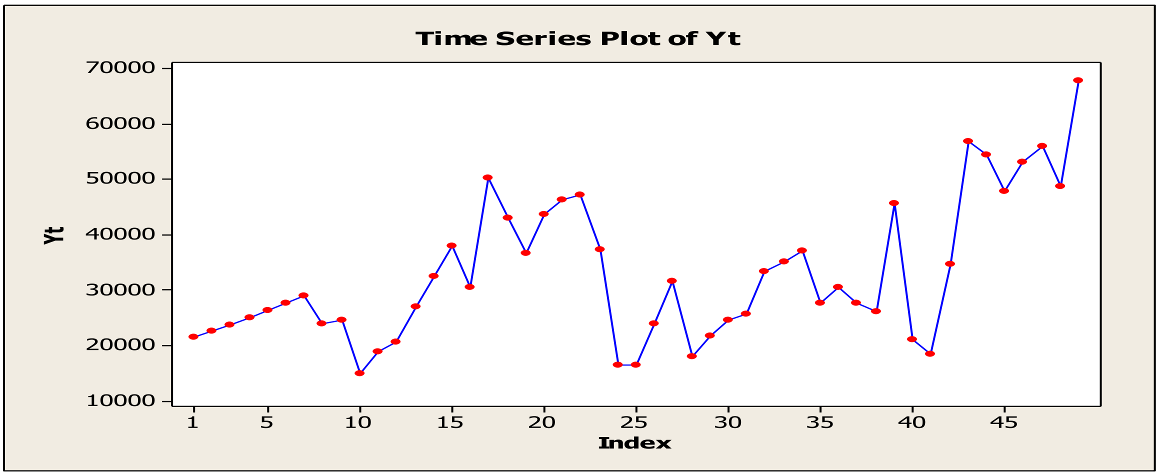
Figure (2-3) represents the exponential trend equation



4-4ARIMA model for the quantity of poultry production

After collecting the data, which is the first stage of the Box Genghis methodology, we draw a series of data for the quantity of poultry production to identify the chain behaviour:

Figure (3-4) drawing the series for the quantity of poultry production



Through Figure (3-4), we note the instability of the time series, and for more accuracy, we draw both the A.C.F. and the PACF partial self-correlation function, respectively:

Figure No. (3-5) a drawing of the A.C.F. series autocorrelation function

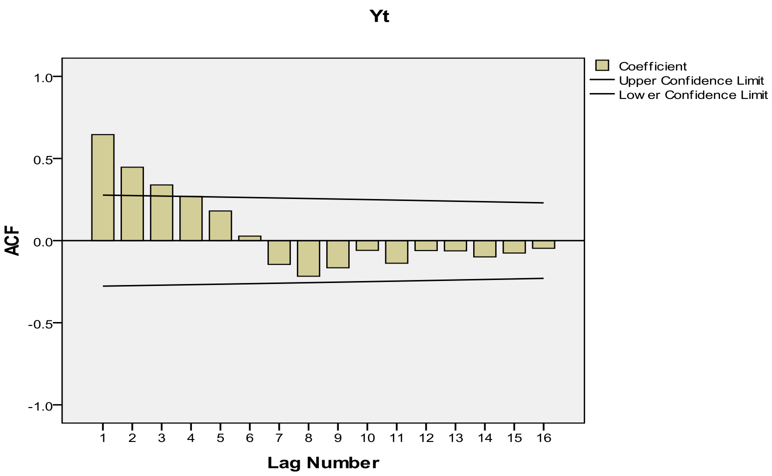
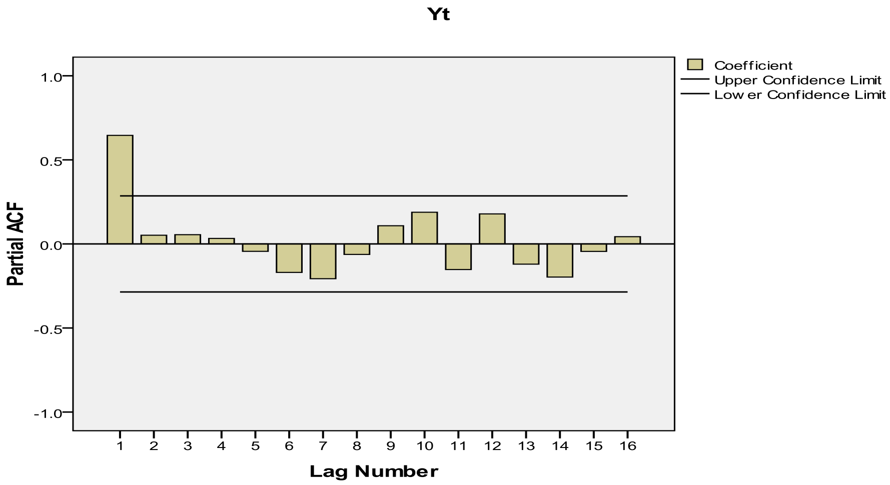


Figure (3-6) a drawing of the PACF chain partial autocorrelation function



Where we notice from Figure (3-5) on the behaviour of partial self-correlation coefficients A.C.F. that the first displacement outside the confidence limits for the autocorrelation coefficients, as well as from Fig. (3-5) for the behaviour of the partial self-correlation coefficients (PACF) that the first shift is outside the confidence limits for the partial self-correlation coefficients This is an indication of the lack of stability in the chain according to the behaviour, and therefore we take the differences where stability is achieved after taking the first difference (dif = 1), so the graphical figure of the resulting chain becomes as shown in Figure (3-7) as it seems that the chain has become stable and draw each The A.C.F. and PACF functions after the first difference, as shown in Figures (3-8) and (3-9) confirm this:

Figure (3-7) drawing the series for the quantity of poultry production after the first difference

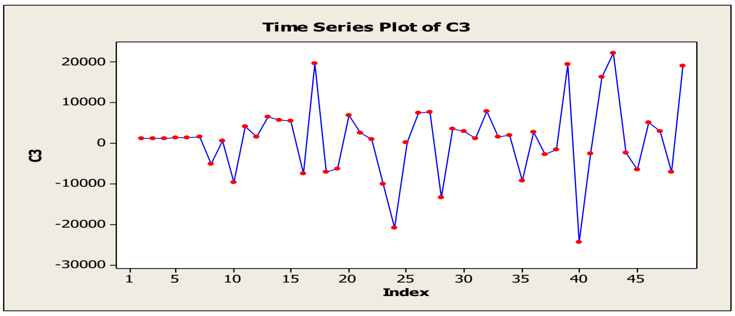


Figure No. (3-8): a drawing of the A.C.F. series autocorrelation function after the first difference

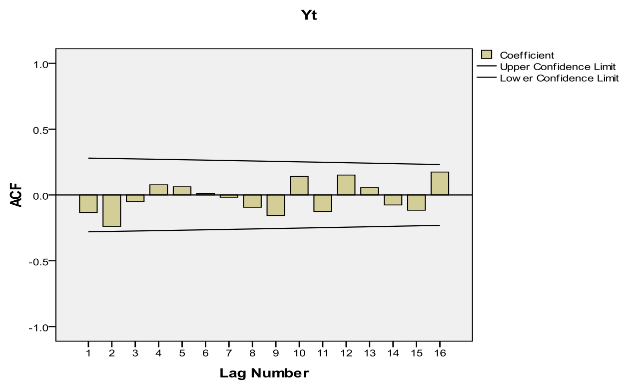
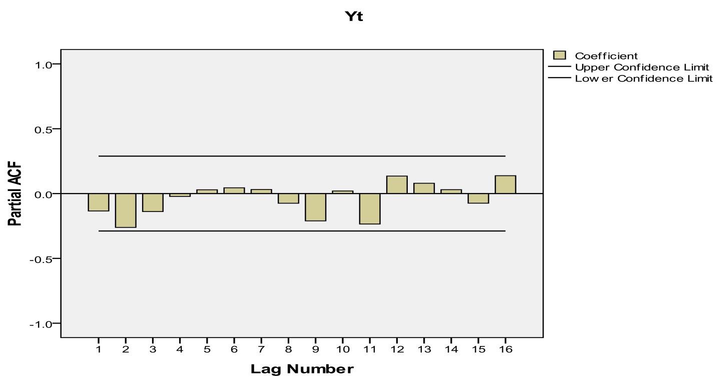


Figure No. (3-9) a drawing of the partial autocorrelation function of the PACF chain after the first difference



5- Model diagnosis and evaluation and selection of the best model

To determine the model's rank more accurately, several models were reconciled, and the best model was chosen according to the criteria for differentiation. The proposed models are as shown in Table (1).

Table No. (1) represents the proposed Box Jenkins models for the general production series

model	MAPE	MAE	AIC	Notes
1,1,0	22.978	6457.47	15.59	
0,1,1	20.78	6021.457	14.024	The model is fits
0,1,2	21.99	6522.168	14.64	
2,1,0	21.003	6036.657	14.68	
1,1,1	20.217	6024.636	14.65	

The best model of Box Jenkins models is (ARIMA), which are used to differentiate between the different models. Table (2) represents the model parameters and the significance of these parameters:

Table No. (2) represents the model parameters and the significant features

		Estimate	S.E.	t	Sig.
Constant		724.024	710.622	1.153	.255
Difference		1			
M.A.	Lag 1	.235	.153	1.461	.151
	Lag 2	.214	.153	1.613	.114

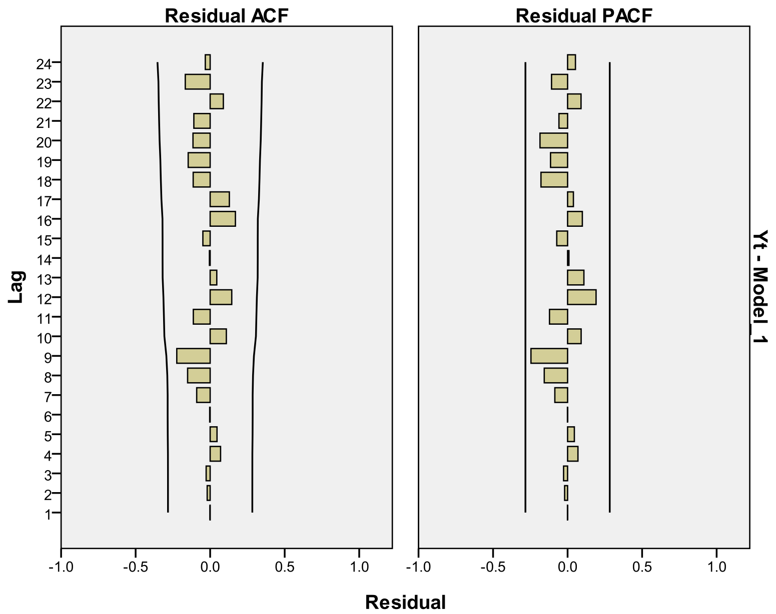
And the mathematical model is

$$Y_t = 724.024 + u_t - 0.235u_{t-1} - 0.214u_{t-2}$$

6- the models' significance test

After diagnosing the model and determining its degree and estimating it, it is necessary to ensure the model's suitability and efficiency. This was done by extracting and drawing partial and self-correlation coefficients for the estimated model's remainder (errors) and drawing them. It means that the residual chain is random, and the model used is excellent and appropriate- : .

Figure (3-10) a drawing of the autocorrelation function A.C.F. and the partial autocorrelation PACF for the remainder



7- Choosing the appropriate model

Some traditional models and Jenkins' models were reconciled, and according to the MAPE criterion, we note that the ARIMA (0,1,1) Box Jenkins model is the best model and as shown in Table (3-4)

Table (3) represents a comparison between the traditional models and the Box Jenkins models

The model	MAPE	الملاحظات
Linear trend	30	
Quadratic trend	29	
Exponential trend	28	
ARIMA (0,1,1)	20.78	The fits model

8-Conclusions

The researcher has reached a set of results through statistical analysis, the most important of which are:

1. The time series for several poultry fields is unstable, so the first difference was taken to achieve stability, and after the first difference, the series became stable.
2. 2The ARIMA model (0,1,1) was chosen for a series of poultry fields in Hilla district by the differentiation between a set of models and adopting the B.I.C. Bayesian Information Criterion.
3. The approved models were well matched (the model is appropriate) after applying the Ljung-Box test and the residual test.
4. Through comparisons, we note that the proposed Box- Jenkins models according to the proposed (MAPE and A.I.C.) standards showed superiority over the general trend equation (linear, quadratic, exponential.(

9-Recommendations

The researcher recommends adopting Holt's Linear Method for prediction.

1. Emphasis on the need to accurately and continuously record the data in the Ministry of Agriculture due to the absence of data for previous years, as the Directorate of Agricultural Statistics data in Babil was relied upon and the study's data could be used.
2. The researcher recommends the Ministry of Agriculture pays attention to the planning aspect, depending on the study's values.
3. The researcher recommends conducting other studies in the field of time series to predict the number of fields available to increase production.

References

1. Al-Hadithi, IssamMawloudAbd Al-Latif Ayyash, "Forecasting for Corn Crop Production in the Iraqi Country", Master Thesis, College of Management and Economics, University of Baghdad 1993
2. Anderson, T.W. (1971), "The statistical analysis of time series", New York , john Wiley and Sons.
3. BLOOMFIELD,PETER," FOURIER ANALYSIS OF TIME SERIES " An Introduction,second edition – 2000 .
4. Bone, R., and Asad, M. (2003), "Boosting recurrent neural networks for time series prediction"m RAFI publication, International conference in Roanne, France, April .

5. Bowerman, B.L. and R.T.O.' Connel (1988), "time series and forecasting: An applied approach", Duxbury press, north scituate, M.A.
6. Box, G.E.P., & Jenkins, G.M. (1970), "Time series analysis: forecasting and control", Holden-Day, San Francisco.
7. Box, G.E.P., & Jenkins, G.M. (1970), "Time series analysis: forecasting and control", Holden-Day, San Francisco.
8. Hole, Y., &Snehal, P. (2019). Challenges and solutions to the development of the tourism and hospitality industry in India. African Journal of Hospitality, Tourism and Leisure. 8 (3), 1-11
9. Hole, Y., &Snehal, P. &Bhaskar, M. (2018). Service marketing and quality strategies. Periodicals of engineering and natural sciences,6 (1), 182-196.
10. Ledolter J., and B. Abraham (1983), "Statistical methods for forecasting", John Wiley and Sons, New York.
11. Makridakis S. and S.C. Wheelwright (1977), "Adaptive filtering: An integrated autoregressive moving average filter for time series forecasting", Oper. Res. Quart .
12. Makridakis,Spyros&C.Whedwright,Steven&J.Hyndman,Rob " FORCASTING METHODS AND APPLICATIONS" , third edition -1998.
13. Rzempoluck, Edward J. (1997), "Neural Network Data Analysis using Simulet", Springer Verlag.
14. Wei, William W.S. (1990), "Time Series Analysis, Univariate & Multivariate Methods", Addison-Wesley Publishin.