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Forecasting the surplus or deficit of the public budget in Iraq until 2025

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Abstract

The general budget is the main tool that facilitates the government to keep pace with the changes taking place in the economy by exploiting its resources in order to achieve economic goals. These models, in addition to analyzing the components of the general budget in Iraq for the period (2004-2021), and the results showed that the best model that can be used to predict actual revenues and the surplus or deficit of the general budget in Iraq is the random behavior model that showed the lowest values to test predictive ability standards (MAPE, SBIC, AIC) used for comparison with other time series forecast models, and that the predicted values of actual revenues in Iraq increased from (109081) billion dinars in the year (2021) to (152323) billion dinars in the year (2025), and this increase has an impact Positive on the general budget of Iraq, and this is what the predictive value of the general budget shows, as it achieved surpluses amounting to (20345) billion dinars in the year (2025) and that these surpluses help the government in facing its expenditures.

Keywords: Public budget surplus or deficit, actual revenues, actual expenditures, time series, forecasting.

First: Introduction

The Iraqi economy is characterized by major structural imbalances, including the imbalance of the state's general budget, as the revenue side of the budget has been based on one resource and almost entirely in financing the state's general budget, which is crude oil, at a time when the volume and importance of other revenues, especially tax, has declined. As the abundance of oil revenues has largely led to neglecting the importance and role of other revenues, and thus the estimate of the state's general budget has become of great importance because it serves as an indicator for predicting the state of deficit that may affect the general budget in Iraq in order to overcome this deficit and address the imbalance in the general budget.

Therefore, this research comes to make a contribution in the field of forecasting the surplus or deficit of the public budget through the use of time series methods to highlight the role of forecasting the state of deficit that may affect the Iraqi public budget in directing fiscal policy makers to the optimal size of spending, and the researcher hopes that this research will contribute to presenting a future picture It is clear to the authorities responsible for fiscal policy in Iraq about the status of the general budget in Iraq to help them in managing their policy

Second: Research Importance

The general budget deficit tended to increase due to the expansionary spending policy pursued by the government after 2003, and the financing of this agreement is based on revenues from crude oil revenues at a very large rate, which constitutes a danger to the entire Iraqi economy, due to the instability of oil revenues as a result of fluctuating oil prices. Oil on the one hand, and the weak contribution of tax revenues and other revenues in financing public spending on the other hand, and from the foregoing it becomes clear the importance of forecasting the surplus or deficit of the general budget, which shows the fiscal policy makers the future trends of actual expenditures and revenues that avoid them from the excessive trends of public expenditures that lead to a deficit problem Public budget.

Third: Research Problem

The Iraqi economy suffers from the problem of deficit in the general budget, resulting from the insufficiency of public revenues to cover public expenditures, which led to the growing volume of internal and external indebtedness in Iraq, as it is one of the means of financing the deficit in the general budget..

Fourth: Research Hypothesis

The research stems from the hypothesis that the use of time series methods to predict the surplus or deficit of the public budget in Iraq reflects its impact on the economy as a whole in Iraq through predicting the state of deficit that may affect the public budget in Iraq in order to overcome this deficit and address the imbalance in the general budget..

Fifth: Research Objectives:

The objectives that the research seeks to achieve are:

1- Analysis of the reality and trends in the surplus or deficit of the general budget in Iraq for the period (2004_2021)>
2- Predicting the surplus or deficit of the public budget in Iraq until 2025 through the application of different time series models and the comparison between these models.

Sixth: Research method

In order to achieve the objectives of the research, the descriptive approach was relied upon to review the concepts of the general budget and economic forecasting, and the analytical approach to analyze the surplus or deficit of the general budget in Iraq, and the inductive approach was relied upon to predict the surplus or deficit of the general budget in Iraq until 2025 using time series forecasting models (The random behavior model, the general trend model, the quadratic trend model, the moving averages model, the simple exponential smoothing model, the quadratic exponential smoothing model (Brown method), the double exponential smoothing model (Holt method)), and the comparison between these models and choosing the best model among them through The use of predictive power measures (MAE test, MAPE test, Root mean square error (RMSE test), MAPE test, Mean Error test (ME), Akake test (AIC), Schwartz test (SBIC), Hanan-Cowen test (HQC), and the statistical program (Statgraphics) was employed to obtain the tracks of financial stability indicators for the banking sector.

Seventh: Research Structure:

The first requirement: Its title was the theoretical framework of the general budget and time series forecasting.

As for the second requirement: it came under the title of analyzing the reality of the general budget in Iraq for the period (2004-2021).

As for the third requirement, its title was predicting the surplus or deficit of the general budget in Iraq until the year (2025).

Finally, the research reached several conclusions, in the light of which it presented some recommendations for the purpose of addressing some aspects of the Iraqi economy.

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1-Section one: the theoretical framework of the general budget and time series forecasting.

1-1-The concept of the general budget in Iraq and its importance

1-1-1-The concept of the general budget

The general budget is the main tool that facilitates the government to keep pace with the changes taking place in the economy by exploiting its resources in order to achieve economic goals, although the budget is a financial tool used to achieve economic stability and economic development, with what the latter requires of mobilizing savings and raising the individual's ability and desire to work, except The general definition of the state's general budget does not deviate from the framework of its being (a document that includes an estimate of the state's expenditures and revenues for a specified period of time, usually one year, which is estimated in the light of the goals of the state's philosophy), in addition to that it clarifies the financial position of the state. **(Mohammed, 2007: 1)**

The public finance literature refers to the principle of the balance of the public budget between the two sides of revenue and public expenditure. Therefore, we try to clarify the imbalance in the public budget by clarifying the theoretical framework for the surplus and deficit in the public budget through the following: **(Sadat and Alloush, 2022: 938)**

1- The general budget deficit means the budget deficit is the sharp decline in actual revenues or the weakness of its ability to cover actual expenditures, and as a result, measures are taken by the state for the purpose of securing the necessary funds for spending, through the new cash issue, or resorting to internal or external borrowing, To bridge the deficit gap in the budget.

2- The general budget surplus The general budget surplus refers to an increase in the volume of actual revenues at a level that exceeds the volume of actual expenditure, as a result of the government adopting a deflationary fiscal policy based on rationalization in public spending or following a sound tax policy, represented by addressing tax evasion, or increasing the tax base, This leads to the creation of a surplus in the general budget resources

1-1-2 The importance of the general budget

The importance of the state's general budget appears from the fact that it expresses the state's economic, social and political goals, and through it, the state's role in influencing those activities is highlighted and has a great impact on construction. National income through the resources that you collect and public spending, which in turn is considered a driving force for the economy and thus be the main pillar of public investment, public consumption and distribution of national income through guidance and determinants of agreement and resources. Of course, this role of the budget is more effective under democratic regimes **(Salloum and Al-Mahaini, 2007: 97).**Table (1) The results of the unit root test according to the (ADF) test at the original level and the first difference.

1-2- Theoretical framework for prediction

1-2-1- The concept of prediction

Scientific prediction is defined as a quantitative estimate of the values of variables expected in the future based on what is available to us of information about those variables in the past and present, because it assumes that the behavior of economic phenomena in the future is only an extension of their behavior in the recent past **(Atiyah, 2004: 701),** and there is often A delay period between the need to realize an imminent crisis or the actual

occurrence of this crisis, and this period of time is the main justification for forecasting and precaution. An integrated part with decision-making processes **(Al-Maliki, 1993: 13)**, and forecasting is considered a planning tool that helps management in its attempts to deal with uncertainty about the future, relying mainly on past data and trend analysis **(Pirvu et. Al, 2012: 197),** or In other words, it is knowing the nature or behavior of a particular phenomenon in the future, based on the behavior or nature of the phenomenon in the past, and then making the appropriate decision in the light of this behavior, assuming the stability of the variables affecting the phenomenon and from the previous definition of the prediction process. The main elements of the forecasting process can be deduced as follows: **(Al-Obaid, 2003: 2).**

- ✓ Determine the phenomenon to be predicted.
- ✓ Studying the behavior of the phenomenon in the past.
- ✓ Use one of the prediction methods to make an estimate of the model parameters.
- ✓ Drawing a future picture of the phenomenon according to the results of the estimate.

2-2-1The importance of forecasting

Forecasting is the goal of economic theory and its practice. When a person studies economic phenomena and analyzes them using the verbal, analogical and mathematical method, it is only an attempt to discover the nature of the phenomenon and its specific factors and the impact of these factors and other theoretical and applied analyzes and studies whose mission is embodied in collecting the largest amount of data and information on the behavior of the phenomenon and associated phenomena and factors. It and its generators and influences and the strength of that connection, and discovering the laws and relationships that control the behavior of this phenomenon, through the use of information, laws, concepts and relationships to direct the behavior of the phenomenon for the benefit of people, which is the method of using objective analysis in the objective or normative management of the phenomenon. **(Sifu et al., 2006: 32)**

The financial system does not always work in static (stable) conditions. If that were the case, planning would have become an easy process, so it was necessary to predict indicators of financial stability in the future.

The importance of financial forecasting in banking institutions mainly comes down to two things, which are planning and control. In the case of planning, the decision-maker is interested in discovering the general trend of the behavior of the analyzed phenomenon so that he can estimate its expected values in order to hedge against the large fluctuations that may occur in its behavior, such as the fluctuation of the volume of deposits and withdrawals and the influencing factors. In which.

In the case of censorship, the interest is not limited to discovering the general trend of the behavior of the analyzed phenomenon only, but rather to predict the deviation of its behavior from its general direction and to try to intervene early to correct its course. **(Hamwi, 2016: 75)**

1- 2-3-Forecasting methods

There are various methods of forecasting, but the problem is choosing the method that best suits the situation in which a decision is required. Forecasting methods vary according to their time periods, the factors that determine the occurrence of events, the patterns of

available data, and also according to many other factors. In general, forecasting methods can be divided into two main parts:

- ✓ Qualitative methods (how).
- ✓ Quantitative methods.

1) Qualitative methods (how): They are methods whose use does not require the presence of data that have the same specifications as the data used with quantitative methods. That is, these methods can be used in the case of the availability of little quantitative data or even in the absence of any quantitative data, but it relies on the opinions of experienced people in order to predict future events, as this information is the product of conscious thinking and the ability to discriminate and past experiences**. (Al-Tamimi and Al-Anbaki, 2013: 16)**

2) Quantitative Methods:

The use of quantitative methods in the field of prediction requires the availability of a set of conditions, the most important of which are: **(Al-Wardi, 1990: 19)**

- ✓ Availability of historical data on the phenomenon whose behavior is to be predicted in the future.
- ✓ This data must be measured in quantitative (numeric) units.
- ✓ Assumption of continuity: that the behavior of the phenomenon that prevailed in the past will continue in the future.

Quantitative prediction methods are divided into two types, according to the model included:

A- Causal models: This model relies on identifying other variables that may be associated with a causal relationship to the phenomenon or variable under study that is to be predicted - which is usually known as the dependent variable - and then selecting the appropriate statistical model or functional relationship that explains how this variable is related. Other variables, which take many names in the statistical convention, such as independent variables, explanatory variables, or predictive variables. By using this model, the dependent variable under study can be predicted in the future if it is possible to determine or know the future values of the explanatory variables. One of the methods that fall under the umbrella of this model is the regression method. This method is used in all types of knowledge and fields of application, especially economic, social and environmental, as this method allows evaluating the impact of the variables involved, which usually reflect the impact of different systems, policies and decisions, and this method, despite its popularity, suffers from some defects, the most important of which are the following: **(Al-Shaarawy, 2005: 16)**

1-The difficulty of identifying the explanatory variables that are related to the seventh variable and the phenomenon under study.

2-It is assumed that there is no correlation between the observations of the variable or phenomenon subject to prediction, which is an unrealistic hypothesis and does not agree with the concept of the time series as a group of related observations, and this unrealistic hypothesis usually leads to unreliable predictions.

3- The application of this method requires the availability of detailed historical data on all the explanatory variables and the ability to know the values of these variables - or at least predict them - at the times when the phenomenon is to be predicted.

Usually, the researcher has only historical observations of the variable under study and wants to predict future observations of this variable by relying only on these observations. In such cases the second method is used for the next prediction

B- Non-causal models (time series methods): in which the future is predicted based on the values of the variable in the past, that is, the purpose of using this method in prediction is to detect whether there is a pattern in the data collected so far and it is assumed that this pattern It can continue in the future .**(Batal and Al-Obeidi, 2018: 584)**

Many models of time series have been used in forecasting financial time series, and these models can be reviewed according to the following:

1) The random behavior model:

The method of random behavior with direction is based on the following formula (Kumar, et. Al, 2019: 65):

$$Y_t = b_0 + b_1 Y_{t-1} + E_t \quad \cdots\cdots\cdots (1)$$

Since:

E_t: the random error is distributed normally, b_0: it represents the trend and the phenomenon follows the random behavior around the general trend, as we assume that the values of (E_t) are not correlated with each other, E_t: it represents the values of the predicted phenomenon.

2) Linear trend model:

It predicts the linear general trend model according to the following formula: (Al-Salmani et al., 2019: 246)

$$Y_t = b_0 + b_1 X_t + E_t \quad \cdots\cdots\cdots (2)$$

Since:

b_0: represents the constant of the equation, b_1: represents the slope of the equation. X_t: represents the values of the independent variable (time), Y_t represents the values of the predicted phenomenon.

3)Exponential Smoothing Model

Exponential smoothing is another method that uses smoothing of time series data. Exponential smoothing models have three types of methods, and they are as follows: **(Mdloul, et. Al, 2022: 80) (Mahmoud and Ibrahim, 2021: 7) (Thamer, 2019: 483)**

A) Simple Exponential Smoothing

This method depends on the following equation:

$$F_{t+1} = F_t + \alpha(Y_t - F_t) \quad \ldots\ldots\ldots (5)$$

Since:

α: weight coefficient (a constant value between zero and one).

Or this form can be explained as follows:

$$F_{t+1} = \alpha Y_t + (1 - \alpha) F_t \quad \ldots\ldots\ldots (6)$$

Since:

F_{t+1}: predicted value for t+1, Y_t: true value for t, F_t: predicted value for t, α: smoothing constant.

B) Double Exponential Smoothing Model (Holt's Linear Method)

Declining relative weights are given to the time series data, and the linear moving averages method is used when used for forecasting, as well as used in many cases to compensate for

the missing time periods in the calculation when using moving averages. Directivity using a parameter different from the parameter used in the original series, and depends on the estimation of the model coefficients (β, α) with a value between zero and the correct one. The prediction for a later period of time is according to the following equation:

$$\mathbf{F_{t-1} = S_t + b_t m} \quad \dots\dots\dots (7)$$

Since:

$\mathbf{S_t}$: represents the value of the phenomenon after it has been smoothed, $\mathbf{b_t}$: represents the value of the trend after it has been modified, **m**: the number of periods to be predicted.

This equation is used to predict values and in which the trend ($\mathbf{b_t}$) is multiplied by the number of time periods to be predicted (m) and then added to the values of$\mathbf{S_t}$

C) Exponential smoothing model (Brown's linear exp)

Decreasing relative weights are given to the time series data, and they are preferred over the linear moving averages method when used for forecasting. The mathematical formula for the linear Brown model is as follows:

$$\boldsymbol{F_{t-m} = a_t + b_t(m)} \quad \dots\dots\dots (8)$$

Since:

$\boldsymbol{a_t}$ ، $\boldsymbol{b_t}$ = represent the parameters of the model, $\boldsymbol{m}$ = represent the time period to be predicted.

1-2-4- Selection criteria for time series forecasting models

Estimation accuracy indicators are used to assess the accuracy of the prediction, and there are several tests that are used in evaluating the predicted models, including the following:

1) Mean Absolute Percentage Error (MAPE) test:

It is calculated according to the following formula: **(Kumar & Susan, 2020: 4)**

$$\boldsymbol{MAPE = \frac{100}{N} \sum_{t=1}^{N} \left| \frac{y_t - \hat{y}_t}{y_t} \right|} \quad \dots\dots\dots (9)$$

whereas:

$\boldsymbol{y_t}$: represent the true values of the variable, $\hat{y}_t$: the predicted value of the variable y_t.

2) Root Mean Squared Error (RMSE) test:

This formula is used to compare several predictive models, and it represents a percentage, calculated according to the following formula: **(Alsharif, et. Al, 2019: 16)**

$$\boldsymbol{RMSE = \sqrt{\frac{1}{N}\sum_{t=1}^{N}(y_t - \hat{y}_t)^2}} \quad \dots\dots\dots (10)$$

Since:

$\boldsymbol{y_t}$: represents the actual values of the variable, $\boldsymbol{\hat{y}_t}$: the predicted value of the variable $\boldsymbol{y_t}$, $\boldsymbol{N}$: the number of search observations.

3) Mean Percentage Error (MPE) test:

It is calculated according to the following formula: **(Saleem, et. Al, 2022: 57)**

$$MPE = \frac{1}{N}\sum_{t=1}^{N} PE_t \quad where\ PE_t = \left(\frac{y_t - \hat{y}_t}{y_t}\right) \times 100 \qquad \dots\dots\dots(11)$$

Since:

$\hat{y}_t$: predicted future value for t, N : number of search observations.

4) Akaikes Information Criterion (AIC):

In 1974, the Japanese scientist Akaki developed the criterion for the development and model of time series, and depended on it for the difference between the density of the model and the real density of observations to be small, or to reduce the variance of the model compared to the increase in the number of estimated features. The following formula: **(Abdul Qadir, 2022: 56)**

$$AIC = log(\sigma^2) + \frac{2n}{T} \qquad \dots\dots\dots(12)$$

Since:

T: number of observations, n: number of features, : σ^2, residual variance.

4) Hannan-Quinn Criterion (HQC):

The researchers, Hanan and Quinn, in the year (1979), proposed a new criterion called the criterion by their name Hanan - Quinn and its abbreviation (HQC) to determine the rank of the studied model, and it is calculated according to the following formula**: (Al-Salmani et al., 2020: 14)**

$$HQC(M) = \ln \hat{\sigma}_e^2 + \frac{2hc \ln(n \ln)}{n} \qquad \dots\dots\dots(13)$$

Since:

c : constant, h : rank function of the form (q+p), n : number of search observations.

5) Schwarz Bayesian Information Criteri (SBIC) test:

The researcher Schwartz proposed in 1978 a criterion on the decision of the Bayes criterion, and it includes the Bayesian criterion proposal in choosing the model, and it is calculated according to the following formula: **(Albahli & Yar, 2022: 1124)**

$$\mathbf{SBIC} = \mathbf{k}\log(\mathbf{N}) + \mathbf{n}\log\left(\frac{SSD}{N}\mathbf{n}\right) \quad where\ SSD = \mathbf{y_t} - \hat{y}_t \qquad \dots\dots(14)$$

Since:

N: the number of search observations, **K**: the number of parameters, $\mathbf{y_t}$: the actual values of the variable, $\hat{y}_t$: the predicted value of the variable $\mathbf{y_t}$.

While calculating precision $\hat{y}_t$is rounded to 0 or 1 but in the case of AIC and BIC while calculating $\hat{y}_t$ is not rounded.

Thus, the AIC and BIC provide more accurate prediction values, in how close the values are to the lower limit.

2- Section tow: Analysis of the general budget in Iraq for the period (2004-2021):

The budget is one of the important tools that are used by public sector institutions, and the budget is a future financial plan that is used as a planning and control tool by most governments in the countries of the world with the aim of overcoming crises that may occur in the future (Youssef, 2015:182), and in Iraq it is noted that the development The

importance of the general budget with the development of economic and social activity since the last century, and the general budget has undergone developments that largely reflect the development taking place on the revenue side, which comes with a large percentage of exports and also contributes to financing expenditures, as the Iraqi economy depends heavily on crude oil revenues by a large percentage In its revenues, and this makes the economy more vulnerable to shocks in the event of a drop in global oil prices, and it is clear from table (1) that the general budget of the Iraqi economy achieved a remarkable surplus in the years (2004-2014) as a result of public revenues covering all public expenditures for the same period. In the year (2015), the public budget witnessed a deficit due to the increase in public expenditures over public revenues, as the amount of the deficit amounted to (12658) billion dinars, and the reason for the increase in public expenditures is due to the increase in military expenditures As a result of the war on terrorism and the expenses for the reconstruction of the liberated areas. As for the years (2017, 2018), the general budget achieved a surplus of (1845, 25696) billion Iraqi dinars, respectively, and this is attributed to the increase in public revenues, which amounted to (77335, 106569) billion Iraqi dinars, respectively, resulting from the increase in the average price of a barrel of oil It amounted to (52.4, 69.8) US dollars per barrel, respectively (Organization of Arab Countries, 2018: 57), due to the cessation of military operations after the liberation of areas from the control of terrorist organizations.

Table (1) shows the surplus or deficit of the general budget and money supply in Iraq for the period (2004-2021) (billion dinars)

The surplus or deficit of the general budget (1_2)	Actual expenses (2)	Actual revenue (1)	السنوات
865	32117	32982	**2004**
14127	26375	40502	**2005**
10248	38806	49055	**2006**
15568	39031	54599	**2007**
20848	59403	80252	**2008**
2642	52567	55209	**2009**
5169	64351	69521	**2010**
30359	69639	99998	**2011**
29091	90374	119466	**2012**
6894	106873	113767	**2013**
21830	83556	105386	**2014**
(3927)	70397	66470	**2015**
(12658)	67067	54409	**2016**
1845	75490	77335	**2017**
25696	80873	106569	**2018**
(4156)	111723	107566	**2019**
(12882)	76082	63199	**2020**
6232	102849	109081	**2021**

Source: - Prepared by the researcher based on:

- **Central Bank of Iraq, statistical website, financial sector, general budget for the years (2004-2021).**
- **Note that the numbers in brackets ( ) meantheir sign is negative.**

In the years (2019-2020), the general budget achieved a deficit amounting to (4156, 12882) billion Iraqi dinars, respectively, in order to increase public expenditures, as it amounted to (111723, 76082) billion Iraqi dinars, respectively, in exchange for a smaller increase in revenues, and to double this deficit As a result of the drop in oil prices and the repercussions resulting from the spread of the Corona virus, and the accompanying negative effects on various economic sectors in light of the forced closure of all business fields for several months with the aim of limiting the spread of the epidemic, and the rise in average oil prices to (69.9) US dollars per barrel, up in a year. (2021) The general budget in Iraq achieved a surplus of (6232) billion dinars **(Organization of Arab Countries, 2021: 24)**. This can be seen in Figure (1).

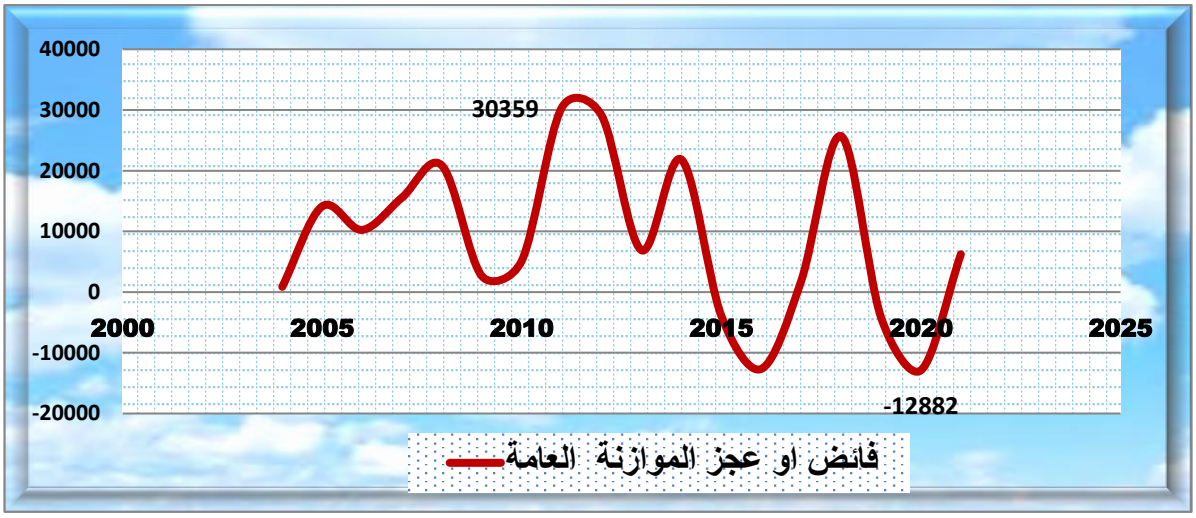

Figure (1) shows the surplus or deficit of the general budget in Iraq for the period (2004-2021)

Source: - Prepared by the researcher based on the data of Table (1).

3- Section three: predicting the surplus or deficit of the general budget in Iraq until the year (2025)

1-3-Research sample and sources:

Before starting to predict the surplus or deficit of the general budget, it is necessary to identify the research sample and the data sources that were used in this research, as the annual data of actual revenues, actual expenditures, and the surplus or deficit of the general budget in Iraq were obtained based on available statistical reports and bulletins and published data On the statistical website of the Central Bank of Iraq (https://cbiraq.org), data were used from the year (2004) to the year (2021) by (18), and the (Statgraphics) program was employed to obtain the actual revenues, actual expenditures, and the budget surplus or deficit public in Iraq through the use of time series prediction models, and the use of predictive accuracy criteria to choose the best models used to predict these variables, which included (7) indicators.

3 -2-Forecasting the course of actual revenues in Iraq for the period (2022-2025):

Time series forecast models were used to predict the actual revenue index in Iraq for the period (2022-2025). Table No. (2) shows the different models that were estimated to predict this indicator.

Table (2) shows the results of estimating actual revenue prediction models in Iraq

Models
(A) Random walk
(B) Random walk with drift = 10810.5
(C) Constant mean = 66842.7
(D) Simple moving average of 2 terms
(E) Simple exponential smoothing with alpha = 0.9999
(F) Brown's linear exp. smoothing with alpha = 0.5572
(G) Holt's linear exp. smoothing with alpha = 0.3308 and beta = 0.109

Source: The researcher's work based on the outputs of the Statgraphics program.

The results showed that the best model that can be used to predict the actual revenues in Iraq for the next four years is the (B) random walk with drift model, which showed the lowest values to test predictive ability standards (MAPE, SBIC, AIC) used for comparison with forecast models. In other time series as shown in Table (3).

Table (3) shows the testing of predictive accuracy criteria for actual revenue forecasting models in Iraq.

Model	SBIC	HQC	AIC	MPE	ME	MAPE	MAE	RMSE
(A)	19.7285	19.7285	19.7285	12.5152	10810.5	23.8553	17071.3	**19230.0**
(B)	19.7263	19.6571	19.7044	-4.6085	0.0	17.2198	11667.0	**17001.8**
(C)	20.7594	20.6902	20.7375	-16.632	-4.8506E-12	38.3581	22637.0	**28498.9**
(D)	20.5183	20.4491	20.4964	17.9485	16067.4	24.2707	19557.9	**25262.8**
(E)	19.9726	19.9034	19.9507	11.1254	9609.99	21.2049	15174.7	**19230.2**
(F)	19.9818	19.9126	19.9599	12.5886	8669.08	25.4863	15789.8	**19318.9**
(G)	19.7711	19.6327	19.7273	1.64489	2343.02	16.6836	11164.6	**15389.2**

Source: The researcher's work based on Statgraphics.

By applying the random behavior model that was chosen and using the time series data for the period (2004-2021), the values of the lower and upper limits and the predicted values of actual revenues in Iraq for the period (2022-2025) shown in Table (4) were obtained.

Table (4) shows projections of actual revenues and the lower and upper limits for the period (2021-2025) (billion dinars)

Period	**Forecast**	**Lower 95.0% Limit**	**Upper 95.0% Limit**
2022	119892	79688.6	**160094**
2023	130702	73846.6	**187557**
2024	141513	71879.1	**211146**
2025	152323	71917.3	**232729**

Source: The researcher's work based on the Statgraphics program.

Table (4) shows that the predicted values of actual revenues in Iraq have increased to reach (119892, 130702, 141513, 152323) billion dinars during the period (2022-2025), respectively, and this increase has a positive impact on the general budget of Iraq and thus achieving financial surpluses The prediction path for this indicator can be seen in Figure (2).

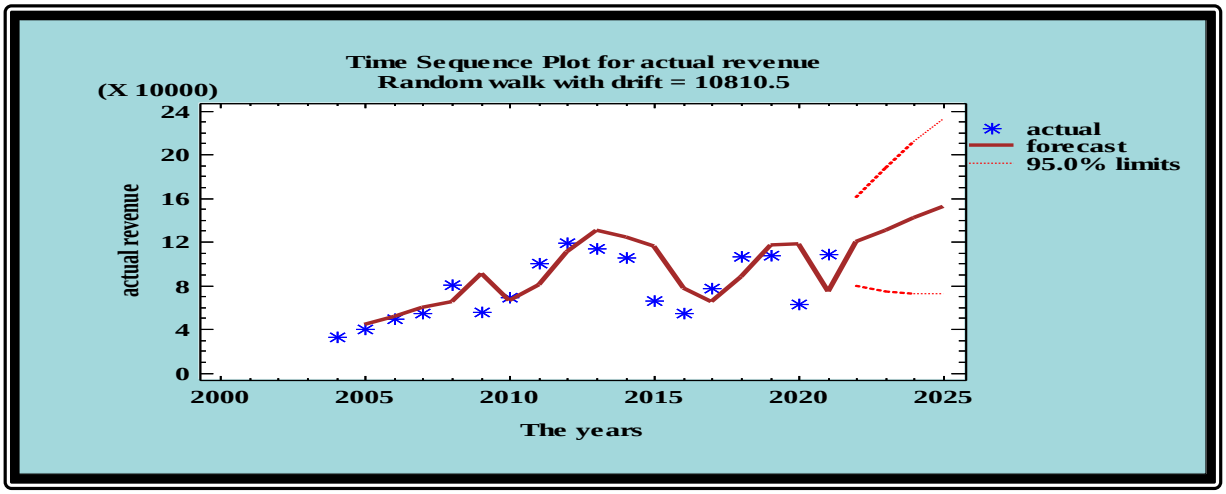

Figure (2) shows the forecast of actual revenues in Iraq for the period (2004-2025)
Source: The researcher's work based on the outputs of the Statgraphics program.

3 -3-Forecasting the course of actual expenditures in Iraq for the period (2022-2025):

Time series forecast models were used to predict the actual expenditure index in Iraq for the period (2022-2025). Table No. (5) shows the different models that were estimated to predict this indicator.

Table(5)shows the results of estimating models for forecasting actual expenditures in Iraq

Models
(A) Random walk
(B) Random walk with drift = 7282.13
(C) Constant mean = 52518.1
(D) Simple moving average of 2 terms
(E) Simple exponential smoothing with alpha = 0.9999
(F) Brown's linear exp. smoothing with alpha = 0.5403
(G) Brown's quadratic exp. smoothing with alpha = 0.3787

Source: The researcher's work based on the outputs of the Statgraphics program.

The results showed that the best model that can be used to predict the index of actual expenditures in Iraq for the next four years is the (G) quadratic exponential smoothing model (Brown's quadratic exp), which showed the lowest values for testing predictive ability standards (HQC, MAPE, SBIC, AIC), used for comparison with other time series forecast models as shown in Table (6).

Table (6) shows the testing of predictive accuracy criteria for forecasting models of actual expenditures in Iraq

Model	SBIC	HQC	AIC	MPE	ME	MAPE	MAE	RMSE
(A)	18.8638	18.8638	18.8638	10.1224	7282.13	18.8161	10426.6	12480.3
(B)	18.8253	18.7561	18.8034	-4.9995	0.0	19.296	9048.38	10835.3
(C)	20.1068	20.0376	20.0849	-15.109	1.616E-12	36.564	16387.4	20564.6
(D)	19.4421	19.3728	19.4201	19.5596	11822.9	19.5596	11822.9	14749.4
(E)	19.1079	19.0387	19.086	8.99861	6473.48	16.7255	9268.14	12480.2
(F)	18.8673	18.7981	18.8453	10.4424	5594.55	16.5137	8345.59	11065.2

Model	SBIC	HQC	AIC	MPE	ME	MAPE	MAE	RMSE
(G)	18.7337	18.6645	18.7118	6.1134	2895.67	15.9512	7795.42	10350.5

Source: The researcher's work based on the Statgraphics program.

By applying the quadratic exponential smoothing model, the Brown method, which was chosen, and using the time series data for the period (2004-2021), the values of the lower and upper limits and the predicted values of the actual expenditure index in Iraq for the period (2022-2025) shown in Table (7) were obtained.

Table (7) shows projections of actual expenditures and the lower and upper limits for the period (2021-2025) (billion dinars)

Period	Forecast	Lower 95.0%	Upper 95.0%
		Limit	Limit
2022	103749	84622.7	**122875**
2023	109498	80550.4	**138447**
2024	115695	74036.1	**157355**
2025	122340	65119.2	**179560**

Source: The researcher's work based on the Statgraphics program.

Table (7) shows that the predicted values of the actual expenditures in Iraq started to increase to reach (103749, 109498, 115695, 122340) billion dinars during the period (2022-2025), respectively, despite the increase in the actual expenditures, but their value is less than the actual revenues, and this It achieves a surplus in the general budget, and the forecast path for this indicator can be seen in Figure (3).

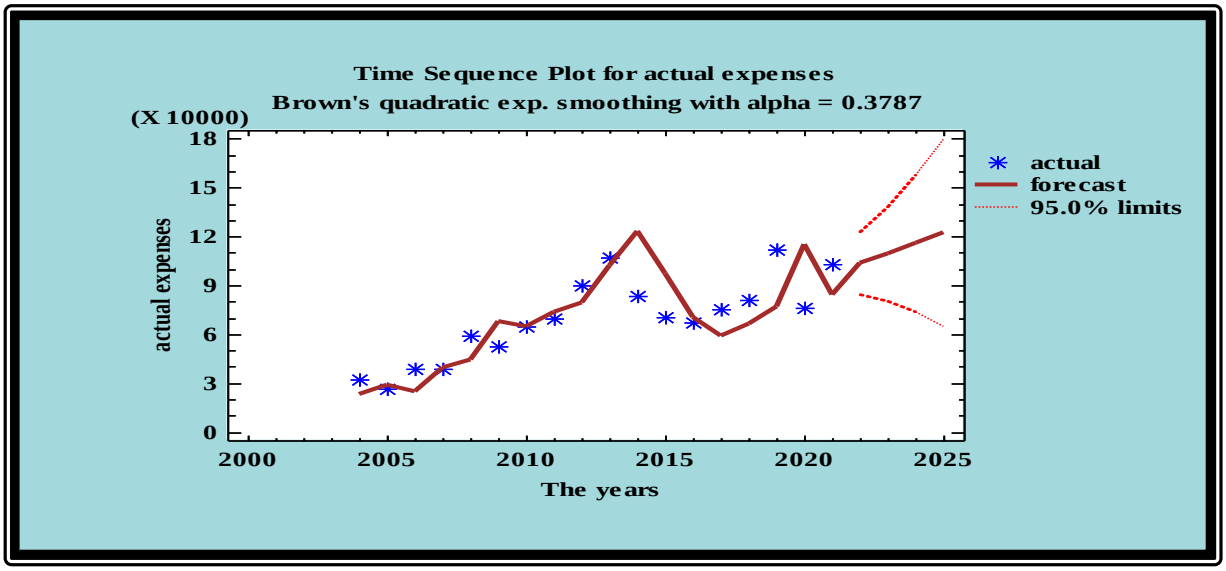

Figure (3) shows the forecast of actual expenditures in Iraq for the period (2004-2025)

Source: The researcher's work based on the outputs of the Statgraphics program.

4-3-Predicting the path of the surplus or deficit of the general budget in Iraq for the period (2022-2025):

Time series forecast models were used to predict the general budget surplus or deficit indicator in Iraq for the period (2022-2025), and Table No. (8) shows the different models that were estimated to predict this indicator.

Table (8) shows the results of estimating models for forecasting the surplus or deficit of the general budget in Iraq

Models
(A) Random walk
(B) Random walk with drift = 3528.25
(C) Simple moving average of 2 terms
(D) Simple exponential smoothing with alpha = 0.1771
(E) Brown's linear exp. smoothing with alpha = 0.0755
(F) Holt's linear exp. smoothing with alpha = 0.3042 and beta = 0.1059
(G) Brown's quadratic exp. smoothing with alpha = 0.0493

Source: The researcher's work based on the outputs of the Statgraphics program.

The results showed that the best model that can be used to predict the indicator of the general budget surplus or deficit in Iraq for the next four years is the (B) random walk with drift model, which showed the lowest values to test the predictive ability criteria (HQC, SBIC, AIC) used For comparison with other time series prediction models as shown in Table (9).

Table (9) shows the testing of predictive accuracy criteria for predictive models of the indicator of the surplus or deficit of the public budget in Iraq

Model	SBIC	HQC	AIC	ME	MAE	RMSE
(A)	18.8436	18.8436	18.8436	3528.25	9366.5	12354.6
(B)	18.7585	18.7585	18.7585	0.0	8734.75	11840.1
(C)	19.3544	19.2852	19.3324	4244.43	10570.7	14116.6
(D)	18.9381	18.8689	18.9162	3622.49	9228.29	11464.2
(E)	18.8876	18.8184	18.8657	2841.51	8988.37	11178.6
(F)	19.1324	18.994	19.0886	1576.18	8128.93	11182.2
(G)	18.8665	18.7973	18.8446	2506.07	8935.77	11061.1

Source: The researcher's work based on the Statgraphics program.

And by applying the random behavior model that was chosen and using the time series data for the period (2004-2021), the values of the lower and upper limits and the predicted values of the indicator of the surplus or deficit of the general budget in Iraq for the period (2022-2025) shown in Table (10) were obtained.

Table (10) shows projections of the general budget surplus or deficit and the lower and upper limits for the period (2021-2025) (billion dinars)

Period	Forecast	Lower 95.0%	Upper 95.0%
		Limit	Limit
2022	9760.25	-20170.3	**39690.8**
2023	13288.5	-29039.8	**55616.8**
2024	16816.8	-35024.6	**68658.1**
2025	20345.0	-39516.2	**80206.2**

Source: The researcher's work based on the Statgraphics program.

Table (10) shows that the predicted values of the surplus or deficit of the general budget in Iraq increased to reach (9760.25, 13288.5, 16816.8, 20345.0) billion dinars during the period (2022-2025), respectively, that these surpluses affect many economic aspects, Therefore, the Iraqi government must use this surplus to reduce the accumulated burdens, to

address the critical economic conditions, and to stimulate growth. The forecast path for this indicator can be seen in Figure (4).

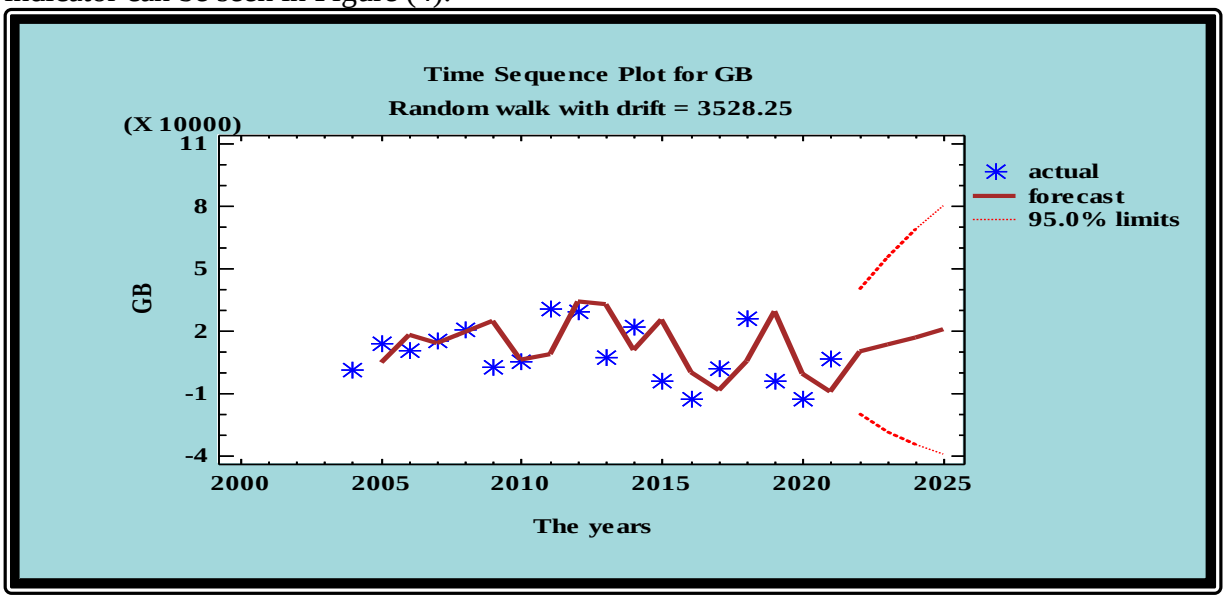

Figure (4) shows the prediction of the surplus or deficit of the general budget in Iraq for the period (2004-2025)

Source: The researcher's work based on the outputs of the Statgraphics program.

Figure (4) shows that the proposed model describes the phenomenon under study in a highly accurate manner, as we find that each of the curves representing the actual values of the series and the estimated values take almost the same direction, and between them there are negligible non-significant differences, which indicates a high predictive ability of the chosen model.

First: Conclusions

1- The general budget in Iraq has gone through developments that largely reflect the development on the revenue side, which comes with a large percentage of exports and also contributes to financing spending, as the Iraqi economy depends heavily on crude oil revenues and a large percentage of its revenues, and this makes the economy more vulnerable to Shocks in the event of a decline in world oil prices.

2- The general budget in Iraq during the research period achieved a deficit during two years (2014, 2015) due to the increase in military expenditures to confront terrorist attacks, while in the two years (2019, 2020) it achieved a deficit due to the outbreak of the Covid-19 pandemic that led to a drop in oil prices Consequently, the decline in oil revenues, which represent the largest part of public revenues in the budget, and this led to a decrease in actual revenues in the general budget in Iraq.

3- The best model that can be used to predict the index of actual expenditures in Iraq for the next four years is the (G) quadratic exponential smoothing model (Brown's quadratic exp), which showed the lowest values to test predictive ability standards, and that the predicted values of actual expenditures in Iraq were taken With the increase from (102849) billion dinars in the year (2021) to (122340) billion dinars in the year (2025), despite the increase in actual expenditures, their value is less than the actual revenues, and this achieves a surplus in the general budget in Iraq.

4- The best model that can be used to predict actual revenues and the surplus or deficit of the general budget in Iraq for the next four years is the random behavior model that showed the lowest values to test predictive ability standards (MAPE, SBIC, AIC) used

for comparison with other time series forecast models, and that The predicted values of actual revenues in Iraq increased from (109081) billion dinars in the year (2021) to (152323) billion dinars in the year (2025), and this increase has a positive impact on the general budget of Iraq, and this is what the predictive value of the general budget shows, as It achieved surpluses amounting to (20345) billion dinars in the year (2025), and these surpluses help the government in facing its expenditures.

Second: Recommendations:

1- Benefiting from the surplus in the general budget and directing it towards investment spending in order to increase investment that leads to providing job opportunities for the unemployed and stimulating the economy on the one hand and increasing production and thus increasing exports on the other hand.
2- Diversifying the sources of financing the public budget in Iraq from government revenues, through developing the efficiency of the administration in charge of collecting economic resources and controlling cases of corruption and tax evasion that accompany collections, and imposing government control over the border crossings from political influence.
3- Conducting more studies and research on a regular and continuous basis on the use of time series forecasting models to predict a surplus or deficit in the general budget because it gave predictive behavior similar to the behavior of the previous series, which helps decision makers in drawing financial policies and taking appropriate decisions to avoid financial crises and achieve financial stability. in Iraq; Which reflects positively on the Iraqi economy.

Sources

1- The Central Bank of Iraq, the statistical website, https://cbiraq.org/Default.aspx
2- The Organization of Arab Petroleum Exporting Countries, OAPEC, the forty-eighth annual report of the Secretary-General, for two years (2018, 2021).
3- Battal, Ahmed Hussein and Al-Obaidi, Othman Falah (2018) **The relationship between optimal monetary policy variables and indicators of financial stability in the Iraqi economy for the period (2008-2015)**, Anbar University Journal of Economic and Administrative Sciences, (Volume 10, No. 21), Iraq.
4- Al-Tamimi, Raad Fadel Hussein and Al-Anbaki, Uday Taha Rahim (2013) **Principles of Time Series**, 1st edition, Al-Kitab Press, Dar Al-Kutub and Documents, Iraq.
5- Thamer, Mathel Kamel (2019) **Using time series (exponential smoothing models and general trend models) to predict the production of some vegetable crops in Iraq**, Anbar University Journal of Economic and Administrative Sciences (Volume 11, No. 25), Iraq.
6- Al-Hamwi, Nermin Muhammad Ghassan (2016) **A proposed model for early prediction of financial failure in Syrian private banks**, Master's thesis (unpublished), Faculty of Economics, Damascus University, Syria.
7- Sajit, Ali Hamza and Aloush Jaafar Baqer Mahmoud. (2022). **Analysis of the relationship between foreign reserves and the net public budget in Iraq for the period (2004-2020)**. Wasit Journal of Human Sciences (Volume 18, No. 52), Iraq.
8- Al-Salmani, Anwar Rashid Background and Battal, Ahmed Hussein and Al-Dulaimi, Abd Ali Hamad (2020) **Using GARCH models to predict the daily trading volume index of the Iraqi stock market for the period 2013-2018**, Journal of Dinars (Volume 1, Issue 20), College of Business Economics, University of The two rivers.
9- Al-Salmani, Anwar Rashid and Battal, Ahmed Hussein and Hamad, Abd Ali (2019) **Using time series methods to predict trading prices for the Iraqi stock market for the period (2005-2018)**, Anbar University Journal of Economic and Administrative Sciences (Volume 11, No. 27), Iraq.

10- Salloum, Hassan Abdul-Karim and Al-Mahaini, Muhammad Khaled (2007) **The state's general budget between preparation**, implementation and control (a field study of the Iraqi budget), Administration and Economics Journal (Volume 1, No. 64), Iraq.
11- Sifo, Walid Ibrahim and Shalouf, Faisal Moftah and Jawad, Faisal Jawad Ibrahim (2006) **Problems of Analytical Econometrics Prediction and Standard Tests of the Second Order**, 1st Edition, Dar Al-Ahly for Publishing and Distribution, Amman, The Hashemite Kingdom of Jordan.
12- Al-Shaarawy, Samir Mustafa (2005) **Introduction to Modern Analysis of Time Series**, Press of the Scientific Publishing Center of King Abdulaziz University, Jeddah, Saudi Arabia.
13- Abdul Qadir, Qaribullah Abdul Majeed (2022) **Using the Box-Jenkins methodology to predict the time series of gross fixed capital formation - an applied study on the Kingdom of Saudi Arabia**, Journal of Economic, Administrative and Legal Sciences (Volume 6, No. 14), Applied College, Taibah University , Saudi Arabia.
14- Al-Obaid, Abdul Rahman Al-Ahmad (2003**) Principles of Administrative Prediction, 1st Edition**, King Saud University - Academic Publishing and Printing. Kingdom Saudi Arabia.
15- Attia, Abdel Qader Mohamed (2004) **Modern Econometrics Between Theory and Practice**, University House, Alexandria, Egypt.
16- Al-Maliki, Mardi Radhi (1993) **The Uses of Time Series in the Social Sciences, Applications to Crime Patterns in the Kingdom of Saudi Arabia**, Master Thesis (unpublished), College of Education, Makkah Al-Mukarramah - Umm Al-Qura, Kingdom of Saudi Arabia.
17- Muhammad, Amr Hisham (2007**) General budget trends with special reference to Iraq after a year (2003)**, Journal of Al-Mustansiriya Center for Arab and International Studies (Volume 22, No. 23), Iraq.
18- Mahmoud, Rania Fikry and Ibrahim, Sahar Abdel Salam (2022) **The use of exponential smoothing models in predicting the production of wheat and bean crops**. Arab Journal of Agricultural Sciences (Volume 5, No. 13), Arab Foundation for Education, Science and Arts, Egypt.
19- Al-Wardi, Adnan Hashem (1990) **Statistical Forecasting Methods and Application**, 1st Edition, Dar Al-Hikma in Basra, Iraq.
20- Youssef, Youssef Dolab (2015) **The role of the general budget in achieving sustainable development A comparative analytical study of the Iraqi public budget**, Journal of Accounting and Financial Studies (Volume 10, No. 32), Iraq.
21- Albahli, S., & Yar, G. N. A. H. (2022). **Defect Prediction Using Akaike and Bayesian Information Criterion**. Comput. Syst. Sci. Eng., 41(3), 1117-1127.
22- Alsharif, M. H., Younes, M. K., & Kim, J. (2019). **Time series ARIMA model for prediction of daily and monthly average global solar radiation: The case study of Seoul**, South Korea. Symmetry, 11(2), 240.
23- Kumar, A., Deepankar, J., PK, M., & Kumar, A. (2019**). Wheat yield forecasting in Haryana: A time series approach**. Bull. Env. Pharmacol. Life Sci, 8(3), 63-69.
24- Kumar, N., & Susan, S. (2020). **COVID-19 pandemic prediction using time series forecasting models.** In 2020 11th international conference on computing, communication and networking technologies (ICCCNT) (pp. 1-7). IEEE .ISO 690
25- Mdloul, N. S., Ahmed, J. S., & Battal, A. H. (2022). **Using time series methods to predict the value of agricultural output and some financial indicators affecting it in Iraq for the period (2021q1-2025q4)**. Tikrit Journal for Agricultural Sciences. 22(1), 78-95,

26- Pirvu, Daniela & et. al., (2012) " **Intelligent Financial Forecasting, The key for a Successful Management** ", International Journal of Academic Research in Accounting, Finance and Management Sciences, Vol. (2), Issue (3)

التنبؤ بفائض او عجز الموازنة العامة في العراق حتى عام 2025		
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Forecasting the surplus or deficit of the public budget in Iraq until 2025		
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