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An economic study of the most important factors affecting the consumption of yellow corn in Iraq for the period (1995-2020)

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Abstract
The research aims to study the factors affecting the consumption of maize in Iraq for the period (1995-2020), and the research reached several conclusions, the most important of which is the population parameter was positive, and the positive sign of this variable parameter agreed with our expectations and the concepts of economic theory that stipulated in its literature the positive relationship between the two variables and the explanation for this lies in the fact that increasing the population contributes to increasing the consumption of maize. Domestic production The positive sign of the parameter of this variable agreed with the concepts of economic theory, as this variable contributes to providing positive incentives to increase domestic production, while the domestic price and the negative sign of this parameter of this variable agreed with our expectations and the concepts of economic theory. It makes the local agricultural producers more competitive in the local and foreign markets due to the low prices of their agricultural products, so their exports increase and their imports of agricultural products decrease, and this leads to an increase in agricultural growth rates. The economic direction should be directed towards increasing production at the level of Iraq in relation to the areas that enjoy a comparative advantage in this crop through vertical or horizontal expansion or both together, the need to provide modern agricultural techniques in the cultivation of the yellow corn crop such as seeds, fertilized hoe, pesticides, sprinkler irrigation system and improved varieties continuously for farmers and work to reduce their prices or deduct their price in installments, especially those that need a large capital when purchasing them.

Keywords: Consumption, maize, factors

Introduction
The yellow corn crop is one of the important grain crops in human and animal life, as this crop comes in terms of importance after wheat, rice and barley crops in terms of the cultivated area and ranks second after rice in terms of productivity [1]. The agricultural sector is considered one of the important and vital sectors in the economy of any country due to what agricultural activity provides in terms of food, clothing, job opportunities for the population and raw materials for industry in Iraq.

In Iraq, yellow maize comes in fourth place after wheat, rice and barley. The cultivated area is relatively small due to the competition of other summer crops such as cotton, potatoes and other crops. It is characterized by its multiple uses as food for humans in various feeding methods and as fodder for animals, in addition to its entry into many industries where it is consumed either directly or indirectly by humans, in addition to its entry into many diverse industries where starch enters in the manufacture of glues, printing ink and others.

The importance of the yellow corn crop has increased with the increase in the expansion of livestock projects in general and poultry in particular, as the yellow corn crop constitutes a large proportion of the concentrated diet components, as it led to an increase in the demand for it because it contains a high percentage of carbohydrates [2].

Research Importance
The importance of research lies in Yellow corn has the importance of being included in many food industries, fodder rations, vegetable oils, and in various food fields. It can also be

used in the bread industry, which is a substitute for wheat flour. Corn remains an important crop, in addition to its importance in knowing the quantities required during the period of time studied.

Research Problem

The Iraqi agricultural economy suffers from many problems in the production of crops in general and the maize crop in particular. This is due to the backwardness of the methods used in its cultivation and the dependence of farmers on the cultivation of local and synthetic varieties of low production, as well as the backwardness of the methods of controlling agricultural pests and diseases, methods of harvesting the crop, and the weakness of its transportation and marketing link. The fluctuation in the demand for yellow corn as a result of the change in the factors affecting it and the nature of consumption, in addition to the fact that the demand for corn is a derived demand, and the stopping of oil factories and the decline in the numbers of livestock affected the level of demand for this important crop, which caused an imbalance in the market system, and all of these reasons led to a large gap between production and consumption, which resulted in an imbalance between the quantities demanded and supplied.

Research Hypothesis

The hypothesis of the research is that the economic relationship of the consumption of the maize crop is affected by many variables, the most important of which are the number of population, domestic production and the world price.

Search Method

In its study, the research relied on the descriptive, analytical, and statistical approach, as the study used the general trend equations, multiple regression in its various forms, and some other economic indicators.

Data Sources

The necessary data for the research were obtained from the Ministry of Planning, the Central Statistical Organization, and the Ministry of Agriculture, Agricultural Statistics Department - Annual Reports - Statistical Pamphlet.

Standard Theoretical Framework

First: Econometrics

Econometrics is one of the branches of economics, which is done by numerical estimation of the relationships between economic variables, relying on economic theory, mathematics, and statistics to reach its goal of testing hypotheses, estimating, and then predicting economic phenomena. And that the word econometrics means many economic concepts, and that most economists are interested in the measurement process, which is the application of mathematical and statistical methods to load economic data with the aim of giving digital content to economic theories to ensure the validity of those theories. In econometrics, experts demonstrate their creativity by formulating hypotheses that are well-specified enough to allow them to gain the greatest possible advantages in light of the available data, giving the field a definition as the branch of study concerned with the empirical determination of economic laws [3].

Predicting the future values of random occurrences is an important statistical task, and one that calls for a thorough familiarity with time series analysis and its theoretical underpinnings. A time series is a collection of observations made at regular intervals over an extended period of time [4] or a set of statistical measures used to describe a particular occurrence over time.

Studies of time series are crucial at present because they reveal shifts and their underlying causes, allowing planners to create effective interventions. As time is the independent phenomenon and the observed values of time series are the return of time in successive and equal periods of time, although this does not prevent the time periods from being unequal, it can be defined as representing time-dependent phenomena and its observed values represent the values of the time-dependent phenomenon [5].

The Dickie-Fuller tests search for stability or lack thereof for a specific time series, by determining the general trend component, whether deterministic or random, and develop it later and call it (Tau), by comparing the values calculated from the estimated equation (Equation No. 1) with the tabular and critical values (*) from the special tables, and the null hypothesis (H0) is accepted in the event that the calculated value is smaller than its critical value at significant levels in proportions (1%, 5%), i.e. when the value is (* >) Using absolute values, this means that there is a unit root and that the values of Yt are unstable and vice versa.

This Test Can be Performed In Three Cases.

$$\Delta Yt = \delta Yt - 1 + \mu t \quad (1)$$

$$\Delta Yt = \beta 1 + \delta Yt - 1 + \mu t \quad (2)$$

$$\Delta Yt = \beta 1 + \beta 2t + \delta Yt - 1 + \mu t \quad (3)$$

Equation (1) represents the variable YtΔ without a fixed limit and without a general trend (trend), i.e. the Random Walk Only equation. Equation (2) includes the presence of a constant (β1) for the series, while equation (3) includes the existence of a constant limit and a general trend, and (t) represents time or the general trend variable.

In all three cases, the null hypothesis is (H0: □ = 0), meaning that the time series of the variable Yt is an unstable series, and we rejected the null hypothesis, that is, we accepted the alternative hypothesis (H1: □ < 0), which means that the time series is stable with a zero mean in equation (1), and stable with a non-zero mean in equation (2) and stable around a specific general trend in the case of equation No. (3), noting that the critical values for and * To test the null hypothesis (H0) differ according to the previous three equations (cases).

Extended Dickey-Fuller Test for Unit Root (ADF)

The basic assumption of the simple unit root Dickey-Fuller test is that the term of error (μt) in the unit root test equation is a variable with a uniform and independent distribution, and the extended Dickey-Fuller test (ADF) has been modified to take into account the possibility that the term of error (μt) is self-related by taking the time limits (periods) of lag (difference). By using the simple Dickie-Fuller test in the previous three cases, we assume that there is no autocorrelation to the error limit, but this is not the common case, so Dickie-Fuller developed this test for the unit root to

allow the presence of autocorrelation and different degrees of the error limit.
The general form of this relationship is.

$\Delta Y_{t-1} + \mu_t$

$$\Delta Y_t = \beta_1 + \beta_2 t + \partial Y_{t-1} + \sum_{i=1}^{n} \alpha i$$

And that (μt) represents the limit of the error included for the assumptions of ordinary least squares OLS and Wan ⊿Yt-1 = Yt -1 - Yt-2 and ΔYt-2 = Yt -2 - Yt-3 and so on, and that (n) represents the number of time lags in the error boundary and is determined empirically. The idea behind these lags is to include enough time lags in the model to make the error boundary (μt) non-self-correlated and obtain white noise buffers [6].
In this test, the stability of the time series for each variable is confirmed separately so that we do not get a false deviation. Despite the multiplicity of tests used in the unit root, the Dickie-Fuller test is the most common and used in economic studies [7].
This test is considered one of the most important tests for the stability of time series and ensuring the degree of their integration. It was proposed by Phillips and Perron (1988) and they used non-parametric statistical methods to deal with serial correlation problems in error amounts without adding differences in late time periods.
This test is more efficient than the Dickey-Fuller test, as it differs from it in that it takes into account errors with heterogeneous data through a non-parametric correction of the Dickie-Fuller test, as well as to treat the existence of the unit root of the time series even if it suffers from the problem of non-correlation in the error term U.
This test is estimated by the usual least squares (OLS) of the three base models of the Dickey-Fuller test with the calculation of the accompanying statistics, and then the first or second short-term variances are estimated in most cases.

Cointegration Test

Cointegration analysis can be used to test for a long-term balance between the unstable time series at their levels if there is cointegration between the integrated time series of the first degree I (1), as between each of Engle & Granger the possibility of generating a stable linear mixture of unstable time series if the data of the variables Y, X are integrated of the same degree. Although there is an imbalance in the near term, there is a long-term relationship between the time series. As the stability rank is crucial in choosing the standard model to investigate the link between two or more variables, we employ unit root tests (Dickie-Fuller test and Phillips-Berron test) to confirm the order of cointegration for each series [8].
When building economic models, it is important to take the time factor into consideration, as it is usually noted that there is a period of time between the movement of dependent variables that respond to independent variables, as there are variables that may be associated with other variables in the same period of time such as the static models, and in most cases they may be associated with past values of some variables so the models become motor, so the factor of the timeline should be entered. Time slowing is an essential place in the economy, by influencing the methods of economic analysis, whether in the short or long term [9].
as these models combine the autoregressive (AR) model with the finite distributed slowing model, which is the most advanced method for processing models based on time series databases, as this test does not require that the time series be integrated to the same degree, and ARDL can be applied regardless of the characteristics of the time series, whether they are stable at their levels I (0) or integrated of first order I(1) or a mixture of the two, but time series must not be integral of second order I(2). This model is characterized by the following characteristics [10].
To acquire the most accurate results from the overarching framework model, a considerable amount of time must elapse.
When compared to more standard cointegration test methods, it excels in the situation of short time series.
The diagnostic tests it employs are highly accurate, and it consistently produces the best long-term outcomes for the criteria.
This model allows us to disentangle the effects over the short and long term by simultaneously determining the size of the effect of each independent variable on the dependent variable and the complementary relationship between the dependent and independent variables in the long and short term.
When compared to approaches like Granger and Johansen, the estimated parameters are more stable in both the short and long run.
In addition to estimating short-term relationships between variables, the ARDL model can also be used to extract implicit cointegration using the Wald Test or so-called Bound Test, or Boundary Test [11], which seeks to prove or refute the existence of a long-term relationship between them.
In addition, there are several statistical tests aimed at assessing the degree of dependence on an estimate

Model parameters and the significance of these parameters, and the most important of these tests are

Test coefficient of determination R^2: The coefficient of determination is used to measure the efficiency of the model used in interpreting the rate of change in the dependent variable due to the change in the independent variable, and its value ranges between zero and one (1 <R2>0). The closer the value of R2 is to the correct one, the more this indicates the efficiency of the used regression model, and vice versa if its value is close to zero [12].

Results and Discussion

Description of the Mathematical Model Used

We have detailed the variables in the mathematical model of the maize crop consumption function, and we have made various attempts to find the best solutions that meet economic criteria. Because of its superior performance, the double logarithmic function has been used.

LnY = f (LnX1, LnX2, LnX3, LnX4)

So, the above-described connection can be expressed as a mathematical model as follows.
LnY = β0+β1LnX1+β2Ln X2 +β3Ln X3 +β4Ln X4 +Ui
lnY = amount of yellow corn consumption

X1 = lnpopulation
lnX2 = domestic production (tons).
ln X3 = the local price of the yellow corn crop (dinar/ton).
ln X4 = the international price of the yellow corn crop
In order to estimate the impact of these variables on the consumption of maize, the following are the steps of the quantitative analysis of the effect of the variables on the cultivated area as follows.

The Test of Rest or Stability of Time Series of Maize Variables

Before carrying out the estimation process, it is necessary to detect the stability of the productivity variables of the main agricultural crops in Iraq combined. There are many methods to detect the stability of these variables, and they can be divided into.

Time Series Graph

Before subjecting the time series to any test, it is necessary to represent it graphically in terms of time to know the type and nature of this series. At the level (At The Level) because the graphic curve of this variable appears in a horizontal form, and this means that the time series of the variable are integrated at the zero rank I(0), while the rest of the study variables (lnX1, lnX4,) we find that they have become stable after taking the first difference for them because the graphic curve of these variables appears in a horizontal form when taking the first difference for them, meaning that they are integrated at the rank I(1).

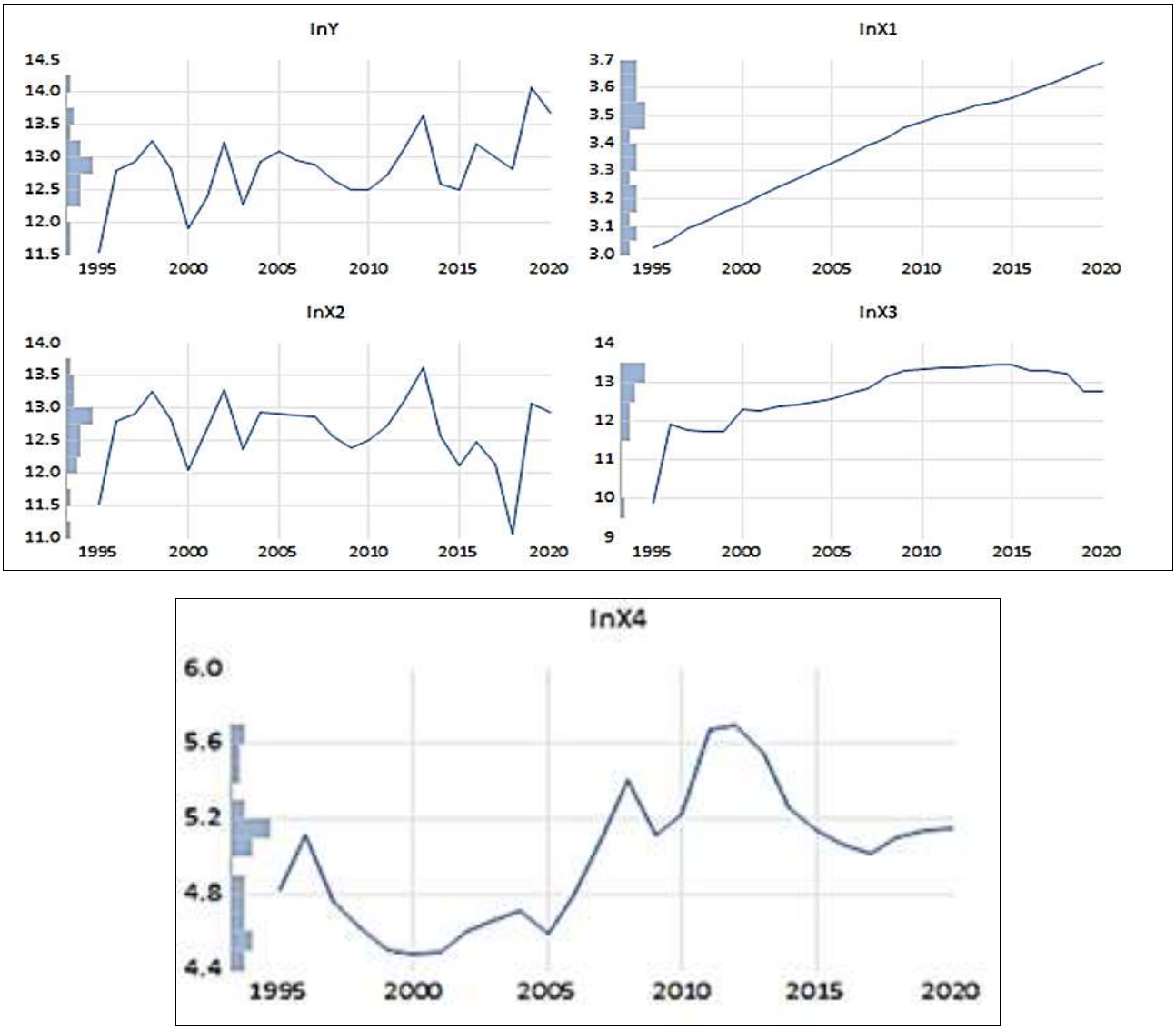


Fig 1: Graph of the evolution of the time series of the variables (Y, X1, X2, X3, X4) at the level. Source: Researcher-prepared using (Eviews10) software results

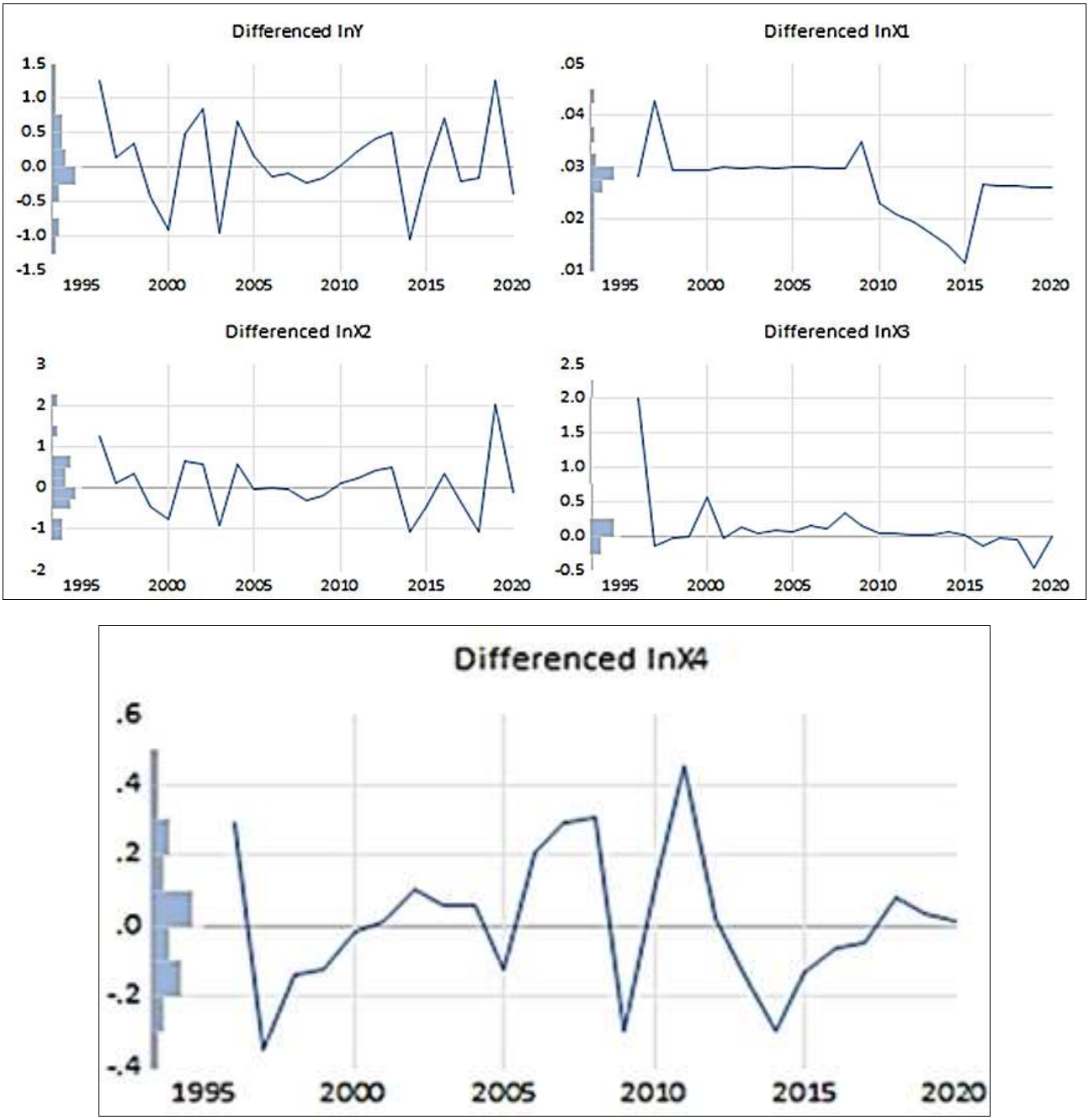


Fig 2: The graph of the evolution of the time series for the variables (Y, X1, X2, X3, X4) at the first difference. Source: Researcher-prepared using (Eviews10) software results.

Unit Root Test for Stability of Time Series

The purpose of the unit root test is to confirm that the economic time series is stable and to ascertain the level of integration between the various variables in the function under examination. With the exception of the lnX4 variable, which did not stabilize at the level and stabilized at the first difference and at the significant level (1%) and (5%), the results indicate that the time series is stable at the level, and the chains of those variables became stable at the first difference I (1) at a significant level (1%) and (5%). Furthermore, we take note from the foregoing that the studied variables were not all of the same stability rank, and that we should stop remembering that the ordinary least squares method (OLS) cannot be used so long as the studied variables are not all of the same stability rank, and also because the (OLS) method assumes that the variables have the same degree of integration (i. Totally Corrected Minorities (FMOLS)).

UNIT ROOT TEST TABLE (PP)

		At Level				
		LNY	LNX1	LNX2	LNX3	LNX4
With Constant	t-Statistic	-4.2148	-2.8162	-4.5831	-4.6990	-1.3648
	Prob.	*0.0032*	*0.0503*	*0.0013*	*0.0010*	*0.5828*
		***	**	***	***	n0
With Constant & Trend	t-Statistic	-4.7104	-1.3802	-5.7927	-4.3854	-1.7192
	Prob.	*0.0048*	*0.8418*	*0.0004*	*0.0098*	*0.7123*
		***	n0	***	***	n0
Without Constant & Trend	t-Statistic	2.3070	10.7145	0.9179	1.1187	0.2346
	Prob.	*0.9931*	*1.0000*	*0.8989*	*0.9269*	*0.7461*
		n0	n0	n0	n0	n0
		At First Difference				
		d(LNY)	d(LNX1)	d(LNX2)	d(LNX3)	d(LNX4)
With Constant	t-Statistic	-11.8645	-2.3035	-15.4280	-10.8544	-4.3735
	Prob.	*0.0000*	*0.1789*	*0.0000*	*0.0000*	*0.0023*
		***	n0	***	***	***
With Constant & Trend	t-Statistic	-14.4618	-3.1533	-14.8146	-13.8746	-4.2994
	Prob.	*0.0000*	*0.1173*	*0.0000*	*0.0000*	*0.0122*
		***	n0	***	***	**
Without Constant & Trend	t-Statistic	-9.6712	-0.4534	-16.2269	-10.6973	-4.4723
	Prob.	*0.0000*	*0.5078*	*0.0001*	*0.0000*	*0.0001*
		***	n0	***	***	***

Fig 3: The results of the stability of the variables at the first level and difference. Source: The researcher's work based on the Eviews12 program

Results of the Quantitative Analysis of the Factors Affecting the Consumption of Maize in Iraq for the Period (1995-2020)

Since it is evident from fig. 4 that the value of the Adjusted Determination Coefficient (R2) is equal to (0.77), i.e. with a random variable, the model is estimated using the fully corrected least squares method (FMOLS) to determine the factors influencing maize consumption in Iraq.

The population number lnX1 parameter was (3.424), and its positive sign was consistent with our predictions and the notions of economic theory, which mandated the positive link between the two variables in its literature. If domestic production increases by 1%, then yellow maize consumption will rise by 0.537 percent, because the domestic production parameter was (lnx20.537). The lower the domestic price, the higher the consumption of yellow corn, and the parameter of t's positive sign agreed with our expectations and the concepts of economic theory. Meanwhile, the flexibility of the local price variable of yellow corn lnX3 reached (-0.788), and the negative sign of this variable parameter agreed with our expectations and the concepts of economic theory. rates of agricultural expansion are on the rise.

Dependent Variable: LNY
Method: Fully Modified Least Squares (FMOLS)
Date: 06/12/23 Time: 00:27
Sample (adjusted): 1996 2020
Included observations: 25 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West automatic bandwidth = 1.9999, NW automatic lag length = 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNX1	3.424933	0.598020	5.727125	0.0000
LNX2	0.537290	0.134761	3.986984	0.0007
LNX3	-0.789886	0.244754	-3.227260	0.0042
LNX4	0.052677	0.275979	0.190872	0.8505
C	4.251058	2.611048	1.628104	0.1192

R-squared	0.816492	Mean dependent var	12.89874
Adjusted R-squared	0.779790	S.D. dependent var	0.471511
S.E. of regression	0.221264	Sum squared resid	0.979153
Long-run variance	0.085925		

Fig 4: Estimation of the maize crop consumption function Source: Prepared by the researcher based on the outputs of the Eviews10 program

Diagnostic Tests

After estimating with the fully corrected least squares (FMOLS) method, where this method is used in the case of different levels of stability of the variables, we will evaluate the study model to see how efficient the model is used, and in this method, we will employ a number of tests known as diagnostic tests to ascertain the model's validity.

Test that the Estimated Values Correspond to the Real Values: Through figure (5) it is clear that the estimated values of the dependent variable are very close to the real values during the years of the study, and we note that the values of the residuals went out of the critical limits in some years and this simple departure may be acceptable in the time series data, especially since the studied period witnessed large fluctuations in some of the study variables.

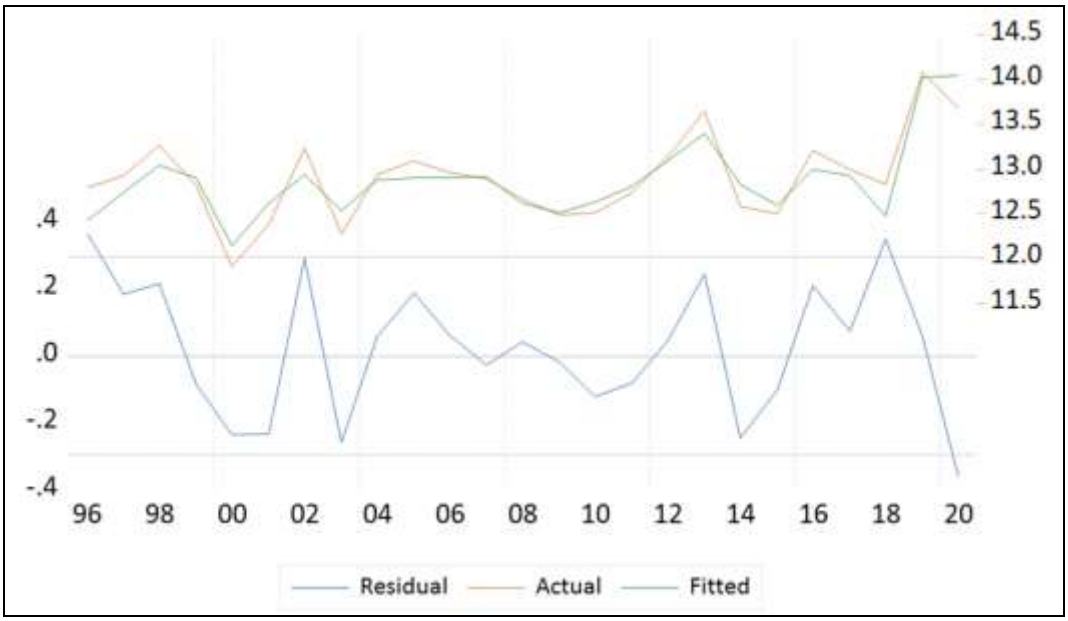


Fig 5: Some of the real and estimated values and remainders of the form. Source: Prepared by the researcher based on the outputs of (Eviews12) program.

Q-Statistic Test for Autocorrelation

To detect the presence of the autocorrelation problem, the CORRELOGRAM-Q-STATISTIC test should be followed.

It was found from the table that the values of the autocorrelation coefficients and partial autocorrelation are entirely within the confidence interval (95%).

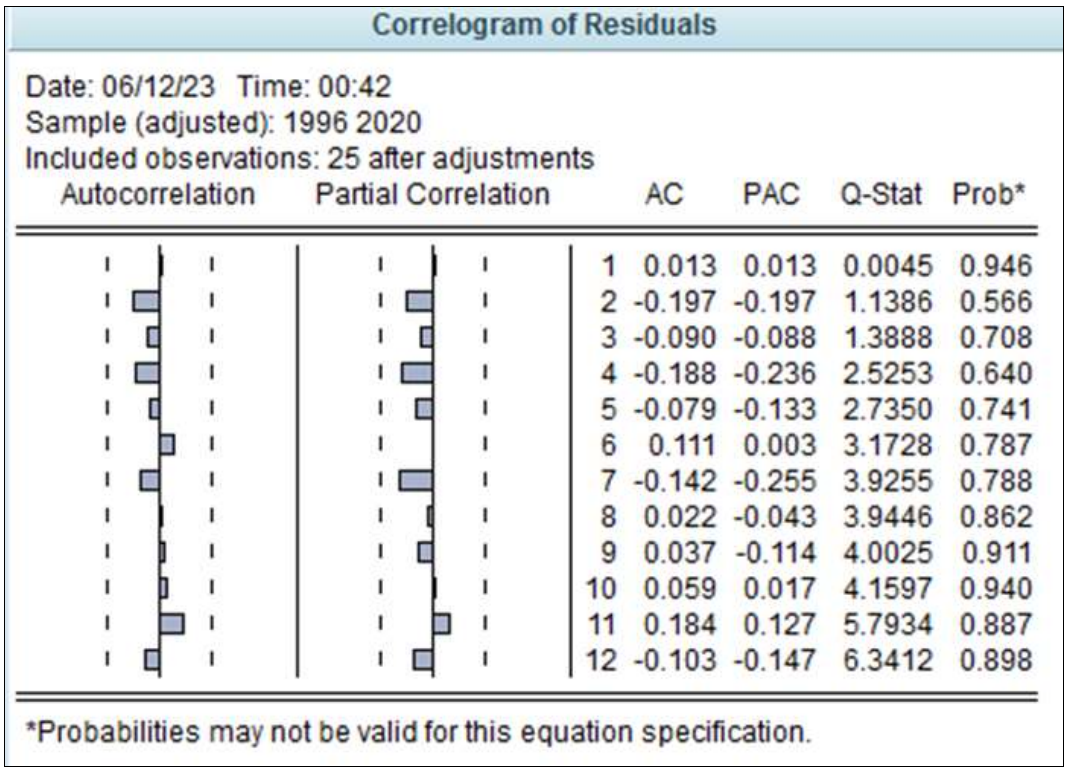
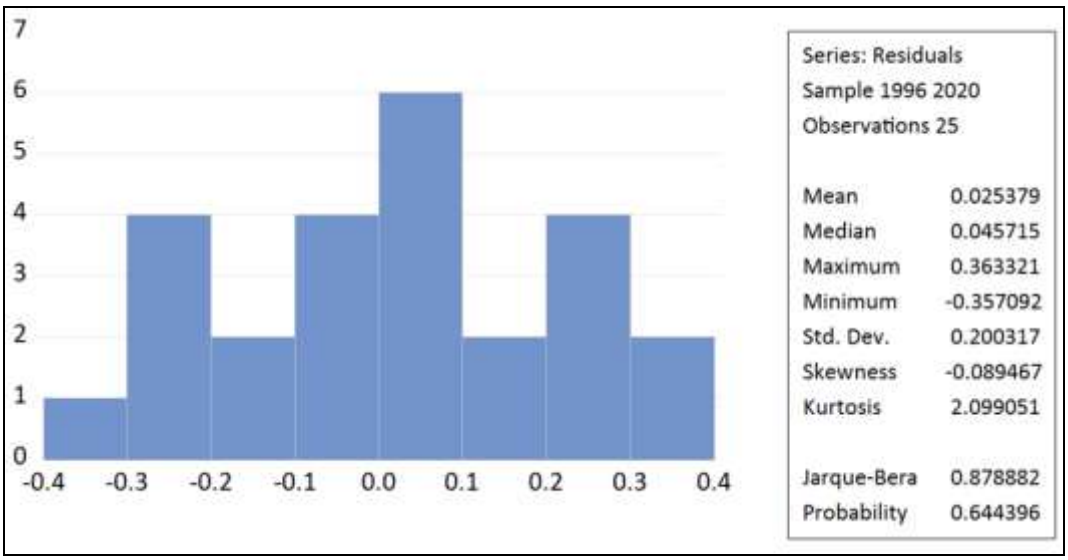


Fig 6: Q-STATISTIC autocorrelation test. Source: Prepared by the researcher based on the outputs of the Eviews10 program

Normal Distribution of Residuals

To ensure the remaining has a natural distribution, as the remaining must have a natural distribution and to explain this, we will use the jarque -bear test for natural distribution; this is supported by fig. (7), which shows that the equation of the decline follows a natural distribution, and by the fact that the value of JB) reached (0.878) at a probability level (0.64), which is higher than the critical value of (5%).



***Source*:** Prepared by the researcher based on the outputs of the Eviews10 program

Fig 7: (Jarque Bera) test for the normal distribution of the residuals

Conclusion

- The population number parameter was positive, and the positive sign of this variable parameter agreed with our expectations and the concepts of economic theory, which stipulated in its literature the positive relationship between the two variables, and the explanation for this lies in the fact that increasing the population contributes to increasing the consumption of yellow corn.
- Increasing the local production by (1%) will lead to an increase in the consumption of maize by (0.537%), and the positive sign of this variable parameter agreed with the concepts of economic theory, as this variable contributes to providing positive incentives to increase local production.
- The local price and the negative sign of the parameter of this variable agreed with our expectations and the concepts of economic theory. The lower the local price, the greater the consumption of yellow corn.
- The positive sign of the global price variable parameter agreed with our expectations and the concepts of economic theory. The explanation for this lies in the rise in the world price of yellow corn, as this variable contributes to providing positive incentives for agricultural production, as the rise in the world price makes local agricultural producers more competitive in the local and foreign markets, due to the decrease in the prices of their agricultural products, so their exports increase and their imports of agricultural products decrease, and this leads to an increase in agricultural growth rates.

Recommendations

- The need to reconsider how to use the available resources in producing the yellow corn crop by farmers within the quantities recommended by the competent authorities to reach the optimal use of resources.
- Supporting yellow maize producers by subsidizing the price of the product or subsidizing the price of the resource, which indirectly leads to support for the poultry and livestock sector in Iraq.
- Because of the economic importance of the yellow maize crop, it should be directed towards increasing production at the level of Iraq in relation to the regions that enjoy a comparative advantage in this crop through vertical or horizontal expansion or both.
- The necessity of providing modern agricultural techniques in the cultivation of the yellow corn crop, such as the seed, the fertilized hoe, pesticides, the sprinkler irrigation system, and the improved varieties, on an ongoing basis, for farmers, and working to reduce their prices or deducting their price in installments, especially those that need a large capital when purchasing them.

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