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Measuring the Relationship between Consumption and National Income in the Iraqi Economy for the Period 1986-2018

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Abstract:
The research consists of two theoretical and practical sides. In the theoretical side, the research deals with the hypotheses and objectives of the research and testing the stability of time series for both national income and consumer spending in Iraq for the period (1986-2018) and the extent of their application of the common complementarity model. As for the research problem, it is represented in how to test the stability of the time series that make up the consumption function in Iraq and how to overcome the false regression characteristic of the estimated model. Determine the variables affecting the model, which are the dependent variable (consumption and self-consumption) And some important notes about them, how to estimate them and their characteristics, in addition to the concept of joint integration and its mathematical equations. On the application side of the mathematical statistical models on the data of the time series of income and expenditures for the period (1986-2018), the research reaches a set of conclusions, the most important of which is that the national income explains about (89.6%) of the current changes and the percentage of the remaining spending is 10%. To the unexplained external factors that are present within the random error component. Finally, there are some recommendations, the most important of which is the necessity to test the degree of completeness of time series before making any estimation, in instruction to evade falling into the problematic of false reversion. Key words in research / co-integration, the self-relevance function, the Engel-Granger method.

The First Topic
Research Methodology
First: Introduction

Before embarking on a study of the fluctuations of any economic phenomenon, it is necessary to make sure that there is a trend in the time series, and according to the nature of the series's growth, we can distinguish between stable time series and unstable time series. The stable time series can be defined as that series whose levels change with time without changing its mean during a relatively extended retro of period, meaning that there is neither a decrease in the direction of the series nor a direction in which there is no direction in it. As for the unstable time series, the level of the mean is constantly changing, whether it increases or decreases. The regression theory that uses time series in estimation assumes that these time series must be characterized by the stationary characteristic, i.e. in the language of Angel - Granger - Engle, they must be integrated time series, denoted by (0) I.

Previously (before the mid-seventies of the twentieth century) researchers used to conduct applied studies without paying any attention to studying the characteristics of different time series. The results of these tests were accepted at the time and acknowledged the significance of the statistical capabilities on the basis that the theory of statistical inference applies to these capabilities. However, Swedish scientists 1974 Newbold and Granger generated stationary non-static time chains using the simulation method. These chains do not express any known variable that is considered and is understood. Then they made a large number of regression estimates by using these chains on each other. After the estimation, the time values of the t statistic were calculated and under the assumption that the real parameter is equal to zero (that is, the parameter estimated from the regression would be immaterial due to the independence and randomness of the variables used in the estimation), but the randomness of the variables used in the estimation was not The worthless theory that the real parameter is equal to zero was disallowed with frequency or probability greater than the theory expects, and the significance of the relationship was accepted statistically. The researchers also noted that the rest of the estimates resulting from regression are of great regression. Consequently, the researchers concluded an important fact that the statistical capabilities and tests resulting from regressions using non-static time series are in themselves incorrect and unhealthy results as they use regressions that do not result in false regression. Therefore, the researchers emphasize an important point which is (in order to obtain correct results for the test, we must take into account the characteristics of time series before undertaking the estimation process.)

Second: The Hypothesis of Research

The research includes testing the following null hypotheses:

H01: The national income variable does not possess the unit root (the series is stable)

H02: The consumer spending variable does not have the unit root (the chain is stable)

H03: The random error variable of the regression of consumption spending on national income does not have the component origin (the series is stable)

Third: The Problem of Research

The research problem is represented in how to test the stability of the time-series constituent of the consumption function in Iraq and how to overcome the false regression characteristic of the estimated model.

Fourth: The objective of Research

The research aims to estimate the consumption function in Iraq using the joint integration methodology for both national income and consumer spending in Iraq for the period (1986-2018) and the possibility of applying the error correction model.

Fifth: The Methodology of Research

The purpose of achieving the goal of the research was the adoption of the analytical deductive approach according to the following steps: -

• A test of the autocorrelation function of the national income variable in Iraq

• A test of the self-correlation function of the consumer spending variable in Iraq

• Test the autocorrelation function of the remainder of the decline in consumer spending on national income

• If both the national income and consumer spending series are integrated from the first degree and the remainder series are integrated from the zero degree, then the appropriate model in the estimation is the error correction model and that the variables are characterized by a common complementarity characteristic.

Sixth: Determining the variables affecting the Variable of Research

The Keynesian theory assumes the existence of a direct relationship between the level of consumption and the size of income, as this theory states that the higher the income the higher the consumption and vice versa. This means that this theory considers income as one of the basic determinants of consumption. On the other hand, the classical theory indicates that the interest rate is the return on savings and the savings relationship, and then it is deduced from this that the attention degree has a negative result on consumption, as the higher the interest degree the advanced the attention degree, the advanced the attention rate. Expectations of price and consumption level. If individuals expect a significant price increase in the future, they will increase the demand for consumer goods at the present time, especially those that can be stored. And some previous studies indicate that there is a association amid the equal of revenue and the distribution of consumption, so the redistribution of income in favor of the poor class and against the benefit of the rich class increases the level of total consumption of the class of self-consumption. Perhaps this means that the different sources indicate that the variables contained in the consumption model are: (8)

The dependent variable includes consumer spending

• The independent variable that includes the national income

The Second Topic

Time series stability and co-integration methodology

First: The concept of stationary of time series

The concept of time series staticity means that the statistical properties of the time series are constant and do not change by shifting forward or backward for any number of time units. The statistical properties of the time series can be described with certainty and completely through the cumulative probability function, and they can be partly described through some important indicators, the most important of which are the expectation, variance and covariance (the moment of the first and second degree). (5)

Second: The standard methods used in testing the stability of the time series.
There are a number of criteria used to test the stability or static characteristic of the series, including: - (11)
1- Autocorrelation function
The self-covariance function y (s, t) events the grade of lined need amid any of the binary variables that are located on the same time series. For example, the self-covariance events the grade of lined need amid the chance mutable y1, which represents the values of the lined need amid the chance mutable y1 and the random variable y1. Which represents the value of the series at the second time point, that is, (2.1) represents the degree of linear dependence between all the values that can be generated by the random process at the first point in time and those values that can be generated by the same random process at the second point. There are some important notes worth mentioning, the most important of which are:

1- If y (s, t) = 0, then this means that the two variables yt and ys are not linearly related, but there may be a non-linear correlation between them.
2- If y (s, t) = 0 and the two variables yt, ys have a normal bivariate, then this means that the two variables are independent.
3- The sample variance can be considered as a special case of the covariance function y (s, t) by setting t = s, and this means that y (t, t)
4- If the series is static, then the covariance function y (s, t) is a purpose of the time gap | s-t | = K only and is usually written in this case y (k)
On this basis, the autocorrelation can be defined as the linear correlation coefficient between the two variables yt, ys and it is written in the following form:

$$\rho(s,t) = \frac{\gamma(s,t)}{\sqrt{Var(Y_s).Var(Y_t)}}$$

Where this function is characterized by several characteristics, the most important of which are: -
1- The self-correlation between the variable yt and itself equals the integer one.
2- The value of the autocorrelation function always falls on the closed interval [1,1-]
3- If the value of the autocorrelation function is equal to zero, then this means that here is no lined association amid the two variables yt, ys, but there may be a non-linear relationship between them.
On the other hand, the autocorrelation coefficient of the static process {y_t} at the time gap k can be defined as the linear correlation coefficient between the two variables k-yt, yt and takes the following form:

$$\rho(k) = \frac{E(Y_t - \mu)(Y_{t-k} - \mu)}{E(Y_t - \mu)^2}$$

$$= \frac{\gamma(k)}{\gamma(0)} \quad , k = 0, \pm 1, \pm 2, \ldots$$

whereas: -
Y (0): represents the variance of the static process
Y (k): self covariance at the k-gap for the same process.
Hence, the autocorrelation coefficient can be calculated for each of the time slots k = 0, ■ (+ @ -) 1, ■ (+ @ -) 2, …….

Then we have a functional relationship between the autocorrelation coefficients P (K) and the time gap K, which is called the autocorrelation function of the static process {y_t}. The association amid the variables on the same period sequence that is far from each other measures a time gap of K.

1-1 Box and Pierce Test
It reveals the significance of the autocorrelation coefficient as a group, using the Pierce, Box test statistic, which takes the following form: (13).

whereas:
m: represents the number of time slots
For large samples, the Q-statistic has a chi-square delivery by a degree of liberty equivalent to m. If the computed Q value is better than the flat value, we reject the null theory that all the self-correlation coefficients are equivalent to the null hypothesis:

H_ °: ρ_k = 0
Hence the chain is unstable
1-2 Ljung-Box test
There is another alternative statistic that is used in performing the same Box and Pierce test called the Ljung-Box statistic, which takes the following form :

$$LB = n(n+2)\sum_{k=1}^{m}\frac{\hat{p}_k^2}{n-k}$$

Which has a chi-square delivery by a grade of liberty equivalent to m. If the computed Q value is better than the flat value, we reject the worthless theory that all the autocorrelation coefficients are equal to zero, i.e., the null theory is rejected:
H_ °: ρ_k = 0

Thus the chain is unstable.

Second: The Unit Root Test of Stationarity
The unit root tests not only serve to reveal the overall trend component, but also help determine the appropriate method for making the chain stable. Among these methods:

2.1 Extended Dicky-Fuller methodology for the Augmented Dicky-Fuller Time Series Stability Test
This test relies on three elements to ascertain the stability or instability of the time series, namely: the format of the used model, the sample size, and the level of significance.
There are three model formats that can be used in the case of ADF that have been used in the implementation side.

Third: Cointegration
This method is based on unstable time series while the linear combinations between them are stable (2) and this technique appeared at the hands of Engel-Granger (1983). If the variable is stable in its original form, i.e. without any modification, it is said to be an integral of the order of zero. Comes: (1)
y_t ~ I (0)
As for the initial differences, their equation is as shadows:
Δy_t = y_t-y_ (t-1)

In general, if the time series for a variable becomes stable after obtaining a number of differences equal to d, it is said that this series is an integrated d-class and it is written as follows: -
y_t ~ I (d)

On this basis, the joint complementarity can be defined as accompanying two or more time series, so that the fluctuations in one of them cancel out the fluctuations in the other in a way that makes the ratio between their two values constant over time. It is stable as a group. In other words, cointegration is the statistical expression of the long-term equilibrium relationship.

The Third Topic: Presentation, Analysis and Discussion of Results
Data on consumer spending and national income in Iraq for the period (1986-2018) were collected as shown in the following table:

Table (1)
National income and consumption for the Iraqi economy for the period from (1986-2018) (million dinars)

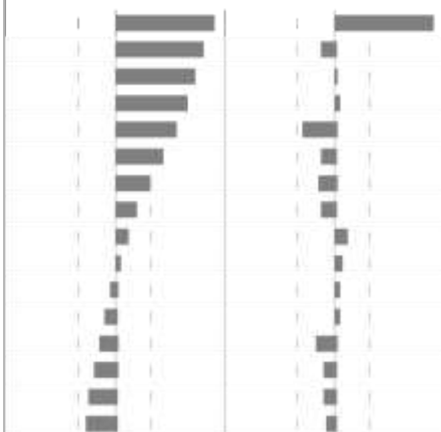
Year	National income	Consumption
1986 1304	12655.6	1986
1987 1584	15311.3	1987
1748.9	16982.9	1988
1836.7	17866.9	1989
7147.3	47941.9	1990
4878.9	36922.2	1991
14185.7	99643.4	1992
41828.2	279805	1993
217368	1440957.9	1994
886250	5807374.9	1995
857072	5641424.3	1996
1660245.8	13235490	1997
1883843.2	15013422.3	1998
2479137.7	31381048.5	1999
3262545.2	46634634.8	2000
4293509.5	36726500.7	2001
5641859.1	34677722.5	2002
3889758.4	25728748.6	2003
6388243	46923315.7	2004
8824031.8	65798566.8	2005
11470554.6	85431538.8	2006
13062198.1	100100816.6	2007
13274531.7	110342875.6	2008
13835190.2	120429277.2	2009
17473035.0	146453468.5	2010
24854165.1	192237070.3	2011
28238666.7	227221851.2	2012
29479807.5	243518658.5	2013
28104388.3	236708036.0	2014
18766031.1	162739468.2	2015
19062947.8	165634417.2	2016
22482053.1	183436173.0	2017
26816130.3	206636228.3	2018

On the practical side, Eviews9 program was used to test the being of the component origin for each of the variables of consumer spending and national income, as follows:

First: Box-Ljung's test of national income stability in Iraq
For the purpose of testing the stability of the time series of the national income chain in Iraq, the autocorrelation function was applied as shown in the following table:

Table (2)
Estimation of the autocorrelation function for the national income chain in Iraq

Date: 01/21/21 Time: 15:54
Sample: 1986 2018
Included observations: 33



Autocorrelation / Partial Correlation	AC	PAC	Q-Stat	Prob
1	0.919	0.919	30.501	0.000
2	0.827	-0.116	55.986	0.000
3	0.743	0.006	77.222	0.000
4	0.673	0.039	95.253	0.000
5	0.566	-0.296	108.46	0.000
6	0.447	-0.108	117.00	0.000
7	0.321	-0.134	121.58	0.000
8	0.203	-0.102	123.49	0.000
9	0.109	0.115	124.06	0.000
10	0.036	0.063	124.12	0.000
11	-0.027	0.033	124.16	0.000
12	-0.083	0.034	124.54	0.000
13	-0.142	-0.160	125.70	0.000
14	-0.194	-0.097	127.99	0.000
15	-0.237	-0.094	131.59	0.000
16	-0.266	-0.055	136.39	0.000

It is noticed after Table (2) that the worth of the Ljung-Box examination reached (136.39), which is a significant value due to the fact that the probability worth of the test of (0.000) is fewer than the equal of meaning (5%), which leads to rejecting the null hypothesis and the excuse of nullity. The time series of national income in Iraq, and this is an indication of the instability of the chain, and what confirms this is that the graph of the self-correlation function falls outside the limits of confidence for some time gaps, so the initial difference was taken and the unit root was tested for this series:

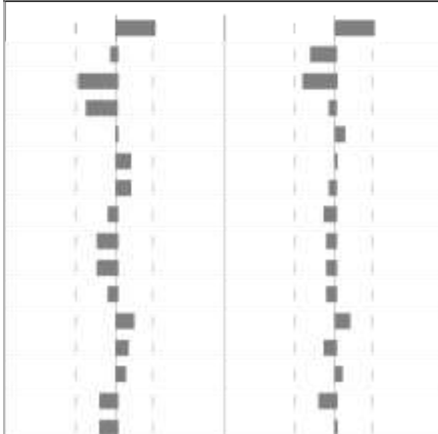
Second: The Ljung-Box test for the stability of the first difference of the national income chain in Iraq

For the purpose of testing the stability of the initial differences of the time series of the national income chain in Iraq, the autocorrelation function was applied as shown in the following table:

Table (3)

Estimation of the autocorrelation function for the primary differences of the national income chain in Iraq

Date: 01/21/21 Time: 15:55
Sample: 1986 2018
Included observations: 32



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.372	0.372	4.8590	0.028
		2	-0.049	-0.217	4.9456	0.084
		3	-0.344	-0.293	9.3792	0.025
		4	-0.265	-0.035	12.115	0.017
		5	0.002	0.095	12.115	0.033
		6	0.155	0.008	13.119	0.041
		7	0.127	-0.035	13.823	0.054
		8	-0.057	-0.097	13.968	0.083
		9	-0.170	-0.057	15.328	0.082
		10	-0.167	-0.059	16.711	0.081
		11	-0.071	-0.061	16.975	0.109
		12	0.163	0.143	18.425	0.103
		13	0.121	-0.085	19.257	0.115
		14	0.094	0.056	19.794	0.137
		15	-0.141	-0.148	21.072	0.135
		16	-0.147	0.024	22.543	0.127

It is noticed after Table (3) that the worth of the Ljung-Box test reached (22,543), which is an insignificant value, due to the fact that the probability worth of the examination (0.127) is greater than the equal of significance (5%), which leads to the impossibility of nullifying it. In the time series of national income in Iraq, this is an indication of the stability of the series. Therefore, the time series of GNI in Iraq is considered an integrated one of the first degree.

Third: The Dickey - Fuller test of the extended unit root for the national income chain in Iraq

In addition to the Ljung-Box test for time-series stability, the extended Dickie-Fuller test was used as shown below:

Table (4)
The results of the expanded Dickie-Fuller test of the national income chain in Iraq for the third model (presence of a breaker and a general trend)

Null Hypothesis: X has a unit root Exogenous: Constant, Linear Trend Lag Length: 1 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.724302	0.2344
Test critical values: 1% level 5% level			-4.284580 -3.562882	
10% level			-3.215267	
*MacKinnon (1996) one-sided p-values. Augmented Dickey-Fuller Test Equation Dependent Variable: D(X) Method: Least Squares Date: 01/21/21 Time: 16:19 Sample (adjusted): 1988 2018 Included observations: 31 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.248189	0.091102	-2.724302	0.0112
D(X(-1))	0.464610	0.163423	2.842994	0.0084
C	-15284524	8761283.	-1.744553	0.0924
@TREND("1986")	2214410.	805804.0	2.748075	0.0106
R-squared	0.336040 var	Mean dependent		6665191.

Adjusted R-squared	0.262267	S.D. dependent var	19701188
S.E. of regression	16921625	Akaike info criterion	36.24600
Sum squared resid	7.73E+15	Schwarz criterion	36.43103
Log likelihood	-557.8130	Hannan-Quinn criter.	36.30631
F-statistic	4.555037	Durbin-Watson stat	1.958541
Prob(F-statistic)	0.010438		

It is noticed after Table (4) that the probability worth of the extended Dickie-Fowler examination reached (0.2344), which is greater than the level of significance (5%). This means accepting the following null hypothesis:

H_ ° : ρ = 1

That is, the chain has a unit root, then we test the following hypothesis:

H: β = 0

And for the temporal trend parameter, where we notice that the calculated value of the test reached (2.748075), which is greater than the tabular value (1.697), and this confirms the presence of the component origin in the series, so we move to the second version of the model that includes the presence of a breaker to test the following worthless theory:

Table (5)

The results of the Dickie - Fuller test of the expanded national income chain in Iraq for the second model (having a conclusive)

Null Hypothesis: X has a unit root Exogenous: Constant Lag Length: 1 (Automatic - based on SIC, maxlag=8)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.501014	0.8780
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 01/21/21 Time: 16:21
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.021533	0.042979	-0.501014	0.6203
D(X(-1))	0.399659	0.179630	2.224902	0.0343
C	5900689.	4624370.	1.275998	0.2124

R-squared	0.150330	Mean dependent var	6665191.
Adjusted R-squared	0.089640	S.D. dependent var	19701188
S.E. of regression	18797457	Akaike info criterion	36.42811
Sum squared resid	9.89E+15	Schwarz criterion	36.56688
Log likelihood	-561.6357	Hannan-Quinn criter.	36.47334
F-statistic	2.476990	Durbin-Watson stat	1.828131
Prob(F-statistic)	0.102212		

It is noted from Table (5) that the likelihood value reached (0.8780), which is greater than the equal of significance (5%), and this means accepting the following null hypothesis:

H_ ° : ρ = 1

This means that there is a component origin, so we test the worthless theory of the disconnector parameter which is:

H_ °: α = 0

Where it is noticed from the above table that the calculated value of (1.275998) is less than the tabular value (1.697). Therefore, we estimate the first formula, which does not include the presence of the categorical and the general trend, where the results are as follows:

Table (6)

The results of the Dickey - Fuller test, extended the national income chain in Iraq for the first model (absence of a breaker and a general trend)

Null Hypothesis: X has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic			0.417237 -2.641672	0.7974
Test critical values:		1% level	-	
		5% level	1.952066	
10% level			- 1.610400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(X)
Method: Least Squares
Date: 01/21/21 Time: 16:22
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	0.013849	0.033191	0.417237	0.6796
D(X(-1))	0.420985	0.180778	2.328747	0.0270

R-squared	0.100923	Mean dependent var	6665191.
Adjusted R-squared	0.069920	S.D. dependent var	19701188
S.E. of regression	18999953	Akaike info criterion	36.42011
Sum squared resid	1.05E+16	Schwarz criterion	36.51263
Log likelihood	-562.5117	Hannan-Quinn criter.	36.45027
Durbin-Watson stat	1.827668		

It is noted from Table (6) that the probability value reached (0.7974), which is better than the level of meaning (5%), and this incomes accepting the following null hypothesis:

H_ ° : ρ = 1

This means that the national income at the level of the time series is not stable, so the first differences were taken and the Dicky-Fuller enlarged test was performed as follows:

Table (7)

The results of the expanded Dickie-Fuller test for the first difference of the national income chain in Iraq for the third model (presence of a breaker and a general trend)

Null Hypothesis: W has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.563640 -4.284580	0.0499
Test critical values:	1% level	-	
	5% level	3.562882	
10% level		- 3.215267	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(W)
Method: Least Squares
Date: 01/21/21 Time: 16:56
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
W(-1)	-0.630738	0.17699	-3.563640	0.0013
C	621978.7	7242607	0.085878	0.9322
@TREND("1986")	226960.5	379435.9	0.598152	0.5545

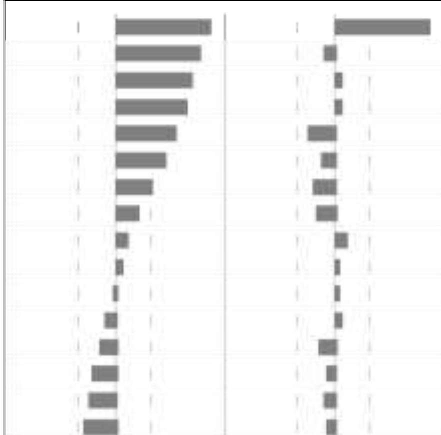
R-squared	0.312556	Mean dependent var	748303.2
Adjusted R-squared	0.263452	S.D. dependent var	21861481
S.E. of regression	18762036	Akaike info criterion	36.42433
Sum squared resid	9.86E+15	Schwarz criterion	36.56311
Log likelihood	-561.5772	Hannan-Quinn criter.	36.46957
F-statistic	6.365284	Durbin-Watson stat	1.828479
Prob(F-statistic)	0.005264		

It is noticed after Table (7) that the probability worth of the Extended Dicke-Fuller test reached (0.0499), which is less than the level of significance (5%). This means rejecting the following null hypothesis:

H_ ° : ρ = 1
That is, the national income chain does not have the root of unity, and this means that the initial differential series of national income in Iraq is stable.
Fourth: The Ljung-Box test for the stability of consumer spending in Iraq
For the purpose of testing the stability of the time series of the consumer spending series in Iraq, the autocorrelation function was applied as exposed in the next table:

Table (8)
Estimation of the autocorrelation function for the chain of consumer spending in Iraq

Date: 01/22/21 Time: 20:32
Sample: 1986 2018
Included observations: 33



Autocorrelation Partial Correlation		AC	PAC	Q-Stat	Prob
	1	0.907	0.907	29.663	0.000
	2	0.807	-0.083	53.936	0.000
	3	0.728	0.062	74.357	0.000
	4	0.671	0.065	92.262	0.000
	5	0.577	-0.236	105.99	0.000
	6	0.468	-0.115	115.34	0.000
	7	0.341	-0.197	120.52	0.000
	8	0.211	-0.180	122.58	0.000
	9	0.119	0.121	123.26	0.000
	10	0.050	0.048	123.39	0.000
	11	-0.015	0.033	123.40	0.000
	12	-0.080	0.053	123.75	0.000
	13	-0.150	-0.140	125.06	0.000
	14	-0.208	-0.068	127.70	0.000
	15	-0.252	-0.085	131.78	0.000
	16	-0.279	-0.064	137.07	0.000

It is noted after Table (8) that the worth of the Ljung-Box test reached (137.07), which is a significant value, because the probability worth of the test of (0.000) is fewer than the equal of meaning (5%), which leads to rejecting the nullity. The time series of consumer spending in Iraq, and this is an indication of the instability of the chain. What confirms this is that the graph of the self-correlation function falls outside the limits of confidence for some time gaps, so the first difference was taken and the first difference was taken.

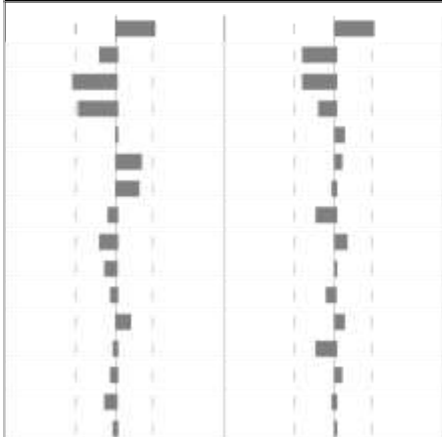
Fifth: The Ljung-Box test of the stability of the first difference in the series of consumer spending in Iraq

For the purpose of testing the stability of the time series for the first difference of the consumer spending series in Iraq, the self-correlation function was applied, as exposed in the next table:

Table (9)

Estimation of the autocorrelation function for the initial differences of the consumer spending chain in Iraq

Date: 01/22/21 Time: 20:39
Sample: 1986 2018
Included observations: 32



Autocorrelation / Partial Correlation	AC	PAC	Q-Stat	Prob
1	0.366	0.366	4.7134	0.030
2	-0.126	-0.300	5.2876	0.071
3	-0.398	-0.290	11.237	0.011
4	-0.339	-0.136	15.703	0.003
5	0.004	0.098	15.704	0.008
6	0.240	0.057	18.122	0.006
7	0.220	-0.015	20.233	0.005
8	-0.068	-0.175	20.442	0.009
9	-0.127	0.109	21.200	0.012
10	-0.096	0.016	21.657	0.017
11	-0.028	-0.074	21.699	0.027
12	0.143	0.095	22.815	0.029
13	-0.009	-0.179	22.820	0.044
14	-0.049	0.058	22.962	0.061
15	-0.075	-0.017	23.325	0.077
16	-0.005	0.009	23.327	0.105

It is noticed after Table (9) that the worth of the Ljung-Box test reached (23.327), which is an insignificant value, because the probability worth of the test of (0.105) is better than the equal of meaning (5%), which leads to the absence of the theory of the worthless theory. In the time series of consumer spending in Iraq, this is an indication of the stability of the chain, and what confirms this is that the graph of the self-correlation function falls within the confidence limits for most of the time gaps, so the time series of the first consumer spending is considered an integrated one.

Sixth: Dickey-Fuller's expanded test of the unity root for the consumer spending chain in Iraq

For the third model, which includes a disconnector with general tendency, the extended Dickie-Fuller test was rummage-sale to test the following worthless theory:

Where the results were as follows:

Table (10)

The results of the Dickey-Fuller test extended to the series of consumer spending in Iraq for the third model (presence of a circuit breaker and a general trend)

Null Hypothesis: Y has a unit root Exogenous: Constant, Linear Trend Lag Length: 1 (Automatic - based on SIC, maxlag=8)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.936772 -4.284580	0.1655
Test critical values:		1% level	-	
		5% level	3.562882	
10% level			- 3.215267	
*MacKinnon (1996) one-sided p-values. Augmented Dickey-Fuller Test Equation Dependent Variable: D(Y) Method: Least Squares Date: 01/21/21 Time: 16:58 Sample (adjusted): 1988 2018 Included observations: 31 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.286634	0.097602	- 2.936772	0. 0067
D(Y(-1))	0.490362	0.163916	2.991552	0.0059
C	-2256904.	1139708.	-	0.0580

			1.980247	
@TREND("1986")	315264.3	104727.1	3.010340	0.0056
R-squared	0.363423 var	Mean dependent		864985.4
Adjusted R-squared	0.292693	S.D. dependent var		2628952.
S.E. of regression	2210990. criterion	Akaike info		32.17569
Sum squared resid	1.32E+14	Schwarz criterion		32.36072
Log likelihood	-494.7232 criter.	Hannan-Quinn		32.23601
F-statistic	5.138127	Durbin-Watson stat		1.877997
Prob(F-statistic)	0.006107			

It is noted after Table (10) that the probability worth of the expanded Dickie-Foler test reached (0.1655), which is greater than the level of significance (5%). This means accepting the following null hypothesis:

H_ ° : ρ = 1

That is, the chain has a unit root, then we test the following hypothesis:

H: β = 0… Concerning the time trend parameter, where we notice that the calculated value of the test reached (3.010340), which is greater than the tabular value (1.697) below the significant level (5%), so we re-test the following hypothesis:

H_ ° : ρ = 1

This is by using the t-test under the normal normal distribution, where we note that the probability worth of the t-test of (0.0067) is fewer than the equal of meaning (5%). - Extended Fuller, as shown in the following table:

Table (11)

The results of the expanded Dicky-Fuller test for the first team of the consumer spending chain in Iraq

For the third model (presence of a circuit breaker and a general trend)

Null Hypothesis: D(Y) has a unit root Exogenous: Constant, Linear Trend Lag Length: 3 (Automatic - based on SIC, maxlag=8)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.254606 -4.323979	0.0011
Test critical values:	1% level	-	
	5% level	3.580623	
10% level		- 3.225334	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(Y,2)
Method: Least Squares
Date: 01/23/21 Time: 13:59
Sample (adjusted): 1991 2018
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Y(-1))	-2.144637	0.408144	-5.254606	0.0000
D(Y(-1),2)	1.290398	0.318213	4.055135	0.0005
D(Y(-2),2)	1.099125	0.300819	3.653772	0.0014
D(Y(-3),2)	1.087882	0.353174	3.080302	0.0055
C	-793317.6	1050439.	-0.755225	0.4581
@TREND("1986")	154777.7	61497.66	2.516806	0.0196

R-squared	0.608255	Mean dependent var	154598.8
Adjusted R-squared	0.519222	S.D. dependent var	3043147.
S.E. of regression	2110061.	Akaike info criterion	32.14974
Sum squared resid	9.80E+13	Schwarz criterion	32.43521
Log likelihood	-444.0964	Hannan-Quinn criter.	32.23701
F-statistic	6.831804	Durbin-Watson stat	1.750280
Prob(F-statistic)	0.000552		

It is noticed after Table (11) that the probability worth of the Extended Dickie-Fuller test reached (0.0011) and it is less than the level of significance (5%). This means rejecting the following null hypothesis:

H_ ° : ρ = 1

That is, the chain has become stable and does not have the unit root after taking the first difference.

By using the t-test under the moderate normal distribution, where we note that the probability worth of the t-test of (0.0196) is fewer than the equal of meaning (5%), which means the value of the trend in consumer spending is significant, so the first consumption is not considered to be a significant chain.

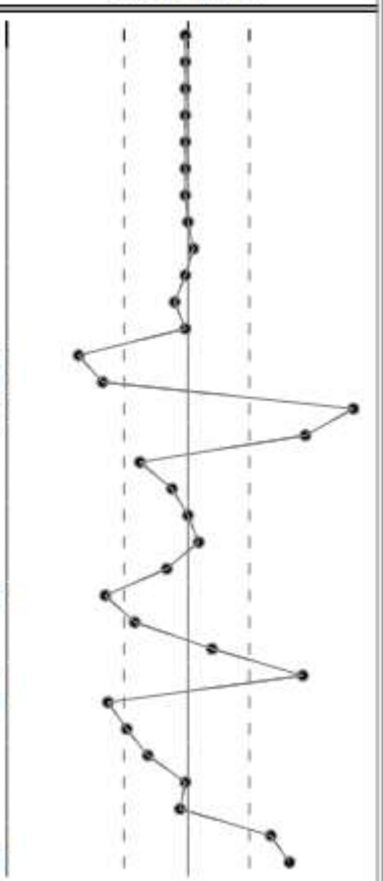
From the above, we note that both the variables of national income and consumption expenditures are characterized by the characteristic of joint integration of the first degree, and this gives the right to apply the error correction model where the results of this model are as follows:

1- Extraction of the remainder of the decline in consumption spending on national income, which is called the error correction limit and shown in the following table:

Table (12)
The remainder of the decline in consumer spending on national income

obs	Actual	Fitted	Residual
1987	280.000	22505.9	-22225.9
1988	164.900	22381.6	-22216.7
1989	87.8000	22282.1	-22194.3
1990	5310.60	25970.2	-20659.6
1991	-2268.40	20778.2	-23046.6
1992	9306.80	30094.8	-20788.0
1993	27642.5	44932.5	-17290.0
1994	175540.	168874.	6666.23
1995	668882.	573835.	95046.8
1996	-29178.0	1203.78	-30381.8
1997	803174.	981625.	-178451.
1998	223597.	246799.	-23201.7
1999	595295.	2090100	-1494805
2000	783408.	1949349	-1165942
2001	1030964	-1229650	2260614
2002	1348350	-236678.	1585027
2003	-1752101	-1108467	-643634.
2004	2498485	2699949	-201464.
2005	2435789	2406920	28868.8
2006	2646523	2502652	143870.
2007	1591644	1875526	-283883.
2008	212334.	1316179	-1103846
2009	560659.	1296513	-735855.
2010	3637845	3310136	327709.
2011	7381130	5806593	1574537
2012	3384502	4442241	-1057739
2013	1241141	2081152	-840012.
2014	-1375419	-838302.	-537117.
2015	-9338357	-9323216	-15141.6
2016	296917.	387926.	-91009.3
2017	3419105	2271292	1147814
2018	4334077	2953327	1380750

Residual Plot



$$\Delta y_t = \beta_\circ + \sum_{j=1}^{k} \beta_j \Delta x_{t-j} + \theta_{t-j} + U_t$$

whereas:

K: represents the number of time slots
〖Δy〗 _t: the first difference of the dependent variable (consumption expenditure)

〖Δx〗 _ (t-j): the first difference of the independent variable (national income) at the time gap j

θ: the adjustment velocity coefficient, which mentions to the amount of change in the reliant on mutable as a result of the deviation of the worth of the independent mutable in the short period from its equilibrium value in the long term by one unit.

Table (13)
Estimation results for error alteration perfect

Dependent Variable: D(Y)
Method: Least Squares
Date: 01/23/21 Time: 16:43
Sample (adjusted): 1987 2018
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7840.608	211245.9	0.037116	0.9706
D(X)	0.126343	0.007965	15.86194	0.0000
X(-1)	0.000199	0.001904	0.104487	0.9175

R-squared	0.896654	Mean dependent var	837963.3
Adjusted R-squared	0.889526	S.D. dependent var	2590716.
S.E. of regression	861091.7	Akaike info criterion	30.25885
Sum squared resid	2.15E+13	Schwarz criterion	30.39626
Log likelihood	-481.1416	Hannan-Quinn criter.	30.30440
F-statistic	125.8048	Durbin-Watson stat	1.505992
Prob(F-statistic)	0.000000		

It is noted from Table (13) that the estimate of the national income coefficient has reached (0.126343), which is a positive quantity, and this is a logical and fair result, as the national income coefficient must be confined between zero and the correct one and that the fixed term (C) is greater than the correct one.

The Fourth Topic: Conclusions and recommendations

First: Conclusions:

1. Both the consumer spending chain and the national income are integrated from the first degree.

2. The national income explains about (89.6)% of the changes in consumption spending, while the remaining percentage (10.4%) refers to unexplained external factors that are included in the random error component.
3. The possibility of applying the mistake alteration perfect due to the fact that the search variables have the property of joint integration.

Second: Recommendations:
The necessity to balance the contribution of national income to consumer spending by reducing the value of the interest rate, which leads to a decrease in savings and a reduction in the amount of change in the dependent variable (consumer spending) due to the decrease in the value of the consumption shift.

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