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Error correction model for estimating the relationship between GDP and inflation in the Iraqi economy (1990-2020)

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Abstract

The relationship between economic growth and inflation a concern for many countries in the developed and developing world, and erected in developed countries, a lot of research to laparoscopy relationship in order to overcome the problems that may be exposed to the States as a result of this association. The current research is an attempt to explore the trends in this relationship in Iraq in order to determine the ranges that can affect or be affected by growth as a result of inflation, period (1990-2020) was adopted to range time frame in which you can determine the nature of the relationship between the two variables as well have been taking data at their nominal value as terms of GDP growth for the accurate diagnosis of the impact of inflation has been relying on time-series analysis to prove the direction of the relationship, and the paper confirmed the conclusion that there are two methods of fundamental bond that link inflation and economic growth in Iraq.

Keywords: inflation, variance, spending, gap, equilibrium.

1. Introduction

Although the prevailing trend in the economy considers the stability of price as a factor of the most important objectives of financial policy, because high inflation rates limit economic growth and increase pressure on the monetary authorities as a result of the failure in one of the economic performance indicators.

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In view of Iraq's reliance on the public sector in directing economic activity and its impact on wars and economic sanctions, as well as international economic conditions such as crises and economic stagnation, the great fluctuation in inflation rates and economic growth of the Iraqi economy requires studying the relationship and knowing the extent of their relationship to know the effect of inflation on the economic growth in inflation and thus knowing the importance of inflation and its role in economic activities and economic growth in Iraq and this is what the current research will try to prove by relying on tests of time series analysis of relationship variables and for you to adopt the period (1990-2020), which is the period that witnessed the highest rates of inflation in the Iraqi economy.

2. Research Methodology

Research problem

There is a wide debate between economists and economic theories about the reality of the link between inflation and economic growth as well as the extent to which the Iraqi economy is affected by this relationship.

Research Hypothesis:

The research assumes that there is a link that associates inflation and economic growth in Iraq for long periods of time.

Research goal:

Verifying the rationality and sort of the relationship of inflation and economic growth in Iraq by modern standard methods and estimating them through time series stability, co-integration and (Granger) causality.

Research limits:

The data on the Gross Domestic Products in Iraq and inflation from 1990 to 2020, provided by : the reports of the economic bulletins of the Central Bank of Iraq, was relied on, as shown in the following table:

2.1. Previous Studies

1- Abdullah Ibrahim [5] presented a study entitled the pivotal relationship between supply of money and exchange rate in Libya, Sebha University. The study intended to investigate the relationship that associates the money supply, in its broad sense, and the exchange rate of the Libyan Dinar which is a two-way correlation between the variables.

2- Farouk Rafeeq [3] presented a study entitled causal relationship and co-integration among Amman Stock Exchange indices. The Hashemite University of Jordan. The study aimed to choose the hypothesis of no static, causal relationship and co-integration between the returns of the Amman Stock Exchange indices 2000-2006 AD. The study confirmed the existence of a different one-direction causal relationship in two directions, between the stock indices, which supports the possibility of predicting each index using the other and vice versa.

3- Magda Muhammad Al-Hassan [6] presented a study entitled: An econometric study of the impact of the link between non-oil exports and the economic growing in Sudan from (1990-2005), University of Khartoum. The study aimed at finding out a link between non-oil exports and economic growth for $(1990-2005)$. The problem of the study is the deterioration of the non-oil exports sector, which includes the agricultural sector, in both the plant and animal sectors, and the mining and industrial sectors.

GDP	Inflation rate	Year
0611.01	56.0	1990
2641.1	55.2	1991
4891.9	09.5	1992
1109.4	50.0	1993
1488.8	9.6	1994
1999	4.4	1995
6926.6	5.2	1996
9256.9	54.5	1997
8949	05.2	1998
55969.0	6.2	1999
51218.2	15.9	2000
04691	596.12	2001
42818	92.96	2002
96421	019.60	2003
029815	480.54	2004
911164	299	2005
861112	56-	2006
5129189	02	2007
5215996	54.9	2008
5492926	50.1	2009
5909116	4.8	2010
0518198	56	2011
2152615	58	2012
0989599	22.6	2013
51549606	06.8	2014
55288501	26.8	2015
51461161	12	2016
05905569	21.9	2017
28189934	0.9	2018
37300030	6.8	2019
51743489	2.4	2020

Table 1: Inflation rate and GDP in Iraq for the period 1980-2010

3. The Reality and Stages of Economic Inflation in Iraq

The historical stability of prices in Iraq was the dominant feature during the First World War, in which the Indian rupee was used as the official monetary unit instead of the gold and silver bimetallic system (which was used during the Ottoman occupation and due to the limited change in the amount of money at the beginning of the twentieth century, there were no inflationary pressures and witnessed The Iraqi economy, the phenomenon of inflation in the fifties, when oil revenues rose, accompanied by the monetary authority's adoption of an expansionary monetary policy, but after the disengagement of the Iraqi Dinar from the sterling pound, the sixties stage was not accompanied by any inflationary pressures, and there was a rapid development in the growth of money supply during the seventies due to the rise in oil revenues after the two oil shocks that It was accompanied by an abundance of financial resources that contributed to the rise in inflation rates. Nevertheless, the levels of inflation during the seventies can be considered logical and acceptable because they are in the rank of ones except for the years 1976 and 1979 when the inflation level in both of them reached 50.9% (51.9%).

3.1. The path of inflation in Iraq for the period (1990-2020)

Inflation in the eighties differs from the seventies, and if the inflation in the seventies is attributed to the inflation of demand withdrawal due to the rise in consumer and government spending, because of the war conditions and the accompanying decline in oil exports and the decline in their prices, and after the decline in global demand for oil in 1992, the inflation in the eighties can be considered double inflation, i.e. inflation Withdrawal of demand due to the increase in government spending for what the wars required of securing material and military supplies, and the inflation of paying costs resulting from external conditions that led to an increase in the level of costs and a shift of the aggregate supply curve to the left.

And the reflection of the high level of government spending on the money supply in the early eighties, which rose by 26.60% (in 1992) and in spite of the drop in global request for oil and the drop in the prices, government spending increased from 9688 million Dinar in 1990 to 51192 million Dinar in 1995 after the great expansion in military spending (and due to the great growth In the money supply for the years 1991 and 1992, which amounted to 37.30% and 36.62% (respectively to finance military expenditures, the Central Bank issued Qadisiyah bonds) to limit the significant growth in the money supplies and control inflation equations.

In general, the increase in public and private consumer spending during the eighties led to an increase in aggregate demand, as the surplus of aggregate demand rose from 599.9 million Dinar s in 1990 to 4828.4 million Dinars in 1995.

The rise in government spending is due to the rise in defense spending from 98.6% of the total public spending to finance war expenditures while reducing government spending on the industrial and agricultural sectors. The stability of the currency ratio in circulation to money supply in the narrow sense is noted at high limits in the eighties at an annual rate of 92.2%.

3.2. Economic inflation in the economic blockade during the period (2000-2012)

Most of the production and service sectors stopped after Iraq was exposed in the early nineties to a heat and economic blockade and with the suspension of oil exports and the freezing of foreign assets, prices rose rapidly, causing excessive inflation, especially in food prices until the mid-nineties, during which the inflation rate rose from 15.9% in 2000 to 480.54% in 2004, after the money supply increased from 51218.2 million Dinars to 298150 million Dinars, i.e. nearly doubled by 51 for the same period, causing an increase in government military spending for reconstruction, during which

the government deficit increased from −0.6168 million Dinar in 2000 to −192989 million Dinar in 2004, which led to a large and constant increase in the level of prices generally. The increase in the money supply and the decrease in demand for it also contributed in a way that led individuals to replace local money with real assets such as real estate and durable goods (and gold or foreign currencies to compensate for the deterioration in the value of The Iraqi Dinar, which lost its job as a mediator of exchange and store of value, in a way that contributed to the emergence of the dollarization phenomenon that appears after the loss of confidence in the local currency.

Despite the continued growth of critics' opposition at high rates during the subsequent years, the consumer price index witnessed a decline when it reached 9, 18101 (compared to 2000 (compared to a negative inflation rate of −4.51%)), which is attributed to the initiation of the oil-for-oil agreement Food with the United Nations.

4. The standard theoretical framework for error correction models

The standard method is one of the tools that the economic researcher relies on for the purpose of reaching a quantitative inference by which he answers the questions that were raised in the study problem, as well as proving or denying the hypothesis based on the data of the model and the standard method used.

Therefore, it is hardly devoid of applied studies within the framework of economic policies and expectations at the macro level, and in light of the developments that econometrics is witnessing at the level of standard programs and models, the Eviwes 9 program was used in this research, which is one of the latest programs in the field of econometrics, using a method Cointegration using the error correction model.

4.1. the co-integration test

This test is one of the methods used in dealing with the inactivity of time series, as well as its support for economic theory by formulating the relationship between economic variables within a statistical space, knowing that economics confirms that there are economic variables whose movement is stable over time, despite being characterized Random fluctuation individually, therefore, the importance of co-integration analysis in the study of economic relations in the long run.

Since the standard analysis is one of the empirical studies, and since we are in the process of analyzing the relationship of variables, economics by conducting a regression analysis of the data of those variables that are a time series, and here several basic steps must be available:

The first step: to ensure that the time series data for each of these variables are integrated with it.

The second step: It is choosing a method for integration. According to this study, the ARDL model is used for the purpose of making sure whether there is a joint integration between the model variables or not.

4.1.1. The Static Test for Time Series

The primary procedure in estimating and measuring the relationships between economic variables within the framework of long-term time series is to ensure that the time series is still in order not to fall into the trap of the false regression that appears in the event that the time sequence is not fixed. The static test reflects the extent to which the phenomenon of false deviation exists in the standard models or not, which is derived from the existence of a unit root in the time series data of the studied variables, and its role is to take measures to treat the time series to make them static through the first and second differences, and thus get rid of False skew in the time series, and from this point of

view, the time series is static if it is characterized by the statistical properties as follows
1. The arithmetic mean of the studied values is still or constant over time, i. e., $E[Y_t] = \mu$.
2. The variance of the studied values is constant or still over time, ie. $Var(Y_t) = E(Y_t - \mu)^2 = \sigma^2$.
3. The value of the variance between two periods must depend on the time gap between them and not on the actual value of time. The variance is calculated according to the following formula: $\gamma_k = E[(Y_t - \mu)(Y_{t+k} - \mu)]$.

There are many tests to find out the inactivity of time series, but the most significant and common among researchers at a wide level are the Dickey/Fuller Test, 1979 and the Philips/Perron Test, 1988 [2, 4].

4.1.2. Dickey-Fuller test

Doing the ADF test to ensure that the time series of the studied variables can be static requires three equations as follows:
A- Possibility of having a fixed boundary and no time direction

$$\Delta Y_t = \mu + \delta Y_{t-1} + \varepsilon_t. \tag{4.1}$$

B- Possibility of a fixed boundary and time trend

$$\Delta Y_t = \mu + \alpha T + \delta Y_{t-1} + \varepsilon_t. \tag{4.2}$$

C- without a stable limit and a broad trend

$$\Delta Y_t = \delta Y_{t-1} + \varepsilon_t. \tag{4.3}$$

According to the above equations, the null hypothesis is accepted ($H0 : \square = 1$), which means that series of time of the studied variables include the unit root, and conversely, the possibility of accepting the alternative hypothesis ($H1 : \square < 1$) which means that the series of time of studied variables are inactive, and the test is verified (ADF) by comparing the calculated value tau with the critical value at a significant level ($10\%, 5\%, 1\%$).

In 1981, Dickey-Fuller developed a unit root test, later called the extended Dickey-Fuller test, using a slowing variable for the interpreted variables to reach a conclusion that addresses the weakness of the simple Dickey/Fuller Test, which is the problem of autocorrelation in the error term, which makes it more Accuracy and efficiency of the simple Dickey/Fuller Test, and the extended Dickey/Fuller Test can be illustrated by the following equation:

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^{n} \theta_i \Delta Y_{t-1} + \varepsilon_t. \tag{4.4}$$

4.1.3. Philips-Perron test

The (PP) test is statistically more accurate in comparison with the (ADF) Test, mainly when the sample size is small. The (PP) test depends on a non-parametric statistical method in correcting the autocorrelation in the remainder of the unit root test equation.

Notably, the PP test has the same distribution as the ADF Test and the same hypotheses (the null-hypothesis and the alternative hypothesis). The second step: Co-integration using the ARDL model (Autoregressive Distributed Lag Estimate). The ARDL methodology has been developed by Daoud [4], Al-Ali [1], and has become popular in recent years as this test does not require that the time series under study be of the same order, i.e. static in The same degree, whether in the level

or the first differences, or a mixture of them, but provided that the time series are not static in the second differences.

The Autoregressive Distributed Deceleration (ARDL) model has several characteristics that distinguish it from other models, as follows:
1. The application of the ARDL test does not require that the studied time series be stationary at the same rank, in addition to the possibility of estimating the short term and the long term at the same time in one equation.
2. The ARDL test is characterized by the possibility of allowing the explanatory variables in the model to have different deceleration periods, and this does not happen in the rest of the other standard models.
3. The ARDL test can be applied in case the sample size is small, and it helps prevent autocorrelation as a result of the estimators resulting from this test being efficient and unbiased.
4. It is characterized by simplicity in estimating the co-integration of the studied time series by the method of OrDinar y Least Squares (OLS) after determining the maximum optimum lag times.

The ARDL model shows a mixture of the two models (Lag- Distributed and the Autoregressive model) when there is a state of conditioning in the dependent variable yt that is affected by changes that occur in the explanatory variable xt and with decelerated values for previous periods of time (x_{t-r}), i.e., the effect of the explanatory variable is not only for the current time period (t), but for multiple previous periods of time (t_r). The ARDL model takes the following equation:

$$y_t = \beta + \beta_0 x_t \beta_1 x_{t-1} + u_t. \tag{4.5}$$

And the dynamic (kinetic) behavior can be expressed by the previous, values of the dependent, variable y_t, which means the same dependent variable is an explanatory variable, but in a time-delayed manner for a previous period ($i - y_t$). This represents an autoregressive model and takes the following formula:

$$y_t = \lambda_1 y_{t-1} + \lambda_2 y_{t-2} + ... + \lambda_p y_{t-p} + u_t. \tag{4.6}$$

According to equation (5) above (ARDL) model, the right side contains a time-delayed explanatory variable (x_{t-1}) in addition to the dependent variable itself containing previous values ($i - y_t$), so it takes the following equation:

$$y_t = \alpha + \alpha_1 y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + u_t. \tag{4.7}$$

where y, x represents the variables that are stationary in degree zero, one, or a combination of both. It is also a test of the probability of a long term relationship (co-integration) between the studied variables using the ARDL model, whether the variables are static of degree zero or degree one or a combination of them.

According to the Bound Test approach, lower and upper limits of the F test are determined by the null-hypothesis ($H0$), which means that there is no possibility of a long-term co-integration relationship between the model variables when the calculated F value is less than the Critical values. It rejects the null-hypothesis and accepts the alternative hypothesis that means the existence of a joint integration, according to the above. From an applied point of view, the error correction model and the boundary test is done after determining the degree of inactivity for the studied variables, we apply the following equation:

$$\Delta y_t = a_0 + \sum_{i=0}^{r} a_{1i} \Delta y_{t-1} + \sum_{i=0}^{r} a_{2i} \Delta p_{t-i} + \sum_{i=0}^{r} a_{3i} \Delta m_{t-i} + \beta_1 y_{t-1} + \beta_2 p_{t-1} + \beta_3 m_{t-1} + \varepsilon t. \tag{4.8}$$

Where:
Δ =The first difference of the values of the variable.
a_0 =constant limit.
r = The number of the optimal time lag.
a_{1i}, a_{2i}, a_{3i} = The short-term coefficients of the dynamic relationship.
β_1, β_2, β_3 = long-term coefficients by which the co-integration is known.
t = time.
εt = Random Error Limit.
According to the above equation, if the possibility of co-integration between the variables under study becomes possible according to the boundary test, the short-term relationship will be estimated using the error correction model as follows:

$$\Delta y_t = a_0 + \sum_{i=0}^{r} a_{1i}\Delta y_{t-1} + \sum_{i=0}^{r} a_{2i}\Delta p_{t-i} + \sum_{i=0}^{r} a_{3i}\Delta m_{t-i} + yECT_{t-1} + \varepsilon_t. \tag{4.9}$$

Where (ECT) represents the error correction term to be added to the model, and (y) represents the percentage of deviation that is corrected in the period $(t-1$ to the period $t)$, and this means the speed of error correction of the dependent variable in the short term towards its equilibrium value in the long term.

4.1.4. Impulse Response Function

To calculate the effect of the shock to an internal variable (VAR and VECM) on the present and forthcoming values of other internal variables through the immediate response function (IRF), as well as the work of this function in tracking the time course of many shocks (Shocks) that are exposed It has most of the variables under study in the VAR model, thus it shows the extent to which each variable responds to any sudden shock in one of the remaining variables that can affect the value of this variable at the same time this effect is transmitted to other variables through the VAR model. The (IRF) function is considered as a tool for assessing the dynamic interaction and the strength of the causal relationship between the under study variables by tracing the time course of the directional responses to a variable caused by a one-unit change in the standard deviation of the other variables. The autoregressive model (VAR) can be expressed as:

$$y_t = \mu + \Gamma_1 y_{t-1} + ... + \Gamma_p y_{t-o} + v_t,$$

whereas: y_t: represents the number of macroeconomic variables in the model $(N \times 1)$, μ: constant boundary vector $(N \times 1)$, Γ: coefficient matrix $(N \times N)$ for each $i = 1, 2, \ldots, p$, v_t: bounds vector The random error, as well as tracing a natural distribution with a mean of zero $(0 = v_t E)$ and a constant variance (δ) and that $(= \Omega E[v_t(v_t)'])$ is a contemporaneous covariance matrix.
If a shock (shock) occurs in the system at one of the v_t (random error limits) for one period, y_t (the variables) will move out of equilibrium (i.e. $y_t \neq y$) and then return to it. The path of return of the variables to equilibrium is named the impulse response (Impulse response) of the VAR model. As for the Autoregressive model, y_t deviates from equilibrium when a change occurs in v_t (for the corresponding random error limits), which means y_{2t} deviates from equilibrium when we shock v_{2t}. Note that the equilibrium in the VAR model when $y_t = y$. Therefore, the error term v is equal to zero in the long run.

The simultaneous integration analysis determines the true relationship between variables in the long run, unlike traditional statistical models, and the concept of simultaneous integration is based on that in the short run the two time series may be unstable, but they integrate in the long run,

that is, there is a steady connection in the long-run between them. This relationship is called the simultaneous integration relationship. To express the relationships between these various unstable variables, the problem of instability must first be removed, and that is the unit root tests and the use of error correction models. As for its stages, they are:
In the first stage, we use the Unit Roots test to find out the stability of the time series used in the research and to avoid false results due to their instability, through the use of the Augmented Dickey/Fuller (ADF) test, Phillips/Perron (PP) Test, (KPSS). Kwiatkowski, Phillips, Schmidt, Shin.

After proving that the two series are stable and of the same order, we turn to simultaneous or co-integration tests using the Engel-Granger methodology or the Johansson test (in addition to the Granger causality test that needs this test).

In the second stage, we use the Error Correction Model (ECM) to find out when the series approaches equilibrium in the long run and the chain's common dynamic changes in the short term, that is, the test has the capability to test and assess the relationship in both the short as well as long term between variables. The model also avoids the standard problems caused by spurious correlation.
1- Unit Root test: To determine the non-stationary properties of the two time series variables at both levels or in the first difference, the Dickey Fuller (DF) or the developed Dickey Fuller (ADF) test is used. (In this paper, we will suffice with the last test) where this test uses the time trend or without it. The general mathematical formula of the Dickey Fuller test (DF) is as follows:

$$\Delta Z_t = \chi + (\rho - 1)Z_{t-1} + \gamma T + e_{1t}.$$

As for the (ADF) test, it is a development of the (DF) test, and by adding the lagged values that belong to the dependent variables added in estimating the mathematical formula of the (DF) test, and the developed mathematical formula is as follows:

Despite the wide use of this test, it undergoes from the problem of not taking into consideration the absence of the problem of variance and test de normalité existing in a time series, and therefore extra test is utilized to test the unit root, which is the Phillips and Pearson test-Perron (PP), because it has a superior and more precise test ability than the ADF Test, particularly when the size of the sample is small, and in concerning inconsistency and inconsistency in the results of the DF test, and the mathematical formula for the (PP) test is as following:

$$\Delta Z_t = \phi + (\rho - 1)Z_{t-1} + \gamma(t - \frac{T}{2}) + \psi \Delta Z_{t-i} + e_{3t}$$

Δ: stands for the first difference Δ.

The critical t-values for testing the null hypothesis in all previous tests basing on MacKinnon's (1991) values. In unit root tests (generally) the two tests (ADF) and (PP) are used, along with the stability test (KPSS). The results of these tests complement each other, and therefore if they agree on one result, the result becomes more accurate, and a test starts from this basic relationship:

$$Z_t = \alpha_{t-1} + \beta + \eta_t + \zeta_t.$$

The mathematical formula of the KPSS test is:

$$KPSS = \sum_t (\sum_{r=1}^{t} \hat{u}_r)^2 / T^2 f_0.$$

The critical values of this test are based on LM statistic values compared to those of the Kwiatkowski-Phillips-Schmidt-Shin.

4.1.5. Johansen's test for simultaneous integration

This test is superior to the Engel Granger co-integration test, because it is proportional to small samples, as well as in the case of more than two variables, and most importantly, this test reveals whether there is a co-integration Unique, that is, the co-integration is achieved only in the case of the regression of the dependent variable on the independent variables, and this is important in the theory of co-integration, as it indicates that in the absence of a unique co-integration, the equilibrium relationship between the variables remains a matter of doubt and question.

The existence of a long-term symmetry between the two stable series of the same order despite the existence of a short-term imbalance is tested by testing the co-integration between variables using the (Johansen and Juselius, Johansen and Juselius) methodology used in the models that consist of more than two variables, which is better even if only two are present; Because it allows the mutual effect between the variables under study, and it is assumed that they do not exist in the (Engle - Granger, Engle - Granger) two step methodology.

The "Johansen" and Johansen/Juslus methodology is a matrix-rank II test. The existence of co-integration between the time series requires that matrix II not be of perfect order $(0 < r(\Pi) = r < \eta)$. In order to decide the number of integration vectors, two statistical tests based on the Likelihood Ratio Test (LR) are used, which are the trace test (λ_{trace}) and the maximum eigenvalues test (λ_{max}). Impact testing is known as:

$$\lambda_{trace} = -T \sum_{i=1+r}^{n} \log(\hat{\lambda}_i).$$

Where the null-hypothesis that the number of cointegration vectors $\leq r$ is tested against the alternative hypothesis that the number of concurrent integration vectors $= r$ (where $r = 0, 1, 2$). The test for the greatest characteristic values is known as:

Where the null hypothesis that the number of cointegration vectors $= r$ is tested contrary to the alternative hypothesis that the number of concurrent integration vectors $= r + 1$.

4- The Error Correction Model-ECM is distinguished from the Engel-Granger model in that it splits the relationship in the long-run from the short-run. It also has better properties in the case of small samples, and the parameter estimated in the model is more consistent than those other methods such as Engel-Granger method [2] and Johansen [7], and to test the extent of simultaneous integration between variables under ECM [1] presents a modern approach to test the extent to which the equilibrium relationship (short and long term) is attained between variables The error correction model remained as it is characterized by the possibility of application whether the explanatory variables were integrated of zero degree $I(0)$ or integrated of first degree $I(1)$, or they had joint integration of the same degree, and it can be applicable when dealing with small samples contrasting to the previous methods. This model is applied only after the success of the Johansen concurrent integration test.

5. the Standard Model for Analyzing the Relationship between Inflation and Economic Growth in Iraq for the Period (1990 – 2020)

In order to study and analyze the relation between inflation and economic growth in the long and short terms in Iraq, standard methods related to time series were used (the stationary test and co-integration), as well as the causality test in the time series models to test the relation between inflation and economic growth and knowing the direction of the causal relationship between the two variables and the error correction model to know the type of relationship between inflation and economic growth in the long and short terms using the $EVIEWS7$ program.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	- 217.6504	NA	12998.70	15.14830	15.24260	15.17784
1	- 211.0094	11.90796	10849.77	14.96617	15.24906	15.05477
2	- 198.1735	*37542.12	*082.1395	*97653.41	*72828.41	*54405.41

Table 2: Edul shows the optimal underdevelopment gap of the relationship between inflation and economic growth in Iraq

The Extended Dickey Fuller Test to measure the stability of the inflation and economic growth series in Iraq. Through the test, it was found that the inflation chain was unstable at its level, and stability occurred after taking the first difference, and thus the chain becomes integrated of degree one (1). Take the constant where the calculated t value is (-4.25), which is larger than the tabular values at the three levels, and when taking the fixed term and the general trend, it was found that the calculated value (-215), which is smaller than the tabular values at the three levels, and the researcher asserts that the series is unstable in its level $*$ due to the presence of the unit root, which requires Finding the integration rank for this series, and when taking the first difference, the series stabilized at the level (1%), where the calculated t value with a fixed term only reached (-6.70), which is greater than the tabular values at the three levels, taking the fixed term and the general trend, the calculated t value reached (-6.67), which is greater than the tabular values at the three levels, and this means that the series has stabilized after taking the first difference to it, that is, it is integrated of degree one (I) and because the inflation series and the growth series at current prices are integrated of degree So one can conduct a cointegration test between them.

5.1. The Results of the Co-integration Test for the Inflation and Economic Growth Series at Current Prices

After conducting stability tests for the two series of inflation and economic growth in Iraq at current prices and their stability when the first difference is taken and its integration is one degree $5(I)$. Therefore, a test of co-integration between the two series can be conducted based on the Johansen and Juselius test. Before conducting the test, the gaps must be determined. Time lag (for the two variables, where the akaike criterion) indicates that the optimal lag gaps for the relation between inflation and economic growing are two years, and the following table shows the test results. The table shows that the lowest value according to the AIC criterion is 14.35, which is at a two-year lag level. By moving to the co-integration test using the Johansson-Jeslius test, which is displayed in the following table. The results of this test according to the Trace ℶ effect test indicate that the calculated value of the greatest possibility equation amounted to 38.85, which is more than The Critical Value (which is 51.48) at the 1% significance level.

This means that we reject the null hypothesis that there is no co-integration $(0 = r)$ and agree on the alternative hypothesis that there are a number of co-integration vectors greater than zero $(1 = r)$. Johansen-Guyselus test schedule for co-integration of inflation and economic growth in Iraq at current prices.

Trace test specifies 2 cointegrating eqn(s) at the 0.05 level
$*$ signifies rejection of the hypothesis at the 0.05 level
$**$ Khazraji [2] p/values

Error correction vector model (VECM) for the relationship between inflation and economic growth in Iraq in both long and short terms. Determining the parameters of the relationship in the long and

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.700008	38.85197	15.49471	0.0000
At most 1 *	0.167706	5.139942	3.841466	0.0234

Table 3: Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.700008	33.71203	14.26460	0.0000
At most 1 *	0.167706	5.139942	3.841466	0.0234

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

short terms requires estimating the vector error correction model (and the following table shows the results of estimating VECM) for the variables of inflation (x) and economic growth (y) in Iraq.

Where the value of the long-run product growth elasticities parameter reached (-61.61) and this parameter is significant due to the fact that the calculated t value was (-50.41) (which is larger than the tabular t value at a significant level of (5%) and the standard deviation value confirms the result because in fact, this indicates that The economy in Iraq affects inflation in the long term, and that the relationship between them is inverse, and this is confirmed by the negative parameter indicated, and this result is agrees with the logic of economic theory.

As for the correction coefficients in the short term, the speed of error correction for inflation in Iraq amounted to (-0.05) (that is, there is (0.005%) of the imbalance in inflation in the long term is corrected in the year. With regard to economic growth in Iraq, the correction factor is in the short term Rather, (-1.15) (meaning that (5%) of the imbalance in long-term growth is corrected in the year, and by moving to the short-term elasticities, we note the significant parameters of $1 - D(Y-1)D(x)$ in the inflation and economic growth functions in Iraq, as shown in the following table:

Cointegrating Eq:	CointEq1
X(-1)	1.000000
Y(-1)	-65.65491
	(5.27026)
	[-12.4576]
C	-13.68514

Table 5: Table showing estimation results vecm (for inflation and growth in Iraq)

CointEq1	-2.217360	-0.010966
	(0.89108)	(0.01588)
	[-]14884.2	[-]76096.0
D(X(-))1	1.575061	0.010993
	(0.54520)	(0.00971)
	[2.88898]	[1.13167]
D(X(-))2	1.044209	0.006556
	(0.76459)	(0.01362)
	[1.36571]	[0.48122]
D(X(-))3	0.486782	0.005735
	(0.38980)	(0.00695)
	[1.24879]	[0.82569]
D(X(-))4	1.005184	0.011448
	(0.37457)	(0.00667)
	[2.68358]	[1.71531]
D(Y(-))1	-130.8404	-1.932622
	(34.0133)	(0.60604)
	[-]47648.3	[-]29881.3
D(Y(-))2	-60.24760	-0.833386
	(30.5009)	(0.54346)
	[-]82579.1	[-]94335.1
D(Y(-))3	24.36235	0.325898
	(26.0454)	(0.46407)
	[0.93538]	[0.70226]
D(Y(-))4	6.464441	0.069107
	(15.0123)	(0.26749)
	[0.43061]	[0.25836]
C	-18.39163	-0.256162
	(17.5839)	(0.31331)
	[-]49540.1	[-]16718.0
R-squared	*0.871073*	*0.872497*
Adj. R-squared	*0.677681*	*0.681241*
Sum sq. resids	*20911.44*	*6.638845*
S.E. equation	*59.03592*	*1.051891*
F-statistic	*4.504199*	*4.561951*

Table 6: Table of inflation and economic growth functions in Iraq Error Correction: D(X) D(Y)

6. Conclusions

Through descriptive analysis and the standard model of the connection between inflation and economic growth in Iraq, the following conclusions can be determined
1- The budget deficit and the imbalance in the production structure are the most important factors affecting inflation and growth in output.
GDP as local factors, and a large impact of supply shocks as an external factor
2- The relationship of GDP growth in Iraq with the growth of the oil field and the increase in oil prices.
Globally, the contribution of the agricultural and industrial sectors to the growth of output, and the contribution of the agricultural and industrial sector in Iraq accounted for $(17\%, 1.5\%)$ of the gross domestic product.
3- The dominance of the public sector over economic activity in Iraq, and the rise in oil revenues contributed to the public sector's removal of the private sector from controlling economic activity, in a manner that led to the occurrence of structural imbalance and the weak contribution of economic sectors to the gross domestic product.
4- The occurrence of stagflation during the nineties, which was matched by the monetary authorities' adoption of monetary policy.
The cheap one, in a way that led to high inflation rates at high levels and the deterioration of economic growth rates 5- The absence of the role of monetary policy in influencing the money supply in Iraq before 2003, and the adoption of The Central Bank on indirect monetary tools with the aim of controlling domestic liquidity in the economy and maintaining price stability after 2003. Recommendations
1- Due to the great importance of relying on statistically superior methods and using them in the forecasting process, we believe that it is necessary for economic policy makers to obtain information on the nature of the relationship between inflation and economic growth in the short and long terms, to know the economic effects and take appropriate and consistent policies to achieve the required economic goals
2- Allowing the space and giving a greater role to promote the private sector and support it to enter into the commodity production activity by providing more government contracts with small and medium industrial and agricultural projects.
3- Giving more importance and a role to monetary and financial economic policies to compensate for the structural imbalances of the economy, on the basis of the possibility of these policies contributing to achieving economic growth through their reliance on disciplined policies such as inflation targeting.
4- The necessity for the monetary authorities to manage the growth of the money supply in line with the growth of the volume of output in accordance with the policy of fixed monetary rules
5- Attention to managing expectations by the central bank, because the trends of modern monetary policy are the art of managing expectations.
6- Controlling the inflation rates and the target inflation should be the main objective for the economic policy makers to reach the goal of economic growth.

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