# ANALYZING THE INFLUENCE OF INFLATION ON ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM IRAQ

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## ABSTRACT

**The inflation as a phenomenon is a crucial economic problem in the world that has negative impact on any country economically and socially. Iraq experiences price increases as a result of the vulnerability of the productive sectors, failure to react to aggregate demand, some other elements such as shocks, conflicts and political and economic turmoil. This paper is an attempt to examine the impact of inflation on economic growth in Iraq for the period of 1990 – 2020, by employing ARDL bounds test approach to explore the long-run and short-run relationship between inflation, exchange rate, interest rate and GDP. The results show that there is a short run and significant relationship between economic growth and inflation in Iraq. The study concluded that inflation control requires achieving a proportional level of economic and price activities, where the ratio of money to income grows in a stable manner consistent with financial growth and macroeconomic stability. Accordingly, controlling inflation needs a mixture of fiscal and monetary policies. The findings shed some new insights for policymakers on dealing with inflation in Iraq.**

***Keywords*: Inflation, Exchange rate, Interest rate, GDP, ARDL approach, Iraq**

## 1. Introduction

The inflation as a phenomenon is a crucial economic problem in the world that has negative impact on any country economically and socially. Inflation also causes an imbalance in macroeconomics indicators level. It is the responsibility of government and monetary authority that protect people's capacity of purchasing via stabilizing general level of prices.

The term "inflation" refers to the phenomenon of the deficit between the circulating money and the sum of goods and services on sale to increase resulting in a rise in prices as a whole and loss of value for the money. This makes inflation an economy-wide issue where the social indicators are also influenced along with economic aspects. Like many developing countries, Iraq also has experienced severe cases of inflation in the recent past and it is currently suffering from inflation consequences. Business and thinking-money investments suffer badly from an uncertain economic environment, wealth is redistributed without balance, borrowing costs skyrocket and making investments all the more difficult. Furthermore, but long-term post-inflation economic habitat is ripe for political instabilities, asymmetrical pricing systems, lose-and-lose exchange rates and complete halting of foreign investor activities. Generally, resources are now being allocated with very low efficiency, making the Iraqi economy weak in competition and completely vulnerable to all types of external impacts. While it is too late to stop past inflations,

it is essential to stay that the current economic circumstance is vigilant and unhealthy inflation events are going to happen. This is, of course, easier said than done, considering the fluctuating trend of the Iraqi market.

The complete lack of balance in the Iraqi market can best be explained with examples. In 1994, the inflation was 448.5%, while it sharply dropped and in fact, switched to negatives with -16.4% in 1996. This fluctuating trend continued albeit with less extreme numbers until 2017, where the inflation was recorded as 0.18%. During that period, the rate of yearly increase was determined as 5.5%. In comparison, in the years between 2004 and 2009 where the sectarian wars were waged, the inflation level had an average of 10.3%. Moreover, around 2019 and 2020, the rate of inflation has fluctuated from -0.2% to 0.8% due to Covid-19 and instability of political situation in Iraq.

There are two theories to cope with inflation in the third world countries; structuralist and monetarist theories. The former claims inflation is solely a monetary event where the monetary expansion is much rapid compared to the actual growth whereas the latter claims inflation is also influenced by the increasing demand in an inflexible production structure. The monetarist idea was driven forward by Milton Friedman, while the structuralist ideas were coined by Myrdal and Straiten in 1972 but later reviewed by Kirkpatrick and Nixon in 1976.

Some outlying years notwithstanding, Iraq has been suffering from unhealthy inflation since 1980. It is therefore important to understand the economic mechanics in these years to better deduce how future inflation events can be contained. Consequently, the present study focuses on a series of data collections referring to the years between 1990 and 2020. The aim is to determine the key factors that influence the chronic inflation level in Iraq. The study uses values from the real gross domestic product, real interest rate, exchange rates, and inflation rate, and employs ARDL to survey any potential relationships between the inflation events and these factors. This study has the following objectives:

(1) To identify and explain the inflation rate channels.

(2) To determine the nature and extent of relationship between Exchange rate, interest rate, GDP of Iraq during 1990- 2020.

(3) To explain theoretically how inflation rate affects other variables in the economy.

The Iraqi economy, particularly after 2019, suffers from an economic phenomenon that has become inherent to it for many years. This phenomenon is called economic inflation resulting from the high general level of prices, which caused problems for members of society due to the high prices of goods and services in exchange for the decrease in the purchasing value of the Iraqi currency in the local market.

The significance of the study comes from estimateing the changes **(increase or decrease)** in the inflation rate which have impact on economic growth in Iraq.

The negative impact of inflation rate upon economic growth in Iraq is subjectively a core issue of this research. In order to achieve the objective of the study, ARDLapproach was adopted and the secondary data during 1990-2020 were used.

The current paper consists of five sections. Section one presents the introductory issues and Section two provides explanations for the terms and literature data related to the study. Section three includes the used data, along with this the research methodology employed. Section four conveys the empirical results and discussions regarding these findings. Conclusions and recommendations given in Section five.

## 2. **Literature Review**

Countless studies have investigated the factors that lead and contribute to inflation events. Specific cases of developed and developing countries have been dealt with and specific cases of selected countries have been studied. Similar studies that sought out empirical findings for inflations events in Iraq, however, are rare. Iraq has several unique characteristics that influence all its economic interactions, like continuous

wars, widespread corruption and severe political uncertainty, all of which have been going on for several decades. The studies that have investigated Iraqi economics mostly focus on money demand functionality, whereas the factors that influence inflation mechanics are multi-dimensional. Most importantly, the underlying configuration of the Iraqi economy had not been determined if it would have been working more closely to monetary or structural theory.

Adaramola and Dada (2020) conduced a research regarding the impact of inflation on economic growth in Nigeria, using ARDL model, indicated that the inflation and real exchange rate effects negatively on economic growth, whereas the interstate rate and money supply have a great influence positively on economic growth. The rest of the variables in the model showed no impact on Nigeria's economic growth. A single direction between interest rate, exchange rate, government consumption expenditures and GDP, illustrated causal relationship, however, the inflation and "the degree of openness" depict no causal relationship with GDP.

A relatively recent study by Chaudhary and Li (2018) focused on the macroeconomic aspects of the Nepal market and attempted to reveal factors that influenced inflation using a series of datasets belonging to 16 years (2000-2016). The researchers employed real gross domestic product, local pricing, and foreign monetary investments as data points, and employed ordinary least squares regression model for statistics. The researchers concluded that all of the investigated parameters were influential in the long term for the Nepal economy. These findings were in line with the monetary thought of school for inflation mechanics.

Ahmed et al. (2018) worked on the Pakistani economy in their research which was based on the relationship between inflation events and export and import volumes. Like the previous study, these researchers also used a dataset spanning 16 years, which corresponded to years between (2001 – 2017). The researchers employed co-integration statistics to measure the long-term effects of the investigated variables and reported

that both export and import parameters were influential over the CPI values in the long run.

Some previous works could be found about this topic in the current context. Eas (2013) looks at the inflation trends in Iraq from 2000 to 2010. The aim was to understand the relationship between inflation and the Dinar exchange rate against the US dollar through calculating the function model via a suitable method of statistical and analyzing the findings with the SPSS software. According to the research, there was a connection among the two factors, throughout the 1990s, the Dinar market value was lower than it should have been. Furthermore, the USD started to play a part in the economy of Iraq after that, with the majority of deposits and industrial transactions taking place through it. In Iraq, the peak rate of inflation was 53.1 percent in 2006, owing to great prices of derivatives of oil (it could be seen from the bulletin information of the statistics central bureau for the records of data). Moreover, thanks to a decrease in the petroleum goods and changes price in the national currency, the inflation rate in Iraq dropped to 2.5 percent in 2010. The inflation rate increased to 0.8% in 2020. Besides, the lack of customs taxes, the reduced levels of annual food rates, and the prices of rental housing all contributed to an inflation rate of lower.

Grigorian and Kock (2010) conducted a similar study. The influence of conventional and unconventional factors was evaluated over the inflation mechanics of Iraq through using a dataset of three years. Their empirical findings indicate that Iraqi inflation was influenced by shortages in a certain range of commodities, the most prominent of which was fuel. The study also remarks on the influence of ongoing violent events and states that they make containment of any influence event extremely challenging. The researchers believed that the violence was even more influential than the fuel shortage. The study also indicated the inefficiency of the government policy of gradual exchange rate control to fight inflation.

The last study related to the subject is the research of Dhakal et al. (1994), investigated the key factors influencing USA inflation rates, using a

vector autoregressive model (VAR). The researchers reported that most findings were in line with the monetarist thought of school, as wage rates, money supply, energy pricing, and budget deficits were strongly influencing USA inflation rates. The researchers also concluded that these factors also contributed to inflation forecast errors, which in turn impacted inflation over the long term.

The result of these findings varies among nations. Most of these have discovered that there is a link between GDP and inflation in short run, but some have found a negative correlation, some positive, while others suggest no causal relationship between the variables. But after some tests of my research I have found out that the relationship between GDP and inflation is statistically significance. .

## 3.   Data and Methodology

### 3.1 DATA

The study used the ARDL bounds testing approach with its assumptions in order to investigate the impact of inflation on Economic growth in Iraq for time period 1990 to 2020. The data main source is "World Development Indicators published by the World Bank and available at: databank.worldbank.org.  Also, interest rate is obtained from International Monetary Fund (IMF), moreover the inflation rate obtained from www.macrotrends.net.
ARDL bounds testing approach is a cointegration method developed by Pesaran et al. (2001) to test presence of the long run relationship between the variables. This procedure, relatively new method, has many advantages over the classical cointegration tests. Firstly, the approach is used irrespective of whether the series are I(0) or I(1). Secondly, error correction model (ECM) can be derived from the ARDL bounds testing through a simple linear transformation. This model has both short and long run dynamics. Thirdly, the empirical results show that the approach is superior and provides consistent results for small sample. (Nkoro,E.Uko.,&Aham,),
This study has one dependent variable called Growth domestic product (GDP). In contrast, three independent variables have been employed

which consist of inflation rate, interest rate, exchange rate. These variables have long time series which we can employ for our model for empirical analysis.

### 3.2 The model

According to the economic theory, GDP is the function of interest rate, exchange rate and level of inflation, so this study uses the following model:

$GDP = B0 + B1\ INF + B2\ INT + B3\ EXCH + U\ (\varepsilon)$ ...... 1

Where:

GDP = is the growth domestic product;

INR= inflation rate;

RIR= is the interest rate;

EX=exchange rate

Ut= is the error term (Or other factors that affect inflation)

In sum, in this study the following steps are performed to estimate the impact of inflation on economic growth in Iraq for time period 1990 to 2020:

First: *Unit root* tests can be used to determine if trending data should be first differenced or regressed on deterministic functions of time to render the data **stationary.**

Second: **cointegration** test is used to establish if there is a correlation between several time series .

Third: Using **Diagnostic** Checking for Accurate Estimation.

Fourth: (**CUSUM** ) tests can be used to test the constancy of the coefficients in a model.

## 4.   The Empirical Results

The empirical outcomes and explanations are reported in this section.to estimate the impact of inflation on economic growth in Iraq for time period 1990 to 2020, to find the result.( Roman,K.

2009;Wang,J.2011; Griffiths,H.2018; Startz,R. 2019) .

### 4.1 Descriptive Statistics:

Table1 illustrates that the average of GDP in this study is 70675.16 as a response variable while the highest average among explanatory variable is Exchange rate (1577.65) followed by Inflation rate (56.3) and Real interest rate (8.8) respectively.

Table (1) Descriptive Statistics for RIR, INR, EX, and GDP

|  | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|
| RIR | 4.00 | 12.80 | 8.80 | 3.21 |
| INR | -16.12 | 448.50 | 56.33 | 112.06 |
| EX | 125.50 | 3000.00 | 1577.65 | 534.29 |
| GDP | 743.78 | 234637.60 | 70675.16 | 75457.52 |

### 4.2 The Unit root test results

The table (2) represents the stationary of all variabiables. They all show the the stationarity at the first difference. The Null Hypothesis is accepted which says: the variable has a unit root, then they all unstationary at the Level. But all show stationary at first difference and at all trends.

Table (2) Unit root results using Augmented Ducky Fuler ADF table

|  |  | At Level |  |  |  | At First Difference |  |  |  |
|---|---|---|---|---|---|---|---|---|---|
|  |  | GDP | EX | INR | RIR | d(GDP) | d(EX) | d(INR) | d(RIR) |
| With Constant | t-Statistic | -2.267 | -1.251 | -2.551 | -0.556 | -5.118 | -7.370 | -5.037 | -3.894 |
|  | P-Value | 0.189 | 0.639 | 0.114 | 0.866 | 0.000 | 0.000 | 0.000 | 0.006 |
|  | Result | No | No | No | No | *** | *** | *** | *** |
| With Constant & Trend | t-Statistic | -0.570 | -3.634 | -3.031 | -3.906 | -3.750 | -7.361 | -4.955 | -3.956 |
|  | P-Value | 0.973 | 0.044 | 0.141 | 0.025 | 0.038 | 0.000 | 0.002 | 0.022 |
|  | Result | No | ** | No | ** | ** | *** | *** | ** |
| Without Constant & Trend | t-Statistic | -0.913 | -1.231 | -2.451 | -0.855 | -5.210 | -7.265 | -5.108 | -3.908 |
|  | P-Value | 0.313 | 0.195 | 0.016 | 0.337 | 0.000 | 0.000 | 0.000 | 0.000 |
|  | Result | No | No | ** | No | *** | *** | *** | *** |

Notes:
a: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant

### 4.3 Optimum lag selection

The lag selection relies on table 3 and 4, which the table 3 shows the selection criteria as a whole. When the Akaike information criteria AIC with the value of 54.44270 has been selected with comparison to Schwarz criterion SIC = 56.14004, because it is smaller. Next with using AIC the optimum lag would be selected. When the results show one lag is the optimum lage because lag length selection criterias defined at the bottom of the table 3 Settle for one lag.

Table (3) Results of lag selection criteria's of the model

| | |
|---|---|
| Determinant resid covariance (dof adj.) | 1.91E+18 |
| Determinant resid covariance | 4.33E+17 |
| Log likelihood | -753.4192 |
| Akaike information criterion | 54.4427 |
| Schwarz criterion | 56.14004 |
| Number of coefficients | 36 |

Table (4) results of the optimum lag selection criteria's for the estimated model

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -768.8821 | NA | 8.59e+19 | 57.25053 | 57.44250 | 57.30761 |
| 1 | -712.5048 | 91.87418* | 4.39e+18* | 54.25961 | 55.21949* | 54.54504* |
| 2 | -701.0177 | 15.31619 | 6.70e+18 | 54.59390 | 56.32168 | 55.10766 |
| 3 | -687.5232 | 13.99429 | 1.03e+19 | 54.77949 | 57.27518 | 55.52159 |
| 4 | -659.6273 | 20.66360 | 7.31e+18 | 53.89832* | 57.16191 | 54.86875 |

## 4.4 Estimating the short-run coeficients of the estimated model

The table (5) shows the short run coefficients for the estimated model. When some of them are significant at the probability less than (%5): GDP(-1) coefficient eqals (0.784026) with the pValue of (0.0023). GDP(-3) coefficient eqals (1.025632) wth the pValue of (0.0317). GDP(-4) coefficient eqals (-1.146920) wth the pValue of (0.0103). (RIR(-4))coefficient eqals (18040.31) wth the pValue of (0.0425). When the rest do not show any impact in the short-run.

**Table (5 ) Short run coefficients results**

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| GDP(-1) | 0.784 | 0.203 | 3.864 | 0.002 |
| GDP(-2) | -0.158 | 0.286 | -0.551 | 0.592 |
| GDP(-3) | 1.026 | 0.422 | 2.431 | 0.032 |
| GDP(-4) | -1.147 | 0.377 | -3.040 | 0.010 |
| EX | 17.765 | 31.379 | 0.566 | 0.582 |
| EX(-1) | -51.090 | 32.728 | -1.561 | 0.145 |
| EX(-2) | 4.439 | 32.050 | 0.138 | 0.892 |
| EX(-3) | -55.576 | 32.431 | -1.714 | 0.112 |
| INR | 62.704 | 75.472 | 0.831 | 0.422 |
| RIR | 6702.548 | 7122.073 | 0.941 | 0.365 |
| RIR(-1) | -18099.210 | 13366.800 | -1.354 | 0.201 |
| RIR(-2) | 17204.580 | 14319.650 | 1.201 | 0.253 |
| RIR(-3) | -17741.310 | 13102.710 | -1.354 | 0.201 |
| RIR(-4) | 18040.310 | 7949.319 | 2.269 | 0.043 |

| C | 108554.100 | 87484.510 | 1.241 | 0.238 |
|---|---|---|---|---|
|  | 0.220 | 0.086 | 2.546 | 0.015 |
| R-squared | 0.915 | Mean dependent var | | 79983.380 |
| Adjusted R-squared | 0.816 | S.D. dependent var | | 76598.310 |
| S.E. of regression | 32828.310 | Akaike info criterion | | 23.936 |
| Sum squared resid | 12900000000 | Schwarz criterion | | 24.656 |
| Log likelihood | -308.138 | Hannan-Quinn criter. | | 24.150 |
| F-statistic | 9.254 | Durbin-Watson stat | | 2.389 |
| Prob(F-statistic) | 0.000 | | | |

### 4.5 Bounds test for cointegration

The table 6 results are used to interpretate of existence of cointegration between dependent variable (GDP) and the independent variables (EX, INR and RIR). Because the number of F-Statistic with (2.191161) is less than all the highest bounds under the column I(1) of the table (6) then the null hypothesis cannot be rejected which says: There is no long run relation between the dependent variable and explanatory variables for the estimated model. Then we conclude that we just estimate short run model. We also conclude that we have ARDL but not ECM. That is why the results of ECM not shown later.

**Table (6) Results related to the Bounds Test for the long run estimated model**

| Null Hypothesis: No levels relationship | | | F-Bound Test | |
|---|---|---|---|---|
| I(1) | I(0) | Signif | Value | Test Statistic |
| Asymptotic: n=1000 | | | 2.191161 | F-Statistic |
| 3.2 | 2.37 | 10% | 3 | K |
| 3.67 | 2.79 | 5% | | |
| 4.08 | 3.15 | 2.5% | | |
| 4.66 | 3.65 | 1% | | |

### 4.6 Statistical assessment of the estimated model

**A- Histogram Normality Test for the estimated model**

In table below the Jarque-Bera statistic is used to check if the residuals are normally distributed or not. The value should be non-significant. The results show the residuals normally distributed. Because the value of (Jarque-Bera=1.79) with the probability (0.40) bigger than (%5), Then the null hypothesis is accepted.
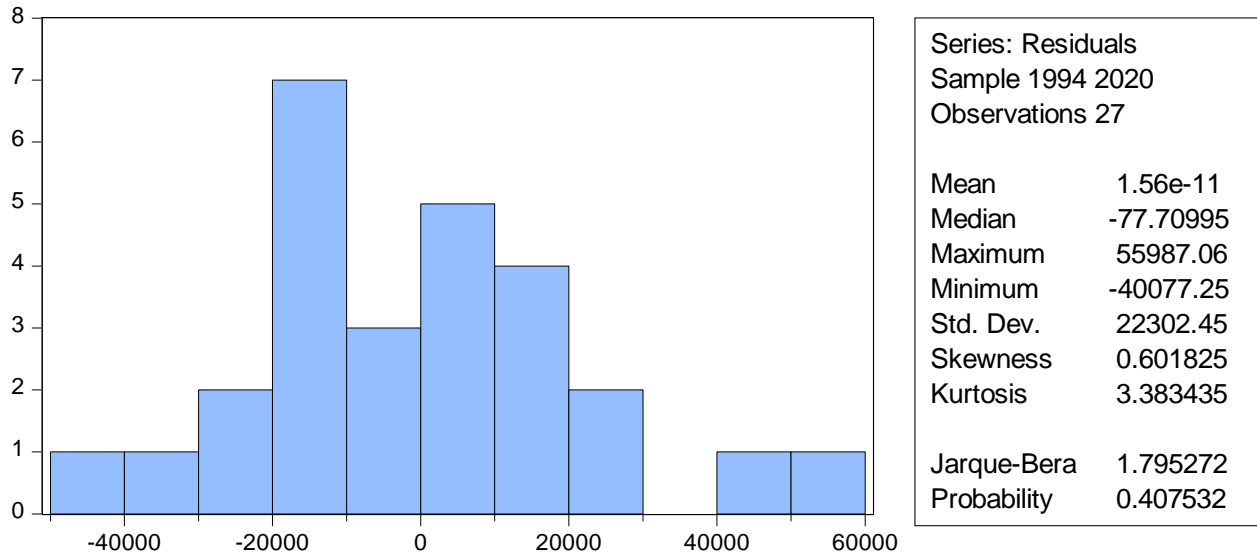
| | |
|---|---|
| Series: Residuals | |
| Sample 1994 2020 | |
| Observations 27 | |
| Mean | 1.56e-11 |
| Median | -77.70995 |
| Maximum | 55987.06 |
| Minimum | -40077.25 |
| Std. Dev. | 22302.45 |
| Skewness | 0.601825 |
| Kurtosis | 3.383435 |
| Jarque-Bera | 1.795272 |
| Probability | 0.407532 |

**Figure (1) shows normal distribution of the residuals**.

**B- The serial correlation LM test for residuals**

Table 7 is allocated for the results regarding serial correlation LM test The value of Prob. Chi-Square(1) equals 0.0954 which it is greater than the significant value of (%5) then the null hypothesis cannot be rejected. This test is considered as a substitution of Correlogram Q-Statistics) and proofs the same result of it.

**Table (7) Breusch-Godfrey Serial Correlation LM test**

| Breusch-Godfrey Serial Correlation LM Test: | | | |
|---|---|---|---|
| F-statistic | 1.262901 | Prob. F(1,11) | 0.2850 |
| Obs*R-squared | 2.780609 | Prob. Chi-Square(1) | 0.0954 |

**D- Heteroscedasticity Test for residuals**

Regarding the results from table 8, the research checks for normal distribution of residuals, through testing two hypothesis: Null hypothesis:- the residuals is normally distributes and the substitude hypothesis:- the residuals are nor normally distributed. Using Heteroskedasticity Test: ARCH the research the Obs*R-squared is equal (1.809345) and the value of Prob. Chi-Square(1) equals (0.1786) which it is greater than (%5) then the null hypothesis cannot be rejected. Then the residuals are normally distributed.

**Table(8) Heteroskedasticity Test: ARCH**

| F-statistic | 1.795085 | Prob. F(1,24) | 0.1929 |
|---|---|---|---|
| Obs*R-squared | 1.809345 | Prob. Chi-Square(1) | 0.1786 |

### 4.7 Stability Diagnostics

**A- Ramsey RESE) Test**

Table 9 shows that the equation shape of the estimated model is correct, because the P Value of (F-statistic =0.438757) is equal to (0.85) which is greater than the significant level (%5)

**Table (9) Ramsey RESET Test**

|  | Value | Df | Probability |
|---|---|---|---|
| t-statistic | 0.662388 | 11 | 0.5214 |
| F-statistic | 0.438757 | (1, 11) | 0.5214 |

**B- Stability of the model: Recursive Estimates, Cusum Test**

This test helps to detect the structural changes; it is used to confirm of the stationary of the estimated coefitients via Cusum Test. Wich the line of the model should lay between the two boundary lines. The figure (2) proves that the estimated coefietents.
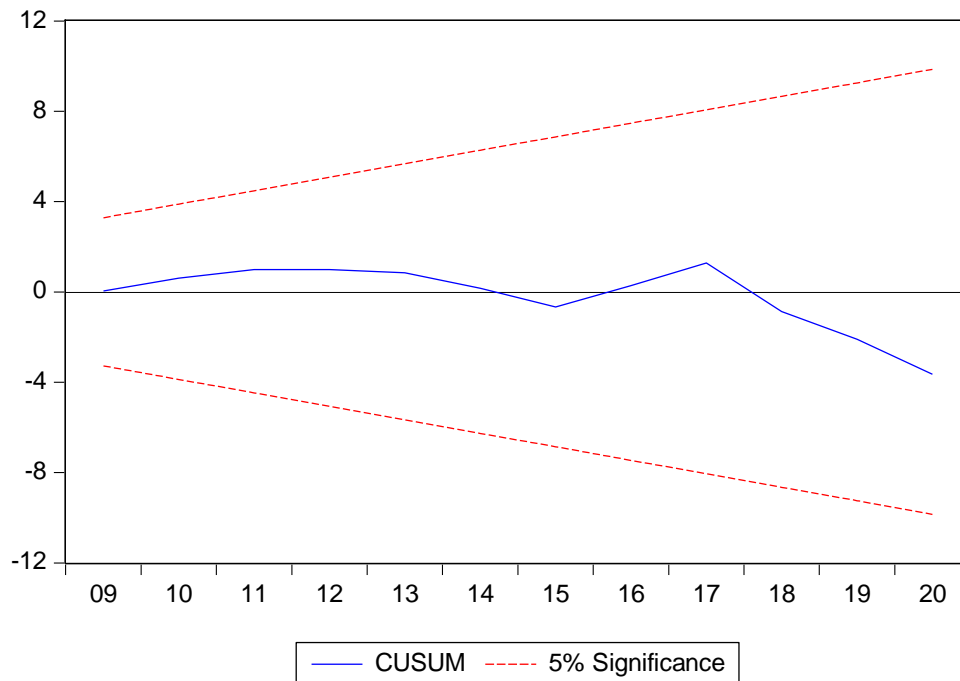


**Figure 2 Recursive Estimates (CUSUM Test)**

### 5.

### 6. Conclusion

This research aimed to affirm the economic hypothesis that inflation and GDP are negatively related .The dependent variable in this study was GDP and also the independent variables were inflation, exchange rate and interest rate for Iraq from 1990 to 2020. According to economic theory and several other researches, the findings of this analysis were investigated that there was

statistically significance and short run relationship between inflation rates and GDP.

The results indicated that inflation in Iraq was triggered by a combination of factors including a rise in the money supply and a lack of aggregate supply as measured by GDP development. Imported inflation could be another source of inflation. Nevertheless, sanctions imposed on Iraq in the aftermath of the invasion of Iraq on Kuwait resulted in the amputation, primarily derived from oil exports, of the country's finances. This had a detrimental impact on the country's capacity to fund its purchases of products from other countries.

Therefore, controlling inflation necessitates obtaining an approximate degree of activities of price and economic. The money-to-income proportion raises steadily in line with financial development and macroeconomic stabilization policies. This cannot, though, be done at the risk of high unemployment rates. An exchange rate of flexible must be used for the Iraqi dinar to prevent large swings. Given the long-term importance of the Iraqi dinar exchange rate, it is critical to achieve a flexible exchange rate for the Iraqi dinar that raises its attraction in comparison to the US dollar, lowering the amount of foreign currency hedging. Major adjustments in the composition of economy are expected and the activation of profitable industries is at the forefront. Finally, government expenditure should be limited to a degree that is proportional to actual GDP growth rates. Fiscal and monetary policy tools can be used in such a manner that they add to the growth phase.

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