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Examining the effect of Inflation on Economic Growth in Iraq: Evidence from ARDL Bound test approach

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Abstract

Inflation is a macroeconomic issue that has drawn the attention of financial analysts, policymakers, and monetary officials in both developed and developing countries. Iraq has had high inflation rates since the fall of the former regime in 2003, due to an overdependence on oil revenues and the importation of enormous goods and services, particularly from neighboring countries that are also experiencing inflation. Furthermore, due to Covid-19 and the political uncertainty in Iraq, the rate of inflation changed between 2019 and 2020. This study examine the short- and long-term effects of inflation on Iraq's economic growth. The Autoregressive Distributed Lag (ARDL) bound test approach was employed, with data ranging from 1990 to 2020. In Iraq, the study found that inflation has statistically significant effect on GDP in the short term. The result also revealed that the estimated model's dependent variable and explanatory variables have no long-term relationship. To summarize, inflation control necessitates achieving a proportional level of economic and pricing activities, in which the money-to-income ratio grows steadily in line with financial expansion and macroeconomic stability.

1. Introduction

Inflation as a phenomena is a critical economic concern around the world that has a negative economic and social impact on any country. Inflation also leads to a misalignment of macroeconomic indices. It is the obligation of the government and the monetary authority to protect people's purchasing power by maintaining a stable price level.

The term "inflation" refers to the phenomena of a growing gap between circulating money and the total amount of goods and services for sale, resulting in a rise in overall prices and a loss of money's value. As a result, inflation has become an economy-wide concern, affecting social as well as economic indices. Iraq, like many developing countries, has recently experienced tremendous inflation and is currently suffering from inflationary implications. An unstable economic environment is detrimental for business and thinking-money investments; wealth is redistributed unevenly, borrowing costs soar, and investments become even more difficult. Furthermore, the long-term post-inflationary economic environment is ideal for political instabilities, asymmetrical pricing systems, lose-and-lose exchange rates, and the ultimate cessation of foreign investor activity. In general, resources are currently distributed inefficiently, leaving the Iraqi economy weak in competition and entirely subject to all forms of external influences. While it is too late to prevent past inflations, it is critical to remember that the current economic situation is volatile and that unfavorable inflation events will occur.

Examples are the greatest way to explain the Iraqi market's complete lack of balance. In 1994, inflation reached 448.5 percent, but it declined significantly and even turned negative in 1996, at -16.4 percent. Until 2017, when inflation was 0.18 percent, this fluctuating trend remained, albeit with fewer dramatic numbers. During that time, the annual rise rate was estimated to be 5.5 percent. In instance, between 2004 and 2009, while sectarian hostilities were raging, inflation averaged 10.3 percent.

There are two approaches for dealing with inflation: structuralism and monetarism. Inflation, according to the former, is simply a monetary event in which monetary expansion is significantly faster than actual growth, but inflation, according to the latter, is partly influenced by rising demand in an inflexible production system. Milton Friedman popularized the monetarist concept, whereas Myrdal and Straiten

established the structuralism concept in 1972, which was later examined by Kirkpatrick and Nixon in 1976.

According to new classical economic theory (Mundell and Tobin) they assume that the relationship between inflation and economic growth has positive, moreover, they believe that inflation has positively affected on economic growth.

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.

The research problem can be formulated in the following question: How can inflation contribute to supporting economic growth? The 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, ARDL approach was adopted and the secondary data during 1990-2020 were used.

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.

This study has the following objectives:

- (1) To examine 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 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.

1. Literature Review

Numerous researches have examined the elements that cause and contribute to inflation. Specific cases of developed and developing countries have been discussed, as well as specific cases of a few countries. Similar studies looking for empirical evidence for inflation occurrences in Iraq, However, are few. Iraq has various distinct traits that have an impact on all of its economic interactions, such as ongoing wars, pervasive corruption, and significant political uncertainty. All of these things have been going on for decades. The majority of studies on Iraqi economics have focused on the functioning of money demand, but the factors that drive inflation mechanics are multi-faceted. 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.

In regards of developing countries, Adaramola and Dada (2020) done a research to determine the impact of inflation on economic growth in Nigeria, using ARDL model, they concluded that inflation and real exchange rate effects economic growth negatively. Additionally, Chaudhary and Li (2018) performed a study on the macroeconomic aspects of the Nepal market. They found that all of the investigated parameters were influential in the long term for the Nepal economy. Likewise another study done by Ahmed et al. (2018) on the Pakistani economy 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. However, in regards of developed country, a study conducted by Dhakal et al. (1994), investigated the key factors influencing USA inflation rates, using a vector autoregressive model (VAR). They found 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.

Some previous research that studied the current context such as Eas (2013) aims to understand the relationship between inflation and the Dinar exchange rate against the US dollar by examining the inflation trends in Iraq from 2000 to 2010. He found that 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, due to great prices of derivatives of oil. 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. Furthermore, Grigorian and Kock (2010) conducted a similar study to determine the influence of conventional and unconventional factors over the inflation mechanics of Iraq. 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.

Summing up these findings differs by country. The majority of them have detected a short-run link between GDP and inflation, while some have found a negative correlation, others have found a positive association, and others have found no causal relationship between the variables. However, after putting my findings to the test, I discovered that the relationship between GDP and inflation is statistically significant.

3. Data and Methodology

3.1 DATA

The study used the ARDL bounds testing approach with its assumptions in order to examine the effect 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 co-integration 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 co-integration 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:

$$GDP = B_0 + B_1 INF + B_2 INT + B_3 EXCH + U(\epsilon) \dots\dots 1$$

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: **co-integration** 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:

Table 1 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 variables. They all show the stationary at the first difference. The Null Hypothesis is accepted which says: the variable has a unit root, then they all non-stationary at the Level. But all show stationary at first difference and at all trends.

Table (2) Unit root results using Augmented Ducky Fuller 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	***	***	***	***
	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

With Constant & Trend	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 shown in table (3 and 4). able 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 coefficients of the estimated model

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 equals (0.784026) with the p-Value of (0.0023). GDP(-3) coefficient equals (1.025632) with the p-Value of (0.0317). GDP(-4) coefficient equals (-1.146920) with the p-Value of (0.0103). (RIR(-4))coefficient equals (18040.31) with the p-Value 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-	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 co-integration

The table (6) results are used to show the existence of co-integration 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)	Sig.	Value	Test
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

(7): Diagnostic tests for Economic growth model

Tests	LM test F- statistic	(ARCH) test	Ramsey RESET test	Jarque-Bera	Stability
-	F- statistic	F-statistic	F-statistic	F-statistic	CUSUM
-	1.262 [0.285]	1.795 [0.192]	0.438 [0.521]	Not applicable [0.407]	Stable

Table (7): shows for all the tests that used (LM, ARCH, Ramsey RESET , and Jarque-Bera the F-statistic is more than the critical value. The model passed these tests. The null hypothesis (H_0 : the econometrics problem does not exist) is accepted for external debt model. Therefore, the ARDL models are correctly specified for Iraq. This finding shows that the model fit the data and has a correct specification.

Figure (1): Relationship between Inflation and Economic growth

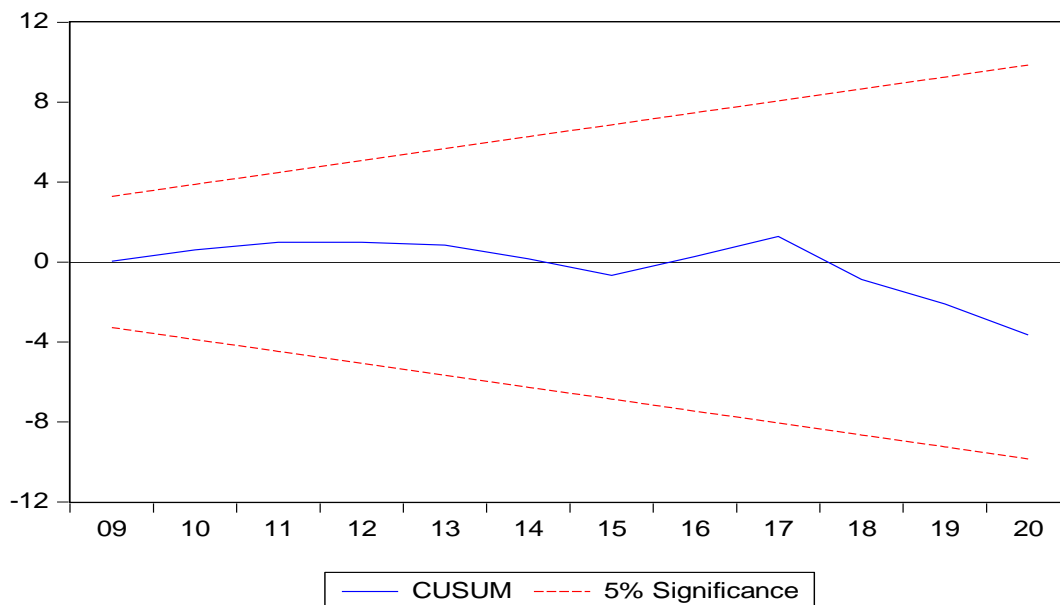


Figure (1): represents the stability test of the model CUSUM and shows that the regression line passes the mean of the critical region boundary lines. Thus, the model is stable at significant limit

5. Conclusion

This study examines the short- and long-term effects of inflation on Iraq's economic growth. The Autoregressive Distributed Lag (ARDL) bound test approach was employed, with data ranging from 1990 to 2020. In Iraq, the study found that inflation has a statistically significant effect on GDP in the short term. The result also revealed that the estimated model's dependent variable and explanatory variables have no long-term relationship.

GDP was the dependent variable in this study, whereas inflation, exchange rate, and interest rate were the independent factors for Iraq from 1990 to 2020.

Inflation in Iraq was generated by a combination of variables, including an increase in the money supply and a lack of aggregate supply as measured by GDP growth, according to the findings. Another source of inflation could be imported inflation. Nonetheless, sanctions imposed on Iraq in the aftermath of its invasion of Kuwait resulted in the amputation of the country's finances, which were mostly generated from oil exports. This has a negative influence on the country's ability to support imports of goods from other nations.

Therefore, controlling inflation demands achieving a reasonable degree of pricing and economic activity. With financial development and macroeconomic stability policies, the money-to-income ratio rises continuously. However, this cannot be done at the expense of high unemployment rates. To avoid excessive swings in the Iraqi dinar, a flexible exchange rate must be employed. Given the long-term importance of the Iraqi dinar exchange rate, achieving a flexible exchange rate for the Iraqi dinar that increases its attractiveness in comparison to the US dollar and reduces foreign currency hedging is crucial. Major changes in the economy's composition are envisaged, with the activation of profitable industries taking precedence. Finally, government spending should be constrained to a proportional level to real GDP growth rates. Fiscal and monetary policy instruments can be employed to contribute to the growth phase.

Reference

Abdullah, Ali, J., & Matahir, H. (2010). ReExamining the Demand for Money in Asean-5 Countries.

Asian Social Science, 6(7): 146.

Ahmed, R. R. et al. (2018), An empirical analysis of export, import, and inflation: a case of Pakistan,

Romanian Journal of Economic Forecasting – XXI (3), 117-130.

- Anthony,O.A.& Oluwabunmi,D.(2020). Impact of inflation on economic growth: evidence from Nigeria. *Investment Management and Financial Innovations*, 17(2), 1-13.
- Burke, O., (2010). *More notes for Least Squares*.Department of Statistics, 1 South Parks Road, Oxford University.
- Chaudhary, S & Li X. (2018).Analysis of the determinants of inflation in Nepal.*American Journal of Economics*, 8(5), 209-212.
- Dhakal, D., et al. (1994). Determinants of the inflation rate in the United States: A VAR investigation. *The Quarterly Review of Economics and Finance*, 34(1), 95-112.
- Eas, A. K. (2013). Analysis of Inflation Rate in Iraq for Period 2000 - 2010. *Journal of Baghdad College of Economic Sciences*, 46
- Grigorian, D. A. &Kock, U. (2010). Inflation and Conflict in Iraq: The Economics of Shortages Revisited. *IMF Working Papers No. 10/159*, 1-24.
- Griffiths,H. &Lim(2018) *EViews for Principles of Econometrics,Principles of Econometrics*, 5th edition, 4-36.
- Hutcheson, G. D., (2011). Ordinary Least-Squares Regression. In L. Moutinho and G. D. Hutcheson, *The SAGE Dictionary of Quantitative Management Research*: 224-228
- Ishikawa, N., & Fukushige, M., (2007). "Impacts of tourism and fiscal expenditure to remote islands: the case of the Amami islands in Japan", *Applied Economics Letters*, 14(9): 661-666.
- Jeffrey M. Wooldridge.(2013) *Introductory Econometrics: A Modern Approach*, , South-Western, Cengage Learning, Fifth Edition ,168-186.
- KUNGL, 2003, *Time-series Econometrics: Cointegration and Autoregressive Conditional Heteroskedasticity*, KUNGL. VETENSKAPSAKADEMIEN, THE ROYAL SWEDISH ACADEMY OF SCIENCE, Sweden.
- Lim, C., (1997). Review of international tourism demand models. *Annals of Tourism Research*, 24(4): 835-849.
- Nkoro,E.Uko.,&Aham, K.(2016). Autoregressive Distributed Lag (ARDL) cointegration technique: application an interpretation, *Journal of Statistical and Econometric Methods*, Vol. 5, no. 4, 2016, ISSN: 1792-6602 (print), 1792-6939 (Online) Scienpress Ltd, London, United Kingdom.
- Phillips, P.C.B., &Perron, P. (1988).Testing for a Unit Root in Time Series Regression. *Biometrika*, 75(2), 335-346.
- Roman,K.(2009).*Financial econometric with EViews*,Ventus publishing APS,ISBN 978-87-7681-427-4:69-75.
- Startz,R.(2019) *EViews Illustrated*. University of California,Santa Barbara. 3-60

Shittu , Olanrewaju I., Yemitan, Raphael A. and Yaya, OlaOluwa S., 2012, On AUTOREGRESSIVE DISTRIBUTED LAG, COINTEGRATION AND ERROR CORRECTION MODEL, [An Application to Some Nigeria Macroeconomic Variables], Australian Journal of Bussiness and Management Research, vol.2 No.08, November, Australia.

Virkun, N. S. & Sedliacik, T., 2007, Forecasting the Austrian Inflation Rate. Case Study for the Course of Econometric Forecasting, Winter Semester 2007. <https://www.youtube.com/watch?v=xpBmXkz1jAg>

Witt, S. F., & Witt, C. A., (1995). Forecasting tourism demand: A review of empirical research. International Journal of Forecasting, 11(3): 447-475.

Wang,J.(2011). Introduction to EViews, Center for Social Science Computation and Research 110 Savery Hall University of Washington Seattle, WA 98195 USA (206) 543-8110.