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The impact of inflation on economic growth in Algeria - a record study during the period (2000 - 2020) –

أثر التضخم على النمو الاقتصادي في الجزائر – دراسة قياسية خلال الفترة (2000 – 2020) –

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Abstract

This study aims to analyze the impact of inflation on economic growth in Algeria during the period (2000-2020), by reviewing the theoretical framework of the relationship between inflation and economic growth, while addressing the development of inflation and economic growth.

In order to do this, modern econometric methods were used through cointegration and the autoregressive model of decelerated distributed time gaps. ARDL that allows realistic and effective estimations.

The study concluded that there is a long-term equilibrium relationship between inflation and economic growth in Algeria during the study period 2000-2020

Keywords: inflation, economic growth, joint integration test, Algeria.

Keywords: Inflation, economic growth, cointegration test, causation, time series

JEL Classification Codes: C22, G22, C32, E31,O1 .

ملخص:

تهدف هذه الدراسة إلى تحليل اثر التضخم على النمو الاقتصادي في الجزائر خلال الفترة (2000-2020)، وذلك من خلال استعراض الإطار النظري للعلاقة بين التضخم والنمو الاقتصادي مع التطرق لتطور التضخم والنمو الاقتصادي.

ومن اجل القيام بذلك تم استخدام أساليب الاقتصاد القياسي الحديثة من خلال التكامل المشترك و نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة $ARDL$.التي تسمح بتقديرات واقعية وفعالة.

وتوصلت الدراسة الى وجود علاقة توازنيه طويلة الأجل بين التضخم والنمو الاقتصادي في الجزائر خلال فترة الدراسة2000-2020.

كلمات مفتاحية: تضخم، نمو اقتصادي، اختبار التكامل المشترك، علاقة سببية، سلسلة زمنية .

تصنيفات JEL : C22, G22, C32, E31,O1 .

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INTRODUCTION:

All countries aim at economic growth, and achieving the goal of all economic policies, and for that all research and studies have sought to find out how to achieve it, whether by following systematic methods, or through the impact of various macroeconomic variables on it. Reducing and eliminating its risks. Among the most prominent of these variables and the most common in recent times is what is known as inflation, and since Algeria is classified among the countries that suffer from this phenomenon since the beginning of the eighties until now, this study came to know the various theoretical aspects of each of the phenomenon of inflation and economic growth, and the relationship that links them in the standard aspect .

The main problem: In light of the above, we can formulate the research problem as follows:

Is there an effect of inflation rates on economic growth in Algeria during the period 2000-2020?

Through this problem, a number of questions can be raised

• Do inflation rates affect economic growth in Algeria?

• What is the nature of the relationship between inflation and economic growth in Algeria?

Study Hypotheses: To answer the main problem, the following two main hypotheses can be formulated:

• The rate of inflation affects the economic growth rates in Algeria;

• There is a causal relationship in both directions between inflation rates and economic growth in Algeria.

The limits of the study: The limits of the study were as follows:

• Objective limits: where the research focuses on studying the relationship between inflation and economic growth in Algeria during the time period (2000-2020);

• Spatial limits: where the study is limited to the case study in Algeria only;

• Temporal limits: the study covers the time period from 2000 to 2020. The study extended the period to make the largest amount of data available. It allows the application of the standard model to obtain peaceful and accurate results.

Study Methodology: In order to understand the various aspects of the study and try to answer the problem, the inductive method was relied on in order to review the theoretical framework by addressing the most important concepts of inflation and economic growth in Algeria, as well as their development during the study period by analyzing and interpreting the data related to them. The inductive approach was also relied upon, in designing an appropriate standard model to test the validity of hypotheses using standard analysis methods in testing and estimation with the help of the statistical program Eviews v10 and using the methodology of modern econometric methods through co-integration and autoregressive model for slow distributed time gaps. ARDL

Objective of the study: The study attempts to reach a number of objectives, which we summarize as follows:

• Attempting to track the development of inflation rates in Algeria and the reasons for their rise during the study period;

• Knowing the relationship between inflation and economic growth in Algeria;

• Learn about the reality of inflation and economic growth in Algeria during the study period

• Shedding light on two very important variables in assessing the Algerian economy: inflation and economic growth.

Study divisions: In order to answer the problem of the study and test hypotheses, the study was divided into the following axes:

First: The theoretical framework for inflation and economic growth;

Second: The evolution of inflation and economic growth rates in Algeria during the period (2000-2020);

Third: The standard study of the relationship of the impact of inflation on economic growth in Algeria.

First: The theoretical framework for inflation and economic growth

The theoretical framework of the study includes the definition of both inflation and economic growth, with reference to the study of the relationship between them, as well as their development in Algeria.

1- inflation

The phenomenon of inflation is one of the most economic problems that both developing and developed countries suffer from, despite the different causes and effects between countries, but it has a significant negative impact on economic policies.

1-1. definition of inflation

It is agreed that there are several definitions of inflation, according to the treatment of this phenomenon by a large number of financial and economic scientists. money supply, or manifested by the demand for money (monetary spending)

As for economists, they defined inflation as: "a rise in the general level of prices (the prices of goods that constitute a basket affecting the purchasing power of the citizen), and the price is determined in the free market as the forces of supply and demand, and if demand rises more than supply, this leads to a rise in price." (عزري و خوني، 2020، صفحة 216) Hence, not every rise in prices is inflation. In order for us to use this term for any rise in prices, the following conditions must be met: **(Samuelson & Nordhams , p. 16)**

• Continuity, i.e. a rise that is not for one specific period and then stabilizes, but the movement must be continuous and at rates set by the economic dealers;

• The adjective of diffusion, which means rise does not affect only a group of goods and services, but affects all goods and services in an economy without exception.

Inflation can also be measured "by the market prices paid for a basket of goods and services in a particular year that represents the consumption of a typical family during a particular year (the comparison year) and by comparing it with the same basket of goods and services during the base year, which is called the CPI consumer price index, which is based on Discounted gross domestic product (GDP) measures the cost of goods purchased whether they are produced within or outside the domestic country.

1-2. Types of inflation

Inflation is characterized by many types, but the common characteristic in all these types is the inability of the monetary unit to perform its functions for which it was created to the fullest. The following are the most important types of inflation: (ادبوب و لسبع ، 2021، صفحة 40)

• **Moderate or creeping inflation:** It is characterized by a simple and continuous increase in price increases, and it often occurs in periods of lack of demand.

• **Accelerated inflation:** It is characterized by the continuous and exponential increase in the price level.

- **Suppressed inflation**: in which prices cannot rise due to the existence of qualitative or quantitative policies and restrictions that prevent this, and once these restrictions disappear, prices will rise very quickly.

• **Hyperinflation:** prices rise dramatically, often in cases of wars and political and social crises.

• **Cyclical inflation:** It occurs as a result of changes in aggregate supply and aggregate demand associated with economic cycles.

2- Economic growth

Economic growth is of great importance in analyzing the economy of any country, as it is considered one of the main objectives that monetary policies seek to achieve and is keen to use its tools to achieve price stability and increase economic growth.

2-1. Definition of Economic Growth:

It is an increase in gross domestic product (GDP) or total national income (GNI) to achieve an increase in the average per capita real income. Economic growth is a quantitative phenomenon represented by an increase in real GDP from one period to another, usually a year and an increase in the share of individual from him. **(Redouane & Nadjat, , (2020), p. 175)**

Economic growth is defined as: "the increase in the quantity of goods and services produced by a particular economy. These goods are produced using the main production factors, which are land, labour, capital and organization. It was also defined as a positive change in the level of production of goods and services in a country over a period of time." (بن عزة و بلدغم، 2018، صفحة 211) a certain state, i.e., an increase in the income of a particular country. It is an economic indicator measured by the level of gross domestic product. (علي، 2012، صفحة 68)

2-2. characteristics of economic growth

Economic growth has a number of characteristics, which we mention as follows:

• Economic growth is not concerned with distributing the proceeds of economic growth, that is, it does not care about who benefits from the fruits of economic growth; **(Khalifa & nadji , 2001, p. 10)**

• Economic growth occurs automatically and therefore does not require state intervention;

• Economic development is broader and more inclusive than economic growth;

• Economic growth is cumulative in nature. If a country grows at a faster rate than others, the gap between the levels in each of them is steadily widening;

• Economic growth raises living standards in the long run, and also addresses policies;

• Redistributing income among members of society in a more accessible and easy manner;

• Economic growth leads to the creation of many investment opportunities, especially in national security.

2-3. indicators of economic growth

Economists relied on the use of a number of economic indicators to express economic growth, the most important of which are: **(Ouel, 2014, p. 10)**

• **Real Gross Domestic Product:** It expresses the value of final goods and services produced within the geographical area of the country during a certain period of time (usually one year), after excluding the added value of all units operating in the various branches of production in an economy.

• **Average real per capita income of GDP:** Although the development of the average per capita GDP may not reflect the real goal of development, which is to raise the standard of living of the individual, yet the development literature has meant this indicator as a development indicator, economic growth means A continuous increase in the average per capita GDP over time.

• **Indicators of foreign trade:** Foreign trade is usually referred to as an engine of growth, and is a source for obtaining the necessary financing for the growth process, as well as being a major source for obtaining intermediate and productive commodities necessary for this process. It also affects and is affected by the structure of economic activity, as it depends on The nature of foreign trade relations and the resulting changes in exchange rates, as exports and imports play an important role in determining the exchange rate of the local currency, and thus affecting the balance of payments situation. Therefore, foreign trade indicators are among the important and expressive indicators of economic growth.

2-4. Theoretical relationship between inflation and economic growth

Over the past few decades, the study of the relationship between inflation and economic growth has received wide attention from experts, economists, policy makers and central bank governors, and in all countries, whether developed or developing, specifically the question of whether inflation is beneficial to economic growth and affects it or is harmful to it. Whoever believes that inflation has a negative impact on economic growth, as a situation arises in society characterized by uncertainty about the economic conditions in the future, **(Hafid, 2012, p. 13)** and this affects investment decisions and the size of the investment decreases, and the decisions of savers are also affected, especially when they expect the continued increase in prices due to the low The true value of savings, and those who hold this view believe that those who are paid for their work are less motivated to work because their real wage decreases with the increase in prices. The other group believes that historical evidence does not indicate a decrease in the volume of their savings or a decrease in the tendency to work. On the contrary, they believe that inflation may be a trigger for the process of economic growth, especially when the economy is at a level below the level of full employment of the factors of production. **(Samuelson & Nordhams , 2000, p. 08)**

Second: The evolution of inflation rates and economic growth in Algeria during the period (2000-2020)

This part of the study dealt with the development of both the rate of inflation and economic growth (represented in the rate of growth of GDP) at constant prices in Algeria over the time period (2000-2021). (**World Bank, 2022)**The stage of the planned economy that immediately followed the colonial period witnessed pent-up inflation rates, Because of the restrictions imposed on the prices of goods and services by the authority, as they were determined in an administrative manner in order to preserve the purchasing power of the Algerian citizen, and with the end of this decade and the beginning of the nineties, internal inflationary pressures appeared that affected one way or another on the internal financial balances of the national economy, which was caused by the lack of efficiency Operational activity in most activities and the failure of the aggregate supply to keep pace with the successive increases in aggregate demand. Looking at the table below, we see the path of development of both inflation and economic growth over twenty-two years:

Table No. 01: Evolution of inflation and economic growth rates in Algeria during the period (2000-2021)

(Unit: % per year)

the year	2000	2001	2002	2003	2004	2005	2006	2007
Inflation rate	0.3	4.2	1.4	4.3	4	1.4	2.3	3.7
GDP growth	3.8	3	5.6	7.2	4.3	5.9	1.7	3.4

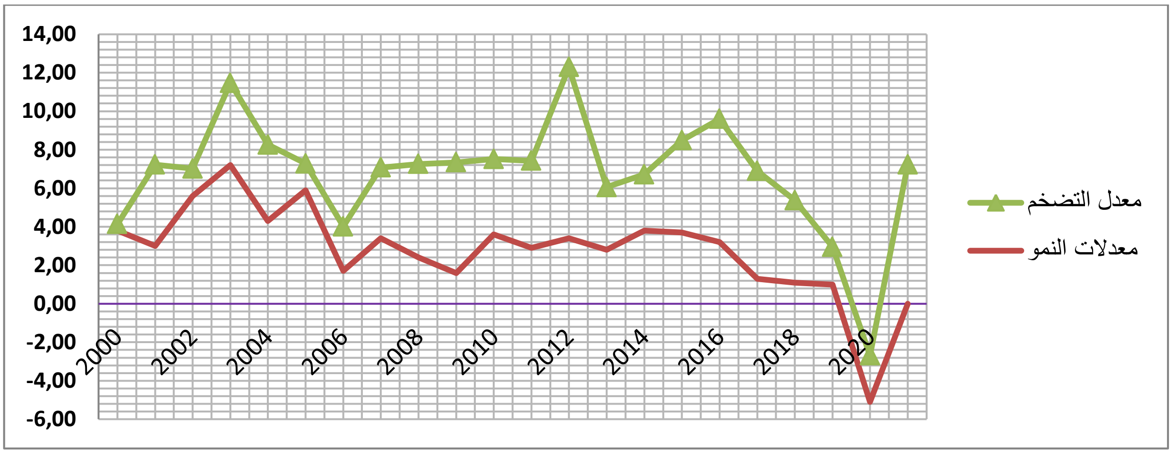
2008	2009	2010	2011	2012	2013	2014	2015	2016
4.9	5.7	3.9	4.5	8.9	3.3	2.9	4.8	6.4
2.4	1.6	3.6	2.9	3.4	2.8	3.8	3.7	3.2

2017	2018	2019	2020	2021	2017
5.6	4.3	2	2.4	7.2	5.6
1.3	1.1	1	5.10-		1.3

Source: World Bank, on the site www.banquemondiale.org. consulted on 05/26/2022

The development of inflation rates and economic growth in Algeria can also be illustrated through the following figure:

Figure No. 01: Evolution of inflation rates and economic growth in Algeria during the period (2000-2021)



Source: Prepared by the two researchers based on Table No. 01.

We note from the previous table and figure that the rates of inflation and economic growth in Algeria witnessed a kind of fluctuation during the study period (2000-2021). The increase in the money supply without being matched by an increase in production, and other structural imbalances that the Algerian economy suffers from. All this was accompanied by fluctuations in economic growth rates, which is still fragile as a result of its dependence primarily on the hydrocarbon sector, and its lack of a diverse base from other sources of growth, and thus the Algerian economic growth is unstable and depends on the hydrocarbon sector, which is affected by global demand, which makes the Algerian economy vulnerable to global fluctuations. And the best evidence of the crisis of the decline in global demand for oil that the Algerian economy suffered in the years 2014, 2015, 2016 led to a decline in oil prices, which led to a decline in economic growth rates.

Third: The standard study of the relationship of the impact of inflation on economic growth in Algeria

After shedding light on the various theoretical aspects of both the phenomenon of inflation and the phenomenon of economic growth and highlighting the theoretical relationship between them, we will try through this standard study through the use of co-integration and the ARDL model for the time period 2000-2020.

1- Determine the study model:

The identification of the model is based on the theoretical framework and previous empirical studies related to the subject of our study, and on this basis, the Eviews v10 program was used as a tool to show the extent of the impact of inflation on economic growth (GDP) in Algeria, which helped us clarify the model to be used (Autoregressive distributed time lags (ARDL) according to previous studies by employing a set of variables obtained from the World Bank represented as follows:

GDP: GDP as a dependent variable

INF: Inflation rate as an independent variable

1-1. Stability study of study variables:

Pesaran and Al (2001) and Shinand and Sun (1998) have combined autoregressive models with finite distributed lag models, in which the ARDL can be applied regardless of time-series properties whether they are stable at I0 levels or integrated of degree The first (1) I or a mixture of the two, but the time series must not be integrated of the second (2) I. The ARDL can be applied in case the sample size is small and this is in contrast to most traditional co-integration tests which require that the sample size be Great for more efficient results.

Figure No. (02): Results of the stability test for the study variables (correlation and partial correlation)

Date: 08/30/22 Time: 08:21
Sample: 2000 2020
Included observations: 21

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.337	0.337	2.7464	0.097
		2	0.305	0.216	5.1168	0.077
		3	0.147	-0.008	5.6958	0.127
		4	-0.082	-0.219	5.8882	0.208
		5	-0.059	-0.022	5.9944	0.307
		6	-0.144	-0.052	6.6627	0.353
		7	-0.001	0.132	6.6627	0.465
		8	-0.020	-0.008	6.6772	0.572
		9	0.039	0.019	6.7395	0.664
		10	0.016	-0.064	6.7503	0.749
		11	0.154	0.193	7.8992	0.722
		12	0.061	-0.035	8.0998	0.777

Source: Prepared by the two researchers based on the outputs of the statistical program Eviews v10

The above figure shows the results of the study of the correlation of the variables of the study through the correlogram, where we notice the presence of white noise, which indicates that all probabilistic values (P values) exceed the level of significance 5%, even until the gap 12, and therefore it can be said that there is a slight correlation between the independent variable Inflation and other dependent variables of economic growth.

Figure No. (03): Results of the application of the cointegration relationship

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Johansen Cointegration Test

Date: 08/30/22 Time: 08:24
Sample (adjusted): 2002 2020
Included observations: 19 after adjustments
Trend assumption: Linear deterministic trend
Series: SER01 SER02
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.305003	7.061509	15.49471	0.5705
At most 1	0.007780	0.148400	3.841466	0.7001

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.305003	6.913109	14.26460	0.4995

Source: Prepared by the two researchers based on the outputs of the statistical program Eviews v10

Through the results of the above figure, it is clear that all the tests used indicate the absence of an unstable root INF, that is, it is stable at the level, while the GDP variable is unit in relation to a variable at the level, but it is stable at the first difference, that is, it is integrated of the first degree, and the result of this test suggests The best and most suitable model for the study data is the Panel ARDL model

Estimation of the study model:

Based on the results of the unit root test, at this stage, we will estimate the short and long-term relationship according to the ARDL (Auto- Regressive Distributed Lag) technique. Accordingly, the model can be written according to the following formula:

ln inf= c+ $\delta_1 GDP_{t-1} + \delta 2 \ 〖GDP〗_{(t-1)} + \sum_{j=0}^{p} \alpha \nabla GDP_{t-p} + \mu_t$

Cointegration Test:

The ARDL model shows that economic growth can be explained by the F-stat by its decelerating values, and by the decelerating values of the independent variables. According to the Pesaran integration of the ARDL model, this method is based on testing the following hypothesis:

H0=δ_1=δ2=0: There is a long-term relationship H0

H1 ≠ δ 1 ≠ δ 2 ≠ 0 : No long-term relationship H1

The test is based on F-statistics, and the decision is as follows:

If the value of the F-stat is greater than the upper bound of the critical values, we reject the null hypothesis that there is no long-run cointegration relationship.

If it is less than the minimum critical values, we accept the null hypothesis that there is no cointegration relationship in the long run.

But if the calculated F-stat value is between the upper and lower bounds of the critical values suggested by Al and Pesaran (2001), then we cannot decide.

The statistical value of the cointegration is F=6.724497, and the limits of critical values at various degrees of significance proposed by (Al and Pesaran (2001), and the results of this table are shown in the following table:

Table No. (02): Boundary tests for the results of applying the cointegration relationship

The highest value The lowest value The degree of significance

high value	Minimum value	The degree of morale
0.15	0.0038	%5
0.30	0.007	% 10

Source: Prepared by the two researchers based on the outputs of the statistical program Eviews v10

Through the results of the above table, we note that the F-stat is greater than the minimum value of the critical value at various degrees of significance, that is, the inflation variable would explain the per capita GDP, and therefore we reject the null hypothesis and accept the alternative hypothesis and say that there is a equilibrium relationship The long-term inverse between the two variables.

Figure No. (04): Results of the unit root test application

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View | Proc | Object | Print | Name | Freeze | Sample | Sheet | Stats | Spec

Group Unit Root Test on UNTITLED

Group unit root test: Summary
Series: SER01, SER02
Date: 08/30/22 Time: 08:23
Sample: 2000 2020
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.37740	0.3529	2	39
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.42315	0.3361	2	39
ADF - Fisher Chi-square	9.76690	0.0445	2	39
PP - Fisher Chi-square	9.85682	0.0429	2	40

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Source: Prepared by the two researchers based on the outputs of the statistical program Eviews v10

Through the above figure, we found that the null hypothesis of Fisher's test is 0.04 less than 0.05, then the developed Fisher test is 0.042 using the normal distribution, while the alternative hypothesis has a probability of 0.35 that is greater than 0.05, from which we accept the null hypothesis and reject the alternative hypothesis.

3- Economic analysis

The results of the estimation of the relationship between the rate of inflation and the rate of economic growth indicated that there is a long-term inverse equilibrium relationship between the two variables, and it was statistically significant, and the main objective of this study was to study the effect of inflation on economic growth in Algeria, where time series data were used. The annual period 2000-2020, and the relationship between inflation and economic growth over time has known a great difference in opinions between different schools of thought, which generated a lot of interest among many economists to find the nature of this relationship and how inflation affects economic growth in an attempt by them to form models To prove this relationship.

Conclusion:

We tried through this research paper to study the impact of inflation on economic growth in Algeria, through the annual time series data for the period from 2000-2021, where the relationship between these two variables knew a lot of difference of opinions between its schools of thought, which made it of interest to many economists. Scientists are trying to find out the nature of this relationship and how inflation affects economic growth.

First: The results of the study:

A set of results were reached, which we will try to list as follows:

• Limits test and the existence of a long-term integrative relationship represented in the error correction coefficient, which allowed the treatment of short-term errors of 33% in the long-term for each year;

• The results of estimating a long-term model showed a negative relationship between inflation and economic growth in the long term, and this is consistent with the ideas of the classics, Keynesians, critics and many theorists of the neoclassical school. In the short term, the negative impact of inflation was observed in the current period, while we find the positive impact in The previous two periods, which indicate the authorities' attempt to influence inflation to increase the rate of economic growth;

• The study also concluded that there is a positive effect of the fixed capital variable and the variable of trade openness (internal influential variables), and the latter, in its positive impact, is due to the rise in oil prices during most of the study periods;

• While the results of the model validity tests proved that the results of the long- and short-term parameters can be relied upon for proper diagnosis.

Second: Recommendations and Study Suggestions:

Rationalizing government spending by adopting a fiscal policy and directing towards investment or production spending;

• Reducing the import bill and relying on local products;

• Diversification of income and not relying solely on petroleum levies;

• Reducing the traditional financing, which leads to the erosion of the value of the currency, which leads to the high cost of import.

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