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The Impact of Investment, Saving, and Consumption on Economic Development in Algeria (1990-2019)

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Abstract

The aim of this study was to analyze the determinants of economic development in Algeria during the period of 1990-2019. Investment, savings, and consumption were used as independent variables, while gross domestic product (GDP) was used as the dependent variable. The Toda-Yamamoto methodology was used, which relies on the vector autoregression (VAR) model. This methodology does not take into account the stability of time series, thus avoiding the problem of spurious regression. According to this methodology, the study concluded that there is a two-way causal relationship between investment, savings, consumption, and GDP. This means that investment, savings, and consumption directly affect the increase in GDP by creating value surpluses and driving production.

Keywords: Investment, Savings, Consumption, Gross DomesticProduct, Autoregression.

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I. INTRODUCTION

Economic development is considered the primary goal of all countries and international organizations, focusing on the financial, economic, and social conditions of nations. Economic development is concerned with macroeconomic and microeconomic factors, economic structures of developing countries, and local and international economic growth. Economic development is also seen as creating wealth that benefits society.It is an investment in the development of the economy in order to provide prosperity and a high quality of life for all people. Economic development allocates several resources such as land and workforce to increase the level of business activity, employment rates, income distribution, and financial viability. Therefore, economic development aims to transform low-income, simple economies into modern industrial economies.

Over the past three decades, Algeria has witnessed major changes in various fields, not only in the economic field. This was accompanied by developmental programs and radical changes at the macro level, as the state's policies aimed to mitigate the negative effects of the changes that occurred in the national economy by directing public and private investment, rationalizing and directing consumption, and mobilizing national savings, with the aim of achieving higher employment rates and maintaining them over the long term to achieve economic development by increasing the gross domestic product.

II. Research Problem:

The long-termincrease in gross domestic product (GDP) is considered one of the most important aspects of economicdevelopment. Therefore, all countries strive to develop economic programs at both functional and strategic levels, using various economic policies to influence the most important determinants of development, such as investment, savings, and consumption. Hence, the problem statement aims to investigate the relationship between some macroeconomic indicators and economic development byanswering the following question: Do some macroeconomic indicators affect economic development in Algeria during the period from 1990 to 2019? Including the following sub-problems:

- Does the level of investment in Algeria affect the economic development represented by the Gross Domestic Product (GDP)in Algeria during the period between 1990 and 2019?
- Does the savings rate in Algeria affect economic development represented by the Gross Domestic Product (GDP) in Algeriaduring the period between 1990 and 2019?
- Does the level of consumption in Algeria affect economic development represented by the Gross Domestic Product (GDP)in Algeria during the period between 1990and 2019?

III. Research hypotheses: To answer the research problem, we test thefollowing hypotheses:

- First hypothesis: The level of investment in Algeria affects economic development represented by the Gross Domestic Product (GDP) in Algeria during the period between 1990 and 2019.
- Second hypothesis: The savings rate in Algeria affects economic development represented by the Gross Domestic Product (GDP) in Algeria during the period between 1990 and 2019.
- Third hypothesis: The level of consumption in Algeria affects economic development represented by the Gross Domestic Product (GDP) in Algeria during the period between 1990 and2019.

IV. Economic Development - Basic Concepts-

Development means bringing about radical changes in some economic variables that lead to achieving growth rates in them faster than their natural growth rates. If economic growth is limited to its economic side or to aparticular sector, development means bringing about radical changes in all economic, social, political, andcultural fields. (Ismael AbdulRahman and other, 1999)

The concepts of economic development have varied depending on different schools, periods, and perspectives:

Manier Baldwin defined it as: 'The process by which real national income increases over a certain period of time'. (Kadhim Jassim Al-Essaawi, Mahmoud Al-Wadi, 2000)

Kindle Berger defined it as: 'An increase in national output over a given time period, with the necessity of bringingabout technological, organizational and institutional changes in existing economic organizations'.(Kamel Bakri, 2007)

And it is 'the set of policies adopted by a particular society based on its self-capabilities, leading to an increase in economic growth rates while ensuring the continuity and balance of this growth for a long period of time to meet theneeds of individuals and achieve the greatest possible degree of social justice'.

1. Goals of economic development

The economic development goals vary from one country to another and from time to time within the same country. However, there are common goals that most countries seek, the most important of which are(KadhimJasim Al-Essawi, Mahmoud Al-Wadi, 2000):

First: increasein real national income

It can be said that an increase in real national income, regardless of its size or type, is considered one of the primary and most important objectives of economic development in developing countries. Increasing real national monetary income refers to the goods and services produced by various (total) economic resources within a certain period of time. Factors such as population growth rate and the country's material and technical capabilities govern the increase in real national income.

Second: improving the standard of living

This happens when the population increases by a percentage less than the increase in the national income. As well as, raising the living standards of the population through the fair distribution of national income among individuals, similarly, increasing the average income per person enables them to raise their standard of living. However, if the population increases at a higher rate than the increase in national income, it becomes difficult to achieve an increase in the average income per person, leading to a decrease in their standard of living,therefore, we find that raising the standard of living is one of the most important goals that economic development should aim to achieve in all underdeveloped countries that seek to develop their economic resources, perhaps the closest measure to indicate the standard of living is the average income per person, the higher the average income, the higher the standard of living, and vice versa. (KadhimJasim Al-Essawi, Mahmoud Al-Wadi, 2000)

Third: Reducing income and wealth inequality

Reducing income and wealth inequality is considered a social goal of the economicdevelopment process, most developing countries that suffer from lownational income and low average income per person alsosuffer from imbalances in the distribution of income and wealth (Kamel Bakri, 2007), A small segment of the population may dominate a large share of the wealth, while the majority of the population suffers from poverty and a low income level, this leads to a decline in health, education, and living standards.

Fourth: Adjusting the Relative Structure of the National Economy

In developing countries, the agricultural sector predominates over the industrial sector, where agricultural production is considered a source oflivelihood, where agricultural production is

considered a source of livelihood, The law takes into consideration the process of economic development in underdeveloped countries in this aspect, and they work on allocating a significant percentage of the state'sresources to the development of the industry, whether by establishing new industries or expanding existingones, in order to address some problems such as the backwardness of the industrial production base, the weak intersectoral linkages, and the dominance of one sector, which is caused by the control of some sectors over the economic structure.(Mohamed Abdel Aziz Agmya, EmanAttiaNasif, 2000)

2. **Measures of Economic Development:**

There are three main criteria for measuring development.(Mohamed Abdel Aziz Agmya, EmanAttiaNasif, 2000)

A. Income Criteria

First-Gross National Income: Professor Mead proposedmeasuring economic development by identifying Gross National Income rather than per capita income. However, this measurement did not gainacceptance in economic circles because an increase (or decrease) in income may not lead to positive (or negative) results. For instance, an increase in national income does not necessarilymean economic growth when the population grows at a higher rate, and a decrease in national income does not necessarily mean economic backwardness when the population decreases at a higher rate. Additionally, this measure is not helpful when migration occurs to and from acountry.

Second-Expected Gross National Income: Some suggest measuring economic development based on the expected gross national income rather than the actual income, as the country may have rich latent resources and different capabilities to benefit from its latent wealth, in addition to the technological advancements it has reached. In this case, some economists believe that these factors should be taken into account when calculating income.

Third-Avera **Third**-reducig income criteria: The average per capita income is considered the most commonly used and accurate criterion for measuring the level of economic progress in most countries around the world. However, there are many problems and difficulties facing developing countries in obtaining accurate numbers that represent the actual income per capita, Among these difficulties is that population and income statistics are incomplete and inaccurate.Therefore, making comparisons between underdeveloped countries is questionable in termsof their accuracy and reliability due to differences in methods and standards, Some economists believe that the focus on development should be directed towards productive development rather than the standard of living, towards the produced income rather than the expended income, On the contrary, some people believe in adhering to theaverage per capita income as the one that should be taken into consideration because the ultimate goal of development is to raise living standards and levels of welfare.

B. Social standards

First- Health standards: Some of the most important standards used to measure the level of health progress include the following: (Adouri Mohammed Ahmed , 2005)

The number of deaths per thousand population, the number of deaths per thousand children inthe population, an increase in the death rate indicate inadequate healthcare services,inadequate nutrition, and malnutrition.

The life expectancy at birth, which is the average lifespan of an individual, Higher life expectancy indicates a higher level of economic development, while lower life expectancy indicates a lower level of economicdevelopment.

Another important indicator is the physician-to-population ratio, which refers to the number of individuals per physician.

Second-Educational standards: The importance of education and its clear impact on both production and consumption, and the consensus that spending on education represents an investment rather than consumption, And that this type of investment, human investment, achieves a high return, both for individuals and for society as a whole, One of the criteria used to identify the educationaland cultural level is: (Adouri Mohammed Ahmed , 2005)

-The percentage of individuals in the society who are literate, i.e.,able to read and write.

-The percentage of individuals enrolled in primary education and secondary education from the society.

- The percentage of expenditure on education at all levels (for everyone) to the Gross Domestic Product (GDP) and to the total government expenditure.

Third-Nutritional standards: Many developing countries are unable to provide basic food for their populations, resulting in malnutrition or under-nutrition, which in turn leads to reduced productive capacities and lower income levels. Among the indicators used to identify malnutrition or under-nutrition are the following:

-The average daily per capita calorie intake.

- The actual proportion of calories consumed compared to the average recommended calorie intake per person.

C. The structural criteria

Advanced countries have long worked on guiding the economies of developing countries towards producing primary products, such as agricultural and mineral products, in order to ensureaccess to these primary products at favorable prices and to create markets for their manufactured goods. However, this situation, especially since the post-World War II era, has become unacceptable for many reasons, including fluctuations in the prices of primary products that have had a negative impact on various economic activities, as well as continued unfavorable international exchange rates and continued economic dependence through the focus on manufacturing to expand the production base and diversify it, in addition to achieving an increase in income and raising living standards. This trend has resulted in noticeable changes in the relativeimportance of different economic sectors and in the distribution of the population between rural and urban areas.

All these changes can be taken as indicators of the degree of economic growth and progress, and themost important of these indicators are: (Ziad Ramadan, 2000)

- The relative importance of industrialproduction to Gross Domestic Product (GDP).
- The relative importance of exports of industrial goods to total exports.
- The percentage of employment in the industrial sector to total employment.

Undoubtedly, the trend towards manufacturing must lead to an increase in Gross Domestic Product (GDP) due to the contribution of new industries, as well as an increase in exports and job opportunities.

3. **The relationship between investment and economic development**

Some argue that the optimal utilization of available productive resources in a society can only be achieved through expanding productive capacity, i.e., by employing idle resources or creating new resources, which naturally requires new investments. However, others see this view as flawed because the efficient and optimal utilization of existing productive resources in a society can be achieved through increasing productivity of the resources already in use, by reorganizing their utilization and redistributing them among different uses. This process, which can be referred to as the process of reorganizing production or reforming the existing socio-economic structure, usually takes place without an increase in the society's capital, i.e., it does not require new investments. This underscores the importance of this process, particularly in developing countries that suffer from capital scarcity.

Based on this basis, the process of reorganizing production should be considered as a fundamental process in the field of economic planning. Planners must take it into account before considering the creation of new productive capacities. Undoubtedly,the ability of planners to increase production without putting pressure on available investment resources would be better for society. This is where the contribution of investment in financing economic development comes in, as accelerating it requires an increase in investments, which in turn requires the provision of domestic sources of financing, including savings from the business sector, government sector, and household sector, as well as external sources of financing such as foreign aid, foreign loans, andprivate foreign investments, which countries use to achieve a level of balance in the national (or gross) income. However, the economy may deviate from the balanced situation, which can be reflected in what is known as inflationary or contractionary gaps,in case the equilibrium level of income deviates from the level of full employment.

4. **The relationship between saving and economic development**

Achieving comprehensive economic development requires multiple factors, including the crucial role of the savings rate in driving economic growth. It is essential to emphasize the need for the participation and cooperation of other factors, such as skilled labor, managerial and organizational skills, high-quality natural resources, technological advancements, favorable political and social climate, as well as a conducive international environment, and mitigating inflationary pressures and reducing the impact of increased aggregate demand that typically accompanies the development process, The policy of increasing savings rates from rising incomes leads to alleviating the severity of inflation and reducing individual consumption spending, allowing for more goods to be directed towards exports. This helps the country obtain the foreign currency needed for economic development projects and achieve more investment that benefits all members of society in terms of public welfare. Additionally, it reduces demand for imported goods on the other hand. (Ben SaadBeloul, 2020)

5. **The relationship between consumption and economic development**

Consumption is considered a fundamental driver of the economic wheel and a catalyst for growth and development in society, as well as a measure of individual welfare indicators. Today,studies are focusing on identifying the economic and social determinants of consumption in increasing or decreasing themarginal propensity to consume.Therefore, any change in consumption expenditure will have tangible effects on the level of economic activity, as it constitutes the basic component of gross domestic product (GDP). As such, any change in the rate of GDP growth can be primarily explained by changes in consumption expenditure.

The arrival of capitalist countries in the West to a stage of large-scale consumption and their need to seek new consumption outlets has led them to turn their attention towards the markets of developing countries, including the Algerian market. This has stimulated the supply side in the economies of these countries and opened the door wide for investments and the influx of imports to meet the demand resulting from the newly adopted consumption patterns, without being accompanied by a real increase in the average per capita income at higher rates. This will weaken the ability of the economy to generate savings and finance local investments, which will have a negative impact on the future of economic development.

V.Literature review

1. GbègniAlladassi-Battostudy (2006)

"Analysis of the determinants of household consumption in Benin; an error correction model approach", The study emphasized the importance of consumption in the formation of gross domestic product (GDP) and the researcher discussed the key determinants of consumption function in Benin, which include income, general price level, and interest rate using the Keynesian model. The findings

of the study revealed that both the general price level and interest rate have a negative impact on household consumption, while income has a positive impact.

2. Ahmed salami study (2014)

Savings in the Algerian Economy and Its Impact on Economic Development: A PhD Dissertation in Economic Sciences. This doctoral dissertation investigates the reality of savings in the Algerian economy and its implications on financing economic development during the period of 1970-2014. The study employs descriptive and analytical methods to examine the determinants of domestic savings and its relationship with domestic investment in the long run, utilizing the descriptive statistical method of least squares and the co-integration test. The findings of the study reveal that there is no long-term equilibrium relationship between savings and investment during the study period.

3. **SamehAjloun and SohailI.Magableh (2016)**

Determinants of Private Investment in Jordan, An ARDL Administrative Science, Volume 43,NO,1,2016bounds Testing Approach, Dirasat,

The aim of this study was to identify the determinants of private investment in Jordan during the period 1970-2012 using the Autoregressive Distributed Lag (ARDL) approach for co-integration analysis. The findings of this study revealed that private investment is positively influenced by real gross domestic product (GDP) and negatively affected by real interest rates and public investment.

4. Abdelkaderallbi and others (2020)

‘’TheRole of Foreign Direct Investment in the Development of the Algerian Economy’’

Foreign direct investment (FDI) is considered one of the most preferred forms of investment, as it represents a type of external financing relied upon by countries to provide the necessary resources for investment programs aimed at achieving their economic development plans. In this study, we aim to examine the role of FDI in the economic development of Algeria during the period (2000-2020) using analytical analysis of economic variables. The results of the study revealed a long-term equilibrium relationship between the independent variables and the dependent variable. As for the long-term model, it showed the extent of the impact of both domestic investment and gross domestic product on the inflow of FDI, while inflation and exchange rate had no significant impact on FDI inflows.

VI.The Impact of Investment, Saving, and Consumption on Economic Development in Algeria

1. The Reality of Investment in Algeria

Algeria has adopted a multi-faceted policy aimed at achieving comprehensive economic development through economic reforms. In the field of investment, the state has worked to encourage both local and foreign investment since adopting its policy of economic openness. After implementing economic reforms, Algeria has gained significant experience in the legislative and regulatory aspects of investments, as it used to primarily consider the value of invested capital when granting incentives to investors in orderto encourage initiatives or attract capital that was initially scarce. However, gradually new measureshave been imposed to direct investments according to three key points:

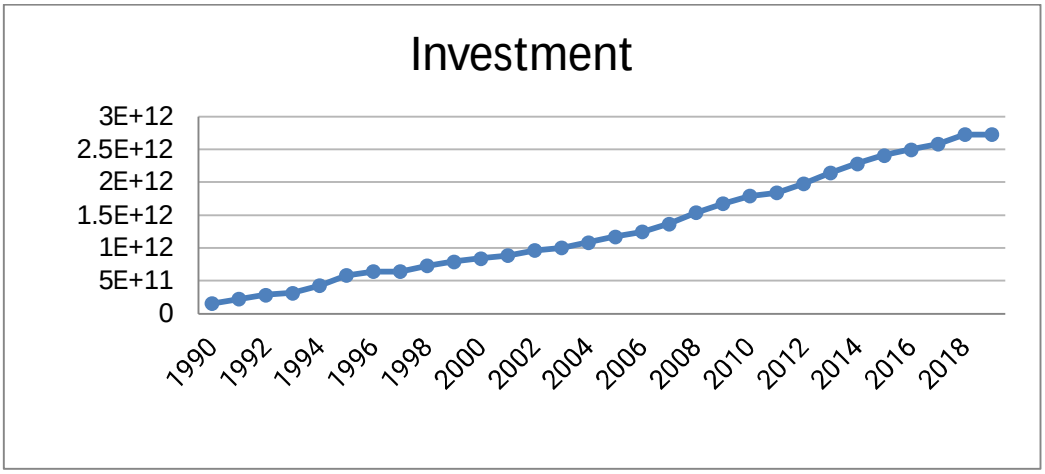
A. Towards employment-generating projects, then towards Job-creating sectors at moderate costs (small and medium-sized industries), and then towards traditional industries, crafts, and small professions that usually create less than ten jobs (projects of the Youth Employment Agency).

B. On the other hand, and in order to avoid exacerbating the acute regional imbalance, bold arrangements have been made to promote decentralization by adopting significant incentives for the regions targeted for upgrading.

C. Finally, and due to the needs related to external resources, export activities are the main source of foreign hard currency and have been encouraged in all annual financial laws and successive investment laws.

The following figure illustrates the evolution of investment during thestudy period:

Figure (01): Investment Evolution Curve in Algeria for the Period from 1990 to 2019.



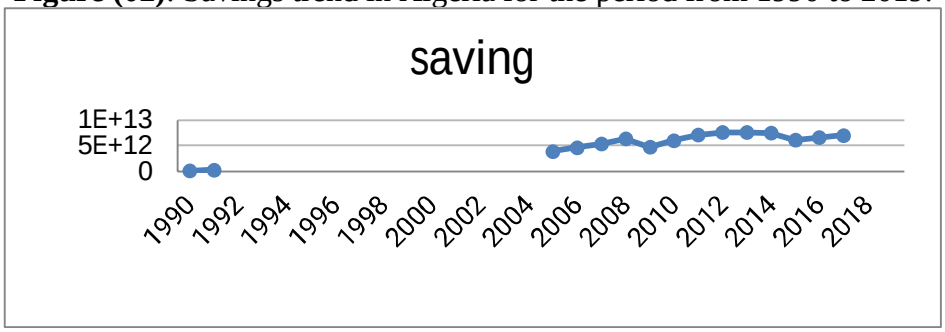
Source: Prepared by the researcher based on Appendix No. 1.

Through the above figure, it can be observed that the investment rate has steadily increased during the study period, which can be attributed to the measures taken by the government to diversify and develop the economy in order to achieve economic growth. However, the hydrocarbon sector continues to provide the best opportunities for foreign investment, especially with the recent increase in prices.

- The Status of Savings in Algeria

Savings is considered one of the means that can be used to address many economic problems and finance development due to the scarcity of resources and limited capabilities in the world. Many economists attribute the poverty experienced by developing countries to the inability of individuals to save. Therefore, we will try to clarify the reality of savings in Algeria during the study period from 1990 to 2019. During the period from 1990 to 1993, savings witnessed a high growth, which can be attributed to the noticeable growth in disposable income, coinciding with consumption growth but at lower rates. Government savings in Algeria are considered among the important sources that played a prominent role in financing development, as it contributed significantly to covering national investments despite their magnitude. It should be noted that there is a distinction between budget surplus and government savings. Budget surplus refers to the excess of general revenues over general expenditures, while government savings refer to the difference between general revenues and current expenditures (operational or ordinary expenditures) only (Iyad Abdel Fattah Al-Nssour, 2014). As long as government savings in Algeria are defined as the sum of general revenues minus current expenditures, analyzing the developments in government savings necessitates automatically analyzing both general revenues and current expenditures as the determining factors for this type of savings. And to understand the developments in household savings, it is worth noting that studying the saving behavior of the household sector requires obtaining individual data. The National Savings and Reserve Fund remained the largest accumulator of savings in Algeria due to the importance of the savings values it obtains, The following bar chart illustrates the evolution of savings in Algeria during the study period:

Figure (02): Savings trend in Algeria for the period from 1990 to 2019.



Source: Prepared by the researcher based on Appendix 2.

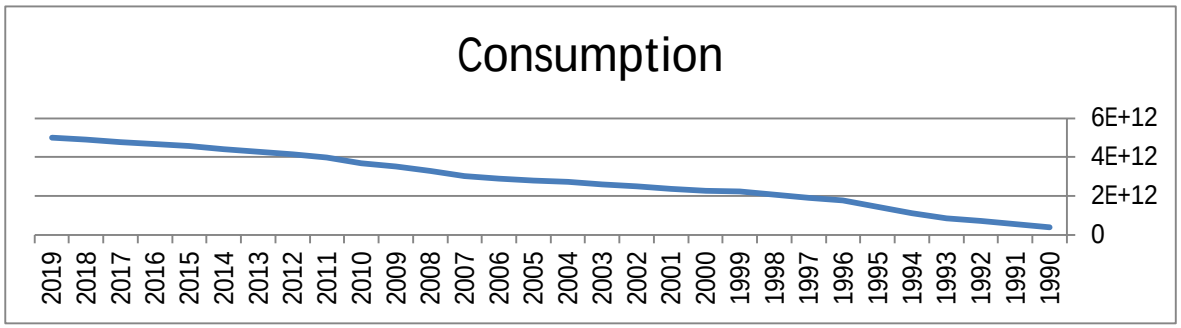
Based on the figure above, it is clear that except the missing years the value indicate that savings are increasing, with consecutive declines in 2008 and 2010 followed by a rebound, and then declining again between 2014 and 2016.

3. - The Reality of Consumption in Algeria

The national territory is characterized by diverse terrain and geographic regions, as well as variations in costumes and traditions from one region to another. This diversity contributes to the variation in the consumption patterns of households. Algeria has also experienced a long period of deprivation, hunger, and austerity during the colonial era. At the beginning of independence, individuals and families in Algeria experienced a decline in consumption levels due to unemployment and the weakness of the national economy. After the economic improvement witnessed in the early 1970s, the situation of families in terms of income and expenses began to improve. This improvement was observed across all social classes, until the onset of the economic crisis in 1986, which prompted the government to embark on a path of reforms. Despite this, Algerian households allocate a larger portion of their income to consumption, while savings do not receive a higher percentage. In 1995, the inflation rate reached an extremely high level of 79.29% due to the liberalization of prices under pressures from the International Monetary Fund (IMF) as part of economic reforms. However, this inflation did not have the same impact on consumption, as prices were subsidized by the state. This led households to consume more than their available income, resulting in the use of their previous savings to meet their needs, which negatively affected investment. During the period from 2000 to 2014, we notice an increase in consumption levels due to improved living conditions after the return of security and a decrease in unemployment rates, which encouraged an increase in aggregate demand. The general price index has continuously increased during the period from 1990 to 2015, with an average change of 57.9%. This can be attributed to the increase in prices due to monetary expansion, as the government resorted to issuing currency to cover budget deficits and finance investment projects. Additionally, the local currency has depreciated in value. Unemployment rates in Algeria increased in the early 1990s due to economic reforms initiated by the Algerian government during that period, accompanied by support from the International Monetary Fund (IMF) following the 1986 oil crisis. This was especially evident after the signing of the first stabilization program in June 1991 and the second in June 1993, followed by the implementation of the structural adjustment program starting in May 1995. This program involved privatizing state-owned enterprises, resulting in the layoff of thousands of workers, as well as a decline in purchasing power for citizens due to the devaluation of the national currency and the rise in prices. However, with the beginning of the 2000s, there was a decrease in unemployment rates due to the implementation of various economic stimulus programs such as the 2001-2004 Economic Recovery Program and the 2005-2009 Supplementary Growth Support Program, which aimed at investing in large projects and developing rural areas, resulting in job

creation and absorption of unemployment. The period from 1990 to 1999 was characterized by a deterioration in purchasing power compared to previous years due to the rapid increase in consumer prices, leading to slow growth. In the last quarter of 1999, fuel prices increased, so economic activity was revitalized through expansionary fiscal policies aimed at stimulating aggregate demand. From 2000 to 2005, wages increased and the government intervened to regulate and support prices, which had a positive impact on the overall price level. From 2006 to 2010, family incomes showed signs of improvement. The following graph illustrates the trend of consumption during the study period.

Figure (03) shows a curve illustrating the evolution of consumption during the study period



The second demand: modified Toda-Yamamoto Granger Causality test

One of the most commonly used methods and approaches to studying causality includes three famous tests: Sims' 1969 test, Granger's 1972 test, and Geweke's 1983 test (Harath and Ramdani, 2018, p. 140). Granger's methodology is the most widely used and popular, but one of the key requirements for its use is the stationarity of time series of the same order, especially at the level. Therefore, Toda and Yamamoto proposed a new methodology, which is considered an alternative causality test.

This test, developed by Hiro Y. Toda and Tuka Yamamoto in 1995, estimates the autoregressive vector (Augmented VAR) self-regression. This test differs from all the ordinary tests of causality due to its disregard for the integration degree of variables I(0), I(1), or even I(2), regardless of whether there is a common integration relationship or not (AYADA & BELMEKADDEM) 2017, p.240.

This approach was developed to address the limitations of the traditional Grenger Causality test, including issues related to model specification, lag length determination, as well as the prominent concern of spurious regression (the problem of non-stationarity) (Mansouri, Widad, 2017, p. 368).

- The stages of applying the Toda Yamamoto methodology: The application of Toda Yamamotocausality test includes several stages(DAMBURE & ZIRAMBA):

a. Determination of the Maximum Integration (D_{max}):The first step is to study the stationarity of time series in order to determine the degree of integration for each series and consequently extract the order of integration. This is done using several tests for unit roots such as the Augmented Dickey Fuller (ADF) test, Perron test (PP), Schmidt and Shin test (KPSS), and Ng-Perron test, among others.

b. Determining the Optimal time lag Period (p): This is obtained through estimating a VAR model for the variables in their levels (original time series data). The optimal lag order is determined using the following statistical criteria: Akaike Information Criterion (AIC), Schwarz Information Criterion

(SIC), and Hannan-Quinn Information Criterion (HQ). The lag order associated with the lowest value of each criterion is chosen as the optimal time lag.

C. causality test: Causality test: This is done by relying on the MWALED (Mean Weighted Absolute Deviation) test to select the imposed restrictions on the parameters of the developed VAR(K) vector auto-regression model, where K is equal to the order of integration plus the optimal lag length K-D_{max}+p. This test follows a Chi-squared distribution with P degrees of freedom.
The VAR(p+D_{max}) model expresses a relationship between two variables asfollows:

$$X_t = \alpha + \sum_{i=1}^{P+Dmax} \beta_i X_{t-i} + \sum_{j=1}^{P+Dmax} \gamma_j Y_{t-j} + \varepsilon_{1t} \dots (1)$$

$$Y_t = \alpha + \sum_{i=1}^{P+Dmax} \beta_i X_{t-i} + \sum_{j=1}^{P+Dmax} \gamma_j Y_{t-j} + \varepsilon_{2t} \dots (2)$$

Where Xt, Yt are the variables under study at time t, t1 £, t2 £ are the white noisesfor both equations and are not linearly related, and t represents time.
Where we test the following hypotheses for equation number1

H_0 : Y_t لا يسبب X_t، إذا كان $\sum_{j=1}^{P+Dmax} \gamma_j = 0$

H_1 : Y_t يسبب X_t، إذا كان $\sum_{j=1}^{P+Dmax} \gamma_j \neq 0$

First: Unit root test for time series stationarity (the unit root test):
In a study conducted by Nelson and Plosser, it was found that most macroeconomic variables are not stationary at the level (Nelson, C. R. and Plosser, 1982), i.e., I(0), which may render the use of ordinary least squares (OLS) method inappropriate. This could result in obtaining high values for both the T-statistic and the coefficient of determination (R2).
To avoid the issue of spurious regression, which may not provide meaningful economic interpretation, the first step in data analysis would be to test for stationarity of time series data (Dickey & Fuller, 1979).
A time series, Xt, is referred to as stationary when(Ayad Hisham, 2017):
Its mean is constant, i.e. :E(Xt)= constant for all t
Its variance is constant, i.e.: Var(Xt)= constant for all t
Its covariance depends on time, i.e.: Cov(Xt ,Xt+k)= depends on t & k≠0

This means that both the mean and variance of the variable X remain constant over time. However, the covariance between any two values of X depends on the time difference between these two values (Thomas, 1997).
The augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test will be used to test the null hypothesis of the presence of a unit root, and thus the non-stationarity of the time series, as follows:

The Augmented Dickey-Fuller (ADF) Test:
The Dickey-Fuller test can be conducted based on the following equation with the presence of a constant (β1) and time trend (t) for the variable (Y):
$\Delta Yt = \beta 1 + \beta 2t + \delta Yt\text{-}1 + Ut$

In this model, it has been assumed that there is no autocorrelation between the error bounds. However, in case of the presence of autocorrelation, the model becomes inappropriate and results in inaccurate estimation. To overcome this situation, this model has been expanded by adding lagged values of the time series under analysis to be known afterwards as the Augmented Dickey-Fuller Test. The model now takes the following formula:

$$\Delta Yt = \beta 1 + \beta 2\, t + \delta Yt\text{-}1 + \Sigma \quad \alpha i\, \Delta Yt\text{-}i + \varepsilon t$$

The test for stationarity of the time series relies on the significance of the parameter (δ), through comparing the computed (t) value with the tabular (tau-statistic) value. If the computed value is greater than the tabular value (in absolute terms), it means that the time series is stationary at the given level. If the computed value is less than the tabular value (in absolute terms), it means that the time series is non-stationary. In this case, taking the first difference is required.
And in order to investigate the stationarity of the study variables, the Dickey-Fuller augmented unitroot test was used, and the results are shown in the following table:

Table 01: Results of Augmented Dickey-Fuller Unit Root Test.

		he Dickey-Fuller augmented test (ADF)					
he Series		t the level		he first difference		he second difference	
		-Statistic	Critical Value 5%	-Statistic	ritical value 5%	T-Statistic	ritical value 5%
O	None	.872832				-	
			1.952910	- 1.515201	1.953381	5.859449	.953858
	Trend, C	1.283832	3.574244-	- 3.585861	- 3.580623	- 5.630447	.587527
	C	.583849	2.967767	- 3.481566	- 2.971853	- 5.729452	.976263
I	None	.478825	1.952910	- 3.618796	- 1.953381	//	
	Trend, C	506968	3.574244	- 4.431574	- 3.580623	//	
	C	2.194497	2.967767	- 3.719295	- 2.971853	//	
S	None	267387	- 1.9 2910	- 5.606768	- 1.953381	//	
	Trend, C	.983215	- 3.5 4244	- 6.251209	- 3.580623	//	
	C	2.056613	- 2.9 7767	- 5.700801	- 2.971853	//	
Y	None	2.579797	- 1.9 3381	- 0.778547	- 1.953858	- 8.499381	1.953858
	Trend, C	3.873131	- 3.5 7527	- 3.082652	- 3.580623	- 8.481919	3.587527
	C	391182	- 2.9 7767	- 3.247604	- 2.971853	- 8.332568	2.976263

Source: Prepared by the researcher based on outputs from Eviews 9

The Augmented Dickey-Fuller (ADF) test indicates the presence of a unit root at a significance level of 5%, indicating that the time series of the study variables (Co, I, S, Y) are non-stationary at the

level. However, after taking the first difference of each time series separately, it is found that all the critical values (in absolute terms) for the first difference of the ADF test are greater than the calculated statistical values for the time series of variables (I, S). This means that these two time series are stationary after the first difference, while the time series of variables (Co, Y) only become stationary after the second difference, as the calculated statistical values for the second difference are greater than the critical values (in absolute terms)

Therefore, the time series are not integrated of order one, and the use of co-integration or ordinary Granger causality cannot be applied. It is necessary to rely on the Toda-Yamamoto methodology for studying causality, which can be applied to non-stationary time series with dmax=2, based on the highest order of integration among the four time series.

Second: Determining the number of time lags

The second stage in estimating causality is selecting the optimal number of lags for a VAR model using Akaike, Schwarz, FPE, and Hannan-Quinn criteria. Care must be taken in choosing the number of lags, as Pittis& Caporal's 1999 (R –Bourbonnais, 2013) study showed that selecting fewer lags than the true number of lags introducesparameter bias, while selecting more lags than the true number of lags renders the estimation statistically insignificant despite significant parameters. The table below summarizes that the optimal number of possible lags is 2, i.e., k=2:

Table (02): Results of Optimal Lag Determination Test in Vector Auto-regression (VAR) Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2764.990	NA	1.41e+84	205.1103	205.3023	205.1674
1	-2618.893	238.0833*	9.35e+79*	195.4736	196.4334	195.7590*
2	-2605.081	18.41630	1.20e+80	195.6356	197.3634	196.1494
3	-2586.278	19.49870	1.24e+80	195.4280*	197.9237	196.1701
* indicates lag order selected by the criterion						

- LR: sequential modified LR test statistic (each test at 5% level)
- FPE: Final prediction error
- AIC: Akaike information criterion
- SC: Schwarz information criterion
- HQ: Hannan-Quinn information criterion

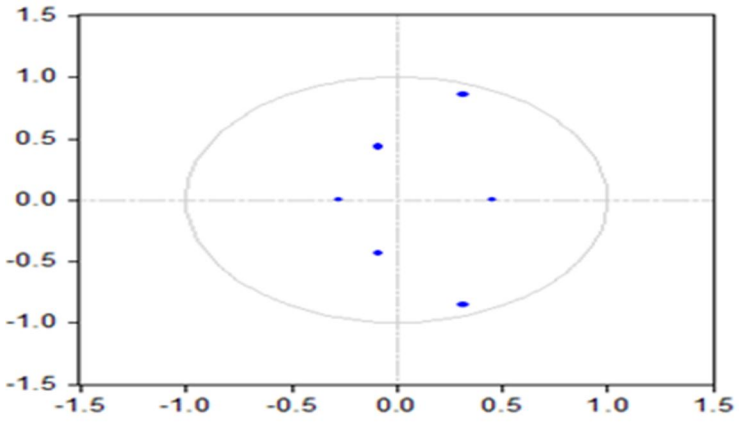
Source: Prepared by the researcher based on outputs from Eviews 9.

Third: verifying that the VAR(p) model is free from statistical issues

1. **Stability analysis of the model:**

To confirm the stability of the model, we use multiple roots tests, where the results of the autocorrelation function are considered stable if the reciprocals of the roots lie within the unit circle. The figure below shows the results of this test.

Figure (04): the unicycle



rom Eviews 9.

Based on the figure above, it is evident that the inverse of the univariate roots of a boundary lies within the univariate circle. Therefore, the model is stable.

2. **Testing the normal distribution of residuals for the estimated model (Jarque-Bera)[1]:**
One of the assumptions of regression is that the residual series follows a normal distribution. To test this assumption, we put forward the null hypothesis H_0 that the residual series follows a normaldistribution.

The hypothesis of non-inferiority is accepted or rejected based
on the comparison between the Jack-Berra statistical method
and the critical value of the chi-square (S) at a certain level of significance :

- If $S > \chi^2_{\alpha}(2)$ then we reject the hypothesis of non-normality, meaning that the residual series does not follow a normal distribution.
- If $S < \chi^2_{\alpha}(2)$ then we accept the hypothesis of non-normality, meaning that the residual series follows a normal distribution.

By utilizing the Eviews software, we can obtain the results of testing the normal distribution for the residuals of this estimated model, which can be illustrated in the following table:

Table (03): Results of **Jarque-Bera** Test for Normal Distribution

Component	Jarque-Bera	Df	Prob.
1	0.788330	2	0.6742
2	0.430933	2	0.8062
3	1.181950	2	0.5538
4	5.141821	2	0.0765
Joint	7.543033	8	0.4793

Source: Prepared by the researcher based on outputs from Eviews 9

[1]The null hypothesis in the Jack-Pera test states that the residuals follow a normal distribution.

In order to test the hypothesis of non-normality17, we compare the Jarque-Bera statistic with the chi-squared value. The chi-squared value is ($\chi^2_{0.05}(4) = 9.48$), which is greater than the Jarque-Bera statistic S=7.54 as shown in the table above. Therefore, we reject the null hypothesis of non-normality at a significance level of 5%. Consequently, this estimated model is acceptable.

3. Self-correlation test between errors LM

To confirm the absence of self-correlation between model residuals, we use an LM test as The null hypothesis assumes no correlation between model residuals, and the results are summarized in the following table:

Table (04): Results of LM Self-Correlation Test between Errors

Lags	LM-Stat	Prob
1	16.25728	0.4352
2	15.19910	0.5101
3	16.42405	0.4238
4	12.83509	0.6848
5	16.69395	0.4057

Source: Prepared by the researcher based on the outputs of Eviews 9

The results mentioned in the table above indicate acceptance of the null hypothesis of no self-correlation between model residuals, as the p-value is greater than 5%.

Fourth:Toda-Yamamoto Causality Test

Testing the nature of Granger causality between variables mainly depending on the MWald test, but first, VAR(4) estimation should be done, where P=2 and d_{max}=2, i.e., V(d_{max}+P)=4. The following table illustrates this:

Table (05): Results of Toda-Yamamoto Causality Test.

dependent variable	Independent Variable	Null Hypothesis	X^2	P-Value
Gros	**Gross Domestic Product (Y)**	Consumption (Co) Co does not cause Y	15.61773	0.0036
Gross DomesticProduct (Y)	Investment (I)	I does not cause Y	12.24299	0.0156
Gross Domestic Product (Y)	Saving (S)	S does not cause Y	10.21989	0.0369
Gross Domestic Product (Y)	(Co, I, S)	(Co, I, S) do not cause Y	42.18867	0.0000

Source: Prepared by the researcher based on outputs from Eviews 9

Discussion of Results

1. **The presence of a causal relationship between consumption (Co) and gross domestic product Y :**

Based on the table above, which illustrates the results of the Spurious Regression Test using the Toda—Yama moto methodology, the following observations can be noted:

1. Existence of a causal relationship from consumption (Co) towards gross domestic product (Y) at a significance level of 5%
2. Existence of a causal relationship from investment (I) towards gross domestic product (Y) at a significance level of 5%
3. Existence of a causal relationship from savings (S) towards gross domestic product (Y) at a significance level of 5%
4. Existence of a causal relationship among variables (Co, I, S) towards gross domestic product (Y) at a significance level of 5%

2. The presence of a causal relationship from investment (I) to gross domestic product (Y):

The causal relationship from investment (I) to gross domestic product (Y) can be explained as follows: The process of investment leads to increased employment and reduced inflation and price hikes, according to the perspective of proponents of the positive impact of investments. Investment will result in increased production and overall employment, leading to growth in the local output and shifting it towards a better curve that reflects increased employment and lower prices, which is a desirable outcome for any developing country.

3. The presence of a causal relationship from savings (S) to gross domestic product (Y):

The causal relationship between savings (S) and gross domestic product (GDP) can be explained by an increase in the efficiency of national savings mobilization in boosting employment levels and, consequently, raising the value of GDP. Additionally, the growth of financial institutions responsible for savings mobilization at the aggregate level, including both banking and non-banking institutions, contributes to this relationship.

4. The presence of causality from the variables (Co, I, S) towards gross domestic product (GDP).

VII. Conclusion

Due to the importance of the impact of savings, investment, and consumption on economic development in Algeria in particular, we conducted a study that examined the relationship between economic development, investment, savings, and consumption from a theoretical perspective. We then conducted an empirical study to measure the impact of investment, savings, and consumption on economic development in Algeria for the period from 1990 to 2019, where we applied the theoretical framework to the Algerian economy through the empirical study, which allowed us to test the hypotheses we formulated. The results were as follows:

Hypothesis testing:

1. The first hypothesis is related to the existence of a causal relationship between investment and economic development in Algeria during the period from 1990 to 2019. After hypothesis testing, we confirmed its validity.
2. The second hypothesis relates to the existence of a causal relationship between savings and economic development in Algeria during the period from 1990 to 2019. After testing the hypothesis, we confirmed its validity.
3. The third hypothesis relates to the existence of a causal relationship between consumption and economic development in Algeria during the period from 1990 to 2019, and after testing the hypothesis, it was confirmed to be true.

Study results

We have reached the following results through this study:

- The consumer demand is considered one of the most important components of total demand, as it constitutes a significant proportion of it.
- The consumer habits in Algeria have not changed during the study period, which indicates difficulty in abandoning the consumption pattern.
- A decrease in the rate of the increase in consumption may lead to an economic recession.
- Savings contribute to the process of economic development in Algeria, but with low percentages. This is primarily due to several reasons, the most important of which are the weakness of financial institutions in Algeria, the lack of liquidity, and the government's failure to establish rates that incentivize individuals to save.

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Appendixes:

Annex (01) illustrates the evolution of investment for the period 1990-2019

years	The real values inDZD		The real values in DZD
1990	149881021811		1170044983075,6
1991	218372345430		1242587771955,7
1992	283764077651		1368089136971,92
1993	314860117648		1537732189910,04
1994	423546363069		1673052622634,12
1995	579726586184		1790166306285,5
1996	639319060693		1842081129092,49
1997	638019187697		1974710970427,15
1998	728707692778		2144536113907,08
1999	789700000000		2281786425149,94
2000	839451100000		2411848251373,29
2001	884781459400		2496262940210,34
2002	959103102023,196		2581135880218,89
2003	1000344535405,39		2725660372392,95
2004	1082372787237,85		2728386032765,34

Source: International Bank Data http://data.worldbank

Annex Number (02) illustrates the evolution of savings

	The real values in DZD	years	The real values in DZD
1990	133268155033,218	2005	3921732255299,99
1991	272429997612,579	2006	4631316604300
1992	00	2007	5315897558219,79
1993	00	2008	6347353319318,79
1994	00	2009	4712054417458,2
1995	00	2010	5979687924947,24
1996	00	2011	7074749603758,92
1997	00	2012	7649901357644,33
1998	00	2013	7553564281620,99
1999	00	2014	7426262459296,91
2000	00	2015	6089084478777,17
2001	00	2016	6546105287575,54
2002	00	2017	7019606703900,81
2003	00	2018	00
2004	00	2019	00

Source: International Bank Data http://data.worldbank