Economic foresight as a strategic option to achieve diversification of GDP in Algeria. An Econometric Study to Anticipate the diversification index in GDP (2020-2030) Using ARDL model

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Abstract:

This study aimed to highlight the Algerian need to adopt economic foresight as a strategic option in order to build an economic system based on economic diversification, which allows achieving diversification in GDP. For this purpose, the descriptive and analytical approach and the forward-looking approach were adopted in order to anticipate the diversification index in GDP during the period (2020-2030). The study confirmed the existence of a long-term balanced relationship between the diversification index in GDP and the added value of economic sectors that can contribute to its diversification. The forward-looking study also reached the construction of two scenarios, the first is exploratory pessimistic and the other is proactive optimistic, through which a future strategy was proposed to achieve diversification of GDP in Algeria.

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Keywords *Economic diversification, GDP, Economic foresight,* herfindahl-Hirschman coefficient, *ARDL model.*
Jel Classification Codes : F42،F47، C32

ملخص:

هدفت هذه الدراسة إلى إبراز ضرورة اتجاه الجزائر إلى اعتماد الاستشراف الاقتصادي كخيار استراتيجي من أجل بناء منظومة اقتصادية أساسها التنويع الاقتصادي، تسمح بتحقيق التنويع في الناتج المحلي الإجمالي، وقد تم من أجل ذلك، الاعتماد على المنهج التحليلي والمنهج الاستشرافي بغية استشراف مؤشر التنويع في الناتج المحلي الاجمالي خلال الفترة (2020-2030)، وقد اكدت الدراسة وجود علاقة متوازنة طويلة الأمد بين مؤشر التنويع في الناتج المحلي الإجمالي والقيمة المضافة للقطاعات الاقتصادية التي يمكنها المساهمة في تنويعه، كما توصلت الدراسة الاستشرافية الى بناء سيناريوهين، الأول استكشافي تشاؤمي والآخر استباقي تفاؤلي، تم من خلالهما اقتراح استراتيجية مستقبلية لتحقيق التنويع في الناتج المحلي الإجمالي في الجزائر.

الكلمات المفتاح : تنويع اقتصادي، ناتج محلي اجمالي ، استشراف اقتصادي ،معامل هيرفندال هيرشمان ،نموذجARDL

تصنيف JEL : C32،F47،F42 .

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I. Introduction:

Economic forecasting is one of the modern scientific methods that have become increasingly interested by most countries, thanks to its ability to contribute to strategic planning to make a better future for the economies of countries, through its essential role in enabling the latter to formulate strategies based on scientific studies that lead to avoiding crises and achieving the goals of development policies.

Economic foresight has helped many countries to develop and diversify their economies, and the experiences of Singapore, Norway and Malaysia are considered leading experiences in this area'. at the Arab level, the experience of the United Arab Emirates is a typical experience, as this country was able to make a qualitative leap in diversifying its economy thanks to economic foresight, and this has led to reducing the dependence of its economy on the hydrocarbon sector and to achieving high growth rates of 5.3% in 2021.

As for Algeria, despite the multiple structural reforms that have affected its economy since the Eighties of the last century, it is still a rentier economy, which is evident through the continued dependence on the hydrocarbon sector by more than 90%. Perhaps this situation necessitates Algeria to seek strategies that enable it to diversify its productive base and raise the contribution of all economic sectors to GDP. Therefore, economic foresight is one of the strategic options to rely on in order to achieve the goal.

Despite the role that economic foresight can play in enabling Algeria to draw up its long-term economic strategies and achieve the Millennium Goals (a convincing Algeria in 2030, a rising Algeria in 2040 and an advanced Algeria in 2050), interest in it is still unclear, especially after the abolition of the delegated ministry in charge of foresight in 2021, at a time when Algeria seeks to achieve economic diversification and sustainable growth.

Based on the above, and with Algeria's tendency to seek to diversify its incomes and get out of the dilemma of almost absolute dependence on oil, the following problems arise:

How can GDP diversification in Algeria be achieved by relying on economic foresight as a strategic option for managing economic activity during the period (2020-2030)?

Sub-questions:
- What are the advantages of realistic GDP structuring in Algeria?
- How can alternative economic sectors affect the GDP diversification index in the long and short term?
- Does the embodiment of economic foresight in Algeria require political will or the competence of decision-makers?

Hypotheses of the study:

The main hypothesis:
The diversification of GDP is linked to the adoption of a strategy based on the activation of economic forecasting mechanisms and their application to the main variables driving economic activity in Algeria.

Sub-hypotheses:
- The realistic structuring of the GDP in Algeria is characterized by the weak contribution of the main economic sectors and the predominance of the hydrocarbon sector.
- The degree of influence of alternative economic sectors on the GDP diversification index varies.

Importance and objectives of the study:

Algeria, as a rentier country, suffers from the risk of economic shocks associated with fluctuations in hydrocarbons prices in international markets. In this context, economic foresight mechanisms can contribute to building a balanced economic system that is resistant to all economic crises that may occur, through its role in anticipating the conditions and results of exiting from the current economic model to a diversified economic model.

Accordingly, this study aims to anticipate the structure of the GDP in Algeria during the period 2020-2030 by anticipating the economic results expected to be achieved by relying on the diversification of the activities of the various economic sectors that generate wealth in Algeria, such as the agricultural sector, the industrial sector, the services sector, and the construction and public works sector.

Previous studies:

In this research, a group of previous studies that dealt with the subject of foresight and economic diversification were exposed, which which were summarizedas follows:

1-Najat kortel, The Algerian economy between the reality of the rentier economy and the stakes of economic diversification –an applied study to calculate the herfendahl Hirschmann index for the period 2011-2017, Scientific article, Journal of Humanities and Social Sciences No. 52, 2019, Algeria,

-Curriculum and Tools :

Analytical approach Calculation of the economic diversification index "herfendahl-Hirschmann" for the period 2011-2017 according to the Exce software Sample: GDP, exports, imports, balance sheet revenues, crude gross composition of fixed capital Country: Algeria

The most important results-

Adopting economic policies based on valuing the resources and competencies available to the national economy and making it a take-off point to achieve diversification.

-The need to support and qualify the sector of small and medium-sized enterprises, which will play a prominent role in replacing some imported products.

-Encouraging private and foreign direct investment, especially in the industrial sector, which helps to promote the sector, which will certainly have a leading role in driving the diversification path.

2- Braji Sabah, The role of economic policies in the diversification of rentier economies to achieve sustainable development –an applied study on the Algerian economy 2000-2014, Scientific article, Journal of strategy and development, Volume 7, issue 13, 2017. For Algeria.

-Curriculum and Tools :

Analytical approach Calculation of the economic diversification index "herfendahl-Hirschmann" for the period 2011-2017 according to the Exce software Sample: GDP, exports, imports, balance sheet revenues, crude gross composition of fixed capital،
Country: Algeria

-The most important results:

The results of the composite index of economic diversification Herman heffendahl, whose value was closer to the correct one.

-Ineffectiveness of economic policies Algeria's approach and its inability to diversify the economic base.

-Designed economic policies, especially fiscal and monetary policy, are designed within the scenario of the flow of oil revenues, away from economic efficiency and effectiveness -

3- Mohammad Omar Joya., Three essayas in macroeconomic volatility thesis to obtain a doctoral degree in economics. Uni.versity of Bordeaux,. France,2017

- Curriculum and Tools :

The analytical and descriptive approach has been followed with regard to the theoretical aspect, the economic literature and the standard approach to highlight the impact of diversification on productivity and fluctuations in the macro economy and the impact of sectoral shocks on macro fluctuations according to eviews10 The sample Macroeconomic indicators
Country: Afghanistan

-The most important results:

Diversification reduces the volatility of production by diversifying risks and allows the gradual allocation of resources in the economy for their most productive uses and diversification leads to increased productivity growth.

.-Resource-rich countries can diversify their economies by developing new industries that are not linked to primary resources and strengthening linkagesbetween sectors.

-The government of Afghanistan has an important role in the process of diversification through effective coordination of investment decisions, providing incentives for investment in new

sectors and allocating resource rents for the development and improvement of infrastructure and investment in human capital.

Location of the current study from Previous studies:

Similarities	Differences	Current study location
-Finding mechanisms to achieve economic diversification. -Study of indicators of economic diversification(GDP, exports, imports, balance sheet revenues, crude aggregate composition of fixed capital. -The use of statistical software in the standard study (excel ,eviews)	-Focus on the herfendl-Hirschmann coefficient of GDP diversification. -Focus on alternative economic sectors to the hydrocarbon sector. -Applying the strategy of economic foresight in order to achieve the diversification of GDP.	The current study differs from the previous studies mentioned in the proposed mechanism for implementation in order to achieve economic diversification in Algeria, namely, economic forecasting, and this is in order to diversify GDP, as one of the indicators of the volume of economic diversification in Algeria .

Source: Created by the researchers

II. . THE THEORETICAL ASPECT OF THE STUDY:

II.1. Definition of economic diversification:

Diversification is defined as the process of transition to the stage of strengthening the industrial and agricultural economic base and creating a productive base, this means building a healthy local economy moving towards self-sufficiency in more than one sector and reducing dependence on a limited number of export products that may be subject to price fluctuations, volume or low situational demand for it. (NHVIDT, 2013, p. 04).

It is also defined as: "That is the development policy aimed at reducing the economic risks, raising the added value, and improving the level of income, by directing the economy towards diverse or new sectors or markets instead of relying on a single market, sector, or product, and GDP diversification is one of the most important economic diversification strategies and represents the amount of contribution of the main economic sectors to GDP(such as agriculture, industry, services, etc.). (Mohammed, 2018, p. 226).

II.2. How to Measuring economic diversification?

There are many indicators for measuring economic diversification, the most important of which is the herfindahl-Hirschman coefficient, as it includes many variables, and the coefficient is defined by the following formula:

$$H = \frac{\sqrt{\sum_{i=1}^{N} (\frac{x_i}{X})^2} - \sqrt{\frac{1}{N}}}{1 - \sqrt{\frac{1}{N}}}$$

N: Number of activities

xi: The value of the variable in the activity (i)

X: The total value of the variable in all activities

The value of the coefficient ranges from 0 to 1, if it is 0, there is complete diversity in the economy, and if it is 1, then there is no diversity, which is the case when the output is concentrated in one economic activity, and the high values of the coefficient are evidence of a weak economy in evenly distributing its activities over a large number of sectors or products. (Zarouk, 2019, p. 28).

III. Definition of Economic Foresight:

Economic foresight is a science that is based on a long-term view, in the first part it is an attempt to analyze the past to draw lessons and lessons, in the second part it is an exploration of the present in order to understand and interpret it, and the third and final part is forecasting for the future industry in a practical scientific method, and therefore foresight is a scientific work aimed at analyzing the past and understanding the present for the future industry, for example, in the government sector, setting strategic goals is a difficult process that needs a common view or agreement of what the country will be in the future, economic foresight facilitates this process by drawing various trends, forecasts and future possibilities that may occur on the subject of a specific project or policy you want the state applies it, and therefore it helps to make the right decisions to avoid getting into crises and achieve the desired goals. (Radwan, 2012, p. 15), and the duration of the supervision, according to the French school, ranges from 10 to 30 years, and according to the American school, it may exceed 70 years. (Khamis, 2016, p. 106).

III. 1. The Economic Foresight Mechanisms:

The mechanisms of economic foresight vary according to the methodology of their use and the requirements of the study. The following table shows the most commonly used mechanisms:

Table (01): The most commonly used economic forecasting mechanisms

Qualitative mechanisms	Scenarios: a description of a possible future situation of a phenomenon, indicating the path towards which it is heading based on the current situation, and distinguish: -Exploratory (ominous) scenario: in case the economic variables proceed in an undesirable way. -Proactive scenario (the brightest): in case the economic variables proceed in a desirable way.
	The wheel of the future: a participatory approach for a group of individuals, using brainstorming to reveal the different levels caused by all kinds of change of emerging trends, new policies and innovations.
	Relational tree: based on the deconstruction of a complex topic into partial topics in the form of a tree representing a hierarchy of deconstruction of the topic to help choose strategies from which solutions to the problem emerge.
Quantitative mechanisms	Time series: analysis of time series data of the variables under study, by analyzing the field of recurrence, by regression analysis of independent variables, and analyzing how time affects the phenomenon by means of a self-regression model, and relies on this technique in planning future macroeconomic policy.

Source: From the achievement of researchers based on what was stated in: (Walid, 2016, p. 26)) and (kalil, 2019, p. 04), (morrison, 1983, p. 44), (Amen, 2018, p. 60).

III 2.The stages of any forward-looking study are generally summarized in : (bouzaiane & mouelhi, 2008, p. 04)
- Retrospective or historical analysis of the phenomenon
- Present analysis and identification of internal and external factors of phenomena
Studied
- Evaluation, forecasting and selection
- Strategy drawing

III **3.Conditions for the credibility of the scenario approach:** (GODET, 2006, p. 98)

-Relevance (or relationship to the topic): The variables studied within the framework of the scenario should be related to its subject in a direct or indirect way; we should not branch out in the analysis in such a way as to deviate from the thrust and rationale of the subject, the basis for constructing this scenario

-Coherence : the ideas discussed in the scenario should be coherent and interconnected in logical relationships; the events and decisions taken should also be logically arranged describing the way of transition from the present to the desired future smoothly and in a detailed chronological order

-Importance: the way to convince decision-makers of the need to move towards a specific desired future is to highlight its importance; most often the method of persuasion is by comparing the desired and ominous scenario; hence, the importance of following the desired path or scenario is highlighted

-Transparency: in no case should the facts be hidden during the scenario creation process; all decisions to be taken and the consequences of their taking and not taking should be explained with absolute credibility and transparency

IV. Methods and Materials:

In this study, the descriptive and analytical approach was used as an attempt to interpret and analyze the facts in order to make suggestions on achieving GDP diversification, the forward-looking approach to building the future of GDP diversification, and the standard approach to measure and analyze the relationships between variables affecting GDP diversification with ARDL model and predict them in the future.

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IV. 1. The econometric study:

The econometric study was based on the self-regression approach of distributed decelerating gaps ARDL, in order to estimate the long-term and short-term relationship between variables, as it combines self-regression models with models of distributed deceleration periods in one model, and in this methodology the time series is a function of slowing down its value and the values of explanatory variables and slowing it down by one or more duration.**(using eviews10 program),** Data for this study were collected from bank-of-algeria and ONS" les comptes économiques". during the period (1990-2019) Appendix No. 04.

. 1. Determination of model variables with indication of mathematical and standard form

The following table shows the components of the study model:

Table (02): The components of the study model

Model name: The contribution of the added values of alternative economic sectors to the diversification of GDP in Algeria				
Mathematical formula	hhpib =f (agr ,ind,ser ,bat)			
Econometric formula	$\Delta hhpib = a_0 + \sum_{j}^{p1} = 1\alpha j\ \Delta hhpib\ t-j + \sum_{j}^{p2} = 0\beta j\ \Delta agr\ t - j + \sum_{j}^{p3} = 0\sigma j\ \Delta bat\ t - j + \sum_{j}^{p4} = 0\gamma j\ \Delta ind\ t - j + \sum_{j}^{p5} = 0\delta j\ \Delta ser\ t - j + \pi 1 hhpib\ t - 1 + \pi 2 agr\ t - 1 + \pi 3 bat\ t - 1 + \pi 4 ind\ t - 1 + \pi 5 ser\ t - 1 + \varepsilon t +$ Where : (Δ) represents the first difference, (π1,π2,π3,π4,π5) represent long-term relationship coefficients, (αj,βj,δj,γj,σj) represents the dynamics of the model in the short term, and ε represents the error limit			
Variables of the study	**Mathematical coding**	**Definition of variables**	**The unit**	**Source of data**

Dependent variable	*Lhhpib* *After entering the logarithm on the data*	The herfendahl Hirschmann coefficient of GDP diversification	Coefficient between 0 and 1	Calculated by EXECL
Independent variables	*lagr* *After entering the logarithm on the data*	Added value for the agriculture sector	billion Algerian dinars	https://www.bank-of-algeria.dz/html/bulletin_statistique.htm consulté le 12/06/2022, à22 :00h https://www.ons.dz/spip.php?rubrique309,les comptes économiques consulted on 20/06/2022, à20:00h
	Lind *After entering the logarithm on the data*	Added value for the industry sector	billion Algerian dinars	https://www.bank-of-algeria.dz/html/bulletin_statistique.htm consulté le 12/06/2022, à22 :00h https://www.ons.dz/spip.php?rubrique309,les comptes économiques. consulted on 20/06/2022, à20:00h
	Lser *After entering the logarithm on the data*	The added value of the service sector	billion Algerian dinars	https://www.bank-of-algeria.dz/html/bulletin_statistique.htm consulté le 12/06/2022, à22 :00h https://www.ons.dz/spip.php?rubrique309,les comptes économiques. consulted on 20/06/2022, à20:00h
	Lbat *After entering the logarithm on the data*	Added value for the construction and Public Works sector	billion Algerian dinars	https://www.bank-of-algeria.dz/html/bulletin_statistique.htm consulted on 12/06/2022, à22 :00h https://www.ons.dz/spip.php?rubrique309,les comptes économiques consulted on 20/06/2022, à20:00h

Source: Established by the researchers

IV. 2 The proposed strategy based on the scenario Matrix:

After the the econometric study and demonstrating the good predictability of the model, we can draw scenarios to build a better economic future than the current situation. The CAGR of the study variables was calculated through the exploratory scenario and the proactive scenario, to build the proposed strategy to diversify GDP in Algeria. The compound annual growth rate (CAGR) was calculated using Excel as follows:
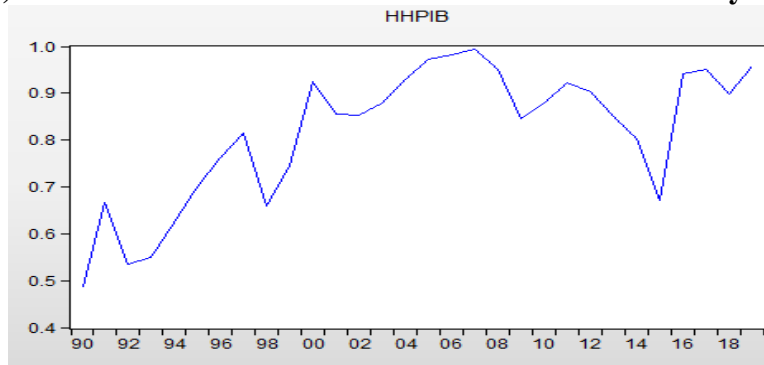
(End value/start value) ^ (1 / intervals) -1.

V. Results and discussion

V .1 Evolution of the GDP diversification index in Algeria during the period (1990-2019):

The GDP diversification index in Algeria was calculated during the period (1990-2019), based on the herfendahl Hirschmann coefficient, where the main sectors that can contribute to the diversification of GDP were selected: agriculture, industry, services, construction and Public Works. The results are shown in the following graph:

Figure (01): Evolution of the GDP diversification index over 30 years (1990-2019)

Source: Established by researchers based on the outputs of eviews10 program

It is clear from the graph curve that the GDP diversification index in Algeria during the period (1990-2019) witnessed fluctuation and instability and ranged between (0.5-0.99), which indicates the weakness of diversification in the economy as a rentier and dependent on hydrocarbons, and the cases of rises and falls in the index during different periods are explained by its association with the rise and fall in oil prices, in 2008 the index was estimated at: 90.9, which means that the diversification in GDP was almost non-existent, and its 1990 to 0.5 and 2014 to 0.6 is due to the decline in oil prices in those two years, and not to an increase in the rate of diversification of the economy

V .2. Study of the stability of time series:

The stability of time series was studied by the Dicky Fuller test (ADF), which showed the following results:

Table (03): Unit root test results for study variables using Dickey Fuller

	At the first difference				
Degree of integration	**None**	**Intercepte**	**Trend and intercepte**	**At the level**	***Variables***
I(1)	P=0.000	P=0.001	P=0.0004	P=0.1645	Hhpib
I(1)	P=0.919	P=0.88	P=0.0024	P=0.4343	Agr
I(1)	P=0.999	P=1.00	P=0.0007	P=1.00	Ind
I(1)	P=0.000	P=0.001	P=0.0015	P=1.00	Ser
I(1)	P=0.793	P=0.71	P=0.0015	P=0.9913	Bat

Source: Established by researchers based on the outputs of eviews10 program

Based on the results shown in the table above, it turns out that the variables of the model under study are unstable at the level and stable at the first difference, because the calculated values of (T) came greater than the values of (T) tabulated at the level of 5% significance, and based on this result, it can be said that the variables of the study are integrated of the first degree, which allows to follow the ARDL methodology as the most appropriate methodology for this study.

V.3. Determination of the number of gaps and slowdowns:

To determine the number of time gaps of the model, the AIC criterion was relied on, and by choosing the lowest value of this criterion, the optimal slowdowns for the ARDL model are (**2.2.1.0.2**) (**appendix 01**).

V.4. The co-integration test (BOUNDS TEST):

In order to confirm the existence of a long-term relationship within the framework of the UECM unrestricted error correction model, Pesaran et all (2001) offers a modern approach to testing the verification of the extent of a long-term equilibrium relationship called bounds test by testing the following two hypotheses:

H0: *the absence of a common integration relationship between variables in the long term*

H1: *the existence of a common integration relationship between variables in the long term*

The results are shown in the following table:

Table (04): The results of the cointegration test according to the bound test

ARDL (2.2.1.0.2)			
The significance level	**The minimum Limit**	**The Upper limit**	**F-statistic**
10	2.45	3.52	
5	2.86	4.10	4.194133
2.5	3.25	4.05	

Source: Established by researchers based on the outputs of eviews10 program

Based on the results of the above table, we note that the Fisher F value was estimated at 4.194133, which is greater than the critical values of the upper limit at all levels of morale, and therefore we accept the alternative hypothesis that there is a common integration relationship between the study variables in the long term, that is, there is a long-term equilibrium relationship between the independent variables (value added of the agricultural sector, value added of the industrial sector, value added of the service sector, value added of the construction and Public Works sector) and the dependent variable (GDP diversification index).

V.5. Estimating the long-term relationship of the model:

Since the ARDL model requires the introduction of time-delayed variables as explanatory variables, the optimal model in terms of the number of delays for the variables included in it is ARDL (**2.2.1.0.2**). After confirming the existence of a long-term relationship between the variables of the study, it became possible to estimate the latter, and the results are shown in the following table:

Table (05): Results of estimating the long-term relationship of the Model ARDL (2.2.1.0.2)

ARDL (2.2.1.0.2) dependent variable: Lhhpib			
Variable	**Coefficient**	**t-statistic**	**Prob**
Lhhpib	0.324694	2.123459	0.0497
Lagr	-1.578682	-3.465410	0.0032
Lind	3.538616	4.303622	0.0005
Lser	-0.033553	-0.914246	0.0070
Lbat	-0.777269	-3.166931	0.0060
Lhhpib = (-1.5787*Lagr + 3.5386*Lind - 0.0336*Lser - 0.7773 *Lbat -6.2354)			

Source: Established by researchers based on the outputs of eviews10 program**(Appendix No03)**

Based on the above results, the parameters of the estimated model can be analyzed in the long term as follows:

- The results of estimating the ARDL model for the long-term relationship indicate that all parameters are significant, which indicates the correctness of the model in the estimate, since the probability values of the variables are less than 0.05, so it turns out through the long-term relationship that the diversification index of GDP hhpib is significant and has a positive effect.

- The added value for the agriculture sector (Lagr): The results show that the lagr variable is statistically significant at a significant level of 5% according to the statistical test, and the same results also show that there is an inverse relationship between it and the economic

diversification index, where the estimated value of its regression coefficient is 1.578682, which means that any

increase in LAGR by 01% will lead to a decline in economic diversification by 1.57%, and this does not correspond to economic theory, but corresponds to economic reality, despite the possibilities available to the sector, but its contribution to the diversification of GDP the total is weak due to the absence of a clearly defined strategy for the sector, especially in terms of strengthening the main components of the sector :land, water, human capital.

- The added value of the services sector (Lser): It has no moral effect in the long term at the level of morale of 1%, 5% as well as 10% according to the t-statistical test, while the relationship between it and economic diversification came in reverse, as the estimated value of its regression coefficient was 0.033553 -, this means that any increase in the LSER by 0.1% will lead to a decline in economic diversification by 0.033%, and this does not correspond to economic theory, but corresponds to economic reality, despite the possibilities available to the sector ,its contribution to the diversification of GDP is weak due to the lack of attention to the two most important drivers of the sector, namely tourism and transport.

- The added value for the construction and Public Works sector (Lbat): The results show that the variable Lbat is statistically significant at a significant level of 5% according to the test-statistical, and the same results also show that there is an inverse relationship linking it with the economic diversification index, where the estimated value of its regression coefficient is 0.777269 -, this means that any increase in Lbat by 0.1% will lead to a decline in economic diversification by 0.77%, and this does not correspond to economic theory, but corresponds to economic reality, despite the possibilities available to the sector and projects implemented during economic recovery programs but its contribution to GDP diversification is weak because infrastructure projects are insufficient to promote the sector.

- The added value of the industrial sector (Lind): It is statistically obvious at a significant level of 5% according to the t-statistical test, and it has a direct relationship with the economic diversification index, as an increase in this value by 01% will lead to a corresponding increase in expanding the base of economic diversification by 3.53%, which is a result consistent with the concepts of the logic of economic theory, that is to say the Algerian economy depends on the industrial sector more than other sectors in diversifying GDP due to the development of manufacturing projects and the support of small and medium enterprises.

V.6. Estimating the short-term relationship of the model:

For the purpose of measuring the relationship in the short term, the error correction model was used, as this model has two advantages: the first is measuring the short-term relationship. The second is that it measures the speed of adjustment to rebalance the dynamic model.

The following table shows the results of estimating the error correction formula for the selected ARDL model:

Table (06): Results of estimation of short-term relationship of a model ARDL (2.2.1.0.2)

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-statistic**	**Prob**
D(Lhhpib (-1))	0.324694	0.152908	2.123459	0.0497
D(Lagr)	-0.395939	0.191422	-2.068413	0.0552
D(Lagr (-1))	0.805105	0.220036	3.658964	0.0021
D(Lser)	0.112566	0.039156	2.874855	0.0110
D(Lbat)	-0.539127	0.168401	-3.201454	0.0056
D(Lind)	0.966211	0.511657	1.888397	0.0772
D(Lind (-1))	-1.177559	0.309961	-3.799055	0.0016
CointEq (-1)	-0.693617	0.184647	-3.756448	0.0017

Source: Established by researchers based on the outputs of eviews10 program(**Appendix No04**)

Based on the above results, the parameters of the estimated model in the short term can be analyzed as follows:

- According to the results shown in the table above, we note the negative reference to value-added transactions for the agriculture, construction and Public Works sectors, while the value-

added transactions for the industry and services sectors are positive, at the same time, the diversification index in GDP is positive and significant, this indicates that diversification in the short term is focused on the industrial and service sectors.

- As for the error correction limit parameter (-1) COINTEQ, according to the same results, its value was negative (-0.693617) and significant at the level of 1% morale, which means that the value of 0.638113 of the short-term errors are corrected within a unit of time estimated at 1.4417 years (1/0.693617=1.4417), i.e. approximately 01 years and 05 months towards its equilibrium value, and this is after the impact of any shock in the model as a result of the change in the explanatory variables ,in other word when the GDP diversification index deviates in the period T-1, the imbalance between the two terms can be adjusted by 69% in the period T.

V.7. Model validity test results:

To make sure of the validity of the estimated form, the latter is required to undergo a set of the following diagnostic tests:

V.7. 1 -Testing the serial correlation of the Model Residual:

The results of the serial correlation test of the residuals can be illustrated in the following table:

Table (07): Results of Breusch-Godfrey Serial Correlation LM test

Breush-Godfrey Serial Correlation LM Test			
F-statistic	0.790672	Prob. F(2,14)	0.4725
Obs*R-squared	2.841708	Prob. Chi-square (2)	0.2415

Source: Established by researchers based on the outputs of eviews10 program

The above table shows that the Fisher probability is equal to 0.4728, which is greater than the significance level of 5%, which means that there is no self-correlation of the residuals of the regression equation.

V.7.2- Testing the instability of error variance:

The results of the variation instability test can be illustrated in the following table:

Table (08): Results of the arch error variance instability test

Heteroskedasticity Test ARCH			
F-statistic	0.092605	Prob. F(1,25)	0.7634
Obs*R-squared	0.099644	Prob. Chi-square (1)	0.7523

Source: Established by researchers based on the outputs of eviews10 program

The above table indicates that the Fisher probability is equal to 0.7634, which is greater than the significant level of 5%, which means that the random error limit variation is constant.

V.7.3. Testing the normal distribution of random errors:

The results of testing the normal distribution of random errors can be illustrated in the following graph:
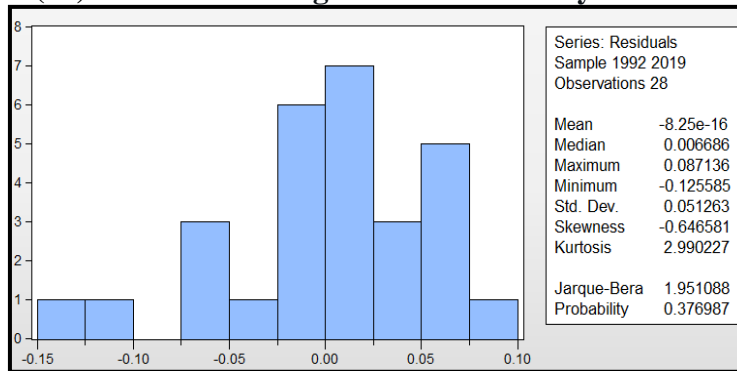
**Figure (02): results of Histogram and Normality test of Residuals**

Source: Established by researchers based on the outputs of eviews10 program

The above graph indicates that the probability of Jack-Berra is equal to 0.376987, which is greater than the significance level of 5%, which means that random errors are distributed normally.

V.7. 4. Test the stability of the structure of the estimated model:

To test the structural stability of the model, the cumulative sum of residues (CUSUM) test was used and the results are shown in the following figure:

Figure (03): Cumulative Sum of Recursive Residual test (CUSUM)
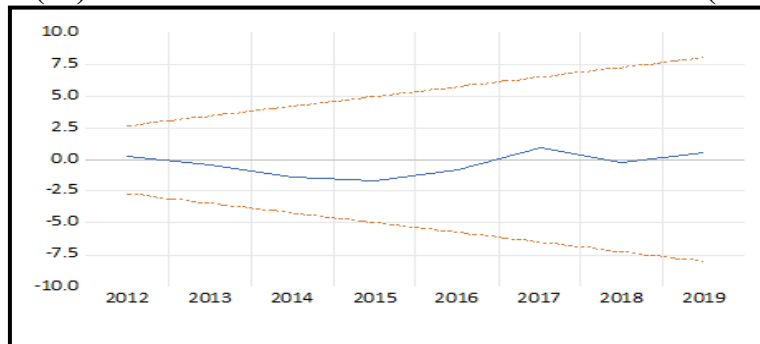
Source: Established by researchers based on the outputs of eviews10 program

From the above figure, we can see that the curve is located within the bounds of significant level (2.5%), which means that there is stability and harmony in the model between the long-term and short-term results. Accordingly, it can be said that the long-term and short-term models do not contain any structural change.

V.8 . Prospective of the GDP diversification index for the period (2020-2030):

The prospective study was conducted through three stages:
- Extension of time series of independent variables depending on the time period to be predicted.
- Setting target values for independent variables in the ARDL model equation.
- Calculation of the diversification index in the forecast GDP for the new time period.

To perform this process, eviews 10 program is used and gave the following results:

*Figure (04): Model foreca*st for 2020-2030
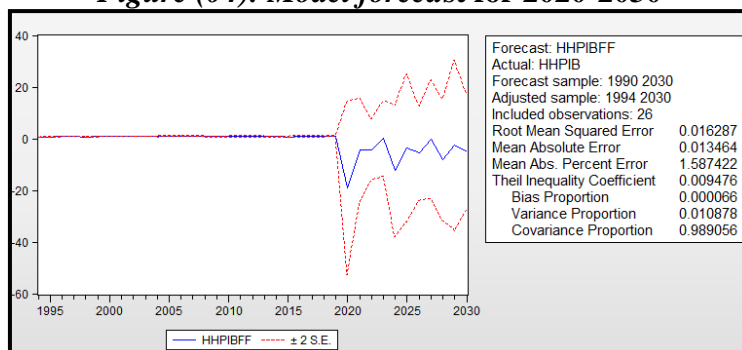
Source: Established by researchers based on the outputs of eviews10 program

The results of the forecast of the GDP diversification index for the period (2020-2030) showed that its value will decrease during the forecast period by (0% -20% as a minimum), and

therefore the diversification in GDP will increase, due to the diversity in economic activities, and this was confirmed by the Herfindahl Hirschman Index. Also, the value of the Theil Coefficient was estimated at (0.009476), the bias ratio at(0.000066), the variance ratio at(0.010878), which is less than 1 and close to 0, and the covariance ratio was estimated at (0.989056), which is close to 1, which indicates that the model has a good ability to predict for the period 2020-2030, so its results can be relied on in drawing up development policies and predicting them in the future in order to Making the right economic decisions to achieve the set goals.

The proposed strategy based on the scenario Matrix:

The results are shown in the following tables (Tables number 9 and 10):

Table (09): Exploratory scenario matrix of study variables

Var	1990	1991	1992	1993	1994	1995	1996	1997
Agr	62725.4	87307	128416.3	131102	145614.5	196559.5	277842.1	242703.2
Ind	66921.9	99536.9	127161.1	130880.2	161647.6	193904.7	213419.5	223180.5
Ser	21594.2	27275	35994.1	43182.7	54741.4	76291.8	90837.9	103307.4
Bat	57185.3	78527.6	102149.4	121496.2	151781.3	991160.7	217685.1	243651
Hhpib	0.486498	0.666779	0.534420	0.549453	0.622904	0.700498	0.763144	0.814458

Var	1998	1999	2000	2001	2002	2003	2004	2005
Agr	324845.8	359665.8	346171.4	412119.5	417225.2	515281.7	580505.6	581615.8
Ind	256821.1	270395.5	290749.6	315230.5	337556.2	355370.6	353370.6	418294.9
Ser	109841.2	118889	130448.6	141882.9	153889.6	169482.6	183559.5	205771.1
Bat	265412.1	271257.7	292046.3	320507.1	369939.3	401014.4	458674	505423.9
Hhpib	0.658849	0.745368	0.924271	0.855914	0.853715	0.879488	0.928317	0.956166

Var	2006	2007	2008	2009	2010	2011	2012	2013
Agr	641285	708072.5	727413.1	931349.1	1015258.8	1173713.9	1421693.3	164000.6
Ind	449581	479791.1	519631.6	570673.2	617404.9	663756.5	728615.2	771787.4
Ser	226224.6	247972.1	280131.5	323684.6	369400	412721.5	460340	516178.5
Bat	505423.9	732720.7	869988.6	100054.9	1194113.5	1262566.7	1411159.6	1569313.5
Hhpib	0.974306	0.993778	0.888932	0.846738	0.878196	0.921560	0.902039	0.850930

Var	2014	2015	2016	2017	2018	2019	CAGR 1990/2019
Agr	1771495.6	1986378.8	2140300	2219100	2427000	2429400	12%
Ind	838504.8	900870.6	979300	1040800	1127900	1198500	9%
Ser	568322.8	629765.7	745300	8235500	8311800	8697800	20%
Bat	1730198.1	1850768.9	2072900	2203700	2346500	2481400	12%
Hhpib	0.803643	0.672067	0.942332	0.950229	0.897941	0.959128	2%

Source: Established by researchers based on Excel

The results of the exploratory scenario of the study variables during the period 1990-2019, which are shown in the table above, demonstrates that the annual rate of added value growth for the agriculture, construction and public works sector came at the same pace for 30 years. It was estimated at 12%. While the value added for the industrial sector was estimated at 9% and services at 20%, which negatively affected the GDP diversification index, which was estimated at 2%.

Table (10): proactive scenario matrix of study variables

Var	2020	2021	2022	2023	2024	2025
Agr	2605000	2752223	2805400	3023658	3225658	3326549
Ind	1202548	1305698	1425648	1623658	1725987	1965987
Ser	8729875	8832456	9036545	9265845	9425005	9600555
Bat	2500366	2605454	2812354	2963544	3125444	3344551
Hhpib	0.927964	0.822591	0.800955	0.795330	0.755542	0.684864

Var	2026	2027	2028	2029	2030	CAGR 2020 2030
Agr	3532654	3725658	3956987	4159875	4436987	5%
Ind	2145123	2351325	2502254	2800547	3036548	9%
Ser	9983265	11260000	11565456	12305445	15069892	5%
Bat	3569875	3702255	3965478	4156888	4309845	5%
Hhpib	0.663600	0.659480	0.635122	0.670336	0.617426	-4%

Source: Established by researchers based on Excel

The table above shows the results of the proactive scenario of the study variables for the period 2020-2030, where the added values of the sectors of agriculture, industry, services, construction and public works will increase, respectively, by percentages: 5%, 9%, 5% and 5%, which will positively affect the diversification indicator in GDP, which will decrease by 4%.

VI. Conclusion

The results of this research have confirmed the importance of Algeria's tendency to adopt a policy of economic diversification in order to diversify its GDP, relying on the mechanisms of economic foresight, as the study allowed to reach the following results:

- The Herfindahl Hirschman coefficient of GDP diversification was fluctuating and unstable, ranging between (0.5-0.99), and was close in most cases to 1 during the period 1990-2019, which indicates a weak diversification in the economy in that period, and this proves the validity of the first sub-hypothesis, which states that the realistic structuring of GDP in Algeria is characterized by a weak contribution of the main economic sectors and the dominance of the hydrocarbon sector.

- The degree of influence of alternative economic sectors on the GDP diversification index varies. The Algerian economy can rely on the industrial sector to diversify GDP to a greater extent than other sectors, as it has a direct relationship with the GDP diversification index, in the long and short term. As for the agriculture, construction, Public Works and services sectors, there is an inverse relationship between them and the GDP diversification index, due to the lack of good exploitation of their resources. This proves the validity of the second sub-hypothesis, which states that the degree of influence of alternative economic sectors on the GDP diversification index varies.

- The embodiment of the economic prospects in Algeria requires the availabilitya strong political will to establish or re-establish the necessary administrative bodies competent in this field, and to eliminate fluctuations in the relevant political decisions (the establishment of a state office in charge of foresight, then its abolition, then the establishment of a secondment ministry that specializes in foresight and then abolishing it), Which, in our opinion, was the result of weak political will in this regard. On the other hand, the success of building an effective economic foresight system in Algeria is linked to the formation of high-level scientific competencies in this delicate scientific field.

- Relying on economic foresight, as a strategy for managing economic activity in Algeria, can contribute to achieving the economic diversification required for a real economic take-off. Relying on economic foresight techniques, including scenario technique, will enable the state to estimate the future structure of GDP in the long term.

-Scenarios technique presents many perceptions for the contribution of alternative economic sectors to the diversification of GDP, which will help the Algerian government to formulate policies and build future strategies in order to achieve the desired results and reach the appropriate degree of diversification, and this will enable Algeria to face the shocks associated to oil price fluctuations.

Accordingly, the diversification of GDP is linked to the need for the Algerian state to adopt an economic strategy based on activating economic forecasting mechanisms and applying them to the main variables that drive economic activity in Algeria, and this confirms the validity of the main hypothesis of this study.

Based on the results of the study, the researchers recommend:

- The need to activate economic forecasting techniques and create appropriate bodies that can take care of the process, especially the re-establishment of a delegated ministry in charge of forecasting and statistics.

- Activating forward-looking Studies in all alternative economic sectors to the hydrocarbon sector, such as renewable energies, tourism, and others.

- Studying successful international experiences in applying foresight and diversification, in order to benefit from them. In light of the successful international experiences in the policy of economic diversification as a result of the foresight strategy, Singapore and the UAE are pioneers in foresight and diversification, and this is evident on the economic sectors, especially the industrial and services sectors.

- Organizing training courses for the benefit of the frames and competencies in charge of foresight in Algeria, similar to the training course held in South Korea in 2013, in order to evaluate and develop the sector of foresight, statistics and knowledge exchange.

- Urging universities to pay attention to the formation of competent frameworks in the field of economic forecasting.

- The need to diversify investment through the contribution of the private sector, which is distinguished in the sectors of services, trade, Public Works and construction, and therefore the need to support it in other sectors, especially industrial, and try to remove the obstacles facing it, especially the problem of industrial real estate, while giving the private sector an opportunity to participate in policy-making, because it is more aware of.

- Supporting and encouraging small and medium enterprises because they are characterized by innovation, diversification in their field of activity, change and adaptation to environmental variables, speed in implementation and achievement and dynamism.

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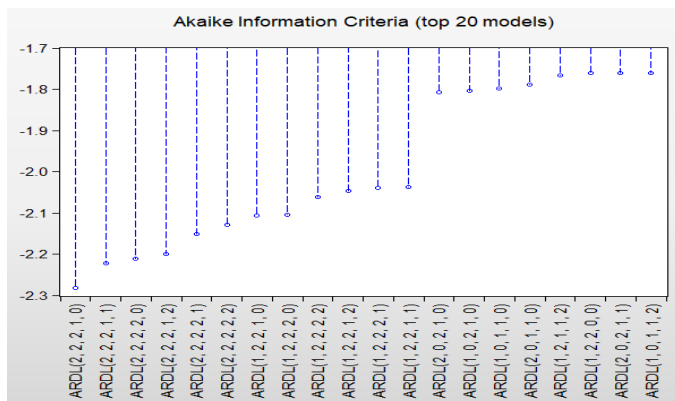bouzaiane, l., & mouelhi, r. (2008). *initiation aux concepts de base de la prospective,projet de M2PA.* université virtuelle de tunisie.

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- Appendices:

Appendix No. 01: the top 20 candidate models for the akaike Criterion

Appendix No. 02: long-term and short-term relationship estimation results

Appendix No03: results of the ARDL model estimation

Dependent Variable: LHHPIB
Method: ARDL
Date: 06/23/22   Time: 14:19
Sample (adjusted): 1992 2019
Included observations: 28 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): LAGR LSER LBAT LIND
Fixed regressors: C
Number of models evaluated: 162
Selected Model: ARDL(2, 2, 1, 0, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LHHPIB(-1)	0.631077	0.152407	4.140741	0.0008
LHHPIB(-2)	-0.324694	0.152908	-2.123459	0.0497
LAGR	-0.395939	0.191422	-2.068413	0.0552
LAGR(-1)	0.106044	0.187709	0.564939	0.5800
LAGR(-2)	-0.805105	0.220036	-3.658964	0.0021
LSER	0.112566	0.039156	2.874855	0.0110
LSER(-1)	-0.135839	0.037367	-3.635300	0.0022
LBAT	-0.539127	0.168401	-3.201454	0.0056
LIND	0.966211	0.511657	1.888397	0.0772
LIND(-1)	0.310673	0.513771	0.604693	0.5539
LIND(-2)	1.177559	0.309961	3.799055	0.0016
C	-4.324955	1.080579	-4.002442	0.0010

R-squared	0.909579	Mean dependent var	-0.198207
Adjusted R-squared	0.847415	S.D. dependent var	0.170478
S.E. of regression	0.066592	Akaike info criterion	-2.282934
Sum squared resid	0.070952	Schwarz criterion	-1.711989
Log likelihood	43.96108	Hannan-Quinn criter.	-2.108391
F-statistic	14.63189	Durbin-Watson stat	1.651304
Prob(F-statistic)	0.000002		

ARDL Cointegrating And Long Run Form
Dependent Variable: LHHPIB
Selected Model: ARDL(2, 2, 1, 0, 2)
Date: 06/23/22   Time: 20:21
Sample: 1990 2019
Included observations: 28

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LHHPIB(-1))	0.324694	0.152908	2.123459	0.0497
D(LAGR)	-0.395939	0.191422	-2.068413	0.0552
D(LAGR(-1))	0.805105	0.220036	3.658964	0.0021
D(LSER)	0.112566	0.039156	2.874855	0.0110
D(LBAT)	-0.539127	0.168401	-3.201454	0.0056
D(LIND)	0.966211	0.511657	1.888397	0.0772
D(LIND(-1))	-1.177559	0.309961	-3.799055	0.0016
CointEq(-1)	-0.693617	0.184647	-3.756448	0.0017

Cointeq = LHHPIB - (-1.5787*LAGR -0.0336*LSER -0.7773*LBAT + 3.5386 *LIND -6.2354)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAGR	-1.578682	0.455554	-3.465410	0.0032
LSER	-0.033553	0.036700	-0.914246	0.3742
LBAT	-0.777269	0.245433	-3.166931	0.0060
LIND	3.538616	0.822241	4.303622	0.0005
C	-6.235366	1.304868	-4.778543	0.0002

Appendix No. 04: time series data for study variables (1990-2019) unit billion Algerian dinars

année	hhpib	Agr	ind	ser	bat
1990	0,48649888	62,73	66,92	21,59	57,19
1991	0,6667794	87,31	99,54	27,28	78,53
1992	0,5344207	128,42	127,16	35,99	102,15
1993	0,54945375	131,10	130,88	43,18	121,50
1994	0,62294086	145,61	161,65	54,74	151,78
1995	0,70049846	196,56	193,90	76,29	191,16
1996	0,76314479	277,84	213,42	90,84	217,69
1997	0,81445876	242,70	223,18	103,31	243,65
1998	0,65884977	324,85	256,82	109,84	265,41
1999	0,74536841	359,67	270,40	118,89	271,26
2000	0,92427156	346,17	290,75	130,45	292,05
2001	0,85591484	412,12	315,23	141,88	320,51
2002	0,85371566	417,23	337,56	153,89	369,94
2003	0,87948877	515,28	355,37	169,48	401,01
2004	0,92831721	580,51	355,37	183,56	458,67
2005	0,95616632	581,62	418,29	205,77	505,42
2006	0,97430651	641,29	449,58	226,22	505,42
2007	0,99377846	708,07	479,79	247,97	732,72
2008	0,8888933	727,41	519,63	280,13	869,99
2009	0,84673817	931,35	570,67	323,68	1 000,05
2010	0,87819662	1 015,26	617,40	369,40	1 194,11
2011	0,92156053	1 173,71	663,76	412,72	1 262,57
2012	0,90203919	1 421,69	728,62	460,34	1 411,16
2013	0,85093037	1 640,01	771,79	516,18	1 569,31
2014	0,80364305	1 771,50	838,50	568,32	1 730,20
2015	0,67206714	1 936,38	900,87	629,77	1 850,77
2016	0,94233253	2 140,30	979,30	7 453,00	2 072,90
2017	0,95022943	2 219,10	1 040,80	8 235,50	2 203,70
2018	0,89794122	2 427,00	1 127,90	8 311,80	2 346,50
2019	0,95912868	2 429,40	1 198,50	8 697,80	2 481,40

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