



УПРАВЛІННЯ ЕКОНОМІКОЮ ТА ЇЇ ІНСТИТУЦІЙНЕ ЗАБЕЗПЕЧЕННЯ

ECONOMIC MANAGEMENT AND ITS INSTITUTIONAL FRAMEWORK

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ZAHAF Youcef, Dr. Sci. (Econ.), Prof.

University Centre of Maghnia, Institute of Economics, LEPPESE Laboratory

Bp 600-13300 Al-Zawiya Road, Al-Shuhada District, Maghnia, Tlemcen, Algeria

e-mail: Youcefmaster2014@gmail.com

ORCID: <https://orcid.org/0000-0002-6453-6686>

CHIBI Abderrahim, Dr. Sci. (Econ.), Prof.

University Centre of Maghnia, Institute of Economics, LEPPESE Laboratory

Bp 600-13300 Al-Zawiya Road, Al-Shuhada District, Maghnia, Tlemcen, Algeria

e-mail: chibirahim@yahoo.fr

ORCID: <https://orcid.org/0000-0001-7565-4656>

THE NATURE OF THE NEXUS BETWEEN CENTRAL BANK INDEPENDENCE AND MACROECONOMIC INDICES: EMPIRICAL EVIDENCE FROM ALGERIA

The article sought to investigate the nature of the relationship between the independence of the Central Bank of Algeria and macroeconomic indices using econometrics. The findings showed that, in spite of the reforms, the Central Bank of Algeria's independence still does not have the necessary efficacy to improve Algeria's economy. Furthermore, the Algerian Monetary Authority's decision-making authority is crowded out by the fiscal policy plans.

Keywords: central bank independence; economic reforms; policy coordination; monetary policy; Algeria.

Delving into the concept of the independence of central banks is considered a permanent renewal because this concept is associated with several research gaps in the field of Economics. The issue of coordinating fiscal and monetary policies is among them, as is the complexity of measuring central bank independence accurately. Further, the concept of central bank independence is linked to the

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extent of control over two key variables in the economy, namely the inflation rate and the exchange rate.

Many debates argued and still the impact of central bank independence on economic performance (Alesina, Summers, 1993) notes the possibility of control price stability, but non-impact on some economic variables (Iversen, 1998) showed monetary policies interaction in a monetary union as a two-stage game, trying to shed lights on the impact of money on economy. Furthermore, some economists investigated the significance of central bank independence and monetary policy measures to define their impact on economic factors (Pollard, 1993) additionally tied economic performance to central bank independence in his work.

Measuring central bank independence developed through many stages, since each stage tried to measure a concept, it is difficult to provide a model that gives very accurate results about it. The process of measuring the independence of the central bank was associated with concepts that emerged through several researches. A. Alesina (1988, 1989), S. Eijffinger and E. Shcalling (1992), A. Cukierman et al. (1992) classified two basic measures to measure the independence of the Central Bank, namely political criteria and economic criteria.

Of course, the Algerian economy, within the framework of Sustainable Development Strategies and the aim of raising GDP¹, and create jobs to reduce unemployment rates, pursues a public policy in accordance with trends that support the financial authority in leading these goals. Where the monetary mass M2 knew a growth of 4.17% in April 2024, in addition to recording an increase in credit to the economy by 1.04%, inflation decrease to 7.44% in the same period. Algeria launched many reforms as new loan and credit law 23-09² to improve monetary authority performance. In addition, several goals have been set to be achieved by the year 2030, such as decreasing the dependence on Oil and Gaz revenues, reforming the tax system.

The purpose of this article is to investigate the relationship between Algeria's economic changes from 1990 to 2024 and the independence of the Bank of Algeria using ARDL model.

The article examines how the Bank of Algeria has molded its capacity to formulate and implement monetary policy independently by examining amendments to statute No. 90-10 on cash and loans, which granted the Bank greater autonomy. The article attempts to understand how much the monetary and fiscal authorities collaborate to create the nation's macroeconomic framework and what

¹ This indicator has known a rise of 3.1% in 2023, according to the reports of the Bank of Algeria, considering the base year 2001. As a result of various measures taken by the Algerian authorities, the most important of which is non-traditional financing, which ensured the continuity of various projects planned after 2017, which defined the expiration of the resource control Fund.

² One of the most important provisions of this law is to integrate with the global economy within the framework of a governance project that ensures the continuity of general economic reforms, and is established to attract investments through facilitating transactions by the Monetary Authority. In addition to strengthening the independence of the Bank of Algeria.

this means for the Bank's freedom to act by examining the relationship between important elements that represent economic reforms, Algeria's macroeconomic policy, and the independence of the central bank in Algeria.

C. de Resende (2007) concluded that there is a fundamental relationship between government debt and future surpluses by determining the price level, and that the central bank is not completely independent by managing the monetary base in determining the price, and this is through a coefficient δ proposed by the researcher that measures the interdependence of both financial and monetary authorities. L. Jácome and S. Pienknagura (2022) have demonstrated through the findings of their research that there is a negative correlation between Latin American countries' central banks' levels of independence and inflation; that is, as central banks' independence grows, so does their ability to control inflation. A. Garriga and C. Rodriguez (2020) reached the same results. Where it turned out that all the dimensions that reflect the independence of central banks affect and contribute to controlling inflation. Moreover, they clarified the criteria for determining the best reforms of central banks to fight inflation in developing countries. In the same context, P. Baumann et al. (2021a) supported the idea that the independence of the Central Bank contributes to reducing inflation, but with the long-term hypothesis. Moreover, transparency supports the independence of central banks in achieving economic goals, especially controlling inflation, and this is shown by the work of N. Dincer and B. Eichengreen (2014). Prior to these studies, H. de Mendonça (2005) concluded that CBI indices are very closely just measure of inflation bias. More than that, he showed the real definition of CBI as a monetary policy conduct not as framework of credibility. H. Berger et al. (2000) reached the existence of a quite robust between CBI and inflation.

D. Masciandaro and D. Romelli (2018) explored the concept of central banks as government institutions and they considered CBI, as endogenous variable must have support to improve economic performance (above the traditional relationship between central banks and inflation target) (Fry, 1998). Measured central bank independence in developed countries, through the control of the central bank to neutralize the impact of the increase in the money supply caused by the government's demand for financing at the expense of the private sector. A. Garriga and C. Rodriguez (2020) confirmed these results. J. de Haan and S. Eijffinger (2019) added that governments must delegate the monetary policy to central banks independently in order to avoid political tussle. More than that, D. Romelli (2022) extended the concept of CBI by building new dynamic index of CBI containing the regional convergence, external pressures, political events, and reform process.

Another limitation, highlighted by J. Forder (1999), is manifested in the study of the independence of central banks and their various effects on economic goals. As this key factor manifested by the succession of elected governments that aim to achieve various suicidal promises in order to achieve continuity in governance, even at the expense of controlling inflation rates and this is in line with what the monetary authorities that enjoy independence seek in building monetary policy that targets inflation and the desired exchange rates.

The concept of the independence of the central bank affects the way it deals with the general economic goals, which are adopted by other bodies such as governments, the private sector and various institutions that are active in the economy. The adoption of an independent policy has multiple consequences on various economic actors and their objectives, particularly in the government sector, the private sector, and output. Using panel data H. Fujiki (1996) reevaluated the results of A. Alesina and L. Summers (1993) work results about CBI nexus with inflation and real growth. He found that both variables become erratic when inflexibility is imposed. P. Loungani and N. Sheets (1997) confirmed that the CBI-inflation nexus is not well explained by initial economic conditions especially in the case of fiscal policy control absence. Secondly, they defined the link between inflation and growth from the negative impact of inflation on investment.

Depending a PANEL ARDL bounds testing approach M. Akinci et al. (2015) tested the link between financial freedom and economic growth and CBI. Main findings were that there is statically significant evidence between all variables. More than that, the results show that CBI and financial freedom are main factors to improve economic growth. Another study by A. Yahaya et al. (2022) investigated the nexus between CBI and two important variables and constraints in economy (inflation and financial stability) in 14 African countries. Results showed relevant and negative linkage between CBI and inflation. Financial stability was relevant just in some countries of the model. As for the impact of the central bank independence systemic risk, A. Andries et al. (2022) concluded that CBI reduces the risks, and it has negative impact on the measures of systemic risk. Through more precise means and tools P. Baumann et al. (2021b) studied the impact of CBI on inflation. Therefore, the results confirm the strong negative effect of higher CBI rates on inflation. Populism factor has great impact on CBI and central banks performance, M. Gavin and M. Magner (2023) reached that populist politicians are more likely than non-populists to practice pressures on central banks governors, and influence the monetary policy. Furthermore, S. Aplanda and A. Honig (2009) stress the impact of political monetary cycles in nations known by dependent central banks.

Other situations showed up because of financial aftermath made the validity of CBI in doubt especially when conventional monetary policy instruments failed to be efficient in facing crisis effects on economy. So many debates took the study of the concept of CBI before and after crisis, which led to new results. J. de Haan et al. (2018) explored the new parameters of central bank meddling in the economy, showing that CBI concept had some changes indicated especially by the increase of the turnover rate of central bank governors in advanced countries. Further, D. Masciandaro and D. Romelli (2015) found out that economic shocks have great positive impact on central bank independence evolution. Another work by Y. Lucotte (2009) argued the correlation between CBI and budget deficit in order to assess the impact of CBI on fiscal discipline in the case of methods to have financial resources to its budget constraint.

G. Diana and M. Sidiropoulos (2006) put forward a channel for the positive impact of the independence of the central bank on the sacrifice ratio through its influence on the nominal wage index. The results confirmed the theoretical assumptions.

LEGISLATIONS AND REGULATIONS ON THE CONDUCT OF MONETARY POLICY IN ALGERIA

Algeria has known several stages in the framework of the work of its monetary authority represented by the Bank of Algeria, which was established with law No. 62-144 in 13-12-1962. During the period 1963-1990, there were no legislations granting the right to manage the monetary policy of the Bank of Algeria and regulating it clearly. In 1990 the law 90-10 on money and credit was released, which established new principles of the Algerian monetary policy in the framework of the market economy. This law was represented through several articles that regulated how the monetary and loan committee works in the framework of conducting monetary policy and also regulated various operations of the Bank of Algeria in the framework of its dealings with other banks active in the Algerian economy. Moreover, he organized the various frameworks governing the board of Directors of the Bank of Algeria.

The post 1990 period witnessed many Programs in agreement with international organizations, including the World Bank and the International Monetary Fund, the most important of which are the first credit readiness agreements of 1989, the second of 1991 and the third of 1994, and then the structural adjustment agreement for the period 1995-1998. In addition to the above, a 61.92% increase in the value of semi-coins was recorded from 1991 to 1992. This reflects the expansionary monetary policy. In 1992/93, it was necessary to monetize the total deficit of the Treasury under a strategy of expanding the monetary bloc to cover the then external debt crisis. This resulted in a rise in the overall price levels. The monetary policy during the period 1994-2000 was also characterized by the adoption of the compulsory Reserve policy, which amounted to 3%. In addition to the above, starting from May 1995, the Bank of Algeria adopted the so-called tender system through tender calls in monetary policy in order to provide the necessary financing to commercial banks with reliance on the interest rate as an effective tool along with the policy of compulsory reserves.

As for the most important amendments that affected the monetary and loan law 90-10, they were after the year 2000, we will explain them through the following Table 1.

Most of the amendments that affected the monetary and loan law after 2000 came with fundamental changes³ that move the Algerian monetary policy to-

³ Order 03-11, of August 26, 2003 included fundamental changes in the management of the Bank of Algeria from the governor and his deputies and the way they are appointed, especially the incompatibility of the governor's job with every government or public job (Article 14). Furthermore, expanding the power of the governor of the Bank of Algeria (Article 16 and Article 19). Article 29 made clear the direct practical relationship bet-

Table 1. Monetary and loan law most important Amended laws and orders after 2000

Laws and ordinances	The most significant changes
Order 01-01 of February 27, 2001	Separation of the board of Directors of the Bank of Algeria and the monetary and Loan Board (each authority works for its mission). Cancellation of the term of office of the governor and his deputies
Order 03-11 of August 26, 2003	Gives more authority to the board in conducting monetary policy. Step up the consultative and coordinating role between the Bank of Algeria and the government on financial matters
Law 02-04 of March 04, 2004	Concerns the conditions for the formation of the mandatory reserve, which amounts to 15%, registered with the books of Bank of Algeria
Order 09-02 of May 26, 2009	Adjustments based on the means of conducting monetary policy
Order 10-04 of August 26, 2010	Amend and complete the order 03-11 significantly
Law 17-10 of October 17, 2017	The license of the Bank of Algeria to print money in the framework of non-traditional financing through Article 45 for a period not exceeding 5 years
Law 23-09 of June 21, 2023	To keep up with the global economic and financial shifts and effectively tackle the challenges they present, governance, control measures, prudential regulations, digitalization of payments, and financial inclusion initiatives are being actively pursued until the legal deadline

Source: made by authors based on: *Bank of Algeria*. URL: <https://www.Bank-Of-Algeria.Dz/Publications-Page/> (assessed on: 20.07.2024).

wards new frameworks that enable it to integrate into the world economy and address the various crises that affected the world and the oil and Gas Exporting Countries, as Algeria is one of the most important, and affected by changes in the levels of prices of energy materials.

Regarding the role of the Bank of Algeria in stabilizing the financial situation, Law 17-10 defines a strategy for 5 years (starting in October 2017) of what known as unconventional financing policy.

ween the governor of Algeria and the president of the Republic. URL: <https://www.bank-of-algeria.dz/ar/%D8%AA%D8%A7%D8%B1%D9%8A%D8%AE-%D8%A7%D9%84%D8%A8%D9%86%D9%83/#:~:text=%D8%A7%D9%84%D8%A3%D9%85%D8%B1%20%D8%B1%D9%82%D9%85%203%2D11%20%D8%A7%D9%84%D9%85%D8%A4%D8%B1%D8%AE,%D8%A7%D9%84%D8%B0%D9%8A%20%D9%8A%D8%B3%D9%85%D9%89%20%D8%A7%D9%84%D8%A2%D9%86%20%D8%A8%D9%86%D9%83%20%D8%A7%D9%84%D8%AC%D8%B2%D8%A7%D8%A6%D8%B1>

THEORETICAL ASSESSMENT OF ALGERIA'S ECONOMIC FEATURES DURING 1990-2024

In this part of our research, we will touch on various aspects that characterize the Algerian economic reality through the most important macroeconomic indicators in Algeria. Figures 1—4 reflect the reality of these indicators in Algeria.

The period 1990-2024 was chosen as a crucial reference point for our analysis. This choice came to reveal the changes that affected the concept of independence of the Bank of Algeria after the main legislative amendment (monetary and credit law 90-10), which affected the role of the Bank of Algeria as a regulator of monetary policy. The same stage also knew several changes in the same context (adjustment of various aspects affecting the work of monetary policy in Algeria) until the last amendment in 2023. In addition to the fact that the beginning of the nineties, several agreements and programs were known between Algeria and international economic organizations with the aim of helping Algeria integrate into the market economy approach and abandon the socialist economic system.

We can divide this period into several time stages according to the events associated with it, and the economic situations experienced by the Algerian economy. As follows:

Stage 1: 1990-2000. *The transition phase in the Algerian economy.* At this stage, there are clear imbalances in all basic indicators of the Algerian economy (inflation, GDP, unemployment and public debt levels). This can be explained by the period of transition that Algeria has gone through, mainly in two aspects: first, the reforms in the field of monetary policy, which we have already mentioned, and second, the economic reforms and the transition from a socialist economic system to a free-market system and related agreements with international economic organizations (IMF and World Bank). The main indicator of economic imbalances during this period is the growth of public debt relative to GDP, which outpaced the GDP level. The highest level of public debt was 106.3%, while the highest level of GDP was 67.17%. Unemployment peaked in 1993 at 11.2%, and inflation also peaked in 1992. All these figures reflect the negative GDP growth between 1990 and 1994. Moreover, according to the data we show, the economic situation in Algeria between 1990 and 1997 was uncertain. For further clarity (Table 2) contains the values of average variables or basic economic indicators for Algeria during the period 1990-2000.

Stage 2: 2001-2019. *Algerian economic take off.* The post-2000 stage can be considered the stage of economic take off in Algeria, as this stage witnessed the largest economic reforms in the history of independent Algeria through several reform programs, which were called schemes to support economic recovery in order to keep pace with rapid economic developments, which came through four stages during this period can be summarized in Table 3.

Furthermore, various fundamental reforms that touched the monetary and loan code 90-10 (discussed earlier) were implemented. As this stage was characterized by several positive economic indicators better than the previous period, we explain them as follows.

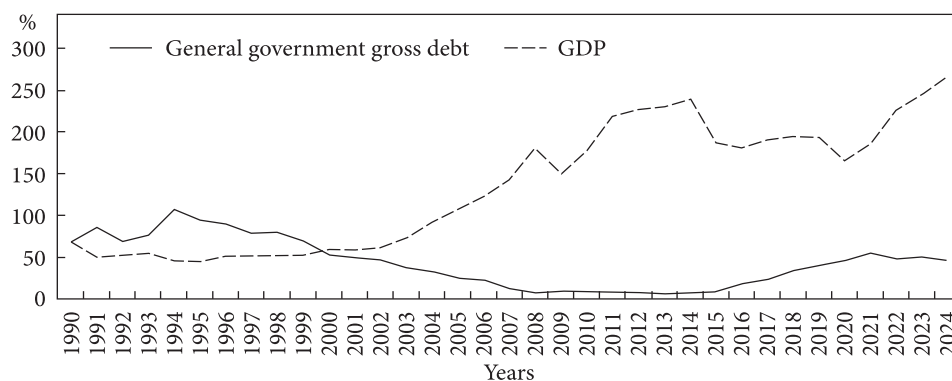


Fig. 1. GDP and Debt, % evolution

Source: made by authors depending on: *International Monetary Fund*. URL: <https://www.imf.org/external/datamapper/profile/DZA> (accessed on: 18.01.2024).

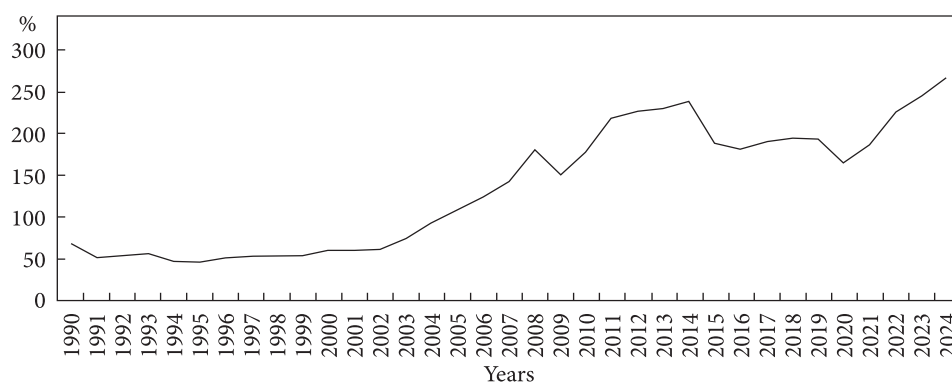


Fig. 2. GDP development in Algeria over 1990-2024, %

Source: made by authors depending on: *International Monetary Fund*. URL: https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/DZA?zoom=DZA&highlight=DZA (accessed on: 18.01.2024).

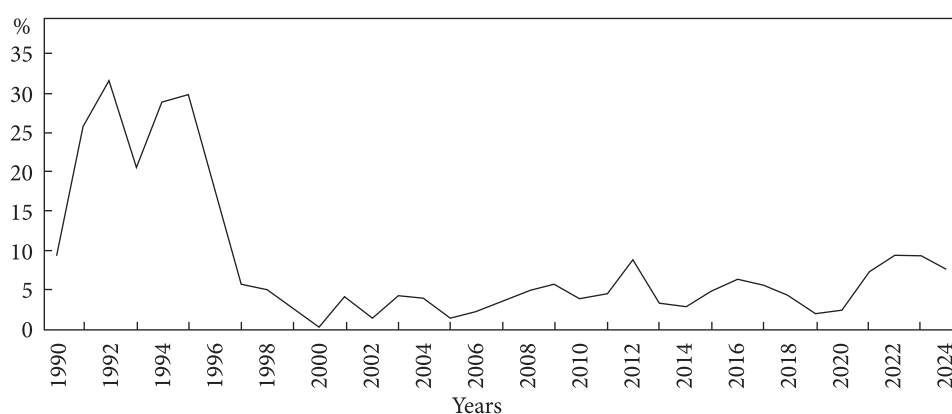


Fig. 3. Inflation rate trend in Algeria over 1990-2024, %

Source: made by authors depending on: *International Monetary Fund*. URL: <https://www.imf.org/external/datamapper/PCPIPCH@WEO/DZA?zoom=DZA&highlight=DZA> (accessed on: 18.01.2024).

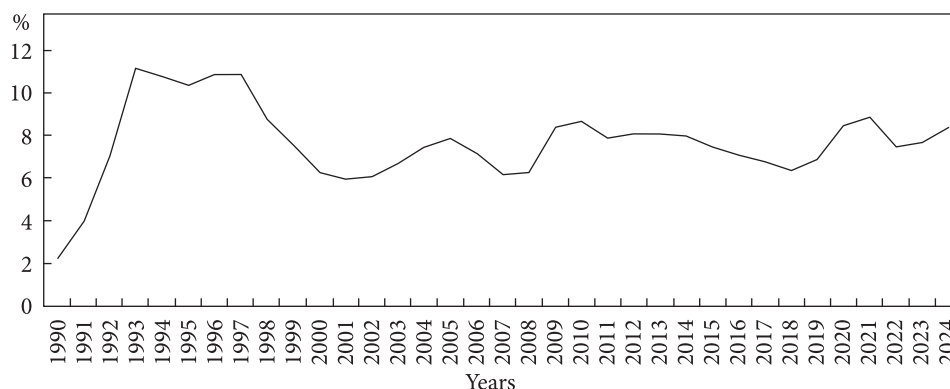


Fig. 4. Unemployment rate trend in Algeria over 1990-2024, %

Source: made by author depending on: *International Monetary Fund*. URL: <https://www.imf.org/external/datamapper/LUR@WEO/DZA?zoom=DZA&highlight=DZA> (accessed on: 18.01.2024).

The GDP values have been continuously rising during the period 2000-2014, reaching in 2014 a value of 238,943, which is the highest value during this stage. Then I experienced a gradual decline until 2019, when it settled in the area of 190 billion dollars. The same applies to the GDP growth rates, the maximum value of which was defined in 2003(6.5%) with better values for the average of both the GDP and its growth rate (Table 4).

As for the public debt index, it has known levels below the values of gross domestic product, and this is considered a good economic indicator. This is due to the fact that Algeria experienced a special financial crisis during the period 2001-2014 due to the high incomes of hydrocarbons. However, the public debt has been relatively high since the beginning of 2015 as a result of the crisis that affected various oil exporting countries through the decline in oil prices in 2014. This affected budget revenues. Despite this, the public debt index during this period remains characterized by reflecting an acceptable economic performance, since its average during the period 2001-2019 amounted to 21.61%.

On the other hand, this period was marked by a slight decrease (0.95%) in the average unemployment rates compared to the previous period, as the unemployment rates were limited between the two values (6% and 8.7%)⁴. As for the inflation rates, they were characterized by relative stability within the framework of rather low rates (between 1.4-4.5%), and the rate of 8.9% was recorded in 2012 as the highest value of inflation during the period 2001-2019. Article 10 of Law 2000-02 dated June 27, 2000 established the revenue control fund which is associated with

Table 2. Average value for variables in the stage 1990-2000 in Algeria

Variables	GDP	INF, %	Gov debt, %	Unemployment, %	GDP evolution, %
Average value	53.29	16.22	79.70	8.2	1.72

Source: made by authors.

Table 3. Economic reform programs in Algeria during the period 2001-2019

Economic reform programs	Periods for programs application	Main procedures
Economic recovery plan (tripartite plan)	2001-2004	At the beginning, it was allocated an amount of 7 billion dollars to reach 16 billion dollars at the end of the program period, it came up with several goals, the most important of which: support of agricultural production; provision of 850,000 jobs; support for local development
The first quintet plan (supplementary program to support growth)	2005-2009	It came as a supplementary program to the previous one-new additional funds were allocated for additional targets affecting the south and upper plateaus programs and the program aimed at absorbing fragile housing. The total amount allocated to this program at the end of the period amounted to approximately 130 billion dollars
The second quintet plan (Economic growth consolidation program)	2010-2014	This program came to ensure the continuation of the dynamic of national reconstruction and was initially allocated 155 billion dollars
The quintet plan of the new growth program	2015-2019	280 billion dollars have been allocated for this program with the aim of achieving the following: support the process of economic growth and development; ensure the maintenance and maintenance of the basic facility; reduce unemployment rates

Source: made by authors on the reports of the Algerian ministry of finance. URL: <https://www.mf.gov.dz/index.php/fr/documentation2020> (assessed on: 20.07.2024).

Table 4. Average value for variables in the stage 2001-2019 in Algeria

Variables	GDP	INF, %	Gov debt, %	Unemployment, %	GDP evolution, %
Average value	159.35	4.13	21.61	7.25	3.27

Source: made by authors.

Table 5. Average value for variables in the stage 2020-2024 in Algeria

Variables	GDP	INF, %	Gov debt, %	Unemployment, %	GDP evolution, %
Average value	217.563	7.16	49.02	8.2	2.08

Source: made by authors.

the supplementary finance law of 2000. The objective of this body is to control the surplus in revenues and transfer it to reduce the Algerian external debt, in addition to controlling public spending and rebalancing the budget when the oil levy decreases (coverage of the budget deficit).

Stage 3: Post 2020. Enhancing integration into the global and local economy through new measures. During this beginning of this stage, the Algerian economy has known economic indicators that reflect the decline in the performance of the economy somewhat, such as an increase in average inflation rates and the same for public debt ratios and unemployment rates (Table 5). Several factors caused this retreat in economic performance mainly what has been known as COVID-19 pandemic.

Algeria faced the COVID-19 pandemic with measures that reduced its consequences, but as it affected the entire global economy due to the closure and lack of trade exchanges and the channeling of large sums to the health sectors, some indicators of the majority of economies declined. However, Algeria has announced several economic programs programmed until 2030, with the aim of supporting and raising GDP, and the authorities have also raised wages to 47%, which contributed to supporting the aggregate demand of the Algerian economy, and this is reflected by the increase in GDP values.

Monetary policy indices trend in Algeria. Throughout the research phase, the monetary policy indicators have seen a number of developments. We chose to discuss a few fundamental indicators in this context. The most significant of these is the “broad money” index, a crucial monetary policy indicator that encompasses savings accounts, term deposits, and other semi-monetary assets in addition to cash and demand deposits (M1). An understanding of the overall liquidity in the economy can be gained from the analysis of Broad Money Trends. The monetary sector lending index for households and the private sector indicates how much credit, primarily from banks, is extended to businesses and households in the private sector (Fig. 5) in relation to the size of the economy as a whole. Not to mention the interest rate (discount rate), which is vital in managing the amount of money in circulation, particularly in nations without established financial markets.

In addition, studying Algeria's interest rate levels are important because they illustrate the fundamentals of the interaction between the financial and monetary authorities, as seen by the direction of this monetary indicator's values in Fig. 6.

⁴ The Algerian authorities have activated the role of several devices that support the operation, the most important of which are:

- The National Agency for youth support and employment in accordance with Order No. 96-14 of June 24, 1996;
- The professional integration assistance device (DAIP) in accordance with Decree No. 08-126 of April 19, 2008;
- Social Development Agency (ADS) according to decree 96-232 of June 29, 1996;
- The program of works of public benefit for the intensive use of Labor.

All these programs contributed to the fight against unemployment and the relative reduction of unemployment rates.

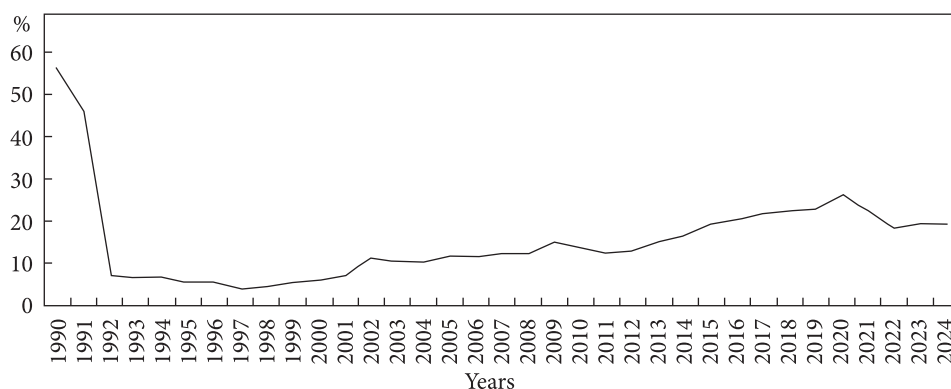


Fig. 5. Monetary sector credit to private sector in Algeria over 1990-2024 (% Gdp)
Source: made by authors depending on: *World Bank Group*. URL: <https://data.worldbank.org/indicator/FM.AST.PRVT.GD.ZS?end=2023&locations=DZ&start=1990> (accessed on: 20.09.2024).

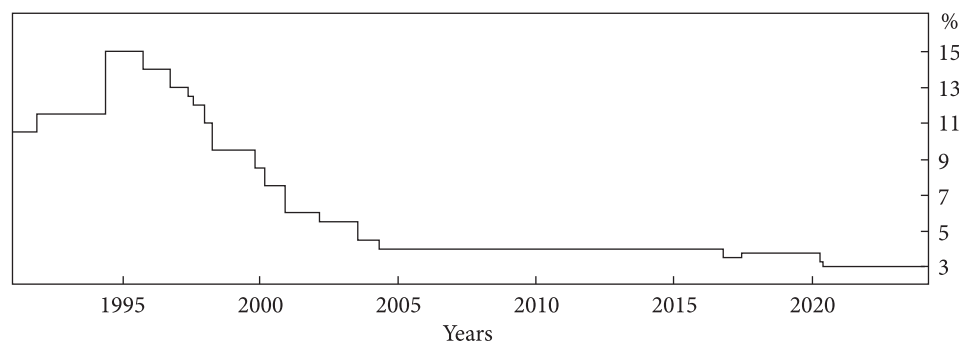


Fig. 6. Algerian interest rate over 1990-2024, %
Source: Algeria Discount Rate. *Trading Economics*. URL: <https://tradingeconomics.com/algeria/interest-rate> (assessed on: 20.09.2024).

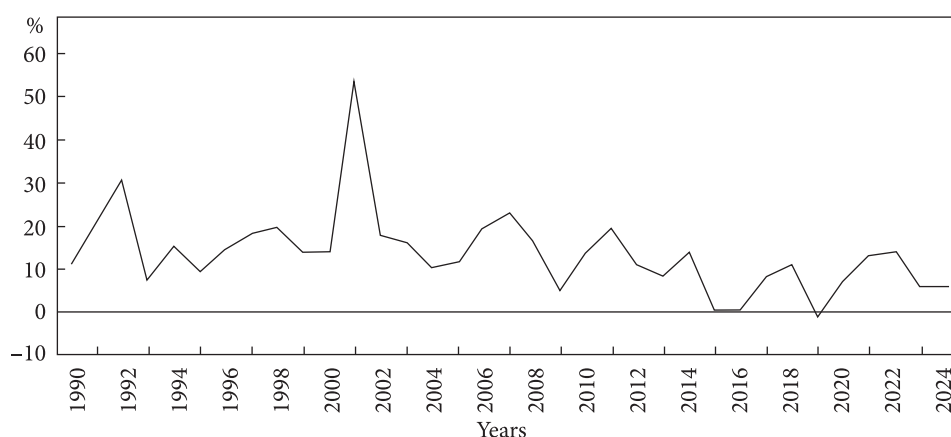


Fig. 7. Broad money growth in Algeria over 1990-2024 (annual %)
Source: made by authors by: *World Bank Group*. URL: <https://data.worldbank.org/indicator/FM.LBL.BMNY.ZG?locations=DZ> (accessed on: 20.09.2024).

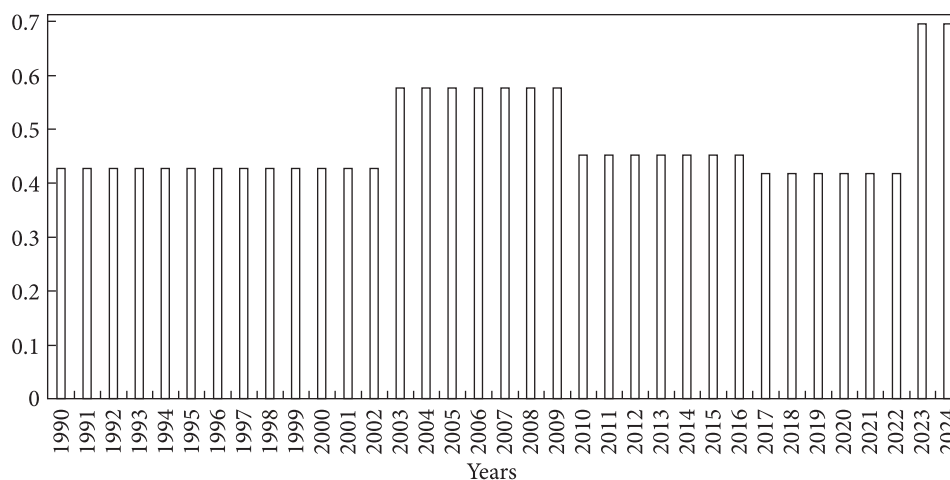


Fig. 8. CBI in Algeria (1990–2024), the ratio is centered between (0—1)

Source: calculated by authors depending on the criterion of Cukierman, Webb and Neyapti's (1992).

As shown in Fig. 7 the Money Index, which measures the money supply in its broadest sense, fluctuated throughout the course of the 1990s–2000s, peaking at 31% in 1992 and 19% in 1998, with an average of 18%. The different requirements outlined in the IMF agreements provide an explanation for this. Among these is managing the money supply. In terms of the period after 2000, there was a discernible shift in the money supply's overall increase, particularly in 2001 when the growth rate exceeded 50%. After 2002, it became clear non-stable situation in the growth value, but it never went above the 20% growth value. These numbers show that Algeria's reform initiatives have raised the nation's relative economic return.

The pattern of interest rate development, or discount rates, validates the evidence underlying Algeria's monetary policy. Beginning in 1990, the indicator's value was 10.5%. From 1991 to 1994, it increased to 11.5%, and in 1995, it reached its greatest point of 15%. The average value of this indicator during the period was roughly 7%. The final recorded value of 3% in 2024 following an extended period of stability at 4 %. An important measure for examining how the crowding-out effect — a phenomenon in which fiscal policy affects the financial system in Algerian economies — is taken into account. The share of the monetary sector credit to households and the private sector knew a decline dramatically between 1990 and 1992 (from 56.15 to 7.25%), with an average of 5.5% between 1990 and 2000. These are noteworthy numbers. This indicator showed a relative improvement after 2000, rising to a value of 26.11% in 2020 because of several revisions affecting Algeria's credit and monetary legislation.

EMPIRICAL STUDY: COMPUTING CENTRAL BANK INDEPENDENCE IN ALGERIA (1990-2024)

In order to study the impact of the independence of the Bank of Algeria on the overall economic variables in Algeria, we will begin our empirical study by calculating the independence of the Bank of Algeria for the period 1990-2024 (Fig. 8), through the criterion of A. Cukierman et al. (1992). In calculating the independence of the Bank of Algeria, we relied on various publications that amended the monetary and loan law (90-10)⁵ and influenced the process of building monetary policy, the conditions of its operation and the extent of independence of those in charge of it.

ARDL approach: The autoregressive distributed lag (ARDL) methodology, developed by H. Perasan et al. (2001), has been frequently utilized in econometric research aimed at examining the relationship between numerous variables. Researchers benefit from this approach in terms of application convenience and both short- and long-term study options. Furthermore, they contain variables that can be stable at level I (0) or stable at the first difference I (1). The ARDL model is expressed and formulated using the following equation:

$$\Delta y_t = \delta_0 + \sum_{i=1}^p \delta_i \Delta y_{t-i} + \sum_{i=1}^q \beta_i \Delta x_{t-i} + \psi_1 y_{t-1} + \psi_2 x_{t-1} + u_t, \dots \quad (1)$$

where y_t is the dependent variable; δ_0 is the A constant term in the model; u_t is the variable that Captures all unexplained variations in the dependent variable; x_{t-1} is the independent variable.

Examining time series stability and model estimation: A stability analysis of the variables should be performed prior to beginning any of the ARDL methodology's stages in order to ensure that the variables are appropriate for the methodology (i.e., stable at the level I (0) or at the first level I (1)). Several tests (**Augmented Dickey-fuller unit root test**) have been conducted in this area, and the results of one of those tests are as follows.

Based on the ADF test results presented in Table 6, we can infer that all the study variables are stable at the first difference (1) level. As a result, we can utilize the ARDL methodology to examine the relationship between the independence index of the Central Bank of Algeria (cbi) and the different economic indicators represented by variables (gdp, govdebt, inflation, unemployment).

Using ARDL approach the model on which our study was built was as follows: $cbi = f(gdp, govdebt, inflation, unemployment)$

$$\begin{aligned} \Delta cbi = & \delta_0 + \sum_{i=1}^p \delta_i \Delta cbi_{t-i} + \sum_{i=1}^q \beta_1 \Delta gdp_{t-i} + \sum_{i=1}^q \beta_2 \Delta govdebt_{t-i} + \\ & + \sum_{i=1}^q \beta_3 \Delta inflation_{t-i} + \sum_{i=1}^q \beta_4 \Delta unemployment_{t-i} + \psi_1 cbi_{t-1} + \\ & + \psi_2 gdp_{t-1} + \psi_3 govdebt_{t-1} + \psi_4 inflation_{t-1} + \psi_5 unemployment_{t-1} + u_t, \end{aligned} \quad (2)$$

⁵ The following laws and orders, which are based on the standards established by Cukierman, Webb, and Neyapti (1992) criteria, have been cited in the Bank of Algeria's independence calculation:

Order 03-11, Order 10-04, Order 17-10, 23-09, and 90-10 Law.

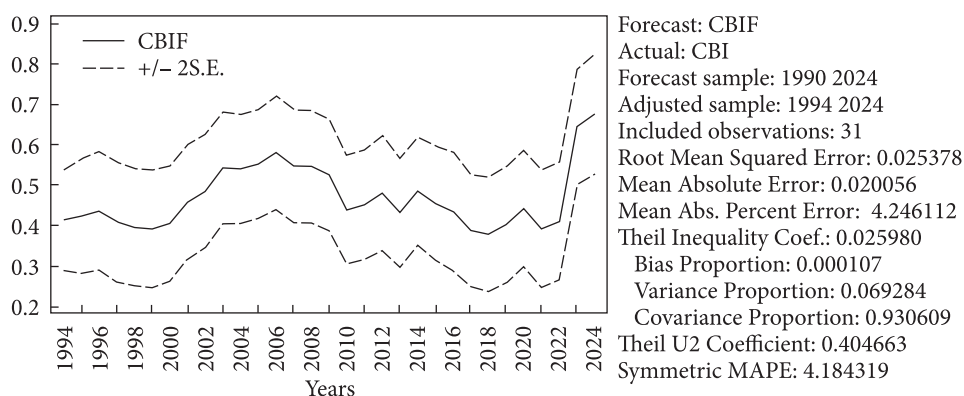


Fig. 9. COSUM and COSUM of Squares test

Source: Eviews 12 outputs.

Table 6. Augmented dickey and fuller unit root test

Test	Level					
	intercept		trend and intercept		none	
	t-value	prob	t-value	prob	t-value	prob
Cbi	-1.3826	0.5791	-1.5865	0.7773	0.5688	0.8342
Gdp	0.0875	0.9600	-2.0779	0.5391	1.6060	0.9710
Govdebt	-3.7730	0.0087	-0.6603	0.9682	-1.4938	0.1245
Inflation	-1.8179	0.3658	-2.1592	0.4959	-1.3344	0.1651
Unemployment	-4.6111	0.0008	-4.7604	0.0029	-0.2814	0.5766
<i>1st difference</i>						
Cbi	-5.6758	0.0000	-5.7255	0.0002	-5.6568	0.0000
Gdp	-4.9709	0.0003	-4.9607	0.0018	-4.5514	0.0000
Govdebt	-5.4666	0.0001	-5.7840	0.0002	-5.4713	0.0000
Inflation	-6.2293	0.0000	-6.2761	0.0001	-6.2811	0.0000
Unemployment	-4.5538	0.0010	-4.3266	0.0088	-4.6497	0.0000

Note: *t*-value, prob are statistical indicators.

Source: made by authors depending on eviews 12 outputs.

where Dependent variable: cbi — central bank independence; Independent variables: gdp — Gross domestic product; govdebt — gross government debt (percent of gdp); Inflation — inflation rate (annual percent); Unemployment — annual rate; Parameters: δ_k $k = 1, 2$ and β_k $k = 1, \dots, 4$ are short run parameters; ψ_n — long term parameters, $n = 1, \dots, 5$; Δ — represents the differences.

Based on the IMF data (2024) and the statistical tool REVIEWS 12, the study data for the variables were used to estimate the ARDL model (The estimated model). According to empirical results, the calculated model's ideal lags that yield the lowest Akaike criterion value are (1, 2, 4, 4, 4).

The boundary tests indicate that the value of the calculated *F*-statistic (3.82) is greater than the upper limit at the level of 5% (3.09) and 10% (3.49); that is, the null

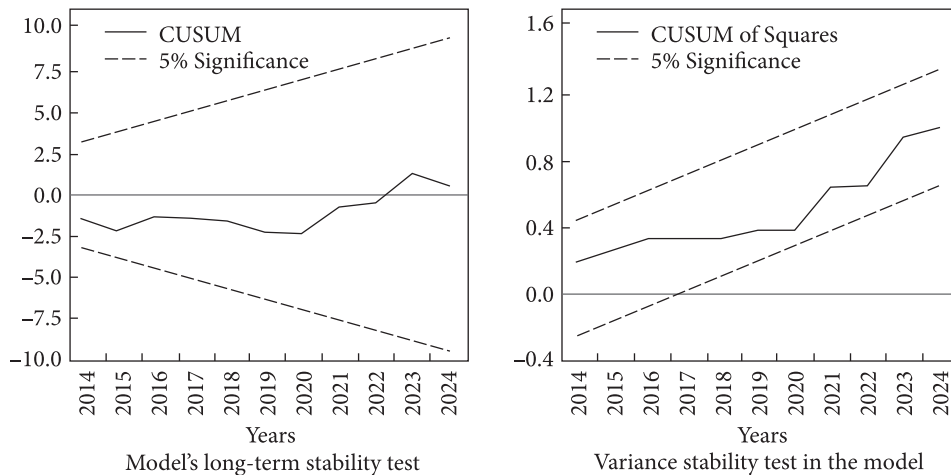


Fig. 10. CBIF test

Source: Eviews 12 outputs.

hypothesis is rejected, and resulting in a long-term relationship between the study variables, so, the long-term and short-term relationship can both be estimated.

Diagnostic tests of the model: Test of the stability of the model according to COSUM and COSUM OF SEQUARES. There is structural stability of the study model at a morale level of 5%, or harmony and stability between the long-term and short-term results, as Fig. 9 illustrates that both the cumulative sum of COSUM residuals and the cumulative sum of squares of COSUM residuals are represented by a median line situated within the boundaries of the critical zone.

The CUSUM test analyzes recursive residuals to ensure parameter stability in a regression model. The graphic shows the CUSUM line within the 5% significance level, showing no structural break. This shows that the model's coefficients are steady, making it reliable for forecasting.

The CUSUM of Squares test measures variance stability over time. The test reveals an ascending trend that approach the 5% significance level, indicating potential variance stability. because it doesn't cross the threshold. it shows no structural changes in residual variance. This may not necessitate changes, such as adopting heteroskedasticity-consistent errors or different model parameters.

The same proof is explained by predictive performance testing of the unappreciated error correction model shown in Fig. 10.

The test for detecting the existence of the serial self-correlation of errors problem. The Breusch-Godfrey Serial Correlation LM Test indicates that the model does not contain Serial Correlation LM. Since the *P*-Value (0.1435) is higher than 0.05, we accept the null hypothesis.

Examining the problem of variance instability (Heteroskedasticity Test). It was discovered that the probability value of the chi-square statistic in the model is more than 0.05 after conducting three separate tests in this regard, because of the aforementioned, we agree with the null hypothesis, which claims that the model is free of the variance instability issue.

CONCLUSION

Our study, particularly depended on the ARDL model based on five variables (GDP, inflation, unemployment, government debt, central bank independence), sought to determine the nature of the relationship between the central bank's independence and the most significant macroeconomic indicators in Algeria during the period of 1990-2024. The findings revealed the following.

Based on the study model, the dependent variable is highly explained by the independent variables ($R\text{-Squared} = 0.8958$), meaning that the obtained results accurately reflect the state of the Algerian economy.

The parameters that indicate the strength of the relationship between the independent variables and the dependent variable had very small values. There was a negative relationship between the central bank's independence and the variables of inflation (-0.0191) and unemployment (-0.0328), and a positive relationship between it and the variables of GDP ($+0.0021$) and government debt ($+0.0073$). This illustrates how the various amendments to the loan and monetary laws have evolved to support the state's financial policies (i.e., the Central Bank of Algeria's lack of functional independence).

The fact that fiscal policy sets goals before monetary policy and that the monetary authority thus has a supporting role to play in this regard sums up the nature of the interaction between the fiscal authority and the monetary authority in Algeria.

A weak correlation between CBI and economic variables.

A negative nexus between CBI and inflation.

Another compelling sign of the power of Algeria's fiscal policy is the positive correlation observed between the government debt and the Bank of Algeria's independence.

Based on the aforementioned, the following recommendations can be made to improve the Monetary Authority's efficacy in Algeria (the central bank independence):

- passing legislation granting the Bank of Algeria the authority to modify interest rates in accordance with monetary policy requirements rather than only financial policy criteria;
- concentrating more on the improvement of Algeria's banking sector in order to increase the efficacy of reforms to legislation that maintain the central bank independence in Algeria;
- finding a middle ground between the fiscal authority's objectives, which include boosting output and employment, and targeting of stable inflation rates;
- appoint the governor of the central bank through an open, merit-based process for clear, protracted periods. For good reasons such accomplishing long-term monetary policy goals;
- financial independence involves limiting government deficit funding and enable Algeria's central bank oversee its own budget, according to the monetary rule chosen;
- the significance of the political element in the establishment of institutional mechanisms for the balancing of the fiscal and monetary aspects of state financial

policy, the inhibition of monetary expansion, the promotion of price stability, and the stability of the national currency purchasing power must be acknowledged, all within the framework of the plan to bolster the autonomy of bank of Algeria;

- clearly define the channels of cooperation with the Ministry of Finance, making sure that tasks are separated strategically (effective cooperation with Government);
- regularly provide the legislature (the parliament) with all pertinent information; additionally, conduct external audits and provide precise updates on monetary policy. Accountability and transparency are hence advantageous elements that improve the effectiveness of monetary policy.

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Захаф Юсеф, д-р екон. наук, проф.

Університетський центр Магнії, Інститут економіки,
Лабораторія з оцінювання і прогнозування економічної політики
та стратегій підприємств

а/с 600-13300, шосе Аль-Завія, район Аль-Шухада,

Магнія, Тлемсен, Алжир

Чібі Абдеррахім, д-р екон. наук, проф.

Університетський центр Магнії, Інститут економіки,
Лабораторія з оцінювання і прогнозування економічної політики
та стратегій підприємств

а/с 600-13300, шосе Аль-Завія, район Аль-Шухада,

Магнія, Тлемсен, Алжир

ХАРАКТЕР ЗВ'ЯЗКУ МІЖ НЕЗАЛЕЖНІСТЮ ЦЕНТРАЛЬНОГО БАНКУ І МАКРОЕКОНОМІЧНИМИ ПОКАЗНИКАМИ: ЕМПІРИЧНІ ДАНІ З АЛЖИРУ

Основна мета дослідження — з'ясувати, як економічні реформи в Алжирі з 1990 по 2024 р. вплинули на незалежність Центрального банку Алжиру (Банку Алжиру), враховуючи, що його незалежність було започатковано поправками до Закону про гроші й кредит. Як наслідок, розуміння взаємозв'язків між ключовими показниками, що репрезентують економічні реформи і елементи макроекономічної політики Алжиру, та посиленням незалежності Банку Алжиру має вирішальне значення, адже ці взаємозв'язки показують, наскільки тісно монетарна і фінансова інституції країни співпрацювали при розробленні її макроекономічної політики.

Головний висновок полягає в тому, що Банку Алжиру все ще бракує самостійності для встановлення власних цілей монетарної політики, навіть після низ-

ки змін у грошово-кредитному законодавстві країни. Хоча метою змін була модернізація банківської галузі, Центральний банк не дістав повної самостійності. Отже, його спроможність здійснювати політику, яка б мала вирішальне значення для усталеної економічної стабільності, є обмеженою, оскільки він усе ще підпорядковується рішенням, які ухвалює уряд.

Крім того, уряд проводить макроекономічну політику за відновленої підтримки з боку монетарної інституції, що вказує на скоординованість взаємодії між урядом і Банком Алжиру. Це заслуговує на увагу, оскільки стандартні результати показали дуже слабкий зв'язок між різними макроекономічними показниками і незалежністю Центрального банку Алжиру.

Ключові слова: незалежність центрального банку; економічні реформи; координація політики; монетарна політика; Алжир.

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