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STUDY OF FOOD SECURITY INDICATORS AND THEIR IMPACT ON POLITICAL STABILITY IN ALGERIA DURING THE PERIOD (1996-2023)

Dr. Imad BOUKLACHI*[1]

bouklachi.imad@univ-alger3.dzGovernance and Modernization of public management Laboratory, Algiers 3 University
imad.bouk@gmail.com

Dr. Ali DJEGHLAF[2]

Applied Economics Laboratory, Medea University
djeghlaf.ali@univ-medea.dz
djehglafali@gmail.com

Dr. Rabeh MEROUANI[3]

Digitization of economic and media organizations and public administration Laboratory, M'sila University
rabeh.merouani@univ-msila.dz
adelrabehmerouani@gmail.com

Dr. Amel KHALI[4]

khali.amel@univ-Governance and Modernization of public management Laboratory, Algiers 3 University
dz.alger3
amelkhali03@gmail.com

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Abstract:

This study aimed to review Algeria's efforts to ensure food security for its population. It examined methods of food access, distribution, and utilization, as well as their impacts. The study also explored how these efforts influenced the cohesion of political structures and supported peaceful political transitions in Algeria, while avoiding social unrest, public demonstrations, and violence between 1996 and 2023. A descriptive statistical approach was adopted, utilizing both standard and inductive methods of quantitative research.

The study reached a key conclusion: in the short term, the state's efforts to improve food security helped avert certain undesirable political maneuvers. However, in the long term, the findings revealed a clear correlation between changes in food security management indicators and fluctuations in political stability. This vulnerability is attributed to a series of ambiguous food policies and the persistent failure to implement genuine and effective structural reforms throughout the period from 1996 to 2023.

Keywords: Food Security, Political Stability, Algeria, Autoregressive Distributed Lag (ARDL) Model.

Introduction

At the beginning of the third millennium, the issue of food security was no longer merely a problem of agricultural production factors or a problem of agricultural land productivity, but a problem linked to politics and governance systems, which will lead us to talk about food security in a country such as Algeria. In this subject, ensuring the security of food supplies and controlling their price levels are issues of concern to members of Algerian society. Moreover, the failure of the Algerian Government to manage the food security file would be seen as an explicit threat to Algeria's political stability, especially if we know that Algeria imports its food needs from the world market, in the presence of global difficulties and problems related to the supply of food caused by the war between Russia and Ukraine.

From the foregoing, researchers and academics have become increasingly interested in studying the relationship between food security and political stability in Algeria. This is in an attempt to see how much relative and quantitative impact the two phenomena have in both directions, and to know the factual figures in this relationship which will constitute a scientific and normative background that can assist in developing appropriate policies, plans, programmes and decisions to address the threats to food security in Algeria.

1. ProblematicOf TheStudy:

Through the above, we pose the following problem:

- To what extent did food security impact political stability in Algeria during the period (1996-2023)?

2. Study Hypothesis:

The research is based on the premise that food security is a challenge for developing countries, including Algeria, and the impact of food security indicators on the country's political stability.

3. The Importance OfThe Study:

This study draws its importance from its topic, which is regarded as an old and renewed societal problem with the growth of Algeria's population and the emergence of new political components. Food production and consumption indicators change from period to period according to the political stages that Algeria has experienced internally, without forgetting the change in the structure of international relations and its implications for Algeria's choices on the issue of food import. This leads to developments that affect Algeria's levels of political stability each time, particularly during the period 1996-2023. In addition, the concept of food security changes from time to time globally, and political stability is linked to this change.

The practical importance of the study is reflected in the study's linkage to a concept and substance of interest to the rest of the world, of particular interest to Algeria, which has a significant impact on ensuring the political stability of state institutions and the calm of the social front. The concept of food security and its effects have always attracted the attention of both developing and developed countries.

4. The Objective OfThe Study:

This research aims to learn Algeria's efforts to ensure food security through its policies and practices in dealing with the practical dimensions of food provision, access, use and results, and then to identify field evidence of the balances of political groups concerned with political stability in Algeria. The study also seeks to investigate the levels of food security indicators in Algeria and the extent to which the reality of these indicators affects the cohesion of political components and peaceful political change away from unrest, demonstrations and violence in Algeria during the period 1996-2023.

5.The Methodology Of The Study:

This study attempts to create a realistic vision and to build a real vision of the developments in food security in Algeria and the extent to which it can affect political stability thathas led to the use of a statistical and measurement study, whereby inductive and mathematical methods have been used in the quantitative research curriculum.

In addition, the study was based on the descriptive curriculum and used some analytical methods and tools to demonstrate the various theoretical aspects of food security. There was also an attempt to prepare a theoretical structure based on the desk survey method, using some foreign and Arab scientific books and articles on food security, as well as some of the literature reported by various publications and research available in the work of international and national conferences.

6.Literature Review:

The empirical literature addressing the relationship between food security and political stability in Algeria is either scarce or virtually nonexistent. Only a limited number of relevant studies are available, most of which focus on countries other than Algeria. For instance, the study by Ali, M.A. in 2018 (Ali, 2018)investigates the nexus between political stability and food security in selected Arab countries such as Egypt, Libya, Tunisia, Iraq, Syria, and Yemen over the period 1996–2015. This study aims to analyze the relationship between political unrest experienced by these countries and the degree to which their citizens enjoy a certain level of food security. The study concludes that there is a causal relationship between political stability and food security, implying that the absence of food security or any of its dimensions contributes to unrest and violent events in the countries under study.

Prior to that, a study by Al-Sarhan, H.A. and Abdul-Amir, H.B. in 2017 (Al-SARHAN & Abd Al-AMIR. 2017) sought to understand the concept of food security by exploring the underlying causes of food insecurity. The study also attempted to identify strategies to address and overcome food insecurity in the African continent. The findings suggest that food security is a multidimensional phenomenon, and that the number of people suffering from chronic undernourishment remains unacceptably high. Eradicating hunger continues to pose a major global challenge, primarily due to the interaction of complex factors. Africa remains committed in the long term to integrating food security into public policy programs as a means to reduce hunger.

A paper published by NAVDEEP and Ankita NIHLANI in 2025 (NAVDEEP & NIHLANI.2025) examines the role of local governments in promoting sustainable agriculture and food security. The study emphasizes that effective local governance is crucial for achieving agricultural sustainability and food security, with decentralized and community-driven approaches proving to be the most successful. In Algeria, the challenges posed by a lack of decentralization contribute to increasing food insecurity and hinder the local government's ability to address this issue.

While a scientific study by Soffiantini, G. in 2020 (Soffiantini, 2020) investigated the relationship between food insecurity and political instability during the Arab Spring. The study focused on the causal connection between food insecurity resulting from extreme climatic events and political instability, through a comparative analysis of three Arab Spring cases: Egypt, Syria, and Morocco. Although the study does not claim that food insecurity was the sole cause of the Arab Spring protests, it argues that rising food prices exacerbated pre-existing social discontent, thereby contributing to the outbreak of protests in Egypt, Syria, and Morocco, and potentially in other MENA countries affected by the unrest. However, the outcomes of these uprisings differed across the three countries. The study argues that this variation can be attributed to the differences in food security policies adopted by each government individually.

An additional empirical study by Zubair, M. et al. in 2021 (Zubair et al. 2021) aimed to explore the potential relationship between food security and conflict in six conflict-affected

South Asian countries during the period 1990–2017, using a fixed-effects model in the analysis.. The study ultimately concluded that conflict in the selected sample ofSouth Asian countries is negatively associated with food security, with each outbreak of conflict leading to a decreasein average daily per capita calorie intake by 26 kilocalories per year. These findings may be consistent with some recent empirical studies that have examined the same relationship in other regions of the world.

Another study, by Al-Rousan, N. et al. in 2024, (Al-Rousan et al. 2024),examined and assessed the impact of the Russia–Ukraine war, the COVID-19 pandemic, and oil prices on global food security. The analysis involved six independent variables : year, month, Brentcrude oil price, the COVID-19 pandemic and the Russia–Ukraine conflict, against six food-related indicators as dependent variables. The study ultimately revealed varying degrees of correlation among the examined variables, with particular emphasis on a strong association between Brentcrude oil pricesand food price indicators**.** Furthermore, linear regression analyses indicated a positive impact of the Russia-Ukraine conflict, Brent crude prices and the COVID-19 pandemic on food price indicators.

Accordingly, our scientific study aims to fill a gap in the empirical literature by investigating the potential relationship between food security as an independent variable and political stability as a dependent variable, specifically assessing the extent to which food security has influenced political stability in Algeria during the period from 1996 to 2023. Algeria is a relatively newly independent state that has experienced episodes of political instability since gaining independence on July 5, 1962, and It aspires to become a leading state in Africa, at the very least. Therefore, the study seeks to answer the following research question: To what extent has food security impacted political stability in Algeria during the period from 1996 to 2023?

In order to deal with this question, first, the two concepts of food security and political stability will be looked at separatelyn the theoretical part of the study. Then, the second part, which focuses on the fieldwork (methodology and tools), will cover the study model, variables, data sources and finally, the results and their discussion. The study will conclude with a summary that presents the main findings and recommendations.

Part I: Theoretical Framework For Variables (Food Security And Political Stability)

In this section, some agreed concepts will be presented on the topic of food security, as well as an account of the historic development of the concept of food security and the most important practices and realities on this subject. The concept of political stability will also be addressed, as well as some practical approaches and trends that discussed the relationship between these two variables (food security and political stability).

1. Food Security:TheConcept and chronology of evolution

The concept of the term "Food Security" has evolved over time from approaches that initially took economic and quantitative considerations and then moved towards humanitarian and qualitative considerations, moving from macro to micro, from supply-side to demand (BOUBAKIRE, 2021, p. 185). The theme of food security then shifted from international and national to family and individual from the idea of providing the minimum essential nutrients for each person to the quality of the ingredients contained in the food ration, as well as families' standard of living, after which thought began to be given to approaches to achieve comfortable levels of food security with the imperative of preserving the environment (natural wealth) as well as ensuring the sustainability of food for future human generations (BOUBAKIRE, 2021, p. 186).

In the same context, the concept of the term "food security" has been widely defined, numbering approximately 200, as endorsed byFAO (FAO, n.d., Chapter 2).and 450 indicators of food security exist(Mechlem, K. 2004, p.633). .

These definitions have been presented in a form of individual jurisprudence of theorists as well as collective work and reports, the most important ones are those which came from competent and non-competent international and regional organizations, some of them will be presented in accordance with their historical and methodological context.

By the way, the concept of food security first appeared in the mid-seventies, in a study report on "The World's Food Problems in the Period OfThe Seventies Crisis"(AL BADJURI, 2014, p. 33).

In the beginning, the concept of food security was limited to States' and institutions' attention to the volume of food production and the stabilization of food prices. In this regard, the first official mention of the concept of food security appeared in the report of the World Food Conference in 1974 (Righettini, M. S., &Bordin, E.2023,p .2740). This reportstipulated the fact that the constant availability of global food supplies makes basic foodstuffs sufficient to sustain the steady expansion of food consumption and to compensate for fluctuations in production and prices

In 1983, FAO redefined food security to include ensuring access to food for groups at risk of hunger, thus incorporating the importance of access to food, in the sense of balancing both supply and demand for food. Accordingly, the definition of food security was formulated as follows : “Ensuring that all people at all times have both physical and economic access to the basic food that they need”. (FAO. 2006).

In 1986, the World Bank issued a report entitled "Poverty And Hunger", which focused on the time dimensions of the problem of food security (Chronic Food Insecurity and Temporary Food Insecurity).

By the mid-1990s, the issue of food security had acquired a new dimension, recognizing that malnutrition had become a matter of great concern, as that concern had spread from the individual level to the international and global level (a cosmic problem), and therefore the problem of malnutrition had become a part of the problem of food insecurity.

On the other hand, the UNDP Human Development Report promoted the idea of building human security, including a number of constituent aspects of the concept of human security, one of which was food security. This concept has been closely linked to the human rights perspective in development which in turn has the impact of discussions on food security. (Al-SARHAN and ABD AL-AMIR, 2017, p. 138). As highlighted in the 2022 Special Report of the United Nations Development Programme (UNDP), humanity’s pursuit of development generates new risks to health and food security, especially in the era of the Anthropocene(UNDP, 2022, p. 03).

The multidimensional nature of food security was also strengthened in 1996; The World Food Summit of 1996 concluded that food security is achieved" when allpeople, at all times, have physical and economic access tosufficient, safe and nutritious food to meet their dietaryneeds and food preferences for an active and healthy life ".(MANIKAS,Iet al, 2023,p. 01)

The definition of 1996 was reiterated in the State of Food Insecurity Report 2001 in this regard. France shares the definition of food and nutrition security adopted by the Committee on Food Security on September 2012, which reads as follows: Food security is achieved when all people have, at all times, the physical, social and economic potential to have adequate, safe and nutritious food that meets their nutritional needs and tastes to enjoy an active and healthy life (French diplomacy, 2021).

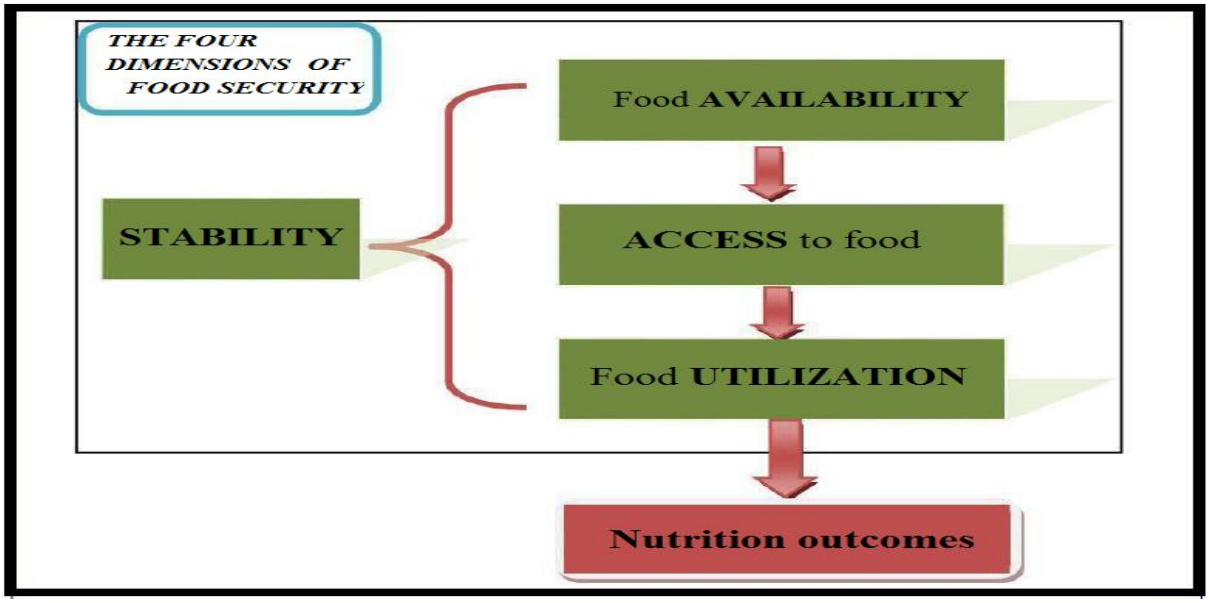
It should be noted that France's social welfare system identifies four fundamental pillars of food security:

- Access to food, in terms of material abundance, cost economy and social right.
- The need for biodiversity of nutrients.
- Quality of food products in terms of health and nutrition.

- Regular access and availability of foodstuffs of the required quality.

Thus, the most important dimensions of food security can be summarized in the following format:

Figure 1: The Four Dimensions Of Food Security



Source: Authors based on:(FAO, 2008, p . 01)

Through the definitions addressed and in accordance with the formerly listed format, the basic aspects of food security can be defined:

- **Availability of adequate food (supply side):** this is to meet the needs of members of human society.Food availability may be aggregated at the national, provincial, district or community level and is determined by:
  - **Production:** food produced in the area.
  - **Stocks:** food held by traders, in government reserves and by households in the area.
  - **Trade**: food brought into (and taken out of) the area through market mechanisms.
  - **Bulk transfers / food aid**: food brought into the area by the government and/or aid agencies
- **Access to food:** members of human society must have the financial, material and legal capacity to access food;
- **Food Utilization:** refers to the human body's ability to absorb healthy and biologically useful nutrients to ensure good nutrition, this will depend on the quantity, quality and variety of food consumed
- Stability: Stability: Achieving food stability depends on the consistent availability, accessibility, and effective utilization of food,meaning the stability of the other three dimensions over time".

For a clearer understanding of the concept of food security,it is necessary to examine its antithetical concept, food insecurity, which refers to the following:"(a) Uncertainty or limited availability of nutritionally adequate and safe foods necessary for normal human growth and a healthy life; and(b) Uncertainty or limited ability to acquire such foods in socially acceptable ways (i.e., without relying on charity-based food distributions)" (Fotakis, E.A.; et al, 2024, p. 01) .

In its broader sense, food insecurity also encompasses the pillar of food utilization or misuse, meaning that individuals and households must have the capacity to utilize food in a manner that results in positive nutritional outcomes.

However, the final definition of food security was expanded to include new concepts that were previously considered missing. These included elements such as ecological sustainability, the affordability of food, and a terminology shift from 'emergency food relief' to 'charitable food relief'. The resulting definition of food security was as follows: "Food security exists when all people, at all times, have regular and reliable physical, social and economic access to sufficient safe, nutritious and culturally relevant food that meets their dietary needs and food preferences. This is supported by an environment of ecological sustainability, adequate sanitation, health services and care for an active and healthy life. This includes the assured ability to acquire acceptable, affordable foods in socially acceptable ways without resorting to charitable food supplies scavenging, stealing and other coping strategies"(Gallegos, D et al, 2023, p. 1990).

2. The concept of political stability and Trends of its study

2.1. Concept Of Political Stability

The concept of political stability is not different from other concepts of political science, in terms of multiplicity and overlap, and sometimes there is a contradiction in terms of the definition of this concept. Here is an attempt to present some of these problems:

A. Some researchers have addressed the topic of political stability using a method that contradicts the positive meaning of the concept of stability.

In the sense of studying the phenomenon of political instability rather than the phenomenon of political stability. On this basis, the definition of political stability is often from the negative picture, In other words, when considering the phenomenon of political stability, political thinking was concerned with analysing the factors of instability by looking at socio-economic inequality, institutional degradation and cultural vulnerability. The study of this concern received the most attention compared to Tahira's characterization of political stability(Al-DARMIKI, 2012, p. 138).Thus, The definition of political instability can be described as "a function ofa lack of consensus, which may arise due to colonialinfluence, a failure to materialize a sense of ‘nation-hood’ in the citizenry, dictatorship, economic instability, or foreign influence "(Fukutomi, M. 2024, p.03).Frequent changes ofgovernment (or attempts to do so), internal dissensions and ethnic disputes, and involvement in borderclashes with neighbouring countries may also contribute to the political instability of a country. Political instability may hinder progress through repressionand negative change and lead to foreign interventionor increased foreign influence.

In general, thereare threeapproaches to define the concept of politicalinstability(AL-BADJOURI, 2021):

- **The first approach** which views political instability in a narrow space, as Governments' propensity and susceptibility to sudden change.
- **The second approach** is seen as government change coupled with political unrest, of a non-peaceful nature and accompanied by violent incidents such as political assassinations, sit-ins or demonstrations;
- **The third approach** is broader and more comprehensive, so that changes in the State's public policies and other changes in the economic system are understood to include any manifestation of economic and social instability, and therefore stability is not limited to political aspects only.

In the context of the political reality on the African continent, the concept of political instability is linked to the concept of fragile State which can be regarded as an extreme form of political instability.The OECD characterises fragility as" the combination of exposure to risk

and insufficient coping capacity of the state, systems and/or communities to manage, absorb or mitigate those risks. Fragility can lead to negative outcomes, including violence, poverty,inequality, displacement, and environmental and political degradation"(OECD, 2022, p. 05) . The concept of state fragility according to this definition is thus not limited to political aspects, but to various economic, environmental and security risks that may affect the State's stability in some way. This is confirmed by the definition of the same organization in 2009 which focuses on the criterion of the imbalance between the State and society's needs (MEGHICHE, 2021, p. 231).

B.From another standpoint, other researchers analyse the concept of political stability by linking it with the competence of the research field wishing to define this political phenomenon.

For example, in examining the concept of political stability from an economic perspective, the concept of political stability is then matched with the reduction of the phenomenon of caste conflict in society. And the concept of political stability could be consistent with the equitable distribution of wealth among groups of society from one labour class to another invested class and a third ruling class.

In this regard, Richard Higot(BOUAFIA, 2016, p. 310) identifies three main trends that seek to define the concept of political stability.

- **The first trend**associates stability with the absence of change in political systems; a system that remains unchanged over time is considered stable.
- **The second trend** defines instability through the frequent turnover of governments; political systems that undergo repeated governmental changes are seen as unstable. In this view, instability is assessed based on the likelihood of a change in government, whether through constitutional means (i.e., within legal frameworks) or unconstitutional ones (e.g., coups) (AMARA.A.M, 2022, p. 11).
- **The third trend** defines political stability as the absence of all forms and levels of violence within society, including the absence of political crimes at the state level.

From the foregoing, it can be said that the phenomenon of political stability is not necessarily linked to the absence of political change, but to the content and direction of such change, as many instances of political change increase the regime's legitimacy and effectiveness. As to the fact that political stability is not necessarily accompanied by the absence of political violence, the frequent resort to political violence means that there is a bankruptcy of means of change or a conviction that they are already futile.

2.2 Approaches To Studying The Phenomenon Of Political Stability

Because of the considerable differences that have emerged between political thinkers about defining and establishing a uniform definition of political stability, the scientific entrances that study this phenomenon have varied from one thinker to another, leading to the emergence of several schools in their studies including: behavioral school, regular school, functional school and performing school.

Table 1: Approaches To Studying The Phenomenon Of Political Stability

School	The most important thinkers	Field of Scientific Interest	Meaning of politicalstability
Behavioral	Tidgier, Rudolph Ramel, Verabend, Domiac and Henry Laporette	The study of the phenomenon of political stability is carried out by focusing on the behaviour, psychological motivation and social conditions that control such behaviour, such as economic deprivation and religious and political persecution.	Political stability means lack of political violence.
Regular	Carl Deutsch, Jeffrey Record, Lucian Bay and David Austin (the last researcher was the one who introduced the idea of a regulatory dimension or systemic format analysis)	A static (rigid) political society is an ideal pattern that cannot realistically be achieved. David Austin presented the following conception: Change > Adaptation = Stability. Change< adjustment = instability.	Political stability according to this school is the case of maintaining and sustaining order (avoiding destabilizing change).
Functional	Richard Rose, Harold La Swell, Max Weber and Emile Durcaim	This school focuses on building the state institution, as the political system is the institutional (legal) expression of the movement of political interactions between different stakeholders within society.	The stability and continuity of the political system depends on the ability of state institutions to adapt to society's interactions and to meet external challenges.
Performing	Harry Eckstein, Verapend list and Johan Galtung	This school focuses on analysing the correlation between political stability and levels of government performance, and researchers consider that the positive performance of government institutions is very necessary to create political stability.	Political stability according to this school is equal to the success of government policies.

SourceAuthors based on:(BOUAFIA, 2016, pp. 315-316)and (BIKR**, 2021, pp. 5-6)**

According to the above table and based on the studies of Bouafia(2016, pp. 315–316) and BIKR(2021, pp. 5–6), the multiplicity of schools in the study of political stability reveals a certain difficulty in defining the concept of political stability. What can be seen is that the behavioural school focuses on the behavioural patterns of political stability in the absence of manifestations of violence. The formal school views political stability as a situation resulting from the maintenance of order. The functional school focused primarily on the institutional and legal expression of the state, while the school's recent view was about the link between political stability and government performance.

In the same context, the complexity of the concept of political instability and the interconnectedness of its definitions have led to a multiplicity of indicators or methods of measurement and evaluation. Various composite indicators have been developed by interested international institutions to assess and measure political stability and its different dimensions. For example, the World Bank has issued the Political Stability and Absence of Violence Index as one of the six dimensions of the good governance index, which also includes political representation and accountability for responsibility, government effectiveness and quality of procedures, the rule of law and the control of corruption. The Political Stability and Lack of Redress Index is defined according to the World Bank as a potential destabilization or overthrow of government by unconstitutional or violent means.

Part II: Applied Study (method and tools)

This study seeks to investigate the impact of food security indicators on Algeria's political stability during the period 1996-2023 by identifying the measurement model selected on the basis of previous study models, identifying the measured variables and how to calculate them. It should be noted that the source of data to be processed is the figure announced by international bodies and organizations with competence in the area of food security and political stability. The completion of section II's report will therefore be with the discussions as follows:

1. Variables And Study Model

1.1Mathematical Formulation OfThe Study Model

The objective of the study is to examine the reality of the determinants' values of food security in Algeria through the values shown by the indicators announced by the competent international bodies, as well as the values of the indicators of Algeria's political stability from 1996 to 2023. A standard model will then be developed showing an influential relationship between the reality of food security and that of Algeria's political stability. Thus, the meaning of the variables of previous studies will be relied upon and used to build the standard model equation according to the following mathematical formula: presented in the equation (01)

$$VA = f\,(COR, FIP, PIBP, INF, RL).....(1)$$

In this model, the dependent variable is the index of political stability and absence of violence, for which we will symbolize: (VA). Independent variables will be represented as follows:

- COR: Control of corruption;
- PIBP: Per capita GDP;
- INF: Inflation rate;
- RL: Rule of law;
- FPI: Food pricesindex.

The Food Price Index (FPI) was adopted as a key indicator of a state's readiness to respond to price fluctuations, thereby enhancing its capacity to achieve food security. This is because it reflects the degree of food accessibility through pricing. Sudden fluctuations in the prices of essential food commodities significantly affect individuals' purchasing power.

Moreover, rising prices may lead to a decline in strategic food reserves and an increase in hunger levels, making the FPI a fundamental metric for assessing a nation's food security status.

1.2 Data Sources

In this study, statistical measurements and tests were applied using the Distributed Delays Autonomous Regression Model (ARDL), using a series of annual quantitative data recorded from 1996 to 2023, a period restricted by the availability of data of some key variables in the study model, mainly: Corruption, political stability, the absence of violence and the rule of law. It should be noted that the data of these indicators were not available before 1996. Table 2 shows the study's variables and the source of data:

Table 2: Study Model Variables And Data Source

Code	Variable	Source
VA	Political stability and the absence of violence	WGI
COR	Control of corruption	WGI
FPI	Food pricesindex	FAO
PIBP	Per capita GDP	WGI
INF	Inflation rate	WGI
RL	Rule of law	WGI

Source:Authors based on data from WGI (2023) andFAO**(2023)**

2.Results And Discussion

For the purpose of identifying and measuring the long impact and then the short impact of sub-variables of food security on political stability. According to the economic measurement approach, the following steps have been applied:

2.1 StudyOfThe Stability Of Series Of Study Variables And Model Estimation

Through the results set out in supplement No. 1, the null hypothesis was accepted, which states that there is a Unit rootfor the time series under consideration because the ADF calculated value is greater than the ADF tabular value at a 5% abstract level. This is demonstrated by the probability value which is greater than the 5% morale level (0.05), and this is for both variables political stability index. (VA), Corruption Control Index (COR), Food prices index(FPI) and Rule of Law Index (RL), which means there is a unit root for these time series, therefore it is not stable at this level, and after the test of the first difference.The zero hypothesis turned out to be unacceptable. When the digital results were examined, the ADF value calculated at less than the tabular value because the probability value (P) is smaller than the value of the degree of statistical indication (Sig), which means that time series are free of the unit's roo. Thereby stabilizing them at the first difference, from which it can be said that both the smooth political stability index (VA), Corruption Control Index (COR), Food prices index(FPI) and Rule of Law Index (RL) are stable chains at the first difference, so they are integrated from the first tier I (1), while at the variable chain we observe all per capita GDP (PIBP) and the inflation rate (INF) had a probability value below 5% (0.05), thus no unit root in these two chains, which means that these two chains are stable at the level of I (0).

This result leads us to use distributed self-regression models (ARDL) as well as the results of the stability test of the dependent variable (political stability and absence of VA violence).

And using the Dickie-Fuller test was shown to have a fixed limit, as the test showed to have a general trend (see annex 2), so we have to take this result into account when estimating the ARDL model, from which the mathematical formula of the measurement model estimated on this form can be written:

$$VA = \mu + \beta T + \sum_{i=1}^{P} \lambda_j COR_{t-i} + \sum_{I=0}^{q1} \varphi_{1i} FPI_{t-i} + ... + \sum_{I=0}^{q8} \varphi_{1i} RL_{t-i} + \varepsilon_t .....(2)$$

After determining the degree of variables integration, optimal slowing periods determined the values (p, q1, q2, q3, q4, q5) of the unrestricted error correction model (UECM), and the best ARDL model (1, 1, 2, 2, 1, 2)(Annex 3).

After estimating the ARDL model, the boundary test (Bounds Test) has been applied to see whether there is a long-term balance between the dependent variable (political stability) and autonomous variables (food security indicators), where the following hypothesis has been tested: (see annex 4)

H0: There is no integrated correlation between variables.

H1: There is an integrated correlation between variables.

The result of statistical processes has shown that Fischer's calculated test value (F) is equal to (6.0095), which is greater than that of the upper limit equal to (4.878), at the level of statistical significance (Sig) 5%, so the null hypothesis would be rejected, from which it could be concluded that there was a common complementarity between the time series studied. Since the result of the joint integration test was positive, the long-term relationship was assessed, and then the restricted error correction (RECM) model was estimated, with the formula formulated as follows:

→ Long-term assessment results: (see annex 5)

$$VA = -0.82COR_t - 0.0021FIP_t + 0.048PIBP_t - 0.026INF_t + 0.33RL_t + 0.048t$$

→ Short-term assessment results: (see annex 6)

$$\Delta VA = -1.41 + 0.04\Delta COR_t + 0.0012\Delta FPI_t + 0.012\Delta FPI_{t-1} + 0.015\Delta PIBP_t - 0.02\Delta PIBP_{t-1} - 0.053\Delta INF_t - 0.15\Delta RL_t - 1.37\Delta RL_{t-1} - 0.744\Delta CE_{t-1}$$

2.2 Analyze the estimation results

2.2.1TestAnd Measure Return Strength Towards Balance

Since the error correction limit parameter ($CointEq_{t-1}$) is negative and statistically significant at the level of (Sig) 5%, the error correction model is acceptable. This confirms a long-term balance between the political stability index and the independent variables represented by food security. It is clear from the error correction parameter (-0,744061) when the level of political stability in the short term deviates from its balance value, the equivalent of 74.40% of this deviation is corrected in the next period, i.e. the imbalance corrects annually by 74.40%.This means that it takes approximately 1.341 years (equivalent to 1 year, 3 months, and 5 days) for the political situation to return to equilibrium. This finding suggests that resolving political turmoil in Algeria is a gradual process that requires time. The trajectory of political stability over time is reflected in the index values, which continue to show negative trends from year to year. These persistent deviations, if left unaddressed, may increase the risk of significant political shocks. (Approximately : 25.6% as an indicative rate of the annual accumulation that generates violence and political tension.).

(Annual accumulation of imbalance in the range of 55.4% is the generator of street explosion and political congestion).

2.2.3Cointegration model analysis. Autoregressive distributed lag (ARDL)

Based on short-term estimation results, Algeria's political stability and absence of violence are estimated to be -1.41, under conditions where external and internal influences are not present. This value puts Algeria under the risk of being subjected at any time to a political blockage along the lines of continuous succession of governments without effective and genuine solutions in the absence of a strategic vision of the political situation in crisis day by day. This situation has contributed in one way or another to constitutional or unconstitutional factors, as well as to unethical factors added to the rise in cases of extremism of all kinds such as terrorism.

As indicated by the analysis, political stability is highly likely to be negatively affected in the coming years due to the failure to address underlying social issues and recurring production deficiencies in the food sector. These unresolved challenges may serve as a catalyst for the emergence of violence and political tension, particularly as a result of speculative practices and manoeuvres by opportunistic actors who profit from the prevailing conditions.

In this regard, two groups can be highlighted:

- The category benefiting from the existing political status quo (apparently encouraging democratic governance, but in fact they are autocrats) seeks to preserve the same status quo and to maintain the same governmental authority, often using various unconstitutional, legal and moral means, such as: forgery, the use of forgers, the purchase of officials, bribery, the administration of blind loyalties, etc.
- The category that rejects political stability in its positive sense (rejects democratic systems and rejects the smooth transition of power). It considers it to be impossible to maintain its previous gains in the period of political stability (the negative concept of authoritarianism - or totalitarian regimes), thus, rejecting any political change for the better (This category resists change and raises the slogan of the above is better than what is to come). Strangely, this category confirms this in its demagogical rhetoric in bold, such as the saying: "We, and after us, the flood".

In the same context, it has been observed that efforts to combat corruption in Algeria positively influence political stability. Specifically, a 1% improvement in the Control of Corruption Index corresponds to a 0.12% increase in political stability. This finding aligns with economic theory, which posits a positive correlation between anti-corruption efforts and the achievement of political stability. Effectively addressing corruption can be seen as a key indicator of greater stability, given that corruption has the potential to undermine political institutions and erode public trust in government, ultimately fuelling political instability. Conversely, reducing corruption has been shown to strengthen the rule of law and accountability, thereby enhancing political stability.

It appears that, in the long term, anti-corruption efforts are associated with a 0.82% decline in political stability. This paradoxical outcome may be attributed to the nature of the adopted anti-corruption policies, which tend to be reactive, non-deterrent, and limited in scope. These measures often target high-profile corrupt individuals while overlooking widespread petty corruption, which remains deeply embedded and continues to grow incrementally over time—much like a snowball effect.

It is also noted that the impact of food security expressed in the Food Prices Index (FPI) has been given positive digital values, in view of the correlation between the realities of the

food sector and the stability of the political situation. If citizens have difficulties to obtain their strength from daily food, they will be fearful and confused, their needs abound and their political consciousness are reduced, they generate social unrest that directly and adversely affects political and security stability. This is precisely the case in Algeria, for example, the large number of social and political unrest in 1988 in the various provinces of Algeria. Other social and political disturbances occurred at the beginning of the third millennium, such as the crisis in the supply of sugar and oil, whose prices rose madly in 2011, as well as the high prices of animal and peasant products (such as infant milk, coffee, potatoes, garlic etc.) after this period.

It should be noted that the events and conditions resulting from the mismanagement of the food security file in Algeria have had a direct impact on Algeria's calm security and political stability. In the 1990s there were violent protests that killed many people, these events and political upheavals almost led to civil war. At the beginning of the third millennium, protests and social unrest returned, but this time less sharply than the previous one, this may be the result of policies adopted at that time, policies aimed at purchasing social peace with petroleum revenues. This was at the exp.ense of real economic development, and the situation of poor management of the food file in Algeria coincided with a Patchwork Policy in government, such as numerous changes in the members of the Government and their change of office without holding them accountable. During this period, Algeria recorded many economic, financial and material losses, and Algeria was unable to invest in agriculture and food production.

The study found that the welfare arising from GDP per capita has a positive impact on political stability, both in the short and long term, and the higher the income , the better the living conditions of citizens (assuming other economic conditions improve). This is reflected positively in political stability and the absence of violence. A citizen who is satisfied with his monthly entrance will reduce his protests against the government, thereby, reducing violence, increasing the citizen's attachment to his political representatives, thereby increasing political stability and security and reducing disturbances and crises.

The study's analysis also found that inflation had a negative impact on political stability in the long and short term. The higher rate of inflation, the greater the collapse of Algerian citizens' purchasing power, which leads to social unrest, increased violence, many thefts and embezzlements, thus, they destabilize political and security stability in Algeria.

The study indicates that the rule of law and the application of legal provisions and texts without discrimination among members of Algerian society in all spheres of economic, social and political life is a necessary condition that will increase Algerian society's confidence in justice and compliance with the provisions of the law. When the rule of law and the force of justice were achieved, there would be fewer misappropriations in public finances and corruption was eliminated, all of which had a positive impact on Algeria's political and security stability. When the judiciary is independent and is not influenced by politicians, financiers, men of power, persons of interest and influence, the state is fair in applying speculative laws in large-scale goods (e.g. essential food goods). The basis for the state's establishment, viability, sustainability and strength is the level of justice in that State.

2.2.4 Model Suitability Test For Measurement And Model Quality

There is a technical possibility to conduct a set of diagnostic statistical tests on the serial data model derived from developments in food security indicators, through which the adequacy of this model used to measure estimated parameters in the long and short term is judged. Pro table 3 shows the results of the tests applied to the model prepared for this study (study of developments in the food security index and its impact on Algeria's political stability during the period 1996-2023): (see annex 6)

Table 3: Diagnostic Tests Results

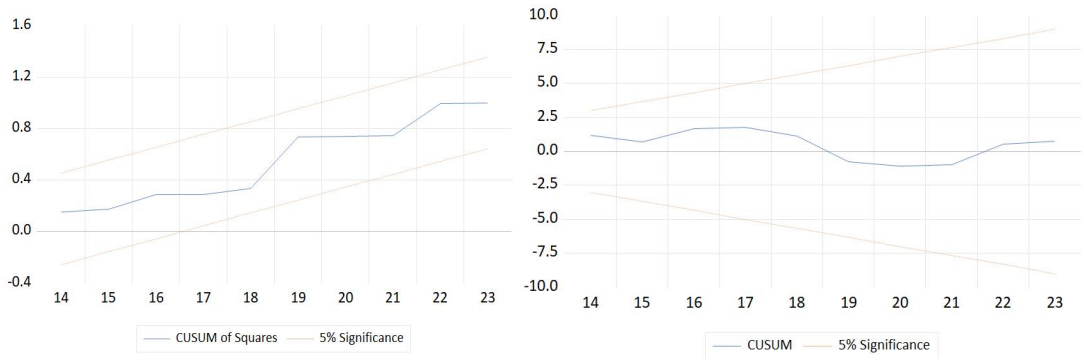
Test	Statisticaltool	Value	Probability
Autocorrelation	F-Statistic	1.885073	0.2134
	Chi-Sqaure	1.328173	0.1554
Normality	Jarque-Bera	4.790357	0.0911
Heteroskedasticity	Chi-Sqaure	1.203238	0.3924
	F-Statistic	16.73036	0.3352

Source:Prepared by Authors

- **Autocorrelation test:** this was done using the test (Breusch-Godfrey) known as LM Test, notes from Table 3 that the value (F-statistic) has no statistical significance in the level (Sig) 5%, which means accepting the null hypothesis (H0), therefore, the estimated model does not suffer from the problem of self-association between errors, which is also confirmed by a statistical value (Chi-Square), it was not statistically significant at a level (Sig) 5%, which means accepting the null hypothesis (H0), so it can be said that the estimated model does not suffer from a self-correlation problem between incoming errors.
- **Normality Test:** Through the results of Table 3, it is clear to us that after the Jarque-Bera test was used, the test result was not statistically significant at the Sig level set at 5%, which means accepting the null hypothesis (H0), so it can be said that errors follow moderate normal distribution.
- **Heteroskedasticity Test:** This test is used in order to ensure that the homogenization of the variability in errors is achieved. This homogenization is one of the basic assumptions underlying the small square method of studying statistical correlation (OLS). On this basis, the statistical test (Breusch-Pagan-Godfrey) was applied, and the results from this test were as shown in table 3, from which it is noted that the value of (Sig) for both tests (F-statistic) and (Chi-Square) were not statistically significant, which means accepting the null hypothesis (H0), thus, it can be argued that there is no problem of discrepancy, in the sense that there is actual homogeneity in the variance of the estimated model's errors.
- **Parameter stabilization tests:** This test was applied using the CUSUM test, which examines the cumulative Sum of recursive residuals, in addition to the use of the

CUSUMSQ test which examines the cumulative Sum of squares of recursive residuals, and the results of these tests, as shown in figure 2 below.

Figure 2 : Structural Stability Test Results



Source: Prepared by Authors.

The above figure shows that recursive residual as well as recursive residual of squares lie within the field (Sig) of statistical significance 5%, which means that the model is structurally stable. Thus, it can be said that previous test results demonstrated the adequacy of the model used and that its estimated results are of high quality

.

Conclusion

This study was aimed at demonstrating the extent to which food security affected Algeria's political stability between 1996 and 2023. Overall, the applied aspect (the section containing economic measurement tests) showed an important result that underscored the positive impact of the food security indicators monitored on Algeria's short-term political stability levels. This result has been substantiated by statistically significant evidence. Efforts to improve the food security margin have also caused some undesirable political manoeuvres. Despite this situation, there is a clear correlation between developments in food security management indicators and political stability and the absence of violence.

It was noted that this long-term relationship became reverse. This is due to actions, decisions and grounding measures taken in achieving food security in the short term, which have had negative implications for long-term political stability. The study also concluded that whenever social well-being (per capita GDP) was achieved, it had a positive impact on Algeria's levels of political stability in the short and long term.

Therefore, we propose to the highest authorities of the country that they pay close attention to the dimensions of food security, particularly those related to expanding agricultural investments, enabling and controlling the food industry, protecting it from speculation and seeking political programmes that link Algeria's political stability to the provision of food security. On the other hand, we propose further efforts, measures, procedures and rigorous decisions based on the results of investigations, research and scientific studies in ways to maintain the safety margin in the food file, far from the class improvisation of certain persons in power and the business sector. This is only to achieve long-term food security, which in turn will help Algeria's political stability.

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Annex

Annex 1: Time Series Stability Of Variables Used In Estimation

UNIT ROOT TEST RESULTS TABLE (ADF)
Null Hypothesis: the variable has a unit root

At Level

		VA	COR	FIP	PIBP	INF	RL
With Constant	t-Statistic	-1.1105	-1.6802	-1.2207	-3.7423	-6.1364	-1.9999
	Prob.	***0.6966***	***0.4295***	***0.6504***	***0.0090***	***0.0000***	***0.2851***
		n0	n0	n0	***	***	n0
With Constant & Trend	t-Statistic	-2.8476	-2.4361	-2.6184	-4.1624	-6.8257	-2.6553
	Prob.	***0.1939***	***0.3544***	***0.2756***	***0.0148***	***0.0000***	***0.2613***
		n0	n0	n0	**	***	n0
Without Constant & Trend	t-Statistic	-1.5679	-0.2954	0.3491	-3.0545	-3.1915	-1.3543
	Prob.	***0.1082***	***0.5699***	***0.7787***	***0.0036***	***0.0025***	***0.1587***
		n0	n0	n0	***	***	n0

At First Difference

		d(VA)	d(COR)	d(FIP)	d(PIBP)	d(INF)	d(RL)
With Constant	t-Statistic	-5.3658	-4.7339	-4.7479	-8.4401	-4.4821	-3.6003
	Prob.	***0.0002***	***0.0009***	***0.0009***	***0.0000***	***0.0019***	***0.0129***
		***	***	***	***	***	**
With Constant & Trend	t-Statistic	-5.2528	-4.6087	-4.6292	-8.2556	-4.6189	-3.5213
	Prob.	***0.0013***	***0.0057***	***0.0057***	***0.0000***	***0.0065***	***0.0579***
		***	***	***	***	***	*
Without Constant & Trend	t-Statistic	-5.0781	-4.8318	-4.6581	-8.6015	-4.6559	-3.5566
	Prob.	***0.0000***	***0.0000***	***0.0001***	***0.0000***	***0.0001***	***0.0010***
		***	***	***	***	***	***

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

This Result is The Out-Put of Program Has Developed By:
Dr. Imadeddin AlMosabbeh
College of Business and Economics
Qassim University-KSA

Annex 2:Dickey- Fuller Test of the Dependent Variable Data Series (Political Stability)

Null Hypothesis: VA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.847581	0.1939
Test critical values:	1% level	-4.339330	
	5% level	-3.587527	
	10% level	-3.229230	

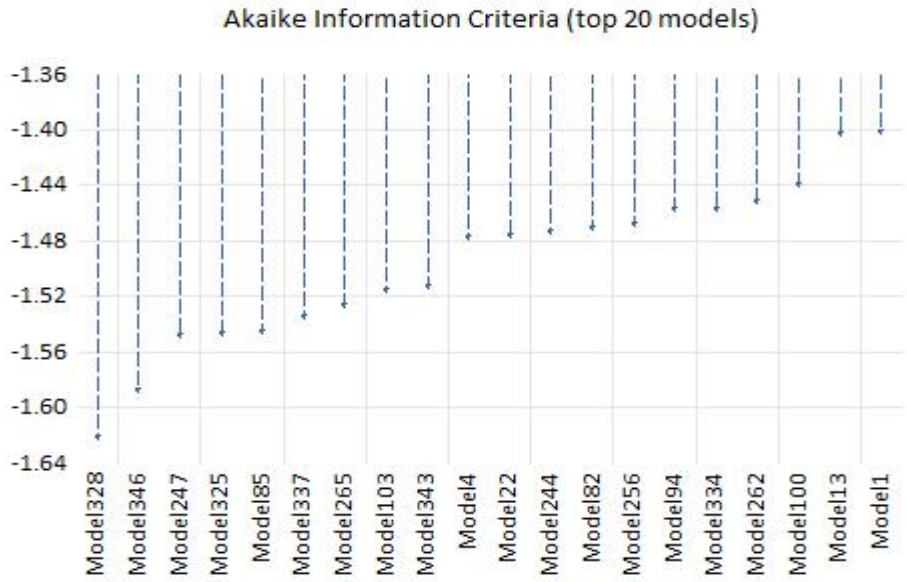
*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(VA)
Method: Least Squares
Date: 03/24/25 Time: 13:03
Sample (adjusted): 1997 2023
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VA(-1)	-0.523536	0.183853	-2.847581	0.0089
C	-0.894924	0.330852	-2.704911	0.0124
@TREND("1996")	0.019767	0.007656	2.581946	0.0164

R-squared	0.254177	Mean dependent var	0.044645
Adjusted R-squared	0.192025	S.D. dependent var	0.176499
S.E. of regression	0.158650	Akaike info criterion	-0.739788
Sum squared resid	0.604079	Schwarz criterion	-0.595806
Log likelihood	12.98714	Hannan-Quinn criter.	-0.696975
F-statistic	4.089607	Durbin-Watson stat	1.742198
Prob(F-statistic)	0.029623		

Annex 3 : Top 20 Models



Annex 4:Bounds Test Results

Bounds Test

Null hypothesis: No levels relationship
Number of cointegrating variables: 4
Trend type: Rest. trend (Case 4)
Sample size: 26

Test Statistic	Value
F-statistic	6.009554

Bounds Critical Values

	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	3.097	4.118	3.715	4.878	5.205	6.640
Asymptotic	2.680	3.530	3.050	3.970	3.810	4.920

* I(0) and I(1) are respectively the stationary and non-stationary bounds.

Annex 5:RECM Restricted Error Correction Model InThe Long Term

Cointegrating Specification

Deterministics: Rest. trend (Case 4)

CE = VA(-1) - (-0.825582*COR(-1) - 0.002162*FIP(-1) + 0.048490*PIBP(-1) - 0.026904*INF(-1) + 0.334818*RL(-1) + 0.048474*@TREND)

Cointegrating Coefficients

Variable *	Coefficient	Std. Error	t-Statistic	Prob.
COR(-1)	-0.825582	0.758039	-1.089102	0.2891
FIP(-1)	-0.002162	0.005490	-0.393846	0.6979
PIBP(-1)	0.048490	0.032815	1.477666	0.1551
INF(-1)	-0.026904	0.032135	-0.837207	0.4124
RL(-1)	0.334818	0.455217	0.735512	0.4706
@TREND	0.048474	0.008082	5.998122	0.0000

Note: * Coefficients derived from the CEC regression.

Annex 6:RECM Restricted Error Correction Model In Short Term

Error Correction

Dependent Variable: D(VA)
Method: ARDL
Date: 03/24/25 Time: 12:38
Sample: 1998 2023
Included observations: 26
Dependent lags: 2 (Automatic)
Automatic-lag linear regressors (2 max. lags): COR FIP PIBP INF RL
Deterministics: Unrestricted constant and restricted trend (Case 4)
Model selection method: Akaike info criterion (AIC)
Number of models evaluated: 486
Selected model: ARDL(1,1,2,2,1,2)
Huber-White (HC0) heteroskedasticity consistent standard errors and covariance
No d.f. adjustment for standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.744061	0.090694	-8.204084	0.0000
D(COR)	0.121128	0.194599	0.622450	0.5424
D(FIP)	0.001221	0.001489	0.820011	0.4243
D(FIP(-1))	0.012693	0.001968	6.448814	0.0000
D(PIBP)	0.015611	0.007722	2.021621	0.0603
D(PIBP(-1))	-0.020800	0.007703	-2.700225	0.0158
D(INF)	-0.053389	0.007508	-7.110867	0.0000
D(RL)	-0.151513	0.142633	-1.062259	0.3039
D(RL(-1))	-1.379070	0.195267	-7.062496	0.0000
C	-1.411485	0.179083	-7.881753	0.0000

R-squared	0.890329	Mean dependent var	0.048201
Adjusted R-squared	0.828639	S.D. dependent var	0.179006
S.E. of regression	0.074101	Akaike info criterion	-2.083062
Sum squared resid	0.087854	Schwarz criterion	-1.599179
Log likelihood	37.07981	Hannan-Quinn criter.	-1.943721
F-statistic	14.43236	Durbin-Watson stat	2.515364
Prob(F-statistic)	0.000004		

* p-values are incompatible with t-Bounds distribution.

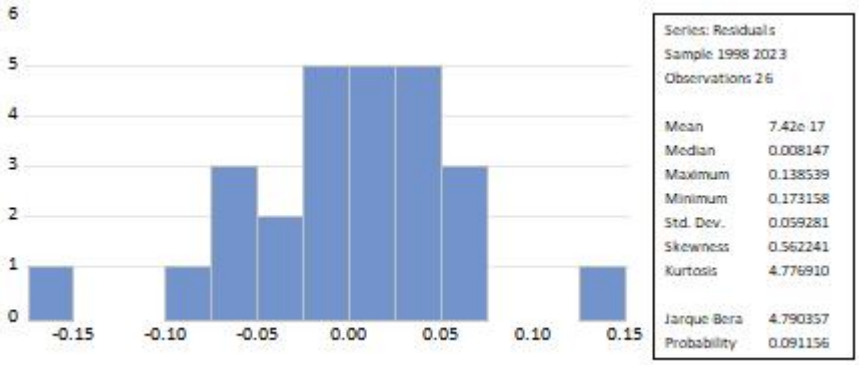
Annex 7:Diagnostic Tests OfThe Model

Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.885073	Prob. F(2,8)	0.2134
Obs*R-squared	1.328173	Prob. Chi-Square(2)	0.1554

Normality Test



Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.203238	Prob. F(15,10)	0.3924
Obs*R-squared	16.73036	Prob. Chi-Square(15)	0.3352
Scaled explained SS	4.673749	Prob. Chi-Square(15)	0.9945