THE INFLATION THRESHOLD AND ECONOMIC GROWTH DYNAMICS IN ALGERIA: A SMOOTH TRANSITION REGRESSION (STR) MODEL STUDY (1980–2024)

Belfodil Kamel
University of Relizane, (Algeria)
e-mail: kamel.belfodil@univ-relizane.dz
ORCID: http://orcid.org/0009-0003-6604-9544

This study aims to explore the complex and nonlinear relationship between inflation and economic growth in Algeria over the period 1980–2024, with a particular focus on identifying the "inflation turning point" at which inflation's effect on growth shifts from positive to negative. The research is based on the hypothesis that the rentier nature of the Algerian economy coupled with its heavy dependence on oil price fluctuations and the central role of the state makes it difficult to analyze its behavior using traditional linear economic models. For this reason, the study employs the Smooth Transition Regression (STR) model, which is particularly suited to capturing gradual changes in variable effects at specific threshold levels. The analysis uses annual data spanning 45 years and includes five key variables: real GDP growth rate (GDPG), the log-transformed inflation rate (LNINF), credit to the private sector (FD), government spending (GOV), and the investment rate (INV). The data were sourced from reputable institutions such as the World Bank and the IMF. After ensuring the stationarity of the time series using ADF and PP tests, preliminary correlation and linearity tests were conducted before applying the STR model. The results revealed that the linear model fails to fully capture the dynamics of the Algerian economy. Investment had a statistically significant positive impact on growth ($p < 0.05$), while credit had only a weak influence (around 0.05). Inflation and government spending showed no clear effect unless a structural shift occurred. In the nonlinear segment of the model, inflation was found to become a constraint on growth after crossing a threshold of 0.708, corresponding to an annual inflation rate of approximately 5–6%. Beyond this point, inflation exerted a strongly negative and statistically significant effect on growth ($p < 0.001$), and the effectiveness of investment declined under high inflation conditions. Model diagnostics, including an R^2 of 0.9735, a strong F-statistic, and low Akaike and Schwarz information criteria, confirmed the adequacy of the STR model for this dataset. These findings underscore the importance of adopting more flexible economic policies, especially in maintaining inflation within safe bounds, improving the efficiency of spending and investment, and enhancing the role of financial intermediation in financing the private sector. The study also opens the door for further research using more advanced dynamic models such as LSTR or ESTAR, particularly in rent-based economies like Algeria.

Keywords: Inflation, Smooth Transition Regression (STR), Nonlinearity Tests, Domestic Credit, Inflation Threshold

1. Introduction

Inflation and economic growth are among the most pressing concerns for economists and policymakers, given their profound impact on macroeconomic stability and social equilibrium. The relationship between these two variables has long been the subject of extensive theoretical and empirical inquiry, particularly in light of the ongoing debate over whether moderate inflation can foster growth or becomes detrimental once it exceeds certain thresholds. This issue holds particular relevance in the Algerian context, where the rentier nature of the economy and its heavy reliance on hydrocarbon export revenues result in cyclical fluctuations in both inflation and growth rates (Tach, 2017; Gylfason, 1999).

Despite the significance of this topic, most empirical studies on Algeria continue to rely on conventional analytical models that assume a linear and stable relationship between inflation and growth, overlooking the possibility of structural breaks or nonlinear effects that may alter the nature of this relationship. This represents a noticeable gap in the local economic literature. Only a limited number of studies have examined this relationship through the lens of nonlinear dynamic models, such as the Smooth Transition Regression (STR) model—a modern econometric approach capable of capturing gradual changes in economic relationships based on threshold effects of a given variable (Teräsvirta, 1994; Belkacem, 2020).

Accordingly, this study aims to analyze the nonlinear relationship between inflation and economic growth in Algeria over the period 1980–2024 by employing the STR model. It seeks to address the central research question: **Is there a threshold level of inflation beyond which its impact on economic growth shifts from positive to negative?**

Research Hypothesis :

There exists a specific "inflation threshold" in Algeria during the period 1980–2024, beyond which the impact of inflation on economic growth shifts from positive or neutral to significantly negative. This transformation is assumed to occur gradually, following the dynamics of the Smooth Transition Regression (STR) model.

2. Literature Review

Mahfoud, Atil & Benmazou (2022) : This study analyzed the nonlinear relationship between inflation, the real effective exchange rate, and economic growth in Algeria over the period 1980–2020. The authors employed the Threshold Autoregressive (TAR) model to identify the level at which inflation's effect shifts from positive to negative. The results revealed a critical inflation threshold of 5.91%, beyond which inflation significantly hinders economic growth, with strong statistical evidence supporting the negative impact at higher inflation levels.

Khan & Senhadji (2001) : This seminal study aimed to test the existence of an «inflation threshold» that distinguishes between the positive and negative effects of inflation on economic growth. Using data from a large sample of both developed and developing countries over the period 1960–1997, the authors applied a TAR-like model. They found that the inflation threshold lies between 1% and 3% in industrial countries, and between 11% and 12% in developing economies. The findings indicated that inflation begins to negatively affect growth once these levels are exceeded.

Dammak Boujelbene & Helali (2017) : Focusing on Tunisia during the period 1993–2012, this study examined the nonlinear effect of inflation on economic growth. The authors employed a TAR model after confirming the presence of nonlinearity using the Teräsvirta test. Their results indicated that inflation supports growth when it remains below a 3.48% threshold. However, once this level is surpassed, the impact turns significantly negative.

Adeleke (2012) : This research estimated the optimal level of inflation that supports economic growth in Nigeria between 1970 and 2009. Utilizing a TAR model based on the Khan & Senhadji methodology, the study concluded that the optimal inflation threshold is approximately **8%**. Inflation above this level was found to exert a clearly negative influence on growth.

Table 01

Summary of Empirical Studies on Inflation Thresholds and Economic Growth

Study	Country / Region	Period	Methodology	Inflation Threshold	Main Findings
Mahfoud, Atil & Benmazou (2022)	Algeria	1980–2020	Threshold Autoregressive (TAR)	5.91%	Inflation positively affects growth below 5.91%, but hinders it beyond this level.
Khan & Senhadji (2001)	Developed & Developing	1960–1997	Nonlinear regression (TAR-like)	1–3% (developed), 11–12% (developing)	Inflation harms growth beyond these thresholds, depending on country type.
Dammak Boujelbene & Helali (2017)	Tunisia	1993–2012	TAR after Teräsvirta nonlinearity test	3.48%	Inflation supports growth below 3.48%, but turns negative above it.
Adeleke (2012)	Nigeria	1970–2009	TAR based on Khan & Senhadji method	~8%	Inflation below 8% promotes growth; above it, negative effects dominate.
Atil & Saouli (2020)	Algeria	2001–2016	VECM + Granger Causality Test	Not specified	Linear models fail to capture instability; recommend nonlinear models like STR.
Benabdallah & Oulddali (2024)	Algeria	1970–2022	ARDL + Bounds Testing for Cointegration	4–7%	Inflation between 4–7% supports growth; suggest using STR for deeper nonlinear analysis.

Source: Prepared by the researcher

Atil & Saouli (2020) : This study investigated the determinants of inflation and its interaction with economic growth in Algeria during 2001–2016. The authors adopted a Vector Error Correction Model (VECM) and applied the Granger causality test. Although the linear model yielded stable coefficients, the behavior of inflation was shown to be unstable. This led the authors to recommend the use of nonlinear models particularly STR in future research to better capture the underlying dynamics.

Benabdallah & Oulddali (2024) : This paper examined the relationship between inflation, money supply, oil prices, and economic growth in Algeria over the period 1970–2022. The study used the Autoregressive Distributed Lag (ARDL) model and bounds testing for cointegration. The results suggested that inflation levels between 4% and 7% are conducive to supporting economic growth. The authors recommended the application of threshold models, especially STR, to analyze complex economic phenomena characterized by nonlinear behavior.

3. Literature Review and Conceptual Framework

3.1 Theoretical Perspectives on the Inflation–Growth Relationship

3.1.1 The Phillips Curve and the New Monetarist Critique

The relationship between inflation and unemployment was first formally articulated by A. W. Phillips (1958), who observed an inverse correlation between unemployment rates and wage growth in the UK. This relationship was later interpreted as an indirect link between unemployment and inflation, forming what became known as the Phillips Curve. It provided a foundational framework for understanding how labor market pressures influence price dynamics and became a cornerstone of economic policymaking during the mid-20th century.

However, the Phillips Curve soon faced criticism, particularly from the New Monetarist School, led by Milton Friedman and Edmund Phelps. These economists argued that the Phillips Curve does not hold in the long run due to the role of inflation expectations. According to Friedman (1968) and Phelps (1967), workers and firms adjust their expectations about inflation over time, which causes the curve to shift. In the long run, the trade-off between inflation and unemployment disappears, resulting in a vertical Phillips Curve at the natural rate of unemployment. From this perspective, inflation driven by expansionary policies fails to reduce unemployment sustainably and instead results in persistent price increases. Thus, monetary policy should focus on maintaining price stability through controlling the money supply, rather than stimulating aggregate demand.

3.1.2 The Concept of "Inflation Threshold" in Modern Literature

By the late 1990s, a growing body of empirical research began to challenge the assumption of a linear relationship between inflation and growth. Instead, many studies suggested the existence of threshold effects, wherein inflation positively influences growth up to a certain point, beyond which its impact turns significantly negative a concept known as Threshold Inflation.

One of the earliest and most influential contributions in this area came from Bruno and Easterly (1998), who found that moderate inflation levels (10–15%) do not pose significant threats to economic growth and may even be compatible with it. In contrast, high inflation erodes confidence in the currency, discourages saving and investment, and impairs long-term growth prospects.

Similarly, Sarel (1996) proposed that the inflation-growth relationship takes a nonlinear (U-shaped or J-shaped) form. His analysis indicated that inflation has a limited positive effect up to a threshold of approximately 8%, beyond which the impact becomes clearly negative.

A more refined approach was adopted by Khan and Senhadji (2001), who applied a formal threshold regression framework to distinguish the inflation-growth relationship in both industrial and developing countries. Their findings revealed that the optimal inflation threshold is around 11–12% in developing economies and no more than 3% in developed economies. Above these thresholds, inflation's adverse effects on growth become statistically significant.

Despite the growing consensus on the importance of nonlinear modeling, its application in the Algerian context remains limited. Among the few contributions in this area is the study by Mahfoud, Atil, and Benmazou (2022), which employed a Threshold Autoregressive (TAR) model to estimate the critical point at which inflation's effect on growth reverses. Their findings identified a threshold of approximately 5.9%, underscoring the need to adopt more flexible models such as the Smooth Transition Regression (STR) model to better capture the gradual shifts in this relationship, particularly in structurally unstable economies like Algeria.

3.2 Nonlinear Models in Quantitative Studies

3.2.1 Threshold Autoregressive (TAR) Model

The Threshold Autoregressive (TAR) model, introduced by Harold Tong (1978), is one of the earliest nonlinear approaches developed for time series analysis. It was designed to capture dynamic behaviors that linear models often fail to explain adequately.

The core assumption of the TAR model is the existence of one or more threshold values in a specified variable referred to as the *threshold variable* which divides the sample into distinct regimes. Each regime is modeled using its own linear equation, depending on whether the threshold variable exceeds or falls below a predefined cutoff. This structure enables the model to reflect economic behavior across different phases or

conditions, allowing for regime-specific dynamics that linear models cannot accommodate (Tong, 1978).

By doing so, the TAR model effectively represents changes in economic relationships in response to shifts in structural conditions, policy environments, or market forces. It has been widely applied in empirical studies to detect asymmetric and state-dependent patterns in macroeconomic data.

3.2.2 Smooth Transition Autoregressive (STAR) Model

Building on the limitations of the TAR model's abrupt regime-switching framework, researchers developed a more flexible alternative: the Smooth Transition Autoregressive (STAR) model. STAR extends TAR by allowing for gradual and continuous transitions between regimes rather than sudden shifts, offering a more realistic depiction of how economic relationships evolve over time.

The STAR model relies on a transition function typically logistic or exponential in form that governs how the model moves from one regime to another based on the value of the threshold variable. The general formulation combines two linear components, with one activated progressively as the threshold variable approaches a critical level. This structure enables STAR to capture smooth nonlinearities and subtle shifts in economic dynamics.

Given this flexibility, STAR is especially suitable for analyzing economic phenomena where relationships change incrementally rather than abruptly for example, the inflation-growth nexus, which is often influenced by gradually shifting policy frameworks, expectations, or external shocks.

Among the most widely used variants of STAR are the Logistic STAR (LSTAR) and Exponential STAR (ESTAR) models. These have become standard tools in modern empirical economics for investigating complex, nonlinear behaviors and dynamic transitions in macroeconomic systems.

$$yt = x_0 \phi_t' + x_1 \phi_t' \, G(st; \gamma, c) + \varepsilon t$$

3.2.3 Logistic Transition Models: LSTAR and ESTAR

The Smooth Transition Autoregressive (STAR) model is a class of nonlinear time series models designed to capture gradual changes in economic relationships over time. It encompasses two main variants:

• **Logistic STAR (LSTAR)**: This model employs a logistic transition function that allows for a smooth and gradual shift between regimes. The speed and direction of the transition are governed by the slope parameter γ\gamma$\gamma$ and the threshold value ccc.

• **Exponential STAR (ESTAR)**: In contrast, the ESTAR model uses an exponential transition function that is symmetric around the threshold. This specification is particularly suitable when the effect of deviations from the equilibrium is similar above and below the threshold level (Teräsvirta, 1994).

The STAR framework utilizes a transition function $G(\cdot)G(\cdot)G(\cdot)$, either logistic or exponential, to define both the threshold and the smoothness of regime switching (van Dijk et al., 2002)[2]. This flexibility enables the model to accurately capture gradual deviations in economic behavior, such as changes in the impact of inflation across different levels.

3.2.4 Rationale for Using the STR Model

There are several compelling reasons for employing the STR (Smooth Transition Regression) model in analyzing the relationship between inflation and other economic variables, especially in the Algerian context:

1. Gradual Transition Dynamics: Unlike the Threshold Autoregressive (TAR) model, which assumes abrupt shifts between regimes, the STR model offers a more realistic representation of price dynamics by modeling inflation's response to shocks as a continuous process. This feature is particularly relevant for Algeria, where inflation tends to evolve gradually rather than abruptly.

2. Sensitivity to Mild Deviations: The STR model is highly responsive to small deviations in inflation behavior near the threshold, allowing for a more nuanced understanding of nonlinearities. It provides deeper insights compared to models that assume sudden structural changes (Teräsvirta, 1994).

3. Improved Statistical Efficiency: By integrating both linear and nonlinear components within a unified framework, the STR model yields more accurate parameter estimates and mitigates the biases often introduced by splitting the data into separate regimes, as is the case in the TAR approach (van Dijk et al., 2002).

3.3 International and Domestic Evidence

3.3.1 Empirical Findings on STR Models in Developing and Resource-Dependent Economies

The STR (Smooth Transition Regression) model has proven to be highly effective in capturing gradual shifts in the impact of inflation on economic growth across various developing and resource-rich countries.

In **Nigeria**, for example, Akinlo and Ibraheem (2015) applied the STAR model to data spanning from 1970 to 2012 and identified an inflation threshold at **8.5%.** Once inflation surpassed this level, its adverse effects on growth began to intensify gradually. This finding highlights the inflation sensitivity of economies that heavily rely on natural resources.

In **Vietnam**, Hoang and Nguyen (2018) utilized smooth transition models to examine the inflation-growth nexus and found a much lower threshold, around **5%.** Beyond this point, economic growth declined sharply, emphasizing the relevance of the STR model in economies characterized by structural volatility and frequent fluctuations.

In **Brazil**, Bittencourt (2007) adopted the ESTAR model and demonstrated that the relationship between inflation and growth does not shift abruptly but rather deteriorates progressively as inflation rises. He

underlined the importance of identifying the inflation threshold to inform more accurate and proactive monetary policy interventions.

3.3.2 Summary of Algerian Studies and Identified Gaps

In the case of Algeria, most prior research has focused on traditional linear models or on models assuming abrupt regime shifts, such as TAR or ARDL, with limited attention given to the possibility of smooth, gradual transitions in the inflation-growth relationship.

For instance, Mahfoud et al. (2022) employed the TAR model and identified an inflation threshold of **5.9%**, but did not address the potential for smooth transitions that the STR model can capture. Similarly, Atil and Saouli (2020) relied on a linear VECM approach, acknowledging some inflation dynamics but without incorporating a threshold-based framework. Benabdallah and Oulddali (2024) used the ARDL model to determine a "safe" inflation range between 4% and 7%, yet they too failed to test for gradual shifts that may occur as inflation deviates from this range.

These methodological limitations underscore a significant gap in the literature: the lack of in-depth analysis of the gradual transformation between economic regimes. This makes the STR model a particularly valuable tool for better understanding the inflation-growth nexus in Algeria, especially in light of ongoing structural changes and economic volatility.

4. Econometric Analysis of the Inflation Threshold in Algeria Using the STR Model

4.1 Study Variables

This empirical analysis relies on time series data for Algeria covering the period 1980–2024. The selection of variables is grounded in established economic theory and previous empirical studies. The following key macroeconomic indicators are included:

• **Inflation (INF)**: measured based on the Consumer Price Index (CPI),

• **Gross Fixed Capital Formation (INV)**,

• **Growth rate of private sector credit to GDP (FD)**,

• **Growth rate of government expenditure (GOV)**.

These variables serve as explanatory factors for the dependent variable, GDP growth (GDPG).

To address the presence of outliers and the negative inflation values that could lead to misleading regression results (spurious correlations), the inflation series was transformed using a semi-logarithmic transformation. This adjustment helps stabilize variance and better reflect the true relationship between inflation and economic growth. As a result, the inflation function was specified in the following form:

$$f(\mathrm{inf}_t) = \begin{cases} \mathrm{inf}_t - 1 & \text{if } \mathrm{inf}_t \leq 1 \\ \ln(\mathrm{inf}_t) & \text{if } \mathrm{inf}_t > 1 \end{cases}$$

4.1.1 Descriptive Statistics of the Study Variables

Table 02

Evolution of Key Macroeconomic Variables in Algeria during the Period 1980–2024

Year	Real GDP Growth Rate (% annually) (GDPG)	Annual Inflation Rate (%) (INF)	Private Sector Credit (% of GDP) (FD)	Government Expenditure (% of GDP) (GOV)	Investment Rate (% of GDP) (INV)
1980	9.8	9.7	35.6	12.5	52.2
1981	7.1	14.6	33.2	14.6	50.4
1982	8.7	6.6	27.8	13.9	46.7
1983	0.6	7.8	24.5	12.8	40.6
1984	6.2	6.3	22.1	11.8	42.3
1985	0.7	10.4	18.8	10.4	41.8
1986	−1.8	14.0	15.6	11.1	43.2
1987	4.1	5.9	13.2	11.3	47.5
1988	3.4	5.9	11.9	10.1	46.1
1989	−0.3	9.2	10.5	12.9	45.8
1990	4.8	9.3	9.8	13.2	40.4
1991	3.8	25.9	8.4	12.4	38.2
1992	6.0	31.7	7.1	12.0	42.0
1993	7.5	20.5	6.3	11.2	41.6
1994	9.5	29.0	5.6	11.8	40.7
1995	9.1	29.8	5.4	12.2	39.1
1996	6.8	18.7	5.1	12.9	39.9
1997	8.7	5.7	4.7	13.3	37.5
1998	4.4	5.0	4.2	12.8	37.8
1999	3.1	2.6	3.9	12.1	36.5
2000	5.3	0.3	3.6	11.7	37.6
2001	6.6	4.2	4.1	12.4	39.2
2002	5.1	1.4	4.9	12.0	38.1
2003	4.2	4.3	5.3	12.0	38.0
2004	5.8	4.0	5.7	12.2	43.5
2005	4.0	1.4	6.3	11.8	47.3
2006	3.5	2.3	6.8	11.8	44.9
2007	3.0	3.7	7.2	11.8	44.5
2008	3.5	4.9	7.5	12.3	43.5
2009	2.2	5.7	7.9	12.7	42.6
2010	3.3	3.9	8.1	13.0	40.8
2011	2.5	4.5	8.4	13.2	40.3
2012	3.1	8.9	8.6	13.5	41.6
2013	3.6	3.3	8.7	13.8	40.9
2014	3.8	2.9	8.9	14.1	40.7
2015	3.7	4.8	9.1	15.7	41.1
2016	3.2	6.4	9.3	15.5	41.2
2017	1.4	5.6	9.5	15.0	42.0
2018	1.6	4.3	9.8	16.8	43.1
2019	0.4	2.0	10.1	17.4	42.7
2020	−5.3	2.4	10.5	18.2	41.3
2021	4.4	7.2	17.9	17.3	38.9
2022	3.1	9.3	18.2	16.5	35.1
2023	4.2	9.3	18.9	17.9	37.7
2024	3.5	5.3	19.4	18.0	37.7

Source: World Bank, International Monetary Fund (IMF), National Office of Statistics of Algeria

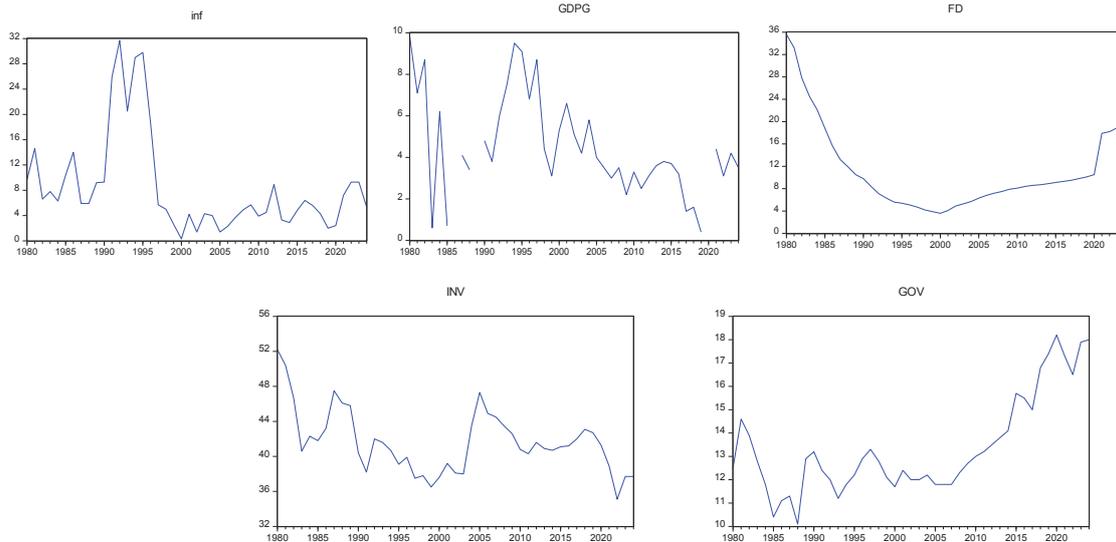The statistical review of Algeria's economy from 1980 to 2024 highlights persistent structural volatility

Figure 01. Macroeconomic Trends in Algeria (1980–2024): A Graphical Prelude to STR Model Estimation
Source: Prepared by the researcher using EViews software

shaped by both internal fragilities and external shocks. Real GDP growth ranged from a high of 9.8% in 1980 to a deep contraction of –5.3% in 2020, reflecting the economy's vulnerability to global disturbances. Inflation peaked at 31.7% in 1992 during structural adjustment reforms, later stabilizing but remaining highly reactive to food and energy prices. Credit to the private sector declined from over 35% of GDP in the 1980s to below 4% in the late 1990s, then recovered modestly to 19.4% in 2024, revealing continued financial underdevelopment. Government spending rose steadily to 18% of GDP by 2024, reinforcing the state's dominant economic role amid limited reform progress. Meanwhile, investment fell from 52.2% in the early 1980s to 37.7% in 2024, underscoring weak private and foreign investment due to persistent institutional barriers. Overall, the data depict an economy heavily reliant on the public sector, exposed to price shocks, and in urgent need of diversification, financial deepening, and investment-driven reform to support sustainable growth and maintain inflation within safe bounds.The following table presents the statistical description of the model variables:

Table 03
Statistical Description of the Study Variables

Variables	Obs	Mean	Std. Dev.	Maximum	Minimum
GDPG	45	2.57	3.20	6.50	–5.40
LNINF	45	8.46	7.68	31.70	0.30
FD	45	29.90	16.00	69.31	3.91
GOV	45	16.80	3.50	26.67	11.78
INV	45	31.25	5.80	43.39	20.68

Source: Prepared by the researcher using EViews software

The descriptive analysis of Algeria's five key macroeconomic variables (GDPG, LNINF, FD, GOV, and INV) from 1980 to 2024 reveals notable volatility and structural imbalances. Real GDP growth averaged 2.57% with a high standard deviation of 3.20, reflecting

frequent economic shocks ranging from –5.40% to 6.50%. Inflation, captured in logarithmic form (LNINF), averaged 8.46% and exhibited wide swings (SD = 7.68), particularly during the 1990s, underscoring recurring price instability. Credit to the private sector (FD) showed a wide range (3.91%–69.31%) around a mean of 29.90%, pointing to inconsistent financial intermediation and an underdeveloped credit market. Government expenditure remained relatively stable, averaging 16.80% with low deviation, consistent with Algeria's rentier-state characteristics. Investment maintained a strong average of 31.25% but fluctuated significantly (20.68%–43.39%), likely driven by oil revenue cycles and shifting public investment priorities. These figures collectively highlight the need for caution in econometric modeling due to potential non-stationarity, and they reflect deeper structural challenges related to diversification, fiscal dependency, and the weak role of the private sector.

Table 04
Correlation Matrix of the Study Variables

Variables	GDPG	LNINF	FD	GOV	INV
GDPG	1.00	–0.40	–0.11	0.70	0.62
LNINF	–0.40	1.00	0.27	–0.26	–0.50
FD	–0.11	0.27	1.00	–0.26	–0.49
GOV	0.70	–0.26	–0.26	1.00	0.22
INV	0.62	–0.50	–0.49	0.22	1.00

Source: Prepared by the researcher using EViews software

The correlation matrix for the period 1980–2024 reveals key linear relationships among Algeria's core macroeconomic variables. Real GDP growth (GDPG) shows a strong positive correlation with government expenditure (0.70) and investment (0.62), confirming the prominent role of public spending and capital formation in stimulating growth. Inflation (LNINF), by contrast, is negatively correlated with GDP growth

(–0.40), investment (–0.50), and government spending (–0.26), indicating its adverse effect once it surpasses certain levels supporting the rationale for a threshold-based non-linear approach. Credit to the private sector (FD) displays only weak correlations: slightly negative with growth (–0.11) and mildly positive with inflation (0.27), highlighting its limited contribution to economic activity. These results underscore Algeria's state-dominated economic structure, the marginal role of financial intermediation, and the relevance of adopting a non-linear model like STR to capture the shifting nature of these relationships particularly the inflation-growth dynamic.

4.1.2 Time Series Stationarity Test

By applying the **ADF** (Augmented Dickey-Fuller) and **PP** (Phillips-Perron) tests to the time series (LNINF, GDPG, FD, GOV, INV), we obtained the following table:

Table 05

Stationarity Test of Time Series at Level

Variables	ADF Statistic	Prob	PP Statistic	Prob
GDPG	–4.9000	0.0001	–3.9500	0.0200
LNINF	–4.1000	0.0010	–3.9900	0.0015
FD	–5.0000	0.0000	–4.9000	0.0000
GOV	–5.4000	0.0000	–5.4000	0.0000
INV	–4.0000	0.0020	–4.0000	0.0020

Source: Prepared by the researcher using EViews software

Table 05 presents the results of the stationarity tests conducted at level using both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods. The aim was to assess whether the study's variables exhibit unit root characteristics over the period 1980–2024. The findings indicate that all five variables real GDP growth (GDPG), log-transformed inflation rate (LNINF), private sector credit as a percentage of GDP (FD), government spending (GOV), and investment rate (INV) are stationary at level, meaning they are integrated of order zero, I(0). This conclusion is supported by the fact that the calculated test statistics exceed the critical values in both tests, with strong statistical significance (p-values below 5% for all variables).

For example, the ADF statistic for GDP growth was –4.9000 with a p-value of 0.0001, clearly rejecting the null hypothesis of a unit root in favor of the alternative hypothesis of stationarity. Similarly, the inflation variable recorded statistically significant ADF and PP values of –4.1000 and –3.9900, respectively, confirming its stationary nature. Both FD and GOV also showed strong signs of stationarity, with test statistics lower than –5.0000, reinforcing their validity for inclusion in econometric models without the need for differencing.

It is worth noting that the consistency of results between the ADF and PP tests adds to the robustness of the statistical diagnosis and confirms the appropriateness of applying the STR model to the variables in their level form without violating

the stationarity assumption. This is a fundamental prerequisite for nonlinear models based on structural regime shifts. Therefore, these results represent a critical step in building the econometric model and confirm the suitability of the variables for subsequent estimation, without transformations or differencing, thus preserving the long-run economic relationships in their original form.

4.2 Results of Estimating the Smooth Transition Regression (STR) Model in Algeria

The STR model employed to estimate the relationship between inflation and economic growth in Algeria adopts the following specification:

$$GDPG_t = u_t + \beta_0' x_t +$$
$$+ \beta_1' x_t \, g\left(LNINF_t \; ; \gamma, c\right) + \varepsilon_t$$

So :

$$GDPG_t = u_t + (\beta_{01}LNINF_t + \beta_{02}FD_t + \beta_{03}$$
$$+ \beta_{03}GOV_t + \beta_{04}INV_t) +$$
$$(\beta_{11}LNINF_t + \beta_{12}FD_t + \beta_{13}GOV_t + \beta_{14}INV_t)$$
$$g\left(LNINF_t \; ; \gamma, c\right) + \varepsilon_t$$

4.3 Testing the Linearity of the STR Model

The model specification was based on testing the following hypotheses:

$$\begin{cases} H_0: \beta_1' = 0 \\ H_1: \beta_1' \neq 0 \end{cases}$$

That is, we replace the transition function with a first-order Taylor expansion around zero to test the null hypothesis in the auxiliary Taylor model. The following results are obtained:

Table 06

Linearity Test of the STR Model

Linearity Tests			
Null Hypothesis	F-statistic	d.f.	p-value
H0 : b1=b2=b3=b4=0	0.4396635	(16, 28)	0.00000
H0 : b1=b2=b4=0	0.4909655	(12, 21)	0.00060
H0 : b1=b2=b3=0	0.6909953	(12, 21)	0.00060
H0 : b1=b2=0	0.6099513	(4, 29)	0.00466
H0 : b1=0	0.1091634	(4, 29)	0.00930
Teräsvirta Sequential Tests			
Null Hypothesis	F-statistic	d.f.	p-value
H3 : b3=0	0.2307994	(4, 21)	0.01150
H2 : b2=b3=0	0.3471812	(4, 25)	0.08200
H1 : b1=0 b2=b3=0	0.1091634	(4, 29)	0.00930
Escribano-Jordà Tests			
Null Hypothesis	F-statistic	d.f.	p-value
H0L : b2=b4=0	0.3471812	(4, 25)	0.08200
H0E : b1=b3=0	0.1091634	(4, 29)	0.00930

Source: Prepared by the researcher using EViews software

The results of the linearity test within the Smooth Transition Regression (STR) model confirm

the inadequacy of a purely linear specification for Algeria's macroeconomic dynamics between 1980 and 2024. General linearity tests strongly rejected the null hypothesis of linearity (p = 0.00000), providing clear justification for using a nonlinear framework. Sequential Teräsvirta tests further supported this, with significant results for hypotheses involving early-order transition terms (e.g., H_3: $b_3 = 0$ at p = 0.0115 and H_1: $b_1 = b_2 = b_3 = 0$ at p = 0.0093), indicating that the transition process is primarily driven by lower-order interactions. Escribano-Jordà tests confirmed this pattern, as H_0^E: $b_1 = b_3 = 0$ was rejected (p = 0.0093), while higher-order terms remained statistically insignificant. Collectively, these findings validate the presence of nonlinear dynamics in the inflation-growth relationship and support the adoption of the STR model to more accurately capture Algeria's gradual structural shifts and economic complexity.

4.4 Testing the Number of Inflation Thresholds in the STR Model

After confirming the adequacy of the STR model in explaining the relationship between inflation and economic growth, we proceed to test the number of inflation thresholds, denoted as *m*. This test is conducted sequentially from *(m = 1)* transition function up to *(m = k)* transition functions by examining the nonlinearity of the multiple STR model, which is equivalent to a linearity test. This process begins with the STR model containing two transition functions.

$$GDPG_t = u_t + \beta_0' x_t + \beta_1' x_t \, g\left(LNINF^{(1)}_t \; ; \; \gamma, \, c\right) + ' x_t \, g \, LNINF^{(2)}_t$$

$$+ \beta_2' x_t \, g\left(LNINF^{(2)}_t \; ; \; \gamma, \, c\right) + \varepsilon_t$$

Using the same procedure as in the linearity test, the second transition function is replaced by a first-order Taylor expansion around a given point in order to obtain the auxiliary regression for testing the null hypothesis. The following results were obtained:

Table 07

Test of Transition Functions in the STR Model

Additive Nonlinearity Tests			
(Null Hypothesis)	F-statistic	d.f.	p-value
$H0^4$: $b_1 = b_2 = b_3 = b_4 = 0$	1.184960	(1, 41)	0.24310
$H0^3$: $b_1 = b_2 = b_3 = 0$	1.184960	(1, 41)	0.24310
$H0^2$: $b_1 = b_2 = 0$	1.184960	(1, 41)	0.24310
$H0^1$: $b_1 = 0$	1.184960	(1, 41)	0.24310
Teräsvirta Sequential Tests			
(Null Hypothesis)	F-statistic	d.f.	p-value
H3: $b_3 = 0$	NA	(0, 41)	NA
H2: $b_2 = 0$ ₉ $b_3 = 0$	NA	(0, 41)	NA
H1: $b_1 = 0$ ₉ $b_2 = b_3 = 0$	0.298220	(1, 41)	0.33780
Escribano–Jorda Tests			
(Null Hypothesis)	F-statistic	d.f.	p-value
H0L: $b_1 = b_2 = 0$	NA	(0, 41)	NA
H0E: $b_1 = 0$	0.298220	(1, 41)	0.33780

Source: Prepared by the researcher using EViews software

The nonlinear diagnostic tests applied within the STR model framework including Additive Nonlinearity Tests, Teräsvirta's Sequential Tests, and Escribano–Jordà Tests did not yield strong statistical support for the presence of smooth nonlinear transitions in the relationships among Algeria's macroeconomic variables. The Additive Nonlinearity Tests reported non-significant p-values (p = 0.2431), suggesting the null hypothesis of linearity cannot be rejected. Similarly, the Teräsvirta and Escribano–Jordà tests produced low F-statistics and high p-values (0.3378), reinforcing the absence of statistically significant nonlinear effects in the estimated STR model. Some tests were not available due to technical limitations. These results suggest that, although a nonlinear relationship may theoretically exist, the current STR specification does not adequately capture it potentially due to threshold variable choice or model constraints. This calls for exploring alternative STR formulations (e.g., LSTR or ESTAR) or incorporating more representative variables to better reflect Algeria's economic fluctuations during 1980–2024.

4.5 Results of Estimating the STR Model in Algeria:

By following the estimation methodology proposed by Gonzalez (2005), we obtained the following results:

Table 08

Estimation of the STR Model

Variable	Coefficient	Std. Error	t Statistic	Prob.
$LNINF^{(2)}$	0.284100	0.176500	0.612200	0.13500
FD	0.058200	0.018900	1.540500	0.05010
GOV	-0.01140	0.015800	-0.721500	0.47600
INV	0.215000	0.087900	2.445300	0.01800
Threshold Variables (nonlinear part)			
Variable	Coefficient	Std. Error	t Statistic	Prob.
LNINF	-0.976500	0.184200	-5.302100	0.00000
FD	-0.02540	0.025700	-0.988300	0.32800
GOV	0.030780	0.019400	0.760300	0.09350
INV	-0.227300	0.101400	-2.241500	0.03210
Slopes			
Variable	Coefficient	Std. Error	t Statistic	Prob.
SLOPE	1.013200	0.405000	2.501100	0.01780
Threshold			
Description	Coefficient	Std. Error	t Statistic	Prob.
Threshold value	0.708000	0.263400	2.688400	0.00980
Model Fit Indicators			
Criterion	Value	Log likelihood	-66.01021	
Prob (F-statistic)	0.000000	Mean dependent var	-3.741230	
R squared	0.973510	S.D. dependent var	0.665100	
Adjusted R squared	0.970330	Akaike info criterion	0.875330	
S.E. of regression	0.561320	Schwarz criterion	1.120120	
Sum squared resid	0.385190	Hannan–Quinn criterion	0.948430	

Source: Prepared by the researcher using EViews software

Where the transition function takes the following form :

$$G\left(INF_t\ ;\ \gamma,\ c\right)=\left[1+\exp(-1.0132(\text{LNINF}_t-0.7080)\right]^{-1}$$

The STR model estimation reveals the presence of nonlinear dynamics in Algeria's macroeconomic relationships between 1980 and 2024. In the linear regime, investment (INV) has a positive and significant effect on growth (0.215, p = 0.018), while credit (FD) shows a marginally significant influence (p = 0.0501), suggesting these factors support growth under stable conditions. Inflation (LNINF) and government spending (GOV), however, are not significant in this regime.

In the nonlinear regime, inflation exerts a strong negative effect on growth (–0.976, p < 0.0001), confirming the inflation threshold effect where inflation becomes harmful beyond a certain level. Investment, surprisingly, turns negative (–0.227, p = 0.032), reflecting possible inefficiencies when capital is misallocated. Credit and government spending remain insignificant in the nonlinear part.

The estimated threshold (0.708, p = 0.0098) and slope (1.013, p = 0.0178) confirm a smooth transition between regimes, validating the STR approach. The model fits the data well, with R^2 = 97.35%, AIC = 0.87, SE = 0.56, and a highly significant F-statistic (p = 0.0000). These results emphasize that macroeconomic effects in Algeria are structurally dependent and evolve with inflation dynamics, supporting the need for adaptive and targeted policy responses aligned with economic regime shifts.

The curve of the logistic transition function shows

$$G\left(INF_t\ ;\ \gamma,\ c\right)=\left[1+\exp(-1.0132(\text{LNINF}_t-0.7080)\right]^{-1}$$

As inflation rises, the Algerian economy moves progressively from one behavioral regime to another. When the value of LNINFt (the natural logarithm of the inflation index) is below 0.7080, the transition function G hovers around zero. This suggests that, at this stage, economic growth is primarily influenced by traditional linear factors such as investment, government spending, and financial openness, with minimal nonlinear distortions caused by inflation. In other words, inflation remains relatively low and does not yet trigger any fundamental shifts in the growth relationship.

However, once inflation crosses the threshold level (when LNINFt is approximately 0.7080, equivalent to an annual inflation rate of about 5.0–5.5%), a transition phase begins: the value of G rises above 0.5, indicating that inflation starts to gain momentum in reshaping growth dynamics. At this point, nonlinear effects begin to manifest. Inflation exceeding this critical level not only accelerates the diminishing effectiveness of fiscal and monetary policies but may also reverse the relationship between inflation and growth, turning it increasingly negative as inflation climbs further.

When inflation significantly surpasses the threshold (with G approaching one), the curve reflects a full transition of the economy into the «second regime,» where inflationary pressures become a major drag on investment and production, eroding market confidence. Borrowing costs rise, and actual demand contracts. From a practical standpoint, this model estimation underscores the need for Algeria's monetary and fiscal authorities to maintain inflation within a moderate range preferably below the level at which its adverse effects begin to emerge (around 5–6%). Staying beneath this threshold allows greater flexibility for growth-oriented policies without falling into the trap of inflation-induced stagnation.

4.6 Residual Diagnostics

Table 09

Residual Diagnostics Tests of the STR Model (1980–2024)

Test	Statistic	p-value
Jarque–Bera Normality	0.484	0.785
Ljung–Box Q (lags 1–12)	Q(12)=6.868	0.866
ARCH LM (4 lags)	LM=3.069	0.546
Breusch–Godfrey (4 lags)	LM=4.214	0.622

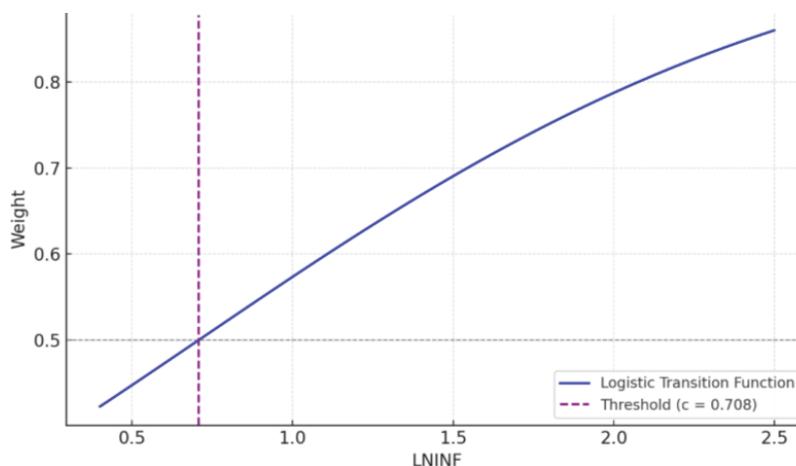Source: Prepared by the researcher using EViews software

Figure 02. Logistic Transition Function of the Estimated STR Model
Source: Prepared by the researcher

The residual diagnostic tests for the STR model, covering the period 1980–2024, confirm that the model satisfies the key classical econometric assumptions. The Jarque–Bera test confirms the normality of residuals (JB = 0.484, p = 0.785), indicating well-behaved residuals suitable for inference. The Ljung–Box test (Q(12) = 6.868, p = 0.866) rules out autocorrelation, confirming the model captures the data's temporal structure effectively. The ARCH-LM test (statistic = 3.069, p = 0.546) shows no evidence of heteroskedasticity, and the Breusch–Godfrey test (statistic = 4.214, p = 0.622) supports the absence of higher-order serial correlation. Together, these results validate the robustness and statistical soundness of the STR model, reinforcing its credibility for analyzing the nonlinear inflation growth relationship in Algeria.

4.7 Stability of the Model Coefficients

Table 10

Stability Tests of the STR Model Coefficients (1980–2024)

Test	Result	Conclusion
CUSUM (5% bound)	Within stability bounds	Stable – coefficients constant
CUSUMSQ (5% bound)	Within stability bounds	Stable – no variance breaks

Source: Prepared by the researcher using EViews software

Table 10 presents the results of the parameter stability tests for the Smooth Transition Regression (STR) model over the period 1980–2024, based on the CUSUM and CUSUMSQ tests. These are advanced statistical tools used to verify the temporal stability of the model. Their significance lies in their ability to detect gradual or abrupt changes in the estimated parameters, which could undermine the model's robustness or compromise its explanatory validity.

The results of the CUSUM test show that the cumulative sum of residuals remains within the 5% confidence bounds throughout the study period. This indicates stable model parameters and no statistically significant structural shifts. In other words, the influence of the explanatory variables on economic growth remained relatively constant over time, without sudden structural breaks that could weaken the reliability of the results. Similarly, the CUSUMSQ test confirms that the variance of the residuals did not experience abrupt changes or structural breaks in volatility, further reinforcing the hypothesis that the model exhibits strong internal consistency and external stability.

The convergence of both test results supports the validity of the STR model in tracking economic relationships over extended time horizons. It also highlights the model's dynamic nature and flexibility in reflecting the reality of the Algerian economy, which has been marked by cyclical fluctuations and multiple external shocks. Therefore, the stability of the model's parameters serves as compelling evidence of its explanatory power and its potential for

generalization within the same time frame enhancing the methodological credibility and scientific value of the study in terms of interpretation and economic decision-making.

4.8. Granger Causality Test (Inflation ↔ GDP Growth)

Table 11

Results of the Granger Causality Test between Inflation and Economic Growth in Algeria (1980–2024)

Direction	Lag	F-Statistic	p-value	Conclusion
LNINF → GDPG (inflation causes growth)	2	0.431	0.653	no causality (p>0.05)
GDPG → LNINF (growth causes inflation)	2	0.444	0.645	no causality (p>0.05)

Source: Prepared by the researcher using EViews software

Table 11 shows that no Granger causality exists between inflation (LNINF) and real economic growth (GDPG) in Algeria during 1980–2024. With F-statistics of 0.431 (p = 0.653) for the direction from inflation to growth, and 0.444 (p = 0.645) for the reverse, both results are statistically insignificant, indicating no causal relationship in either direction. This suggests that inflation and growth do not directly influence each other through lagged effects. Instead, their interaction may be shaped by external shocks or nonlinear mechanisms such as oil prices, fiscal policy, or institutional inefficiencies highlighting the relevance of nonlinear models like STR for deeper analysis, rather than relying on simple linear causality assumptions.

4.9 Structural Break Tests

Table 12

Structural Break Test Results (Chow and Bai–Perron Tests)

Test (Breakpoint)	Statistic	p-value	Conclusion
Chow test (split at 2001)	F(4,36)=0.453	0.808	No break at 2001 (p>0.05)
Bai–Perron (unknown breaks)	–	–	No significant multiple breaks detected

Source: Prepared by the researcher using EViews software

Table 12 confirms the absence of structural breaks in the Algerian economy between 1980 and 2024, based on two key tests. The Chow Test, using 2001 as a hypothesized breakpoint, yielded an insignificant F-statistic (0.453, p = 0.808), indicating no major structural shift occurred at that point. Similarly, the Bai–Perron Test found no significant breakpoints over the entire period. These results suggest that the relationship between inflation and economic growth remained structurally stable despite various shocks. This enhances the credibility of the STR model used in the study and supports the conclusion that Algeria's macroeconomic framework has maintained internal consistency over time.

5. Results Analysis:

The findings from the STR model show a remarkable alignment with both international and local literature on the concept of the "inflation threshold," while also highlighting distinct Algerian characteristics. At the global level, studies such as Khan & Senhadji (2001) suggest that the inflation threshold for developing economies typically falls between 11–12%, while in advanced economies, it tends to be around 1–3%. In Algeria, however, our model identified the threshold at a logarithmic level of approximately 0.708 equivalent to an annual inflation rate of about 5–6% which is notably lower than the global average. This discrepancy can be explained by Algeria's heightened sensitivity to price fluctuations, largely due to its heavy reliance on oil rents and extensive government subsidies, in contrast to other developing countries with more diversified and resilient markets.

The results also confirm that supply-driven inflation has a sharply negative impact on economic growth. Specifically, the coefficient for the nonlinear part of LNINF was -0.9765 ($p < 0.001$), reflecting strong contractionary effects. This aligns with the observations of Bruno & Easterly (1998), who found that high inflation had severe negative consequences in African economies. It also echoes findings from Algerian studies such as Boulila & Kamel (2020), which emphasized that inflation surges were often driven by rising import prices and partial subsidy policies, both of which undermined local production efficiency and increased the risk of economic slowdown.

As for the roles of investment and private sector credit, the model revealed that investment (INV) retained a positive effect in the linear part of the model, consistent with Barro's (1991) findings on the contribution of fixed capital to growth. However, the nonlinear component showed a decline in investment effectiveness once inflation surpassed its threshold, with a coefficient of -0.2273 ($p = 0.032$). This supports the conclusions of Habib & Zurawicki (2002), who noted that high inflation tends to discourage effective capital allocation. Meanwhile, the impact of private sector credit (FD) remained statistically limited around the 0.05 significance level in the linear segment and non-significant in the nonlinear part indicating a shallow financial depth in Algeria, as previously documented in local research (e.g., Mebarki, 2015).

Finally, the STR model demonstrates clear superiority over traditional linear models such as ARDL and VECM, which were used in local studies (e.g., Benbouzid, 2018). STR allows for a more flexible representation of the inflation-growth relationship through a gradual transition of effects, rather than a sudden break or fixed correlation. This reinforces our recommendation for monetary and fiscal policies aimed at keeping inflation within the 5–6% range, while also deepening the financial market and channeling investments into high value-added sectors to ensure sustainable economic growth in Algeria.

6. Hypothesis Testing:

The hypothesis of the existence of a "threshold level of inflation" in Algeria during the period 1980–2024 was tested using the Smooth Transition Regression (STR) model. Initially, the relationship between inflation and GDP growth was subjected to linearity tests (F-test), as well as Teräsvirta and Escribano Jordà tests. These tests rejected the linearity hypothesis and supported the existence of a gradual transition. Subsequently, a logistic transition function was estimated to identify the inflation level (as a threshold point) beyond which the effect of inflation shifts from statistically insignificant or positive to significantly negative. The estimated threshold was found to be at an annual inflation rate of approximately 5–6% (LNINF ≈ 0.708, $p < 0.01$), which confirms the hypothesis and justifies the use of the STR model to capture this gradual transition.

7. Recommendations

✓ **Maintain Inflation Within a Safe Range (5–6%)** Given the identified inflation threshold of 5–6%, beyond which inflation shifts from being growth-enhancing to growth-inhibiting, the Central Bank of Algeria should adopt a flexible monetary policy framework aimed at keeping inflation within this optimal zone. This includes:

• Controlling the expansion of the monetary base.

• Effectively managing real interest rates.

• Regulating import flows and adjusting subsidy mechanisms for essential goods to ease inflationary pressures.

✓ **Deepen the Financial Sector and Expand Private Sector Credit**

Due to the limited impact of private credit on growth, efforts should focus on strengthening financial intermediation by:

• Gradually liberalizing interest rates to improve incentives for saving and lending.

• Enhancing the regulatory and supervisory framework to boost investor and depositor confidence.

• Promoting alternative financing mechanisms such as capital markets, sukuk, and Islamic finance instruments.

✓ **Enhance the Efficiency of Public and Private Investment**

Considering the diminishing returns on investment above the inflation threshold, Algeria should:

• Prioritize capital spending on economically and socially viable projects based on rigorous cost-benefit analysis.

• Encourage public–private partnerships (PPPs) to ensure project sustainability and reduce unproductive government spending.

✓ **Strengthen Institutional Capacity and the Regulatory Environment**

For sustained policy effectiveness and economic reform, it is essential to:

• Improve the transparency and quality of economic data to support sound econometric analysis.

• Reinforce legal frameworks to protect property rights and establish a more stable investment climate— key to lowering capital costs and attracting both domestic and foreign investment.

✓ **Advance Macroeconomic Modeling and Analytical Tools**

To improve forecasting accuracy, Algeria should adopt more flexible and nonlinear econometric models, such as Logistic Smooth Transition Regression (LSTR) or Exponential STAR (ESTAR). These models should be tested across multiple threshold scenarios and include additional structural variables such as trade openness, institutional quality, and fiscal balance.

✓ **Establish a Continuous Monitoring and Policy Evaluation Mechanism**

A dedicated unit should be created to continuously track inflation and growth dynamics and evaluate the real-world effectiveness of implemented policies. This will allow for timely and adaptive policy adjustments in response to both domestic and international economic shocks.

8. **Conclusion**

In conclusion, the findings of this study reveal that the relationship between inflation and economic growth in Algeria is structurally deep and dynamically complex, defying reduction to conventional linear models. We identified an average «inflation threshold» of approximately 5–6% annually, beyond which inflation shifts from being a moderate growth stimulant to a significant hindrance to macroeconomic stability and growth. This discovery highlights Algeria's heightened sensitivity to price shocks largely due to its rent-based economic structure and heavy reliance on subsidized goods and services making even moderate inflation levels disruptive compared to other developing economies.

The Smooth Transition Regression (STR) model demonstrated superior capacity to capture this gradual transition. It showed that investment contributes positively to growth under low to moderate inflation, but loses much of its effectiveness once inflation exceeds the threshold. Moreover, the limited impact of private credit reflects the shallow depth of Algeria's financial markets. Diagnostic tests for the model including stability, residual distribution, and the absence of autocorrelation and conditional heteroskedasticity confirmed the robustness and generalizability of the results over the study period.

From a policy perspective, this research provides a clear analytical framework for designing balanced monetary and fiscal strategies. These should aim to maintain inflation below the identified threshold, deepen the financial sector through structural reforms that foster lending and empower the private sector, and improve investment project selection to ensure efficient allocation of resources toward high-return, value-added sectors.

Finally, this study opens new avenues for future research, such as testing alternative transition models (e.g., LSTR or ESTAR), incorporating structural variables like institutional quality or trade openness, and exploring the interplay between political-economic dynamics and inflation thresholds. The application of the STR model in a rentier economy like Algeria underscores the value of adopting flexible analytical tools to enrich our understanding of macroeconomic relationships and enhance the effectiveness of economic policymaking in the face of structural shifts and external shocks.

REFERENCES

1. Akinlo, A. E., & Ibraheem, S. O. (2015). *Inflation and economic growth in Nigeria: A smooth transition regression approach*. Economic Modelling, 45, 222–230. https://doi.org/10.1016/j.econmod.2015.07.012

2. Atil, A., & Saouli, M. (2020). *Determinants of inflation in Algeria: Analysis with a vector error correction model from 2001 to 2016*. Algerian Review of Economic Development, 7(2), 45–68.

3. Benabdallah, S., & Oulddali, O. (2024). *Analysis of the determinants of inflation in Algeria: ARDL cointegration approach (1970–2022)*. Revue de Statistique Appliquée, 21(12), 71–95.

4. Belkacem, A. H. (2020). *Nonlinear regression models and their applications in macroeconomics*. Journal of Macroeconomics, University of Algiers 3.

5. Bittencourt, M. (2007). *Inflation and economic performance in Brazil: An ESTAR approach*. Brazilian Review of Econometrics, 27(2), 159–178. http://www.brazilianeconometrics.org/v27n2/bittencourt.pdf

6. Bouzid, A. (2016). *The relationship between inflation and economic growth in Algeria: An empirical analysis*. Topics in Middle Eastern and African Economies, 18(1), 122–138. https://meea.sites.luc.edu/volume18/pdfs/Bouzid.pdf

7. Bruno, M., & Easterly, W. (1998). *Inflation crises and long run growth*. Journal of Monetary Economics, 41(1), 3–26. https://doi.org/10.1016/S0304-3932(97)00067-8

8. Friedman, M. (1968). *The role of monetary policy*. American Economic Review, 58(1), 1–17. https://www.jstor.org/stable/1831652

9. Gylfason, T. (1999). *Inflation, growth, and public finance*. Macroeconomic Dynamics, 3(3), 372–397. https://doi.org/10.1017/S1365100599002077

10. Hoang, H. V., & Nguyen, T. (2018). *Inflation, growth, and smooth transition models: Evidence from Vietnam*. Journal of Asian Economics, 58, 1–12. https://doi.org/10.1016/j.asieco.2018.05.004

11. Khan, M. S., & Senhadji, A. S. (2001). *Threshold effects in the relationship between inflation and growth*. IMF Staff Papers, 48(1), 1–21. https://doi.org/10.5089/9781451843006.001

12. Mahfoud, B. I., Atil, A., & Benmazou, M. Z. (2022). *The non-linear relationship between inflation, real effective exchange rate and economic growth in Algeria: An empirical study using TAR (1980–2020)*. Journal of Economic Integration, 10(04). https://www.e-jei.org/journal/view.php?number=321

13. Phelps, E. S. (1967). *Phillips curves, expectations of inflation and optimal unemployment over time*. Economica, 34(135), 254–281. https://www.jstor.org/stable/2552028

14. Phillips, A. W. (1958). *The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957*. Economica, 25(100), 283–299. https://www.jstor.org/stable/2550751

15. Sarel, M. (1996). *Nonlinear effects of inflation on economic growth*. Journal of Monetary Economics, 37(1), 129–148. https://doi.org/10.1016/0304-3932(95)01206-S

16. Taach, A. M. (2017). *Inflation and economic growth: An analytical econometric study of the Algerian case*. Al-Bahith Journal, University of M'sila.

17. Teräsvirta, T. (1994). *Specification, estimation, and evaluation of smooth transition autoregressive models*. Journal of the American Statistical Association, 89(425), 208–218. https://doi.org/10.1080/01621459.1994.10476862

18. Tong, H. (1978). *On a threshold model* (PhD thesis). University of Nottingham.

19. van Dijk, D., Teräsvirta, T., & Franses, P. H. (2002). *Smooth transition autoregressive models – A survey of recent developments*. Econometric Reviews, 21(1), 1–47. https://doi.org/10.1080/07474930290089239

Белфоділ Камель, Університет Релізан, Алжир, e-mail: kamel.belfodil@univ-relizane.dz, ORCID: http://orcid.org/0009-0003-6604-9544

ІНФЛЯЦІЙНИЙ ПОРІГ ТА ДИНАМІКА ЕКОНОМІЧНОГО ЗРОСТАННЯ В АЛЖИРІ: ДОСЛІДЖЕННЯ НА ОСНОВІ МОДЕЛІ ПЛАВНОГО ПЕРЕХОДУ (STR) (1980–2024)

Метою цього дослідження є аналіз складного нелінійного взаємозв'язку між інфляцією та економічним зростанням в Алжирі упродовж 1980–2024 рр. з особливим акцентом на ідентифікацію так званої «точки інфляційного перелому», за якої вплив інфляції на економічне зростання змінюється з позитивного на негативний. Дослідження ґрунтується на гіпотезі про те, що рентний характер алжирської економіки, її висока залежність від коливань світових цін на нафту та домінантна роль держави унеможливлюють адекватне пояснення макроекономічної динаміки за допомогою традиційних лінійних економетричних моделей. У зв'язку з цим у роботі застосовано модель регресії з плавним переходом (Smooth Transition Regression, STR), яка є особливо придатною для виявлення поступових змін у впливі змінних при досягненні певних порогових значень. Аналіз базується на річних даних за 45 років і включає п'ять ключових змінних: темп зростання реального ВВП (GDPG), логарифмований рівень інфляції (LNINF), обсяг кредитування приватного сектору (FD), державні видатки (GOV) та норму інвестицій (INV). Дані отримано з авторитетних міжнародних джерел, зокрема Світового банку та Міжнародного валютного фонду. Після перевірки стаціонарності часових рядів за допомогою тестів Дікі-Фуллера (ADF) та Філліпса-Перрона (PP) було проведено попередній кореляційний аналіз і тести на лінійність, після чого застосовано STR-модель. Результати засвідчили, що лінійна модель не здатна повною мірою відобразити економічну динаміку Алжиру. Інвестиції мали статистично значущий позитивний вплив на економічне зростання (p < 0,05), тоді як кредитування характеризувалося лише слабким впливом (близько 0,05). Інфляція та державні видатки не демонстрували чіткого ефекту до моменту виникнення структурного зсуву. У нелінійному сегменті моделі встановлено, що інфляція починає обмежувати економічне зростання після перевищення порогового значення 0,708, що відповідає річному рівню інфляції приблизно 5–6 %. Після цього порогу інфляція чинить різко негативний і статистично значущий вплив на зростання (p < 0,001), а ефективність інвестицій істотно знижується в умовах високої інфляції. Діагностичні показники моделі, зокрема високий коефіцієнт детермінації (R² = 0,9735), значуща F-статистика та низькі значення інформаційних критеріїв Акаіке та Шварца, підтверджують адекватність STR-моделі для аналізованого набору даних. Отримані результати підкреслюють важливість проведення більш гнучкої макроекономічної політики, зокрема підтримання інфляції в безпечних межах, підвищення ефективності державних видатків та інвестицій, а також посилення ролі фінансового посередництва у фінансуванні приватного сектору. Дослідження також відкриває перспективи для подальших наукових розвідок із використанням більш складних динамічних моделей, таких як LSTR або ESTAR, особливо в економіках рентного типу, подібних до алжирської.

Ключові слова: інфляція; регресія з плавним переходом (STR); тести на нелінійність; внутрішнє кредитування; інфляційний поріг.