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Monetary-fiscal policy regimes and economic growth in Algeria: a Markov-switching analysis (1990Q2–2025Q4)

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Abstract. *This paper investigates whether the growth effects of monetary and fiscal policies in Algeria are regime dependent, with particular emphasis on monetary–fiscal policy coordination. Using quarterly data for 1990Q2–2025Q4, we first estimate a baseline linear model and formally test for parameter instability. Structural-break diagnostics (Quandt–Andrews and Chow tests) strongly reject coefficient constancy, indicating that Algeria's growth process is characterized by discrete shifts that cannot be adequately captured by a single linear specification. Motivated by this evidence, we estimate a two-regime Markov-Switching Dynamic Regression model in which the intercept, policy coefficients, and error variance vary across regimes, while external controls are kept common across regimes. The Markov-switching model provides a substantially better fit than OLS and identifies two persistent regimes that differ in baseline growth and volatility. The central result is that monetary–fiscal policy coordination—measured by the interaction between lagged fiscal and monetary policy indicators—has a positive and statistically significant effect on GDP growth in both regimes, but the effect is markedly stronger the lower-growth, crisis-related regime. Transition probabilities imply long expected durations in both regimes, and smoothed regime probabilities align closely with major shock episodes, notably the 2014 oil-price collapse and the 2020 COVID-19 shock. Overall, the findings highlight the importance of institutionalized policy coordination frameworks, particularly during adverse macroeconomic conditions, while underscoring the growth costs associated with inflationary pressures.*

Keywords: Algeria, economic growth, monetary policy, fiscal policy, policy coordination, Markov-switching, structural breaks.

JEL Classification: E52; E62; E63; O47; C22; O55.

1. Introduction

The relationship between monetary and fiscal policies constitutes one of the most complex and debated issues in macroeconomic research, particularly in resource-rich economies such as Algeria, where understanding the coordinated or uncoordinated impact of these policies on economic stability and growth necessitates a rigorous empirical and theoretical framework (Djaballah, 2024). Algeria is characterized by what is termed the "Algerian Coordination Paradox," manifested in persistent inflation despite substantial hydrocarbon revenues, and the simultaneous occurrence of fiscal expansion and monetary accommodation during specific periods such as the oil price collapse (2014–2016), the COVID-19 pandemic (2020–2022), and the ongoing digital finance reforms (2024–2026). Each of these episodes has imposed unique challenges requiring nuanced policy responses.

This study aims to examine how event-driven structural shocks influence the effectiveness of monetary–fiscal policy coordination in promoting sustainable economic growth in Algeria (Hanif et al., 2023).

Algeria's economy is heavily reliant on hydrocarbon exports and has historically faced structural imbalances, with fiscal policy—frequently shaped by oil revenues—playing a pivotal role in determining the budget deficit and the overall economic landscape (Ikram & Mohammed, 2023). In the aftermath of the COVID-19 pandemic, Algeria experienced significant increases in public debt and fiscal pressures, raising concerns about long-term sustainability and implications for macroeconomic stability (Chekouri et al., 2024). These conditions underscore the necessity of analyzing the interaction between fiscal and monetary policies, especially in the presence of exogenous shocks, which can either exacerbate vulnerabilities or present opportunities for structural reforms (Boulila & Benbouziane, 2018).

The "Algerian Coordination Paradox" is defined in this study as the coexistence of large hydrocarbon revenues with fiscal expansion and monetary accommodation, generating persistent inflationary pressures without proportional real economic growth. This structural misalignment is observed across three distinct event regimes: the oil price collapse (2014–2016), the COVID-19 pandemic (2020–2022), and ongoing digital finance reforms (2024–2026), each profoundly shaping policy coordination dynamics (Mahfoudi et al., 2024; Mamman, 2025).

Historically, Algeria's fiscal policy has been procyclical, expanding during periods of high oil prices and contracting when prices fall, rather than acting as an automatic stabilizer (Ikram & Mohammed, 2023).

This procyclical behavior underscores the critical need for effective coordination between monetary and fiscal policies to cushion the economy against external shocks and promote sustainable development (Mamman, 2025). Furthermore, the COVID-19 pandemic introduced unprecedented challenges, necessitating substantial fiscal stimulus and monetary financing, thereby intensifying coordination challenges and their implications for inflation and growth dynamics (Ikram & Mohammed, 2023).

More recently, institutional reforms associated with the digital transformation of the financial system have introduced an additional dimension to Algeria's macroeconomic policy framework (Jackson, 2024). By modernizing payment systems and strengthening financial infrastructure, these reforms may fundamentally alter the transmission mechanisms and operational frameworks of monetary and fiscal policy. At the same time, the transition toward a more digitalized financial environment may temporarily generate institutional frictions that affect the degree of coordination between economic authorities (Jackson, 2024).

Despite the growing literature on macroeconomic policy in developing and resource-rich economies, most studies tend to analyze monetary and fiscal policies separately. As a result, insufficient attention has been devoted to the joint dynamics of these policies under event-driven structural conditions. In particular, existing research rarely examines how episodic shocks such as commodity price collapses, global crises, or institutional reforms reshape the coordination mechanisms between policy authorities.

This study seeks to determine whether these shocks have exacerbated existing structural imbalances or triggered adaptive policy responses, ultimately influencing the effectiveness of coordinated efforts toward sustainable growth. Expansionary fiscal policies often generate inflationary pressures, necessitating monetary countermeasures, which is especially relevant given Algeria's persistent inflation despite fiscal expansion and monetary accommodation (Bozagiu et al., 2025). This dynamic is further complicated by government programs aimed at economic revitalization, including efforts to control money supply and improve financial stability; however, significant challenges remain in achieving sustainable industrial development (Aid & Benelbar, 2023; Messaoudi et al., 2023).

To address this gap, this study examines the impact of event-driven shocks on the coordination between monetary and fiscal policies in Algeria over the period 1990–2025. The analysis employs a Markov-Switching framework to capture regime-dependent dynamics in monetary–fiscal policy interactions, allowing for endogenous transitions between distinct macroeconomic regimes driven by structural shocks.

Building on the preceding discussion, this study contributes to the literature in three main ways. First, it examines monetary–fiscal policy coordination in Algeria as a resource-dependent economy where hydrocarbon revenues, fiscal pressures, and monetary accommodation jointly shape macroeconomic outcomes. Second, it adopts a nonlinear Markov-Switching framework that allows the effects of fiscal policy, monetary policy, and their interaction on economic growth to vary across unobserved macroeconomic regimes, rather than assuming a stable linear relationship over the whole sample. Third, it distinguishes between relatively stable and crisis-related regimes, thereby assessing whether policy coordination plays a different role during normal macroeconomic conditions compared with periods of stress, such as oil-price shocks and the COVID-19 pandemic. The remainder of the paper is organized as follows. Section II discusses event-driven regime switching in the Algerian context. Section III presents the data and econometric methodology. Section IV reports and discusses the empirical results. The final section concludes and provides policy implications.

This raises a critical theoretical question for the Algerian context:

Does Algeria's persistent inflation reflect a fiscal-led price level determination rather than purely monetary mismanagement?

If oil price shocks reduce expected future surpluses (H1), the model predicts stronger inflationary pressures and weaker coordination effectiveness. Similarly, if extraordinary fiscal expansions during systemic crises—such as pandemics—are not accompanied by credible medium-term consolidation (H2), inflation may emerge as the adjustment variable validating fiscal imbalances.

2. Event-Driven Regime Switching

Macroeconomic policy coordination in Algeria operates within a volatile, resource-dependent environment, where external shocks frequently disrupt fiscal space, monetary policy reaction functions, and the effectiveness of policy coordination. By analyzing these shocks individually, this study aims to better understand the mechanisms through which they induce regime switches between monetary and fiscal dominance.

Oil Price Collapse Regime (2014–2016)

Algeria's economy is heavily reliant on hydrocarbon exports, which historically contribute over 90% of export revenues and approximately 60% of fiscal revenues (International Monetary Fund. Middle East and Central Asia Dept., 2021). A sharp decline in global oil prices between 2014 and 2016 led to a contraction in fiscal revenues of approximately 30–35%, widening budget deficits and reducing fiscal space for countercyclical spending. This environment created conditions conducive to fiscal dominance, as the government faced political and social pressures to maintain public spending, often financed through central bank borrowing or debt monetization. (Elkhdari et al., 2018)

From a theoretical perspective, the oil shock represents a regime-dependent exogenous variable that alters the effectiveness of monetary policy instruments. The fiscal constraint imposed by declining revenues modifies the central bank's reaction function, potentially forcing it to accommodate inflationary pressures to prevent sovereign default risk. Empirically, inflation in Algeria remained elevated (approximately 6–8%) during this period despite tight monetary measures, indicating that fiscal shocks dominated price level determination, consistent with the Fiscal Theory of the Price Level (FTPL) (Ikram & Mohammed, 2023; Mehibel & Belarbi, 2018)

COVID-19 Pandemic Regime (2020–2022)

The COVID-19 pandemic introduced unprecedented macroeconomic and fiscal challenges globally and in Algeria. In 2020, Algeria implemented massive fiscal stimulus programs, including liquidity injections and subsidies, which temporarily increased the fiscal deficit by more than 4% of GDP (International Monetary Fund. Middle East and Central Asia Dept., 2021). Simultaneously, the pandemic triggered disruptions in global trade, oil demand, and domestic economic activity, amplifying uncertainty in both monetary and fiscal policy transmission mechanisms (Ikram & Mohammed, 2023).

In this regime, the policy environment shifted dynamically between active fiscal interventions and constrained monetary policy responses (Ferdj, 2024). The central bank's ability to stabilize inflation and the real economy was partially constrained by the necessity to accommodate fiscal stimulus without jeopardizing public debt sustainability. This scenario illustrates a temporary regime-switching phenomenon, where fiscal actions dominated short-term economic outcomes, while the central bank retained partial autonomy to manage inflation expectations, highlighting the asymmetric interaction between the two authorities. (Campos et al., 2025)

Digital Finance Reform Regime (2024–2026)

Ongoing digital finance reforms in Algeria aim to modernize payment systems, enhance financial inclusion, and improve liquidity management (Mahfoudi et al., 2024). This regime represents a structural institutional shock that affects both fiscal and monetary policy implementation. Digitalization expands the central bank's operational capacity while also increasing transparency and accountability in fiscal spending, potentially reducing unmonitored fiscal dominance. (Dionysopoulos et al., 2024; Genc & Takagi, 2024)

From a theoretical standpoint, these reforms alter the policy transmission channels, creating opportunities for improved coordination between fiscal and monetary authorities. However, the transition phase introduces temporary frictions, where legacy fiscal practices may still clash with modern monetary management tools. This justifies the adoption of a Markov-Switching framework, allowing the model to capture nonlinear regime-dependent effects on inflation, money supply, and growth dynamics.

Building on the historical and institutional analysis presented above, this study develops a regime-dependent monetary–fiscal coordination framework grounded in a Markov-Switching paradigm. Rather than modeling external shocks—such as oil price collapses, global crises, or institutional reforms—through deterministic and exogenously imposed dummy variables, which implicitly assume that structural breaks are perfectly known and discrete, this framework treats such events as underlying structural catalysts that induce endogenous transitions between unobserved macroeconomic regimes.

Accordingly, the Algerian economy is assumed to evolve under a set of latent regimesS_t, which capture distinct patterns of policy interaction (e.g., monetary dominance, fiscal dominance, or hybrid coordination regimes). These regimes are not directly observable but are inferred probabilistically from the data, reflecting the inherently nonlinear and time-varying nature of macroeconomic dynamics.

Formally, the theoretical specification can be represented as a regime-dependent interaction model:

$$Y_t = \alpha_{S_t} + \beta_{1,S_t} FB_t + \beta_{2,S_t} MS_t + \beta_{3,S_t} (FB_t \times MS_t) + \gamma X_t + \varepsilon_t, \varepsilon_t \sim N\left(0, \sigma_{S_t}^2\right)$$

where:
$Y_t$denotes the macroeconomic outcome variable (e.g., economic growth or inflation),
FB_t represents the fiscal policy stance (fiscal balance),

MS_t denotes the monetary policy stance (money supply),
$FB_t \times MS_t$ captures the degree of policy coordination,
X_t is a vector of control variables (e.g., oil prices, exchange rate, inflation),
$S_t \in \{1,2,\dots,K\}$is an unobserved regime variable indicating the prevailing macroeconomic regime at time$t$,
$\alpha_{S_t}, \beta_{1,S_t}, \beta_{2,S_t}, \beta_{3,S_t}$, and $\sigma^2_{S_t}$are regime-dependent parameters.

The latent regime variable $S_t$evolves according to a first-order Markov process:

$$P(S_t = j \mid S_{t-1} = i) = p_{ij}, \sum_{j=1}^{K} p_{ij} = 1$$

This specification implies that the probability of transitioning between regimes depends solely on the previous regime, thereby capturing the persistence and stochastic nature of macroeconomic regimes.

From a theoretical perspective, this regime-dependent structure reflects the notion that policy effectiveness, dominance structures, and coordination mechanisms are inherently state-contingent. For instance, adverse oil price shocks may compress fiscal revenues and induce a transition toward a fiscal dominance regime, wherein monetary policy becomes accommodative. Conversely, institutional reforms—such as financial digitalization—may enhance policy transmission and facilitate a transition toward a more stable and coordinated regime.

Importantly, the Markov-Switching framework allows these regime changes to be identified endogenously, without imposing prior assumptions regarding their timing or duration. This provides a significant methodological advantage over conventional approaches based on deterministic structural breaks, as it enables the data to reveal the underlying regime dynamics.

Consequently, this specification offers a robust and flexible empirical representation of macroeconomic behavior in Algeria, allowing for the identification of whether economic outcomes are driven by monetary dominance, fiscal dominance, or transitional hybrid regimes, in line with the theoretical predictions of nonlinear policy interaction models.

3. Materials and Methods

3.1. Data and Variables Description

This study employs a quarterly multivariate dataset covering the period 1990Q1–2025Q4 to examine the regime-dependent dynamics of monetary–fiscal policy coordination in Algeria. Given the limited availability of official quarterly fiscal data in the early part of the sample, annual series are temporally disaggregated using the Denton–Cholette method and cubic spline interpolation. These procedures preserve the long-run properties of the original data while allowing for the construction of higher-frequency observations suitable for capturing nonlinear dynamics and potential regime shifts.

All variables are transformed where necessary (growth rates and log differences) to ensure stationarity. The stationarity properties of the series are confirmed using Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests.

The dataset includes the following key variables:

The dependent variable is real GDP growth ($GDPG_t$), which captures short-term fluctuations in economic activity and serves as the main indicator of macroeconomic performance across regimes.

Fiscal policy (FB_t) is measured by the overall fiscal balance as a percentage of GDP. Positive values indicate fiscal surpluses (contractionary stance), while negative values reflect fiscal deficits (expansionary stance). In the Algerian context, this variable is closely linked to hydrocarbon revenues and external shocks.

Monetary policy (MS_t) is proxied by the growth rate of broad money (M2). Given the limited role of interest rates in the Algerian monetary transmission mechanism, money supply growth represents the primary operational instrument of monetary policy.

The policy interaction term ($FB_t \times MS_t$) captures the joint effect of fiscal and monetary policies. A positive coefficient is interpreted as policy complementarity (coordination), while a negative coefficient suggests policy conflict. Within the Markov-Switching framework, this interaction is allowed to vary across unobserved regimes, capturing potential regime dependence in policy coordination effects.

Finally, a set of control variables (X_t) is included to account for external and structural influences. These include global oil prices (OIL_t), the nominal exchange rate (EXR_t), and the inflation rate (INF_t), which jointly capture external shocks, competitiveness effects, and macroeconomic stability conditions.

3.2. Econometric Specification: Markov-Switching Framework

To capture nonlinear and regime-dependent interactions between monetary and fiscal policies in Algeria, this study employs a Markov-Switching Dynamic Regression (MS-DR) model. Unlike linear specifications, this framework allows model parameters to vary across unobserved regimes governed by a latent regime variable S_t.

Let $S_t \in \{1,2,\dots,K\}$ denote the unobserved regime at time t. To mitigate potential endogeneity arising from the simultaneous interaction between economic growth and policy decisions, fiscal and monetary variables are introduced with a one-period lag.

The regime-dependent growth equation is specified as:

$$GDPG_t = \alpha_{S_t} + \beta_{1,S_t} FB_{t-1} + \beta_{2,S_t} MS_{t-1} + \beta_{3,S_t} (FB_{t-1} \times MS_{t-1}) + \gamma X_t + \varepsilon_t$$

where:
α_{S_t}: regime-specific intercept
$\beta_{1,S_t}, \beta_{2,S_t}, \beta_{3,S_t}$: regime-dependent coefficients for fiscal policy, monetary policy, and their interaction
X_t: vector of control variables (oil prices, exchange rate, inflation)

ε_t: error term

To account for regime-dependent volatility, the disturbance term is specified as:

$$\varepsilon_t \sim N\left(0, \sigma_{S_t}^2\right)$$

This specification allows both the conditional mean and variance of economic growth to vary across regimes, thereby capturing differences in macroeconomic stability and shock absorption capacity between periods of stability and crisis.

3.3. Markov Transition Matrix (Regime-Switching Dynamics)

The evolution of the unobserved regime variable S_t is assumed to follow a first-order Markov process, implying that the probability of being in a given regime at time $t$depends only on the state at time$t-1$, and is independent of the full historical path.

Assuming a two-regime structure (Regime 1; Regime 2), the transition dynamics are characterized by the Markov transition matrix:

$$P = \begin{bmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{bmatrix}$$

where the transition probabilities are defined as:

$$p_{ij} = P(S_t = j \mid S_{t-1} = i)$$

Specifically:
p_{11}: probability of remaining in Regime 1
$p_{12} = 1 - p_{11}$: probability of transitioning from Regime 1 to Regime 2
p_{22}: probability of remaining in Regime 2
$p_{21} = 1 - p_{22}$: probability of transitioning from Regime 2 back to Regime 1

High values of the diagonal elements (p_{11} and p_{22}) indicate strong regime persistence, implying that once the economy enters a given macroeconomic state, it is likely to remain in that state for a prolonged period.

In the case of Algeria, these transition probabilities provide a probabilistic representation of regime stability and exposure to external shocks, such as oil price fluctuations, global financial disruptions, or pandemic-related shocks, which may induce transitions between Regime 1 and Regime 2.

3.4. Estimation Strategy: Maximum Likelihood and Filtering Approach

The empirical estimation of the Markov-Switching model is based on Maximum Likelihood Estimation (MLE), which enables the joint estimation of regime-dependent parameters and the probabilities of the unobserved state variable S_t. Since the regime is not directly observable, the likelihood function is constructed by integrating over all possible regime paths.

To infer the latent regimes, the study employs the Hamilton (1989) filtering algorithm, a recursive procedure that updates the probability of each regime conditional on information available up to time t. This filtering approach allows the model to track time-varying regime probabilities in a consistent and data-driven manner.

The log-likelihood function is maximized using numerical optimization techniques, specifically the Broyden–Fletcher–Goldfarb–Shanno (BFGS) algorithm. To improve estimation robustness and mitigate the risk of convergence to local maxima, a random search over multiple sets of initial parameter values is implemented. Initial regime probabilities are obtained from the ergodic (long-run) distribution of the Markov chain, ensuring consistency between initial conditions and the estimated transition dynamics.

This likelihood-based estimation strategy allows both parameter heterogeneity and regime transitions to be fully determined endogenously from the data. Consequently, the framework is able to capture genuine structural changes in the Algerian economy—such as those associated with the 2014 oil price collapse and the COVID-19 pandemic—without relying on exogenously imposed dummy variables.

4. Results and Discussion

4.1 Baseline Linear Estimates and the Rationale for Non-Linearity

A baseline OLS regression was first estimated as a benchmark under the maintained assumption of stable parameters over the full sample.

Table 1: *Baseline OLS Estimation Results (1990Q1–2025Q4)*

Variable	Coefficient	Std. Error	T-Statistic	Prob
C	3.007715	1.08000	2.784921	0.0061
FB (-1)	-0.504397	0.167251	-3.015810	0.0031
MS (-1)	-0.097299	0.019189	-5.070426	0.0000
FB_MS_LAG1	0.008164	0.002731	2.986752	0.0033
OIL	0.130059	0.043545	2.986752	0.0033
EXR	0.048681	0.008664	5.619028	0.0000
INF	-0.040662	0.025027	-1.624743	0.1065
DW	0.161946			

Source:

While several coefficients appear statistically significant, the linear specification is empirically fragile. In particular, the Durbin–Watson statistic is extremely low (DW ≈ 0.16), indicating strong residual persistence and suggesting that a constant-parameter model is unable to capture relevant shifts in the underlying data-generating process.

To distinguish between simple serial correlation and genuine parameter instability, formal breakpoint tests were conducted.

Table 2: *Structural Break Tests for the Baseline OLS Equation (Quandt–Andrews and Chow Tests)*

Quandt–Andrews unknown breakpoint test		
Statistic	**Value**	**Prob**
Maximum LR F- Statistic (2013Q1)	39.92077	0.0000
Maximum Wald F- Statistic (2013Q1)	279.4454	0.0000
Chow breakpoint test		
F- Statistic	**Prob**	
5.042713	0.0000	
38.49927	0.0000	
38.188087	0.0000	

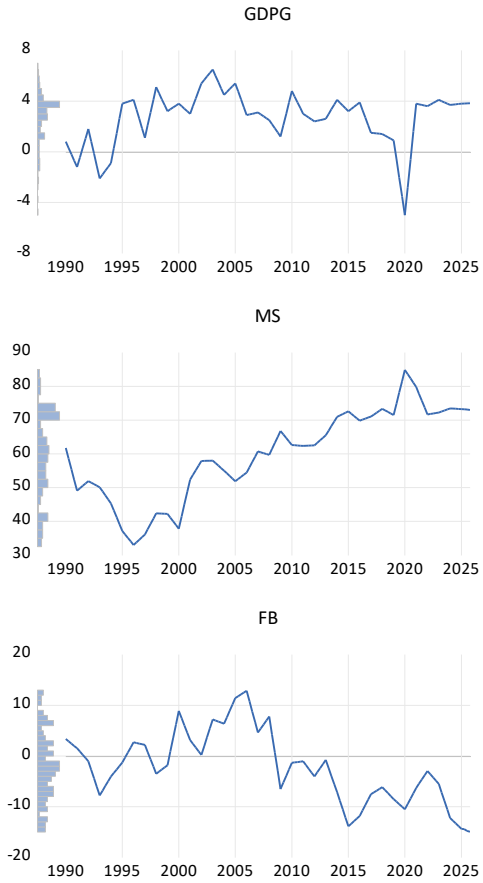
Source:

reports the Quandt–Andrews unknown breakpoint test, which strongly rejects the null hypothesis of no breaks within the trimmed sample (all test statistics significant at the 1% level), with the maximum statistic indicating a likely break around 2013Q1.

In addition, Chow breakpoint tests at economically meaningful dates 2014Q3/2014Q4 (the onset of the oil-price collapse) and 2020Q1 (the COVID-19 shock) also reject parameter constancy at conventional significance levels (p-values < 0.01).

Overall, the baseline diagnostics and breakpoint evidence indicate that Algeria's growth process is characterized by discrete shifts and regime-dependent parameters. This provides direct empirical motivation for adopting a Markov-switching framework in the subsequent analysis.

Figure 1: *Time-Series Plots of GDP Growth and Policy Variables (GDPG, FB, MS)*



Before exploring the state-dependent dynamics of monetary and fiscal policy, an initial linear Ordinary Least Squares (OLS) model was estimated to serve as a baseline reference. The linear specification assumes that the macroeconomic relationships and policy transmission mechanisms in Algeria remained constant throughout the entire 1990–2025 sample period, effectively ignoring the potential impact of structural shocks.

4.2. Markov-Switching Estimation Results and Regime Identification

A two-regime Markov-Switching Regression model was estimated to capture potential nonlinear dynamics in Algeria's output growth. The model was estimated using maximum likelihood techniques with the BFGS/Marquardt optimisation algorithm and converged successfully after 56 iterations, indicating a stable and well-behaved likelihood function. The specification allows for regime-dependent intercepts and variance structures, while maintaining common slope coefficients for macroeconomic variables across regimes.

Table 3: *Markov-Switching Dynamic Regression (MS-DR) Estimation Results (Two-Regime Model), 1990Q2–2025Q4*

Panel A. Regime-dependent coefficients

Variable	Regime 1 Coef.	Std. Err.	z-Stat	p-value	Regime 2 Coef.	Std. Err.	z-Stat	p-value
C	8.047184	1.416757	5.680003	0.0000	4.717387	0.758026	6.223255	0.0000
FB (-1)	-0.51029	0.220508	-2.31416	0.0207	-0.84694	0.133869	-6.32666	0.0000
MS (-1)	-0.11040	0.015976	-6.91079	0.0000	-0.09083	0.019975	-4.54767	0.0000
FB_MS_LAG1	0.007977	0.003230	2.469420	0.0135	0.015217	0.002519	6.039994	0.0000
LOG(SIGMA)	-0.37922	0.103078	-3.67903	0.0002	-0.02252	0.096513	-0.23343	0.8154

Panel B. Common (non-switching) regressors

Variable	Coefficient	Std. Error	z-Statistic	p-value
OIL	0.063536	0.045438	1.398309	0.1620
EXR	0.034363	0.005010	6.858371	0.0000
INF	-0.127204	0.018915	-6.725037	0.0000

Panel C. Model fit and estimation information

Item	Value
Included observations	143
Number of regimes	2
Convergence	Achieved after 56 iterations
Log-likelihood	-202.3562
AIC	3.039946
BIC (Schwarz)	3.350734
Hannan–Quinn	3.166236
S.E. of regression	1.056574
Durbin–Watson	0.442254

The estimation results reported in Table 3 confirm the presence of two statistically distinct regimes with differences in intercepts, dynamic coefficients, and variance structures. Most regime-dependent parameters are statistically significant, while the common regressors display heterogeneous levels of significance. Overall, the results provide strong evidence of regime-dependent dynamics in Algeria's economic growth process

4.3. Regime Characterization and Economic Interpretation

This section provides an economic interpretation of the two latent regimes identified by the MS-DR model and discusses the role of the common control variables. While Section 4.2 established the presence of statistically distinct regimes, the present section characterizes their macroeconomic features and examines how key fundamentals shape growth across regimes.

Regime 1:

Regime 1 is characterized by a high and statistically significant intercept (C = 8.047, $p < 0.01$), indicating strong underlying growth momentum when the economy operates in this regime. In addition, the estimated log-variance term is negative and statistically significant (LOG(SIGMA) = −0.379, $p < 0.01$), suggesting relatively low output volatility and a more stable macroeconomic environment.

Economically, this regime is consistent with periods in which macroeconomic conditions are relatively predictable, often associated with favorable external conditions and improved fiscal space in a hydrocarbon-dependent economy.

Within this regime, both lagged fiscal and monetary policy variables are statistically significant, and the interaction term remains positive and significant. This suggests that policy actions and their interaction contribute to growth dynamics under relatively stable macroeconomic conditions.

Regime 2:

Regime 2 exhibits a substantially lower (though still statistically significant) intercept (C = 4.717, $p < 0.01$), indicating weaker baseline growth performance relative to Regime 1. The estimated log-variance term is close to zero and statistically insignificant (LOG(SIGMA) = −0.023, $p = 0.815$), which is consistent with a more uncertain and less stable macroeconomic environment.

From an economic perspective, this regime corresponds to periods of macroeconomic stress, where adverse shocks and structural constraints—such as fiscal pressures or unfavorable external conditions—limit growth performance.

Importantly, fiscal and monetary policy coefficients remain statistically significant in this regime, indicating that policy transmission mechanisms persist even under adverse conditions, although they operate within a context of weaker fundamentals and higher uncertainty.

Common Control Variables (Non-Switching Regressors)

The control variables are specified as common across regimes, implying that their marginal effects are assumed to be stable across different macroeconomic regimes.

Oil prices (OIL): The estimated coefficient is positive but statistically insignificant at conventional levels (0.0635; $p = 0.162$). This suggests that oil-price effects may be transmitted indirectly through policy responses or regime shifts rather than through a stable within-regime marginal effect.

Exchange rate (EXR): The exchange-rate coefficient is positive and highly significant (0.0344; $p < 0.01$), indicating a robust association between exchange-rate movements and output growth. This relationship may reflect competitiveness effects as well as broader macroeconomic adjustment mechanisms.

Inflation (INF): Inflation exerts a strongly negative and statistically significant effect on growth (−0.1272; $p < 0.01$), consistent with the view that persistent inflation undermines

real economic performance through its impact on purchasing power, investment, and macroeconomic stability.

4.5. Transition Dynamics and Historical Shock Alignment

This section examines the persistence of the estimated regimes and the likelihood of switching between them. The Markov transition probabilities summarize the degree of regime persistence, while the implied expected duration measures how long the economy typically remains in each regime once entered. These results provide a bridge between the latent regimes identified by the model and Algeria's macroeconomic history.

Table 4: *Transition Probabilities and Expected Duration*

Panel A. Transition Probability Matrix

From / To	Regime 1	Regime 2
Regime 1	0.932	0.068
Regime 2	0.078	0.922

Panel B. Expected Duration of Regimes

Regime	Expected Duration (Quarters)	Approx. Years
Regime 1	14.76	3.7
Regime 2	12.85	3.2

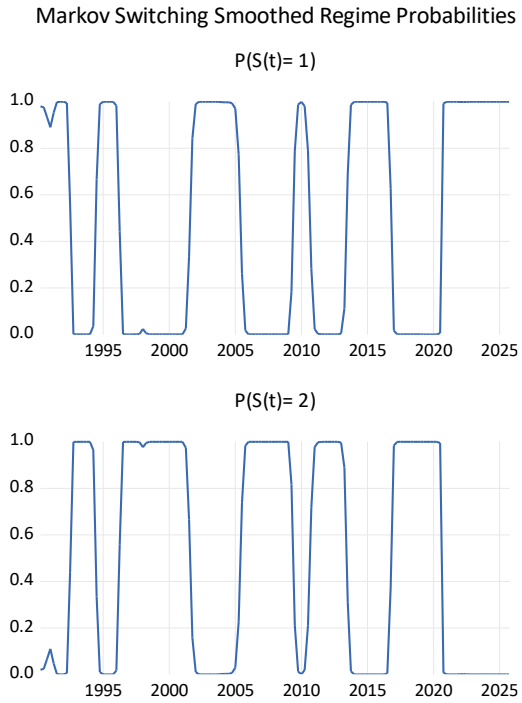
The estimated transition matrix indicates a high degree of persistence in both regimes. The probability of remaining in Regime 1 conditional on being in that Regime is high ($P_{11} = 0.932$), implying that periods of relative macroeconomic stability tend to be sustained over time. The corresponding expected duration is approximately $D_1 = 1/(1 - P_{11}) \approx 14.76$quarters (about 3.7 years).

Similarly, the probability of remaining in Regime 2 is also high ($P_{22} = 0.922$), with an expected duration of approximately $D_2 \approx 12.85$quarters (about 3.2 years). These results suggest that once the economy enters a stress regime, it tends to remain there for a prolonged period, consistent with the persistence of macroeconomic imbalances in resource-dependent economies.

The off-diagonal elements of the transition matrix capture switching behavior between regimes. The probability of moving from Regime 1to Regime 2 is relatively low ($P_{12} = 0.068$), while the probability of transitioning from Regime 2 back to Regime 1is slightly higher ($P_{21} = 0.078$). Although both probabilities remain modest, this pattern suggests that recoveries are feasible but tend to occur gradually rather than abruptly.

To relate these latent dynamics to observable history, the smoothed regime probabilities provide a time-varying measure of the likelihood that the economy is in each regime.

Figure 2: *Smoothed regime probabilities of Regime 1 and Regime 2 in the Markov-Switching Model (Probability of Regime 1 and Regime 2)*



Periods in which the probability of Regime 2 approaches one can be interpreted as episodes where the economy is more likely to be in a stress regime. These intervals broadly coincide with major macroeconomic disturbances, including the decline in oil prices around 2014 and the global disruptions associated with the COVID-19 pandemic.

Overall, the transition analysis confirms that Algeria alternates between two persistent regimes, with stress episodes exhibiting substantial inertia once triggered. Combined with the regime-dependent coordination effects documented in Section 4.4, these findings suggest that policy coordination may be particularly important during prolonged stress periods, when the economy's capacity to self-stabilize is relatively limited.

Conclusion

This paper examined the growth effects of monetary and fiscal policies in Algeria with a particular focus on whether policy coordination is regime-dependent. Using quarterly data over 1990Q2–2025Q4, baseline OLS estimates and structural-break diagnostics provided strong evidence against parameter stability. The Quandt–Andrews and Chow tests reject the null of no breaks, indicating that a constant-coefficient linear specification is not adequate for capturing Algeria's evolving macroeconomic environment.

Motivated by this evidence, the analysis employed a two-regime Markov-Switching Dynamic Regression (MS-DR) model. The Markov specification fits the data substantially

better than the linear benchmark and identifies two persistent regimes that differ in baseline growth and volatility. Most importantly, the results show that the growth impact of monetary–fiscal coordination is positive and statistically significant in both regimes, but markedly stronger in the crisis regime. This confirms that coordination is not merely a "normal-times" optimization tool; rather, it becomes particularly consequential when the economy is subject to adverse shocks and heightened uncertainty.

The transition probabilities indicate that both regimes are highly persistent, and that crisis episodes, once triggered, tend to last multiple quarters. The smoothed regime probabilities align closely with historically salient shocks—most notably the 2014 oil-price collapse and the 2020 COVID-19 shock—supporting the interpretation that the estimated regimes capture meaningful shifts in Algeria's macroeconomic conditions.

From a policy perspective, these findings suggest that strengthening institutional mechanisms for monetary–fiscal coordination can yield growth benefits, especially during periods of macroeconomic stress when policy inconsistency is more costly. At the same time, the consistently negative effect of inflation highlights the importance of anchoring price stability objectives within any coordination framework to avoid growth-eroding inflationary outcomes.

This study is not without limitations. The regime-switching framework remains a reduced-form representation of complex policy interactions, and alternative measures of fiscal stance, monetary conditions, and external vulnerability could further refine the analysis. Future research could extend the model by allowing additional regimes, incorporating time-varying transition probabilities linked to oil-market indicators, or exploring nonlinear effects on other macroeconomic outcomes such as inflation and unemployment.

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