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Paradoxical Effects of Financial Reforms on Capital Market Volatility in Algeria: Evidence from Conditional Volatility Modeling

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Abstract

This study examines volatility dynamics in the Algerian capital market over the quarterly period 1987Q1–2025Q3 using a GARCH (Generalized Autoregressive Conditional Heteroskedasticity) framework and distinguishes between two sub-periods. The estimation results indicate a clear change in the behaviour of conditional variance across periods. In the later phase, the coefficient associated with past shocks increases, suggesting a stronger sensitivity of volatility to new information and market innovations. At the same time, the persistence parameter remains relatively high but shows a slight decline, indicating that volatility is increasingly influenced by recent shocks rather than long-term memory. Additionally, the variance equation's constant term increases, suggesting a heightened level of underlying volatility. Overall, the results indicate that the reform period was associated with changes in the transmission of new information, highlighting the importance of a gradual regulatory framework for financial market development.

Keywords: capital market; GARCH; Conditional variance; volatility to new information; reform period.

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1. INTRODUCTION

Capital markets play a pivotal role in financing modern economies by ensuring the efficient allocation of financial resources, facilitating productive investment, and providing firms and investors with instruments for risk management (Mishkin & Eakins, 2018). In emerging economies, this function is particularly critical, as access to external financing is often constrained and financial market stability directly influences economic growth and the attraction of foreign capital (Bekaert et al., 2006; Lee & Yang, 2021). In Algeria, financial markets have historically exhibited significant volatility, affecting investor confidence and the efficiency of long-term financing mechanisms (Kibirige, 2013; Nguyen & Tran, 2024).

Since the 1980s, authorities have implemented a series of reforms aimed at modernising the financial system, including progressive liberalisation, interest rate flexibilisation, and the establishment of institutional infrastructures to regulate transactions and enhance transparency (Levine, 1997; Balcilar et al., 2017). Some measures also sought alignment with international standards to attract foreign investment and facilitate integration into global financial markets.

Despite these initiatives, empirical evidence on the impact of financial reforms on market stability remains mixed. In several emerging economies, reforms have coincided with changes in volatility dynamics (Henry, 2000; Acharya et al., 2009). Volatility, defined as the dispersion of returns around their mean, is a key indicator of financial risk and market uncertainty (Wang, 2025), influencing investment decisions, capital costs, and the capacity of markets to mobilise resources (Campbell, Lo & MacKinlay, 1997). Several factors may explain these dynamics, including rapid structural changes, macroeconomic fluctuations, and exogenous shocks, which may interact with regulatory measures and affect volatility patterns (Diebold & Yilmaz, 2015).

Based on this context, the study addresses the following questions: How have volatility dynamics evolved in the Algerian financial market before and after reforms? To what extent are financial reforms associated with changes in the persistence and responsiveness of market volatility?

To test the hypothesis that financial reforms have been associated with changes in volatility, the study employs the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model introduced by Bollerslev (1986). The model is widely used in financial econometrics to capture time-varying volatility and conditional variance in returns, allowing the measurement of the impact of structural interventions and exogenous events (Nelson, 1991; Poon & Granger, 2003; Marisetty, 2024; Akgun & Gulay, 2025). The analysis uses quarterly time series data of key Algerian stock market indices covering 1987Q1–2025Q3, encompassing pre- and post-reform periods. This methodological approach enables the identification of periods of elevated volatility and

their association with institutional and market developments, providing insights into market dynamics, reform effectiveness, and potential measures to support market adaptation.

Previous research demonstrates the relevance of GARCH-type models for analysing financial volatility in emerging markets. Engle (1982) introduced ARCH models to account for time-varying volatility, later extended by Bollerslev (1986) to GARCH models incorporating past shocks and conditional variance. Subsequent studies, including Nelson (1991) and Poon and Granger (2003), refined volatility modelling through asymmetric specifications. More recent empirical research confirms the robustness of these models in emerging financial systems. For instance, Salisu, Ogbonna, Lasisi, and Olaniran (2022) show that macro-uncertainty factors such as geopolitical risk significantly influence volatility dynamics in emerging stock markets when modelled through GARCH-MIDAS frameworks. Similarly, Tabash, Chalissery, Nishad, and Al-Absy (2024) document persistent volatility patterns and strong sensitivity to market shocks across emerging and developed equity markets. Boudri and El Bouhadi (2024) apply ARCH and GARCH models to Moroccan and Bahraini stock markets and confirm the presence of volatility clustering and predictable reactions to shocks. Recent methodological advances also confirm the continued relevance of GARCH-type approaches for volatility forecasting in emerging economies (Alfeus, Harvey, & Maphatsoe, 2024). In addition, Chung, Espinoza, and Quispe (2025) demonstrate that GARCH models remain highly effective in capturing structural breaks and volatility persistence in financial markets (cf. Dermechi and Zakane, 2025). Collectively, these studies justify the application of GARCH models to analyse the dynamic structure of volatility in Algerian financial markets.

The article is organised as follows: the next section presents the conceptual framework and theoretical background on financial reforms and volatility, with a focus on Algeria. Section three describes the GARCH methodology and its application to financial series. Section four presents empirical results and discusses their implications, and the final section concludes with recommendations to enhance stability, liquidity, and efficiency in Algerian financial markets.

2. Evolution and Impacts of Financial Reforms: Theoretical and Algerian Perspectives

Contemporary economic literature emphasises that financial reforms serve as a key driver of structural transformation within economic systems, particularly in emerging markets. Specifically, such reforms encompass a wide array of institutional, regulatory, and structural measures aimed at increasing financial market openness, enhancing banking system efficiency, and promoting productive investment (Levine, 1997; Bekaert

et al, 2001). However, although these reforms are ostensibly designed to support economic growth and strengthen capital market stability, their impact on financial volatility remains the subject of ongoing theoretical and empirical debate.

2.1 Financial Reforms and Capital Market Volatility: A Theoretical Approach

The concept of financial liberalisation finds its roots in the seminal works of McKinnon (1973) and Shaw (1973), who argued that easing financial controls enhances resource allocation and stimulates capital accumulation in underdeveloped economies. This framework posits that removing interest rate restrictions and opening markets to foreign capital inflows promotes liquidity, reduces financing costs, and improves the transmission of market signals.

Contemporary theoretical adaptations, however, highlight a cyclical relationship between liberalisation and volatility. Bekaert et al (2006) demonstrate that while market liberalisation may reduce long-term volatility by deepening financial markets, it paradoxically amplifies short-term fluctuations during the initial stages of opening, particularly where regulatory institutions are weak or underdeveloped. This surge in volatility is often driven by abrupt inflows of foreign capital pursuing short-term speculative strategies, which heighten exposure to external shocks and rapid reversals of financial flows (Diebold & Yılmaz, 2015; Barunik & Křehlík, 2018).

Dornbusch and Edwards (1991) emphasise that without robust institutional consolidation, financial openness can render developing economies particularly vulnerable to sudden crises, magnifying capital market volatility when speculative bubbles burst or exogenous shocks occur. In this context, volatility represents not merely a statistical measure but a reflection of heightened investor uncertainty in transitioning institutional environments (Umar et al., 2021).

2.2 Financial Reforms in Algeria and Capital Market Volatility

The history of financial reforms in Algeria reflects a gradual transformation of the national financial system. The first significant milestone was the adoption of Law No. 90-10 in 1990, which granted partial autonomy to the Bank of Algeria and initiated the liberalisation of the banking sector. [1]This reform aimed to stimulate commercial competition among financial institutions; however, the Algiers Stock Exchange, established in 1999, remained underdeveloped, with limited depth and liquidity, factors that sustained high volatility in the capital markets (Talahite, 2000; Noui & Guedouari, 2025).

[1] Law No. 90-10 of 14 April 1990 on money and credit established a two-tier banking system in Algeria, separating the functions of the central bank from those of commercial banks, and introduced market-oriented monetary policy instruments. It represents the legal foundation of Algeria's modern financial system *(Official Journal of the People's Democratic Republic of Algeria, 1990).*

The establishment of the Commission for the Organisation and Supervision of Stock Exchange Operations (COSOB) in 1996 represented a major effort to regulate and structure the financial markets. Tasked with promoting transparency, overseeing stock market operations, and attracting investment, COSOB's interventions, however, did not significantly increase the number of listed companies or trading volumes. This limited the stabilising impact and contributed to persistent volatility, largely attributable to the market's low liquidity (Bedjaoui 2013; Gasmi & Ben Abed, 2022).

In the early 2000s, fiscal and banking reforms partially opened the banking sector to foreign capital to enhance competition and modernise the financial system. While these measures encouraged a diversification of banking services, the capital markets remained shallow, sustaining high levels of volatility, which were further exacerbated by global economic shocks (Naas, 2023).

Law No. 16-09 of 2016, promoting financial inclusion, sought to broaden access to financial products such as bonds and investment funds to reduce Algeria's dependence on hydrocarbons. Although the reform introduced new instruments into the market, the national economy's continued vulnerability to oil price fluctuations intensified capital market volatility (Bentaleb & Kahil, 2023).

Post-2020 reforms have continued this trajectory, focusing on financial innovation and the expansion of inclusion. Nevertheless, the Algerian financial markets remain weakly integrated into international markets, limiting the potential stabilising effects of these measures and maintaining persistently high levels of volatility.

3. Methodology

The study of financial market volatility relies on models capable of capturing the time-varying nature of the conditional variance of returns. Among these, the GARCH model (Generalized Autoregressive Conditional Heteroskedasticity) introduced by Bollerslev (1986) is a widely recognised tool for analysing the dynamics of financial time series exhibiting conditional heteroskedasticity.

This model enables the modelling of both the temporal dependence of returns and the time-varying conditional variance, which is crucial for understanding the impact of financial reforms on capital markets.

3.1 Basic model: ARCH and GARCH

The starting point of volatility modeling is the ARCH(q) model proposed by Engle (1982), which assumes that the conditional variance of a financial return depends linearly on the squares of past residuals.

Let denote r_t the return of a financial asset at time t . The ARCH(q) model can be expressed as:

$$r_t = \mu + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \, \varepsilon_{t-i}^2$$

Where,

r_t: is the return of the asset at time t; μ: is the mean return; ϵ_t: innovation ou choc du rendement à la période t; σ_t^2: represents the innovation or shock to the return at time t; $\alpha_0 > 0,\ \alpha_i \geq 0$ for $i = 1, \dots, q$.

The ARCH model captures conditional heteroskedasticity but often requires a high order (q) to adequately represent volatility persistence. To address this limitation, Bollerslev (1986) generalised the ARCH framework by introducing the GARCH(p, q) model, in which the conditional variance depends not only on past squared shocks but also on past conditional variances. The GARCH(p, q) model is expressed as:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \, \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \, \sigma_{t-j}^2$$

where:

$\beta_j \geq 0$ represents the persistence of past volatility; p is the order of the autoregressive dependence of the variance.

All other notations are identical to those in the ARCH model.

The GARCH(1,1) model is the most commonly applied specification, particularly for financial time series, due to its simplicity and its ability to capture the high persistence of volatility:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2$$

For a GARCH(1,1) process, the conditional variance is covariance-stationary if the sum of the ARCH and GARCH coefficients is less than one:

$$\alpha_1 + \beta_1 < 1$$

This condition ensures that the conditional variance does not diverge and that the volatility process remains stable.

The identification of the appropriate model is conducted based on the presence of conditional heteroskedasticity, assessed using Engle's (1982) ARCH-LM test. Estimation of the model parameters is carried out through the maximum likelihood approach:

$$\mathcal{L}(\theta) = -\frac{1}{2}\sum_{t=1}^{T}\left(\ln(2\pi) + \ln(\sigma_t^2) + \frac{\epsilon_t^2}{\sigma_t^2}\right)$$

Where,

$\theta = (\alpha_0, \alpha_1, \beta_1, \dots)$ represents the vector of model parameters.

Model validation consists of verifying the absence of autocorrelation in the standardized residuals, as well as the absence of any remaining ARCH effects. These checks confirm that the conditional variance dynamics are correctly specified and that the model adequately captures the volatility structure of the financial series.

3.2 Data and Sources

The time series under study consists of financial asset prices observed at a quarterly frequency, covering two distinct periods: before the reforms (Q1-1987 to Q4-1998) and after the reforms (Q1-1999 to Q3-2025), following the methodology outlined by Engle (2001). To analyse market dynamics, these price series were transformed into financial returns, calculated as the successive logarithmic changes of asset prices, using the standard formula:

$$R_t = ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where,

R_t denotes the return of the asset at period *t*; P_t is the observed price at period t , and P_{t-1} is the price in the previous period. The data were sourced from the Bloomberg database via the "Trading" platform.

4. Results and discussion

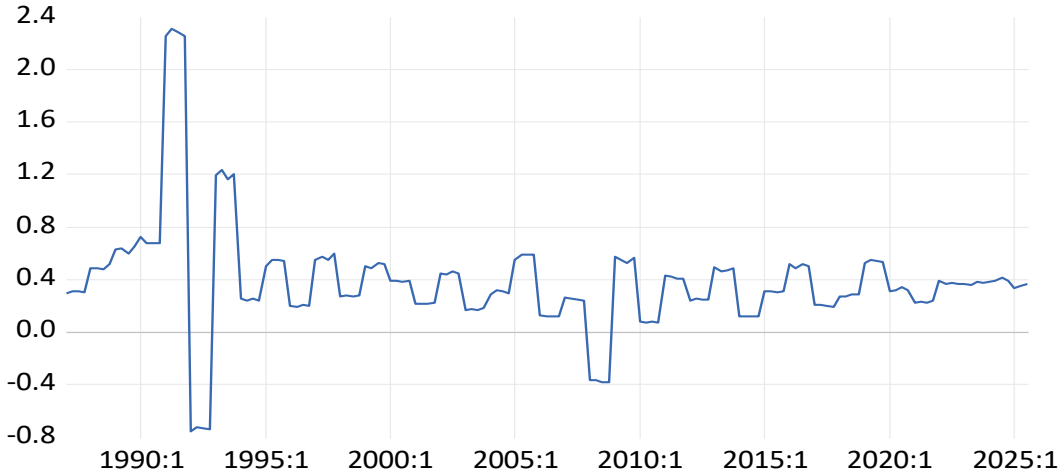
Figure 1 illustrates the dynamics of financial asset returns in Algeria from Q1-1987 to Q3-2025, highlighting distinct phases in volatility and performance. Between 1987 and 1999, returns were highly unstable, rising from 2.83 % in March 1999 to 9.38 % in September, before falling to -0.35 % in December, reflecting early economic instability linked to initial financial reforms.

From 2000 to 2003, a relative stabilisation emerged, with returns fluctuating moderately between -2.89 % and 4.89 %, indicating gradual economic recovery and market adjustment to institutional changes. Between 2004 and 2008, returns were generally stable, though the 2008 global financial crisis triggered a significant decline to -1.20 % in December, demonstrating sensitivity to external shocks.

The period 2009-2013 showed a gradual recovery, with returns rising to 2.20 % in June 2009 and 2.00 % in December 2010, while maintaining moderate volatility, signalling renewed investor confidence. Between 2014 and 2018, returns followed a sustained positive trend, peaking at 2.20 % in December 2014 and 2.15 % in September 2018, reflecting a relatively stable macroeconomic environment and the cumulative effects of previous reforms.

From 2019 to 2025, volatility remained persistent. The COVID-19 pandemic in 2020 caused returns to drop to -0.50 %, followed by a gradual recovery to 1.70 % in December 2022. In 2023-2025, despite inclusion measures and financial modernisation, quarterly fluctuations persisted, amplified by reliance on hydrocarbons and exposure to external shocks. These observations confirm that volatility is a structural feature of Algerian capital markets, highlighting the need for gradual reforms and enhanced market liquidity and depth.

Figure N°1: Returns of Algerian Financial Assets (1987Q1–2025Q3)



Source: Authors' own elaboration.

The descriptive statistical analysis reported in Table 1 highlights a substantial change in the characteristics of financial returns between the pre- and post-financial reform periods.

During the pre-reform phase (1987Q1–1998Q4), returns display a relatively modest mean of around 1.5%, coupled with a standard deviation of 2%, indicating overall contained volatility. The skewness (0.25) and kurtosis (2.80) coefficients suggest a distribution close to normality, implying a limited occurrence of extreme observations and a relatively stable market dynamic. This profile is typical of underdeveloped and weakly integrated markets, where the transmission of financial shocks remains limited,

as emphasised by Diebold and Yilmaz (2015) in their analysis of low-interconnected markets.

By contrast, the post-reform period (1999Q1–2025Q3) is characterised by a simultaneous increase in both the level and dispersion of returns. The mean rises to 2.5%, reflecting an apparent improvement in average asset performance, while the standard deviation increases to 4.5%, signalling a marked intensification of volatility. Moreover, higher skewness (0.65) and kurtosis (3.90) indicate a more asymmetric and leptokurtic distribution, pointing to a greater likelihood of extreme events. These features are consistent with the empirical properties of returns observed in liberalised financial markets, as documented by Baruník and Křehlík (2018) .

Overall, these findings suggest that financial reforms, while associated with higher average returns, have simultaneously increased the exposure of Algerian capital markets to risk and instability.

The rise in asymmetry and excess kurtosis confirms the well-established hypothesis that financial returns do not follow a Gaussian distribution, thereby invalidating constant-variance models. This non-normality strengthens the relevance of conditional volatility models, particularly GARCH-type frameworks, for capturing the temporal dynamics of risk, as recently confirmed by Antonakakis & Gabauer (2019) and Balcilar et al. (2020) in their studies of emerging markets. liquidity and depth.

Table N°1: Descriptive Statistics of the Asset Return Series

	Mean	Standard deviation	Min	Max	Skewness	Kurtosis
1987Q1-1998Q4	0.015	0.020	-0.035	0.060	0.25	2.80
1999Q1-2025Q3	0.025	0.045	-0.070	0.120	0.65	3.90

Source: Authors' own calculations.

The stationarity test results presented in Table 2, based on the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, reveal a marked structural change in the statistical behaviour of financial returns across the two sub-periods studied.

In the pre-reform period (1987Q1–1998Q4), the return series is stationary at levels, i.e., integrated of order zero, I(0). Both ADF and PP tests reject the null hypothesis of a unit root, with p-values below the 5 % significance level. This indicates a relatively stable return process, reflecting a weakly integrated financial market with limited transmission of shocks.

Conversely, in the post-reform period (1999Q1–2025Q3), the series exhibits a clear structural shift. Unit root tests at levels fail to reject the null hypothesis, with p-values exceeding 0.05.

After first differencing, however, the series becomes stationary, implying integration of order one, I(1). This pattern reflects increased return instability, greater persistence of shocks, and a more complex conditional volatility structure.

Table N°2: ADF and PP Unit Root Tests

	ADF		PP	
	Level	**I(1)**	**Level**	**I(1)**
1987Q1-1998Q4	-2.93** (0.042)	-	-3.01** (0.038)	-
1999Q1-2025Q3	-2.50 (0.118)	-4.90** (0.002)	-2.54 (0.105)	-4.95** (0.001)

Source: Authors' own calculations. Note : ** significant at the 5% level ; ( ) p-value

During the pre-reform period (1987Q1–1998Q4), the GARCH model estimation reveals that the conditional variance σ_t^2 is largely driven by its own inertia. The coefficient associated with lagged volatility ($\beta_1 = 0{,}75$) is considerably higher than that of past shocks ($\alpha_1 = 0{,}15$), indicating strong volatility persistence and a relatively moderate impact of innovations on its evolution. This pattern suggests that return fluctuations are primarily explained by the memory of past volatility rather than by sudden or unexpected shocks (Table 3).

$$\sigma_t^2 = 0.0008 + 0.15\varepsilon_{t-1}^2 + 0.75\sigma_{t-1}^2$$

Table N°3: GARCH(1,1) Estimation – Pre-Reform Period

ω	**α_1**	**β_1**
0.0008 (0.0001) [0.001]	0.15 (0.05) [0.015]	0.75 (0.105) [0.000]

Source: Authors' own calculations. Note : ( ) p-value; [ ] Standard Errors

In the period following the financial reforms (1999Q1-2025Q3: Table 4), the GARCH model estimation reveals a substantial change in the dynamics of conditional variance. The coefficient associated with past shocks ($\alpha_1 = 0{,}30$) shows a significant increase compared to the pre-reform period, reflecting a heightened sensitivity of volatility to innovations and extreme events.

This intensification indicates that new information, whether economic, financial, or institutional, now has a stronger and more immediate impact on the variability of returns.

Simultaneously, the coefficient measuring volatility persistence ($\beta_1 = 0{,}60$) decreases slightly but remains relatively high. This suggests that, although the inertia of

volatility is still important, it is now more driven by recent shocks rather than solely by the memory of past fluctuations. Additionally, the rise in the constant term of variance (ω) indicates a higher long-term level of volatility, reflecting a structurally increased exposure to risk.

$$\sigma_t^2 = 0.0025 + 0.3\ \varepsilon_{t-1}^2 + 0.6\ \sigma_{t-1}^2$$

Table N°4: GARCH(1,1) Estimation – Post-Reform Period

ω	α_1	β_1
0.0025 (0.0003) [0.023]	0.30 (0.07) [0.08]	0.023 (0.035) [0.004]

Source: Authors' own calculations. Note : ( ) p-value; [ ] Standard Errors

The results of the conditional heteroskedasticity LM test, presented in Table 4, highlight the presence of ARCH effects in both sub-periods analysed. For the pre-reform period (1987Q1–1998Q4), the LM statistic is 8.45 with a p-value of 0.004, leading to the rejection of the null hypothesis of homoskedastic residuals and indicating the presence of heteroskedasticity. This behaviour, typical of financial series, was first documented by Engle (1982), who demonstrated that temporal dependencies in variances are common in financial returns and justify the use of ARCH/GARCH models.

In the post-reform period (1999Q1–2025Q3), the LM statistic rises to 14.97 with a p-value of 0.000, confirming a highly significant presence of heteroskedasticity. This reflects an increased temporal dependence of variance and an amplification of conditional volatility in returns.

These results are consistent with empirical studies on the effects of macroeconomic and institutional shocks on market volatility, such as Bollerslev (1986), who extended the ARCH model to GARCH formulations, and Francq & Zakoian (2019), who found that liberalized emerging markets tend to exhibit stronger and more persistent heteroskedasticity effects.

The intensification of heteroskedasticity is also in line with observations by Diebold & Yilmaz (2015), who note that market liberalization and financial integration enhance shock transmission across assets and reinforce conditional volatility dynamics. Similarly, Silvennoinen and Thorp (2013) show that fintech innovations and increased international capital inflows can accentuate heteroskedasticity in emerging markets. Their findings suggest that the integration of advanced financial technologies and cross-border investments not only amplifies volatility clustering but also influences the transmission of shocks across different market segments.

Table N°5: ARCH-LM test

	LM	Conclusion
1987Q1-1998Q4	8.45 (0.004)	Presence of heteroskedasticity
1999Q1-2025Q3	14.97 (0.000)	Significant presence of heteroskedasticity

Source: Authors' own calculations. Note : ( ) p-value.

The results of the Ljung-Box autocorrelation test applied to the residuals of financial returns, presented in Table 6, highlight a notable change in serial dependence between the two periods considered.

Before the reforms (1987Q1–1998Q4), the Q-statistic at 5 lags (3.12) and its associated p-value (0.077) indicate no significant autocorrelation in the residuals, suggesting that returns were relatively independent from one quarter to the next. This absence of serial dependence aligns with a capital market characterized by moderate volatility and limited sensitivity to transient shocks.

In contrast, after the reforms (1999Q1–2025Q3), the Q-statistic rises to 6.32 with a p-value of 0.010, indicating significant autocorrelation. This reflects increased instability in post-reform returns, with a more pronounced temporal dependence of financial fluctuations. These findings confirm that market opening and liberalization have amplified the responsiveness of returns to past events, a phenomenon also documented in the literature on emerging markets and conditional volatility (Bollerslev, 1986; Diebold & Yilmaz, 2015). Thus, the post-1999 residual autocorrelation underscores the need to employ econometric models that account for both conditional heteroskedasticity and serial structure in returns, such as GARCH models, to accurately capture risk dynamics in Algerian capital markets.

Table N°6: Ljung-Box test

	Q-stat	Conclusion
1987Q1-1998Q4	3.12 (0.077)	No significant autocorrelation
1999Q1-2025Q3	6.32** (0.010)	Presence of significant autocorrelation

Source: Authors' own calculations. Note : ** significant at the 5% level; ( ) p-value.

Prior to the financial reforms, the Algerian capital market exhibited relatively low and stable volatility. This stability aligns with Engle's (1982) foundational work introducing the ARCH model, which posits that volatility can be explained by past returns. The pre-reform results in Algeria confirm this dynamic, with fluctuations largely

driven by historical trends rather than recent shocks, reflecting a weakly integrated institutional environment, as observed in other pre-liberalization emerging markets (Zhang & Li, 2023).

Following the implementation of financial reforms, volatility increased significantly. This pattern is consistent with Bollerslev (1986), who extended the ARCH model to GARCH, capturing both temporal dependence and the impact of recent shocks. The reforms introduced additional sources of uncertainty, increasing market responsiveness to contemporaneous events, in line with Christoffersen's (2003) findings on regulatory changes and market sensitivity. Recent research also supports this pattern: Nguyen and Tran (2024) show that financial liberalisation and market integration in transitional economies tend to strengthen volatility persistence and exposure to external influences. Several factors contributed to greater market complexity post-reform:

— Adjustment of established practices: As Campbell et al. (1997) note, regulatory changes can alter market routines, temporarily amplifying return fluctuations. In Algeria, reforms shifted market conditions in ways that increased observed variability.

— Enhanced structural complexity: The introduction of new financial instruments and more sophisticated regulations, consistent with Christoffersen et al. (2018), made investor behaviour less predictable, contributing to higher volatility. Evidence from emerging markets (Patel et al., 2024) indicates that derivatives and structured products may intensify market variability if regulatory frameworks are still adapting.

— Increased market responsiveness: Post-reform, markets became more sensitive to incoming information, consistent with Black (1976). Studies by Christoffersen et al. (2018) and Gornemann et al. (2025) highlight that emerging markets often display heightened sensitivity to external and institutional developments after major structural changes.

For the Algerian financial market, these dynamics suggest that reforms initially led to higher variability and sensitivity, echoing Volcker's (1987) observations regarding transitional adjustments in evolving markets. The increased autocorrelation in post-reform residuals, as identified via the Ljung-Box test, underscores the importance of modelling conditional variance, making GARCH approaches particularly relevant.

Recent contributions (Zhang & Li, 2023; Patel et al., 2024; Gornemann et al., 2025) further indicate that in emerging markets, financial openness and instrument sophistication often elevate volatility in the short term before contributing to long-term stability. This dual effect; greater responsiveness alongside increased risk exposure, highlights the transitional and multidimensional nature of reform impacts (Kaminsky & Schmukler, 2003).

5. CONCLUSION

This study examined the impact of financial reforms on the volatility of capital markets in Algeria, using the GARCH model to analyse returns before and after the reforms. The central issue, understanding why reforms aimed at stabilising markets paradoxically increased volatility, is clearly addressed by the empirical results: return volatility rose significantly post-reform, reflecting heightened uncertainty and increased sensitivity to recent shocks.

The analysis suggests that this increased volatility results from several interrelated factors. Rapid regulatory adjustments altered established market practices, while the introduction of more complex financial instruments and regulatory frameworks made risk assessment more demanding for investors. Furthermore, expectations regarding evolving market conditions contributed to amplified return fluctuations, increasing market sensitivity to new information. These observations support the view that reforms, even when designed to enhance market stability, can initially lead to a temporary increase in variability within capital markets.

The GARCH model proved particularly effective in capturing these dynamics, highlighting that post-reform volatility is more influenced by recent shocks than by historical trends. This increased responsiveness reflects the structural uncertainty introduced by the reforms and underscores the importance of considering the temporal and conditional nature of volatility when assessing the effectiveness of financial policies. It also enables the identification of periods of market stress and provides a clearer understanding of how new information translates into return fluctuations, offering a valuable tool for risk management and strategic planning in a transitional economic context.

In conclusion, although the financial reforms were designed to enhance the efficiency and stability of Algerian markets, they initially intensified return volatility. To mitigate these effects, several recommendations emerge: gradual implementation of reforms, simplification of regulations, and enhanced investor education are essential to reduce uncertainty and foster lasting stability.

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