



Algeria's economic diversification challenge : the role of startups, hydrocarbon rent, and institutional quality

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Abstract

The aim of this study is to assess the impact of SME and startup creation on economic diversification in Algeria for the period 2000-2021. The methodology employed in this research involves modeling the relationship between the normalized diversification index, the number of private SMEs, hydrocarbon revenue, and institutional quality using a Vector Autoregressive (VAR) model with lagged variables. Our study reveals a significant influence of SME creation, hydrocarbon revenue, and institutional framework quality on export diversification in Algeria.

Keyword : Diversification, SME, Hydrocarbon Rent, Institutional Quality, ARDL

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1. INTRODUCTION

Seven decades after gaining independence, the Algerian economy continues to rely heavily on oil. The oil sector poses a significant challenge to Algeria's economy, with revenues from hydrocarbon exports accounting for two-thirds of the budget revenue, 30% of the GDP, and 90% of the country's exports. This heavy dependence on oil makes the Algerian economy highly vulnerable to external shocks. Recent crises, such as the Subprime crisis in 2008, the oil collapse of 2014, and the COVID-19 pandemic, have highlighted the urgent need for economic diversification in Algeria. In 2020 alone, the COVID-19 crisis caused a 40% decline in oil export revenues.

The concept of diversification as a solution to reduce the impact of external shocks has long been a topic of economic debate. Scholars like Raul Prebisch (1950), Hans Singer (1950), and Michael Michaely (1958) emphasized the need to protect the economy from price shocks. Diversification offers benefits such as risk reduction, economic growth improvement, and poverty reduction, as demonstrated by Berthelemy (2005), Funke & Ruhwedel (2005), Hausmann et al. (2007), and Agosin (2007). However, the abundance of natural resources poses challenges to diversification, as noted by Sachs & Warner (1995, 2001) and Auty (2001), who have examined the negative effects of dependence on natural resources, including rent-seeking, corruption, political instability, and the erosion of the rule of law (UNCTAD, 2018).

In response to these challenges, Algerian authorities have adopted a new economic policy orientation focused on diversification, particularly through small and medium-sized enterprises (SMEs) and startups. Startups, with their unique characteristics and potential for infinite growth, differ from traditional SMEs and offer rewarding experiences (Marty, 2002). With innovative ideas and projects, startups play a crucial role in economic growth and sectoral diversification, whether in education, transportation, healthcare, or other fields (DJEKIDEL et al., 2021). The establishment of a new ministry dedicated to startups in Algeria and recent regulations providing

numerous advantages to young entrepreneurs, as evidenced by the 2020 financial law, reflect the government's enthusiasm and ambition for economic growth and development. This raises the question: To what extent can startups and SMEs contribute to the development and economic diversification of Algeria, moving away from reliance on hydrocarbons?

The purpose of this research is to investigate the impact of SME and startup creation on economic diversification in Algeria. To address this objective, we adopt an institutional approach and utilize econometric modeling, specifically employing an autoregressive model with distributed lags (ARDL). Our research is structured into three sections. The first section provides a brief literature review on the subject, introducing the topic. The second section presents an inventory of SMEs and startup creation in Algeria. Finally, the third section evaluates the impact of SMEs on economic diversification.

2. Literature review

Diversification involves fundamentally reshaping the export product landscape within a given country, aiming to redirect exports or redistribute production across various sectors (Compi, Duenas, and Wu, 2017). Numerous indices are utilized to gauge diversification, including the Ogive index, Hirschman index, Herfindahl index, and the aggregative normalized index of Hirschman-Herfindahl.

The benefits of a development strategy centered around diversification have been substantiated and proven. Diversification, as a factor, significantly contributes to economic growth and helps mitigate vulnerabilities to external shocks. An extensive body of literature supports this notion (Bertinelli, 2009; Cadot, Carrere & Strauss-Kahn, 2011). This is particularly crucial, considering that dependence on natural resources is often regarded as detrimental to the development prospects of resource-rich nations (Bartz, 2010).

Multiple factors contribute to enhancing diversification, with income per capita playing a pivotal role (Imbs and Wacziarg, 2003). An increase in income per capita up to a certain threshold fosters diversification within a country (Klinger and Lederman, 2006; Hesse, 2009; Cadot et al., 2011). Melitz (2003) expounds on liberalization as a driver of diversification by encouraging greater diversification of exports across different sectors. Goldar and Banga (2006) delve into the impact of foreign direct investment (FDI), showcasing its potential to bolster diversification into non-traditional sectors.

Beyond these factors, substantial research has explored the influence of rents, institutions, and diversification. Gylfason (2001) demonstrates that an abundance of natural resources tends to displace other forms of capital, such as human, physical, and social capital. Resource-rich countries often grapple with suboptimal utilization of their resources, impeding economic diversification and the growth of robust industries. Moreover, Alsharif, Bhattacharyya, and Intartaglia (2016) underscore that resource abundance often leads to specialization in basic products at the expense of diversification.

For Acemoglu, Johnson, and Robinson (2003), export diversification and economic growth heavily hinge on institutional quality. The institutional framework determines the intensity of trade interactions between high-income partners and the limited bilateral trade with less developed counterparts (Anderson and Marcouiller, 2003; Soussa and Disdier, 2006). Maon and Sekkat (2008) contend that robust institutional quality can boost exports of manufactured goods.

The various crises linked to oil price declines (e.g., COVID-19, the 2014 oil price slump, and the subprime crisis) underscore the perils of economic reliance on hydrocarbon revenues. Such concentration can hinder development and growth (Chatelus, 1986). Startups and SMEs offer a tangible solution for resource-dependent countries, as well as for curtailing sectoral concentration. Analogous to finance, a

diversified portfolio is less susceptible to risks compared to an undiversified one (Mathias et al., 2018).

SMEs and startups emerge as pivotal players in diversification, rivaling the significance of previous factors. These enterprises substantially contribute to economic globalization, enhancing competitiveness through commercial exchanges. Startups, with their multi-sectoral nature, serve as a promising avenue for fortifying the development of resource-rich nations. They offer innovative solutions to recurring issues, such as unemployment rebound (Cumming et al., 2014), and the reduction of informal sectors. Recognizing their importance in new diversification strategies, public authorities are actively encouraging their exportation. Several empirical studies underscore the role of public assistance in the international performance of SMEs (Niosi & Zhegu, 2011). The subsequent section provides a concise overview of startups and SMEs in Algeria.

3. Status of smes and launch of startups in Algeria

The objective of this section is to provide an overview of SMEs in Algeria, as well as to discuss the initiation of the startup initiative.

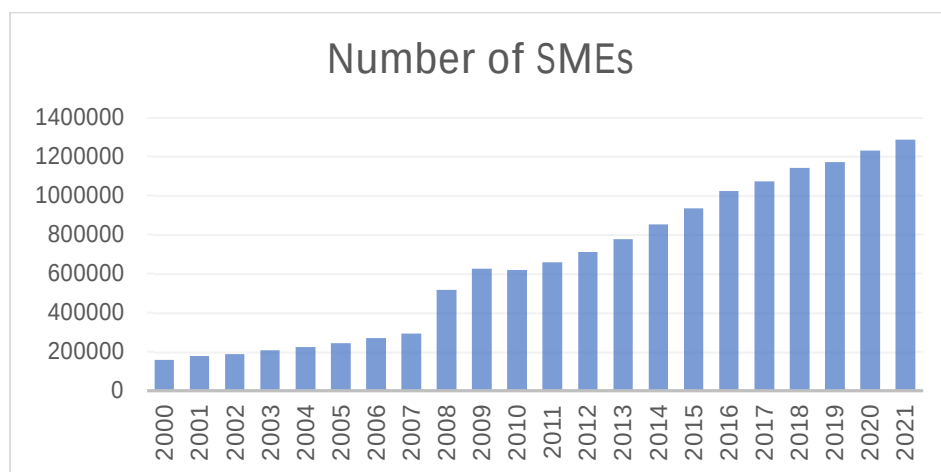
3.1. Current State of SMEs

Since Algeria gained its independence in 1962 and adopted a socialist economic system, the establishment of SMEs was predominantly in the hands of the public sector. This left limited room for private entrepreneurs to launch their own ventures. The absence of public financial support posed a significant hurdle to the promotion of innovative ideas and initiatives. The democratization of private SMEs faced several obstacles, including unfavorable taxation policies, stringent labor regulations, and restricted foreign trade (Merzouk, 2009). Furthermore, avenues for expressing innovative ideas were severely limited.

In the late 1980s, following the oil shock of 1986 that disrupted the growth trajectory Algeria had experienced during the period of centralized planning, the country embarked on a series of liberal-inspired reforms. These reforms were bolstered by the implementation of a structural adjustment plan in 1994. This comprehensive plan encompassed the elimination of subsidies, the privatization of state-owned enterprises, and the liberalization of prices and trade.

After the setback of the 1993 investment promotion law, which offered various incentives to private investors, the government introduced pivotal measures to foster development. These included the issuance of the Investment Development Order (Order No. 01/03 of August 20, 2001) and the SME Orientation Law (Law No. 01/18 of December 12, 2001). Notably, there has been a significant surge in the number of SMEs since the early 2000s, as depicted in Figure 1, illustrating a pronounced upward trajectory in SME growth.

Fig.1. Number SMEs in Algeria between 2000 and 2021



Source: Realized by ourselves

3.2. The Startup Concept

The concept of a startup, rooted in its English etymology of 'Start' and 'Up', symbolizes the genesis of something from a certain point that burgeons into significance, a contrast to the static evolution of a traditional SME which seldom undergoes dramatic size changes. The intrigue surrounding startups was kindled in the

United States during the 1920s and experienced a meteoric ascent, notably in innovative companies situated in California's Silicon Valley (Bartlett et al., 2019), nestled in the southeastern fringes of the California Bay.

Numerous startups boasting considerable growth potential emerged in the 20th century. Many of these began from scratch and have since achieved remarkable scale, exerting substantial influence. Examples of such technological giants include Alphabet (formerly Google), Meta (formerly Facebook), Amazon, and Walt Disney. Apple, renowned for its plethora of pioneering products and services since its inception in 1976, now boasts a staggering market capitalization of \$2.68 trillion in 2023¹, approaching the \$3 trillion threshold.

Startups are characterized by their temporal nature; they are destined to traverse a trajectory from modest beginnings ("zero-to-one") to significant proportions (Thiel, 2021). Beyond motivation and an appetite for success, entrepreneurs must possess a clear-cut business plan, an innate understanding of their initial idea, the capacity to embrace risks and challenges, an acute awareness of the worth of their products and services, and an insight into their societal impact. For startups, success hinges on executing daring and innovative ventures, fostering exponential growth. Moreover, the scalability of services and products must be realized, honed, and fine-tuned in tandem with a qualified workforce, all to ensure the company thrives amidst the burgeoning market landscape.

Nassim Nicholas Taleb (2018), in his book "Skin in the Game: Hidden Asymmetries in Daily Life," asserts that the greater the potential risk, the more rewarding the outcome. This principle serves to invigorate entrepreneurs to embrace risk strategically, calibrated by an adept assessment of risk measurement and prudent avoidance of unforeseen environmental pitfalls.

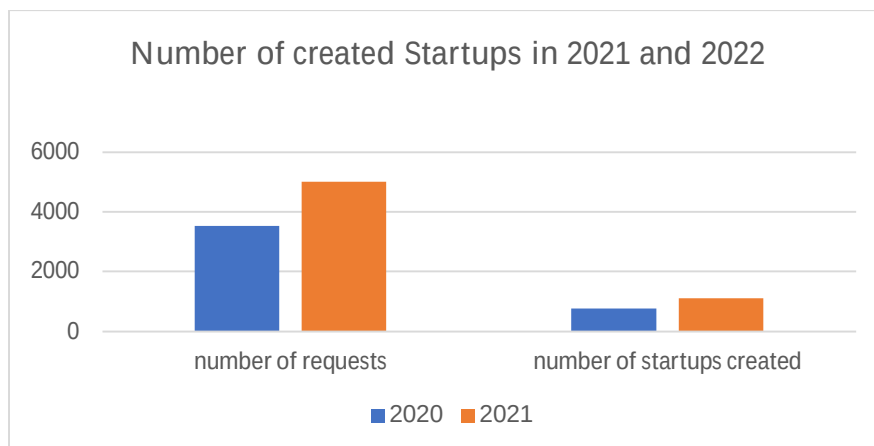
¹ <https://compagniesmarketcap.com/apple/marketcap/> Viewed in April, 29, 2023

3.3. Launch of the Startup Label in Algeria

In 2019, with a strategic vision to promote startups and drive economic transformation away from a rentier-based economy, the Algerian government initiated the establishment of a dedicated Ministry for Startups, aimed at fostering entrepreneurship and wealth creation (Khelil, 2022).

Under the provisions of the 2020 financial law, startups now enjoy significant tax incentives and enhanced access to public financial assistance through various bodies such as ANSEJ, ANGEM, and others. Recognizing their innovative and distinctive nature, the Algerian government places substantial emphasis on startups and accords them privileges that traditional SMEs do not receive through official labeling. It's worth noting that SMEs under 8 years old and meeting specific criteria are also eligible for the Startup label. Companies with this label receive financial backing from the Algerian Startup Fund, established by governmental authorities and funded by six public banks.

Fig.2. Number of created Startups in 2021 and 2022



Source: Realized by ourselves

In 2021, the nation recorded a total of 3,516 applications, out of which 751 companies were successfully awarded the coveted startup label. The momentum continued into 2022, witnessing a remarkable surge as the count of labeled companies reached 1,100 out of 5,000 applications². Concomitantly, the proliferation of incubators

²<https://www.aps.dz/economie/150427-start-up>, viewed in April 24, 2023. At 10:05 pm.

shows no sign of abating on a national scale. The count has escalated from 14 incubators in 2020 to 42 in 2021, further surging to a total of 60 by 2022³.

Moreover, the trajectory of innovation projects receiving funding and the establishment of startups shows a relentless ascent. The nation is steadfast in its commitment, aiming to support and facilitate up to 1 million project leaders by the year 2023.

4. Estimation of the relation between diversification and sme

The objective of this section is to analyze the interplay among SME creation, oil revenue, institutional quality, and economic diversification, as measured by the market concentration index (Normalized Herfindahl-Hirschman Index) over the period spanning from 2000 to 2021. To achieve this, we will employ an Autoregressive with Distributed Lags (ARDL) model.

4.1. Model and Data specification

Our aim is to assess the influence of SMEs' establishment on economic diversification in Algeria during the period from 2000 to 2021. The selection of variables has been guided by both economic literature and empirical evidence, as well as data availability.

To empirically examine the role of SME creation in the context of economic diversification in Algeria, we have employed a cointegration method. This approach is utilized to identify long-term relationships within time series data. Specifically, the model we have employed for this purpose is known as the Error Correction Model (ECM).

4.1.1. Variable Choice and Data Sources

We operate on the assumption that diversification, as an endogenous variable, is influenced by a multitude of economic and non-economic factors encompassing

³ <https://www.algerie-eco.com/2023/01/19/start-up> , Viewed in April 24, 2023. At 10:22 pm.

physical, political, macroeconomic, and institutional aspects. Our modeling framework incorporates the following key variables.

- **DIV (Diversification Index):** This variable serves as our endogenous measure of diversification and is quantified using the Normalized Herfindahl-Hirschman Index. This index is commonly employed in economic literature to gauge export diversification. It encapsulates both intensive and extensive aspects of economic diversification. It's essential to note that this index, while often referred to as a diversification index, is, in fact, an index of export concentration. In simpler terms, it provides an inverse measure of diversification. Values close to 1 indicate a high concentration of exports in one sector, while values nearing 0 signify a well-diversified set of exports. We sourced our data for this variable from the UNCTAD (2023) database.

- **SME:** This variable represents the number of small and medium-sized private enterprises across various sectors, excluding the hydrocarbons sector. Data for this variable is drawn from the statistical bulletins of SMEs published by the Ministry of Industry and Mines in Algeria. The rationale behind using this variable is rooted in the fact that startup data is only available from 2021 onward, making SME data a more accessible proxy for entrepreneurship and business activity.

- **RENT:** Rent corresponds to the difference between international crude oil prices and the total production cost. This calculation, as per the World Bank, excludes transportation costs and normal capital remuneration. These values are expressed as a share of GDP (Collier, 2005; 2008).

- **INST (Institutional Quality):** This variable reflects institutional quality and is measured using the Worldwide Governance Indicator developed by Kaufmann et al. These measures have been available since 1996 for 215 countries. Kaufmann et al. devised six distinct indicators, each addressing a specific dimension of governance (Kaufmann, 2004). Typically, each indicator falls within the range of -2.5 to 2.5, with

higher positive values indicating better institutional quality. Data for this variable is sourced from the Worldwide Governance (2023) dataset.

In summary, our model takes into account a comprehensive array of variables, including the Diversification Index, SMEs, Rent, and Institutional Quality, to scrutinize their combined influence on the diversification of Algeria's economy over the specified period. This allows us to gain valuable insights into the complex dynamics driving economic diversification in the country.

4.1.2. Model Specification

Upon selecting our variables, we present the estimated model as follows:

$$DIV_t = \beta_0 + \beta_1 SME_t + \beta_2 RENT_t + \beta_3 INST_t + e_t$$

With:

- **DIV**: Economic Diversification Index
- **SME**: Number of SMEs Created
- **RENT**: Crude Oil Export Revenues divided by Production Costs
- **INST**: Institutional Quality
- **$\beta_0, \beta_1, \beta_2, \beta_3$** : Model Parameters
- **e_t** : Error Term

This model structure facilitates the examination of the relationships between these key variables and their impact on economic diversification in our analysis.

4.2. Stationarity test

To utilize a chronological variable in an ARDL model, it is imperative to assess the stationarity of the selected variables before embarking on any economic analysis. This step is crucial as it serves as a prerequisite to prevent erroneous estimations and to ensure that no variable is integrated with an order of I (2). This condition is fundamental for the ARDL estimation process, as it necessitates that all variables are

either integrated at I (0) or I (1). If any variable is identified as being integrated at a level of two, I (2), the Fisher statistics calculated according to Pesaran et al.'s methodology (2001) may not yield accurate results. The outcomes of the Augmented Dickey-Fuller test are detailed in Table 1 below.

Table 1. ADF Stationarity Test Results

Variables	ADF Test in Level		ADF Test in 1st difference	ADF Test on regression residuals on tendency	Décision
	Calculated ADF Value	ADF Critical value at 5%	Calculated ADF Value	Calculated ADF Value	Commentary on the ADF Stationarity Test Results
DIV	-0.15	-1.95	-4.65		Stationary in first difference, DS process without intercept
SME	3.87	-1.95	-2.49		Stationary in first difference, DS process without intercept
RENT	-2.51	-3.65		-2.66	Stationary in first difference, TS process
INST	-5.29	-3.04			Stationary in level, DS process with intercept

Source: Authors' Analysis, Estimated Using EViews 9

The Augmented Dickey-Fuller test (ADF) outcomes indicate that all the series are integrated at the first order, denoted as I (1), with the exception of the institutional quality variable (INST). It is essential to underscore that none of the variables exhibit second-order integration I (2), as this condition is fundamental for the accurate estimation of an ARDL model.

4.3. Cointegration test

To apply the ARDL cointegration Bound test developed by Pesaran et al. (2001), it is essential to first determine the optimal lag structure using the Akaike Information Criterion (AIC). The results indicate that the optimal lag structure for our analysis is (1,2,2,2).

Table 2. Cointegration Test Results

Variables		DIV, SME, RENT, INST
F-Statistics		5.44*
Critical Value	Lower Bound Value	Upper Bound Value
1%	4.29	5.61
2.5%	3.69	4.89
5%	3.23	4.35
10%	2.72	3.77

Source: Authors' Analysis, Estimated Using EViews 9

Note: Significance levels are denoted by asterisks (*), with * indicating significance at the 5% level based on the criteria established by Pesaran et al. (2001).

Based on the results of the cointegration bound test presented in Table 2, we can deduce the existence of a long-term cointegration relationship between the series. Specifically, the F-Statistic value of 5.44 exceeds the 5% Upper Bound Value established by Parasan et al. (2001), which is 4.35.

4.4. Toda Yamamoto Causality Test

When dealing with non-stationary series that are not cointegrated or integrated at different orders, the standard Granger Causality test becomes ineffective. In such instances, we turn to the Toda-Yamamoto (1995) Causality test employing the Wald Statistic, which relies on a Chi-squared distribution. The null hypothesis posits the absence of causality between the series, indicated by a Chi-squared p-value greater than 5%.

Table 3. Toda-Yamamoto Causality Test Results

Endogenous Variables	Exogenous Variables		
DIV	SME	RENT	INST
	8.28	7.38	4.10
	(0.040)	(0.006	(0.042)

Source: Authors' Analysis, Estimated Using EViews 9

Note: the values in paratheses (..) are p-values.

The table's results reveal a noteworthy causal relationship between the endogenous variable of diversification and the exogenous variables, namely, the number of SMEs created, oil rent, and institutional quality.

4.5. Model Estimation

The results of the ARDL (1,2,2,2) model estimation can be found in Table N° 4.

Table 4. Long-Term Relationship Results of the ARDL Model

Variables	Coefficient	t-statistic	p-value
RENT	0.259846	2.64	0.0269
SME	-0.055654	-4.47	0.0016
INST	-0.177008	-6.28	0.0001
c	2.291848	9.41	0.0000
CointEq(-1)*	-0.515610	-3.067135	0.0134

Source: Authors' Analysis, Estimated Using EViews 9

The results presented in Table N° 4 indicate that the coefficients in the long-term equation are statistically significant at a 5% significance level.

4.6. Model Validation

We have conducted a battery of residual tests to rigorously assess the robustness of our model. The results indicate a lack of autocorrelation, as supported by the LM-test

for serial autocorrelation, and confirm homoscedasticity, as per the White test. Additionally, our residuals exhibit stationarity, reinforcing the model's stability. Furthermore, the Jarque-Bera test affirms the normality of the errors. These findings collectively validate the reliability of our model (See Appendix).

5. RESULTS AND DISCUSSION

The "RENT" variable exhibits both statistical significance and a positive coefficient. A mere 1% increase in oil rent translates to a substantial 25% boost in the Herfindahl-Hirschman index, making it the most influential factor among the three exogenous variables. This finding resonates with Algeria's economic landscape, characterized by the predominant role of oil rent. It aligns with Alsharif et al.'s (2016) research, which suggests that abundant natural resources often drive specialization in basic products at the expense of economic diversification.

Conversely, the influence of the number of SMEs on economic diversification is notably negative. A 1% rise in SME numbers corresponds to a 5% increase in diversification. This counteracts the concentration of Algerian exports in hydrocarbons, enhancing diversification and mitigating risks associated with oil price fluctuations, as highlighted by UNCTAD (2022). Algeria's government's recent strategic focus on promoting startups and SMEs has the potential to serve as an engine for economic diversification, reducing the nation's dependence on oil rent.

Furthermore, the "Institutional Quality" variable (INST) demonstrates a significant negative impact. A 1% improvement in the diversification index leads to an impressive 17% reduction in concentration. This underscores the paramount importance of institutional quality in the diversification process. The limited diversification of Algeria's economy can, in part, be attributed to the country's subpar institutional quality. This observation echoes Botswana et al.'s (2003) findings, underscoring the pivotal role of institutions in fostering long-term economic growth and diversification, especially in resource-rich nation.

6. CONCLUSION

The primary focus of this paper is to provide evidence of the impact of Startups and Small and Medium-sized Enterprises (SMEs) on the economic diversification process in Algeria during the period from 2000 to 2021.

In this study, we have employed an econometric ARDL model to investigate the role of SMEs and Startups in reducing the concentration of hydrocarbon exports within the Algerian economy. The results obtained from our analysis highlight several key findings:

1. The significant reliance on hydrocarbons is evident in the Algerian economy, underscoring their substantial weight and influence.
2. Furthermore, institutional quality plays a crucial role in the diversification of export activities, emphasizing its importance in facilitating economic growth.
3. Regrettably, the results also reveal a lack of economic diversification within the country. The heavy dependence on oil resources has led to a specialization in basic products, limiting the expansion of economic activities.
4. It is worth noting that while the dominance of hydrocarbons in the Algerian economy is a significant factor contributing to its limited diversification, the poor institutional quality typical of less developed countries exacerbates this dependence and further reinforces the focus on oil-based exports.

In summary, this paper highlights the pivotal roles played by SMEs, Startups, hydrocarbons, and institutional quality in shaping the economic diversification landscape of Algeria, shedding light on the challenges and opportunities for the country's economic development.

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Appendix

1- Heteroskedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

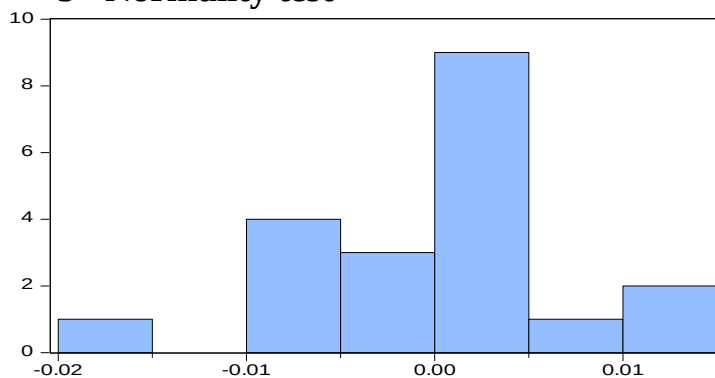
F-statistic	1.158955	Prob. F(10,9)	0.4171
Obs*R-squared	11.25770	Prob. Chi-Square(10)	0.3378
Scaled explained SS	2.662571	Prob. Chi-Square(10)	0.9883

2- Autocorrélation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.313570	Prob. F(2,14)	0.7358
Obs*R-squared	0.900378	Prob. Chi-Square(2)	0.6375

3- Normality test



Series: Residuals	
Sample 2002 2021	
Observations 20	
Mean	3.77e-16
Median	0.001982
Maximum	0.012902
Minimum	-0.018848
Std. Dev.	0.007511
Skewness	-0.451845
Kurtosis	3.335912
Jarque-Bera	0.774577
Probability	0.678895

4- Stability test

