Modeling the relationship between Small and medium-sized enterprises and economic growth in Algeria: An empirical analysis via the NARDL approach

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Abstract:

This study aims to examine the symmetric or asymmetric effect of SMEs on Algeria's growth (GR) for the period 1990 to 2019. This empirical study adoptsthe nonlinear autoregressive distributed lag estimation technique (NARDL).

The short and long-run symmetry test confirms the existence of symmetric and asymmetry effects of SME on Algeria's growth. Further, asymmetric cointegration is confirmed between small and medium enterprises and economic growth in the long run, and symmetric effect in the short run. As expected, the impact of negative decomposition (SME⁻) is greater than positive decomposition.The findings suggest that a 1 % increase in SMEs leads to an increase in economic growth by 13 %. Similarly, the negative parameter describes 1 % decrease in SMEs causing to decrease in economic growth by 17 % for Algeria.So, the results confirm the positive impact of SMEs on economic growth. These results involve those policymakers who should be persuaded to increase the creation of small enterprises.

Key Words :symmetric, asymmetric, economic growth, Small enterprises,Medium enterprises, NARDL.

JEL Classification: C32, M13, N87, O47, R11

1. INTRODUCTION

The world is currently experiencingan ongoing debate about the significance of SMEs. As our economy becomes more complicated, in recent years, many countries have given great importance to the development of SMEs. As well, various studies have proved the positive effect of SMEs on economic growth and development of a national economy (Anthony & Arthur , 2008) , (Ming-Wen , 2010)&(Eze & Okpala, 2015).

In consequence, small and medium enterprises (SMEs) including microenterprises have been considered as an engine for fostering growth. In addition, it is so important to mention that there is an extensive broad debate about the significant role of SMEs on the economic development among the government, policymakers, academics, researchers, and economists, thus, SMEs are key indicators of a country's economic development. This means that SMEs could be a basic instrument of employment, according to (James , 1990) the employment growth rate is much faster in small size enterprises than in large enterprises, as well as contribute to innovation, enhance competition, become part of the global market, increase the aggregate productivity, boost exports and reduce imports (Grisejda & Krisdela, 2016).

Problematic of the study:

It is widely recognized that at all levels of development, small and medium-sized enterprises (SMEs) have a significant role to play on economic growth. Around the world there were 213.52 million SMEs, comprising 57 million SMEs in Europe and the Middle East, 131.88 million in the Asia-Pacific region, and over 25 million in North and South America (STATISTA, 2020). Typically, SMEs in Algeria accounts for more than 1.19 million in 2019, and thus, they are the biggest sources of employment, providing for over 25% of the country's workforce, so do SMEs havea positive effect on the economic growth of Algeria?

Objectives of the study:

Algeria's gross domestic product heavily depends on crude oil production for over 60% of its GDP, which requires economic diversification and a move away from heavy dependence on crude oil. Small and medium enterprises (SMEs) are crucial for economic growth, thus, playing a notable role in job creation, and economic diversification, but they face many obstacles to financing, land, and bureaucracy. The main purpose of this paper is to identify the impact of SMEs on the economic growth of Algeria over the period from 1990 to 2019. It also aims to find if there is a long-run both short-run relationship between SMEs and growth.

2. Theoretical Review:

The classical hypothesis accepts that the profits and earnings generated by SMEs will be fallen gradually, as a result; big enterprises will then engender economic growth marked by intensification in income. Whereas, the neo-classical model of economic growth implies that growing capital or labor is responsible for diminishing returns. As a result, growing capital has only a temporary and partial effect on the rise of economic growth.

As capital increases, the economy maintains its steady-state rate of economic growth. Thus, it suggests that poor countries that invest more should see their economic growth converge with richer countries.

Moreover, Harrod-Domar proved that the growth rate depends on a function of the savings rate, as well as the efficiency of investment. Subsequently, if savings are too high, this leads to a decline in growth because people cannot afford to consume (Robert, 1994).

Endogenous growth models, founded by (Paul Romer& Robert Lucas), are based on the role of human capital. How workers with greater knowledge, education, and training can help to increase rates of technological advancement (Paul , 1994).

3. Empirical review:

This section presents a review of the existing empirical literature on whether SMEs stimulate growth. As mentioned in the introduction, a growing body of studies proves that SMEs boost economic growth. Initially (Hande , 2016) argued that the economic growth and development of SME sector are strongly linked in both developed and developing economies.

(Thorsten , Asli, & Ross, 2005) This study explores the relationship between the small and medium enterprise (SME) sector and economic growth. Using a panel of data from 45 countries, they find a strong positive correlation between SMEs and GDP per capita growth. Besides, Small and medium enterprises play an important role in terms of the growth and development of an economy. In Nigeria, for example using data from 1986 to 2016, and regression analysis, the finding estimation provides a positive and significant correlation at the intersection of small and medium enterprises and output growth, implying that small and medium enterprises are a pillar factor in Nigeria's growth (Aminu , Adamu , & Ibrahim , 2018).

Moreover,(Pamela , 2007) finds that entrepreneurship has a positive impact on economic growth. In addition, (David , 2007) has argued that entrepreneurship and small firms are important determinants of economic growth.

Furthermore,(Hirnissa , Nurshuhaida , & Fadilla , 2018) empirical evidence in Malaysia suggests that SMEs are important to the Malaysian economy, which comprises 99.2% of total business establishments, where SMEs contributed 32% of Gross Domestic Product (GDP).

Besides, SMEs comprise approximately 90% of total businesses in Pakistan, and approximately 40% of GDP is contributed by SMEs. Therefore, we can conclude that SMEs play a dynamic role in the economic growth of the country (Nooreen & Muhammad , 2018).

(Dixit & Kumar , 2011) Examined the role of SMEs in Indian economic growth, they employed the cointegration approach to look at the causal relationship between SMEs output, exports, employment, number of SMEs, and their fixed investment and India's GDP, from the period 1973 to 2006. The results indicated a positive correlation amongst SME's output and India's GDP. However, a few studies have found an insignificant effect of SMEs on economic growth. For example, (Tulio , Adrian , & Bettina , 2009) examine the link relating to the small and medium-sized enterprise (SME) sector and economic growth for annual data of Brazilian states for the period 1985-2004. The empirical findings confirm that the relative importance of SMEs is negatively correlated with economic growth.

4. Data and Methodology:

This study employs annual time-series data for the period 1990to 2019, to analyze the asymmetric or symmetric relationship between small and medium enterprises and economic growth in Algeria. Thereby, the data used in this study were collected from various sources such as the bank of Algeria, the statistical bulletin published yearly by the industry minister of Algeria (IMA), World Bank.

In this part, we will describe the method that will be used, as well as, we will present the main findings results. The examined variables are presented in table1.

Table 1. Variables Selected for Analysis and Respective Data Source

Variable	Proxy used	Source of Data
Economic growth	GR	Bank of Algeria
Small And Medium Enterprises	SME as rate of GDP	Industry Minister of Algeria (IMA)
Investment	Rate of investment	UNACTED&World Bank.
Human capital	H	Barro and lee

As well, we use NARDL model to order to interpret the estimation results.In the present study, variables are selected based on previous results in the literature rather than on an explicit theoretical model.

4.1 Tools of analysis:

This study explores an asymmetric relationship between SMEs and GR utilizing an asymmetric autoregressive distributed lag model approach (NARDL). The NARDL approach has recently been used in various fields. Subsequently, the known advantage of the NARDL methodology so it is valid if the variables are integrated of order I(0)/I(1) or a combination of both.

At first, we have specified the following formula of the linear (ARDL) model as in Eq (1), and then we explain the NARDL model.

$$\Delta GR_t = C_0 + \rho GR_{t-1} + \theta_1 SME_{t-1} + \theta_2 H_{t-1} + \theta_3 I_{t-1} + \sum_{j=1}^{p-1} \alpha_j \Delta GR_{t-j} +$$
$$\sum_{j=0}^{q} \mu_j \Delta SME_{t-j} + \sum_{j=0}^{q} \sigma_j \Delta H_{t-j} + \sum_{j=0}^{q} \delta_j \Delta I_{t-j} + \varepsilon_t \qquad (1)$$

Whence Δ represents the first difference operator, GDP_t is the dependent variable in period t, C_0 implies the intercept;

$\langle SME_t; H_t; I_t \rangle$ vector of regressors;

ρ and θ indicate the long-run coefficients;

As well, α_j ; μ_j ; σ_j; and δ_j are the short-run coefficients, p and q which signify the optimal lags for the dependent variable and the independent variables, respectively, to end with, ε_t the error term at time t.

We cannot suppose that all adjustment process proceeds with a linear trend. However, it could be nonlinear. NARDL approach was introduced by (SHIN , et al., 2014)and can utilize positive and negative partial sum decomposition to differentiate between asymmetric effects in the short-run and long-run period. Following (Shin, 2014) the NARDL model is based on the following asymmetric long-run regression model:

$$GR_t = \beta_0 + \beta_1 SME_t^+ + \beta_2 SME_t^- + \beta_3 I^+_t + \beta_4 I^-_t + \beta_5 H_t + \varepsilon_t (2)$$

Where; The independent variables $\langle SME \rangle \langle I \rangle$ are decomposed into its positive and negative partial sum:

Increases reaction:

$$POS = SME_t^+ = \sum_{j=1}^{t} \Delta SME_j^+ = \sum_{j=1}^{t} max \, (\Delta SME_t; 0) \qquad (3)$$

$$POS = I_t^+ = \sum_{j=1}^{t} \Delta I_j^+ = \sum_{j=1}^{t} max \, (\Delta I_t; 0) \qquad (4)$$

And decreases reaction:

$$NEG = SME_t^- = \sum_{j=1}^{t} \Delta SME_j^- = \sum_{j=1}^{t} min\,(\Delta SME_t; 0) \qquad (5)$$

$$NEG = I_t^- = \sum_{j=1}^{t} \Delta I_j^- = \sum_{j=1}^{t} min\,(\Delta I_t; 0) \qquad (6)$$

(Shin & al, 2014) demonstrate that by relating (2) with the ARDL (p, q) model (1) we get the NARDL(p, q) model as:

$$\Delta GR_t = \rho GR_{t-1} + \theta^+ SME_{t-1}^+ + \theta^- SME_{t-1}^- + \gamma^+ I^+{}_{t-1} + \gamma^- I^-{}_{t-1} + \varphi H_{t-1}$$
$$+ \sum_{j=1}^{p-1} \varphi_j \Delta GR_{t-j} + \sum_{j=0}^{q} (\delta_j^+ \Delta SME_{t-j}^+) + \sum_{j=0}^{n} (\delta_j^- \Delta SME_{t-j}^-) + \sum_{j=0}^{m} (\pi_j{}^+ \Delta I^+{}_{t-j})$$
$$+ \sum_{j=0}^{k} (\pi_j{}^- \Delta I^-{}_{t-j}) + \sum_{j=0}^{s} (\delta_j \Delta H_{t-j}) + \varepsilon_t \quad (7)$$

Then, we can observe that the equilibrium relationship among the dependent variable GR and explanatory variables $\langle SME \rangle; \langle I \rangle$ are separated into positive $(\beta^+ x_t^+)$ and negative $(\beta^- x_t^-)$ changes, ρ_t representing possible deviations from the long-equilibrium. Where $\langle \theta^+ \rangle; \langle \theta^- \rangle ; \langle \gamma^+ \rangle$; and $\langle \gamma^- \rangle$ are the asymmetric long-run parameters related to positive and negative changes in $\langle SME \rangle$, and $\langle I \rangle$ respectively. $\langle \sum_{j=0}^{q} \delta_j^+ \rangle$ Indicates the short-run effect of Small and medium enterprises increases on GR, while $\langle \sum_{j=0}^{n} \delta_j^- \rangle$ illustrates the short-run effect of Small and medium enterprises decrease on GR.

4. RESULTS AND DISCUSSION

This section is provided to explain the empirical finding and discuss our main results. It was important to perform unit-root test in order to avoid spurious regression.Estimation findings inAppendix(1) provide the results of the ADF test. The variables $\langle GR \rangle ; \langle H \rangle$ are stationary only at the first difference;$\langle SME \rangle ; \langle I \rangle$are stationary both at levels and at thefirst difference. These results justify the use of the NARDL method.

4.1 Bounds Testing for Cointegration :

The bounds testing approach allows us to determine whether there is a long-run relationship among the variables. The results exhibit the estimated F-statistics in the NARDL bound test is **12.683**, which is significant at the 1% significance level. Therefore, the nonlinear long-run cointegration between **GR, SMEs, Human Capital, and the rate of Investment (I)** in Algeria is observed. This implies that the null hypothesis of no cointegration can be rejected, indicating there is a presence of long-run linkage among the selected variables.

Table 2. Results of NARDL bounds test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	12.68317	10%	2.08	3
		5%	2.39	3.38
K	5	2.5%	2.7	3.73
		1%	3.06	4.15

Source: Author's computation from E-View 10.

Having observed the presence of a long-run relationship between SMEs, economic growth, and the other selected variables, we then apply the NARDL method to estimate the long-run parameters of equation (2).

4.2 Long run analysis:

Findings results in Table (3) provide the estimated long-run coefficients. The lag length of the long-run model was selected based on the AIC.

Table 3. Estimated long-run coefficients using the NARDL approach

Variable	Coefficient	Std. Error	t-Statistic	Prob.
H	0.442260	0.107670	4.107531	0.0026
I_POS	0.195171	0.069571	2.805353	0.0205
I_NEG	4.424574	0.986995	4.482872	0.0015
SME_POS	0.134216	0.043924	3.055655	0.0137
SME_NEG	-0.177079	0.100524	-1.761564	0.1120
C	11.30258	0.102119	110.6805	0.0000

EC = GDP - (0.4423*H + 0.1952*I_POS + 4.4246*I_NEG + 0.1342*SME_POS-0.1771*SME_NEG + 11.3026)

Source: Author's computation from E-View 10.

The findings imply that the positive parameter of SMEs explains that 1 % increase in SMEs leads to an increase in economic growth by 13 %. Similarly, the negative parameter describes 1 % decrease in SMEs causinga decrease in economic growth by 17 % for Algeria.

The findings suggest that GR rises by 13 **%**while SMEs increase by 1 **%**, as explained by the positive changes in SMEs. Additionally, the negative changes explicate that 17 **%** of GRdecreases when SMEs drop by 1 **%**. As expected, the impact of negative decomposition (SME⁻) is greater than positive decomposition. So, the results confirm the positive impact of SMEs on economic growth.

This implies that the policymakers should prioritize enhancing the creation of enterprises. However, some factors have more influence on the growth of the business sector in Algeria, including; Corruption; Weak infrastructure; Difficulty in obtaining loans from banks and financial institutions; Difficulty in obtaining industrial land and Not following modern management methods. Besides, human capital is also a key

determinant for boosting economic growth. As well, the growth rate in Algeria increases by 44 **%**in response to a 1 **%**growth in human capital. Moreover, the rate of investment (I) is found to have a positive significant relationship with GR.

Basically, the long-run results indicate that small and medium enterprises, human capital,and rate of investment, all have a significant, positive effect on economic growth in Algeria. This implies that the SMEs are the pillar determinant Algeria's economic growth. Then, the finding is consistent with those of (Dounya , Zouleykha , & Abdallah , 2019), (bouchikhi , rahmani , & ghrissi, 2016), and (Baderi, 2015). Further, the experiences of many countries such as the United States, Japan, China, Malaysia, and other Europeans, and Asian countries confirm that the support and encouragement of the creation of small and medium enterprises, within the framework of the institutional environment and appropriate legislation, have achieved a qualitative leap in the field of strengthening and developing economic resources and diversifying the productive base of the economy. Therefore, it diversifies the economy as a whole. This will allow us to solve part of the problem of dependence on a single sector and reduce dependence on it.

4.3 Short run analysis:

The short-run coefficients for the relationship between SMEs and economic growth are given in Table 4. Similar to the long-run model, the lag length of the short-run model is selected based on the AIC.

The signs of the short-run estimates are not similar to those of the long-run model. The estimates are significant at the 1 percent critical level. Further, the results show that there is a significant, positive relationship between SMEs and economic growth in the short run. We can explain thisby:

In the Doing Business 2020 report published by the World Bank, economies are ranked by their ease of doing business, from 1 to 190. A high ease of doing business ranking means that the regulatory environment is more conducive to the creation and operation of a local company. In which 190 countries were compared in terms of ease of doing business, Algeria ranks (157) among the 190 countries cited. This can be explained by: The complexity of government procedures for doing business in Algeria, which leads investors whether local or foreign to avoid making their investment in Algeria and go to other countries, where the climate for doing business is conducive, simpler, and less complicated than in Algeria.

Therefore, it is necessary to strengthen the process of creating and expanding medium and small enterprises by removing barriers that exist in the institutional environment; eliminatingbarriers regulatory; encouraging transparency and reducing corruption, through collaboration with international institutions such as the United Nations (UN) agencies and the World Bank to bring about change the most complex at the policy and

legislative level; Develop a program of organizational reforms to help create and development of medium and small enterprises; Prepare laws and simplify operational procedures; Elaboration of a guide for investors in various fields (industrial and agricultural, service and commercial); Reforming laws related to (business registration systems, licensing systems industrial regulations, import licensing, investment regulations, bankruptcy law and project closure system).

As consequence, it is clear that the creation and development of small and medium enterprises are not easy for an economy like the Algerian one, however, it is aneffort that needs a lot of organizational and administrative reforms and a series of integrated and interdependent procedures, as a result, it becomes clear that thesechangesare the responsibility of the authorities Government and private sector, in cooperation with international organizations.

Table 4. Short-run results for selected ARDL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GR(-1))	0.241222	0.093045	2.592531	0.0291
D(GR(-2))	0.897996	0.097127	9.245572	0.0000
D(GR(-3))	0.324455	0.087316	3.715872	0.0048
D(H)	2.135306	0.420435	5.078805	0.0007
D(H(-1))	-2.028596	0.443954	-4.569380	0.0013
D(I_NEG)	4.160839	0.389749	10.67569	0.0000
D(I_NEG(-1))	1.882846	0.181557	10.37054	0.0000
D(SME_POS)	0.124927	0.012440	10.04240	0.0000
D(SME_NEG)	0.194841	0.030630	6.361144	0.0001
CointEq(-1)*	-0.853980	0.070204	-12.16430	0.0000
R-squared	0.937342			
Durbin-Watson stat	2.394693			

Source: Author's computation from E-View 10.

Similarly, ECM is used to find the short-run connection between the concerned variables. The value of ECM indicates the speed of adjustment toward equilibrium level when the economy has faced an economic shock. The speed of adjustment toward stability depends upon the ECM coefficient; it must be negative and significant. Further, the empirical results prove clear that the error correction parameter (ECT_{t-1}) term is statistically significant at the 1 percent critical level, and has a negative coefficient, indicating the existence of a stable short-run relationship. This means that it takes about 85% for the speed of adjustment to return to the equilibrium path.

Human capital has a significant, positive impact on economic growth in Algeria. The coefficient of determination (R-squared) is about 0.93, which implies that about 93 percent of the variations in economic growth are explained by variations in all the independent variables. Finally, DW statistic =2.39, however, we cannot rely on this result, since our study contains lagged variables, which violates one of the conditions

for using test DW statistic,so we cannot prove the absence of autocorrelation in the model.This means that we have to use other tests to make sure that there is no autocorrelation and to show that the model is valid.

For the confirmation of the long-run asymmetric nexus, this study used the Wald test. The turns out from the Wald test are represented in Table 5. Wald test confirms the Asymmetric linkage between economic growth (GR) and small and medium enterprises (SME)in long-term and symmetric relationship in short term.

Table 5.Testing hypothesis for asymmetric analysis

Null hypothesis	F-Statistics	Prob.	Symmetric/Asymmetric
SME			
WALD-Long run	4.226108	0.0700	Asymmetric
WALD –short run	6.762694	0.0161	Symmetric
I			
WALD-Long run	1.291819	0.0192	Symmetric

Source: Author's computation from E-View 10.

4.4 Diagnostic tests:

Our findings indicate thatthe values of the diagnostic tests take the expected values and that there are no problems to form the model. In this context, the coefficient of **LM** Test (Breusch-Godfrey) is **"1.692868"** while its probability value is **"0.2514"**. The coefficient of the Jarque-Bera Test is **"0.848221"** while the probability value of this coefficient is **"0.091788"**. Heteroskedasticity Test based on ARCH technique has a coefficient of **"1.020742"** with **"0.32292"**as the probability value. Based on these results, we can conclude that there is no statistical problem to establish the model.

Table 6.diagnostic test results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.692868	Prob. F(2,7)	0.2514
Heteroskedasticity Test: ARCH			
F-statistic	1.020742	Prob. F(1,23)	0.3229
Obs*R-squared	1.062355	Prob. Chi-Square(1)	0.3027
Normality test : Jarque-Bera			
Jarque-Bera	0.848221	Prob	0.654352

Source: Author's computation from E-View 10.

The findings revealed that all the diagnostic tests pass the model's requirement, indicating that it is normally distributed, free of autocorrelations and heteroskedasticity, and stable. Moreover, the cumulative sum of squares of recursive residuals (CUSUMSQ) in Fig. 1 shows that the error correction model is stable within the critical limits.

Fig. 1.Plot of CUSUMSQ tests for Eq. (2).
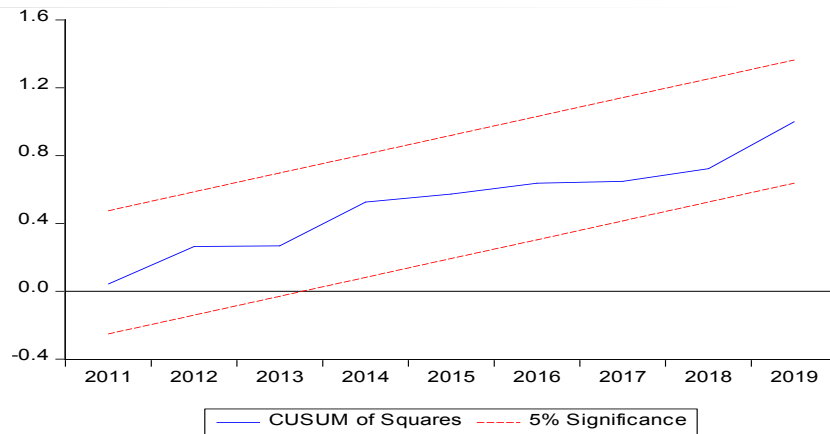
Source: Author's computation from E-View 10.

5. CONCLUSION

The successful international experiences of small and medium enterprises indicate the need for the existence of a clear approach and specific objectives for the development of such institutions, and those policies for the development of small and medium enterprises in the most comprehensive economic policies of the country. It has long been recognized that Small and medium enterprises are a vital component in the process of economic growth.

Our empirical resultsconfirm this view.The finding reveals that through the positive change in SME, the growth rate (GR) increases by 13 %, although due to the negative change in SME, the growth rate (GR) decreases by 17 %. In addition, the significance of F-statistics (12.68317) confirms the existence of co-integration between SME and economic growth. The Wald test confirms the asymmetric association between SME and economic growth over the long term. Besides, the empirical results indicate that the impact of negative decomposition (SME$^-$) is greater than positive decomposition. The finding recommends that therealization of sustainable economic growth in Algeria needs to support small and medium enterprises, as well as to achieve an independent source of oil by creating a national income. However, some obstacles prevent the creation of small and medium enterprises in Algeria, the main ones are financing and other obstacles, including dependence on oil revenues, administrative obstacles, and the problem of obtaining industrial land; Poor infrastructure.

Finally, the study recommends that authorities should put in placea new economic strategy to limit the colossal importation of goods and services, particularly those goods that SMEs can produce locally. Given that Algeria is economically underdeveloped, and depends largely on the price of oil, a most population must be integrated into the process of economic development through entrepreneurship in small businesses. This means encouraging further investment in SMEs and prioritizing their access to finance, and infrastructure development, to promote long-run economic growth.

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7. Appendixes

Appendix 1.Unit root tests results

UNIT ROOT TEST RESULTS TABLE (ADF)

Null Hypothesis: the variable has a unit root					
AtLevel					
		GR	SME	I	H
With Constant	t-Statistic	-0.4605	-2.7656	0.7026	-2.0254
	Prob.	*0.8856*	*0.0789*	*0.9902*	*0.2743*
		n0	*	n0	n0
With Constant & Trend	t-Statistic	-1.1232	-2.2306	-4.1047	-0.8473
	Prob.	*0.9080*	*0.4536*	*0.0156*	*0.9419*
		n0	n0	**	n0
Without Constant & Trend	t-Statistic	0.6681	0.9727	3.1331	3.9801
	Prob.	*0.8544*	*0.9070*	*0.9992*	*0.9998*
		n0	n0	n0	n0
At First Difference					
		d(GR)	d(SME)	d(I)	d(H)
With Constant	t-Statistic	-1.1092	-4.3931	-3.9405	-2.0643
	Prob.	*0.6978*	*0.0023*	*0.0053*	*0.2596*
		n0	***	***	n0
With Constant & Trend	t-Statistic	-2.1896	-4.0313	-3.6830	-4.0824
	Prob.	*0.4773*	*0.0222*	*0.0399*	*0.0247*
		n0	**	**	**
Without Constant & Trend	t-Statistic	-1.6332	-0.9394	-1.5290	-1.1440
	Prob.	*0.0957*	*0.2998*	*0.1163*	*0.2196*
		*	n0	n0	n0
Notes:					
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant b: Lag Length based on SIC c: Probability based on MacKinnon (1996) one-sided p-values.					

Source: Author's computation from E-View 10.0