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IMPACT OF PUBLIC AND PRIVATE INVESTMENT ON ECONOMIC GROWTH IN NIGERIA: A MARKOV REGIME-SWITCHING APPROACH

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ABSTRACT

The contention in the literature is the relative contribution of private and public investment on economic growth and whether the relationship is linear or non-linear. In addition, there is the issue of whether the impact of investment on economic growth changes depending on public and private investment

Purpose. *The study examines the relationship between investment (public and private) and economic growth in Nigeria over the period 1970-2016.*

Design/Methodology/Approach. *The study employs Markov regime-switching approach developed by Hamilton (1989, 1990). Specifically, a multivariate dynamic Markov-switching model is estimated using maximum likelihood estimation techniques. The study employs annual time-series sourced from Central Bank of Nigeria, Statistical Bulletin and World Bank, World Development Indicator.*

Findings/Implications. *The results show that the relationship between investment and economic growth is non-linear. Also, both public and private investments have a significant positive impact on economic growth. However, private investment contributes more to economic growth than public investment during the period of expansion. The reverse is the case during the period of contraction. The results support the basic neoclassical framework, with emphasis on savings and investment for analyzing long-term growth performance. Also, it is crucial to make a distinction between the impact of investment (public and private) on growth in two stages of growth.*

Originality. *Government needs to be innovative by spending more during period of slump as more public investment will be required to pump prime the economy for increased private investment.*

1. INTRODUCTION

In the last few decades, several studies have examined the effects of investment on economic growth. The consensus in the literature is that investment plays a critical role in the growth process (see, for example, Jongwanich & Kohpaiboon 2008; Kormendi & Maguire, 1985; Serven & Solimano, 1989; Levine & Renelt 1991; Barro & Sala-i-Martin, 1999; Ocolisanu, Debrotta & Debrotta, 2022). However, two main issues on the relationship between investment and economic growth remain unresolved. The first is the relative contributions of public and private investment to economic growth. The second is whether the correlation between investment and economic growth is linear or nonlinear. That is whether the linkage between investment and economic growth is state-dependent. Some empirical studies, including Crowder & Himarios, (1997); Lighthart, (2000) have found that public capital is more critical to economic growth than private investment. In contrast, some other studies by Yang (2006); Khan & Reinhart (1989); Khan & Kumar (1997) showed that private investment contributes more to growth than public investment for USA economy.

Moreover, most existing empirical studies have assumed linear dependence and that the relationship between investment and economic growth is not state-dependent. This assumption explains why earlier studies relied on linear model using either bivariate/multivariate and or autoregressive distributed lag model (ARDL) approaches. However, in recent times, few studies have drawn attention to the dynamic behaviour of economic growth to the dynamics of the business cycle (Brock, 2018). The argument is that economic growth does not proceed in steady-state; hence the linkage between macroeconomic policies such as fiscal, monetary, investment and economic growth is state-dependent. This issue is yet to be examined in the case of Nigeria.

The Nigerian economy is an oil-dependent economy with public sector dominance, particularly after the civil war in 1970 and following the massive revenue from oil revenue in the 70s. However, the poor economic performance of the economy led to the economic reforms introduced in 1986 to reduce the share of the public sector and promote private investment. However, the economy did not perform better in terms of economic growth and other economic indices after the implementation of the adjustment programme. Indeed, the poor performance of the economy the reforms has brought to the front burner the debate on the superiority of private investment over public investment in the growth process. Besides, the Nigeria economy system underwent structural changes in the light of the structural adjustment reforms introduced in 1986 with the observed episodic growth rate over the study periods. How this unsteady growth rate is related to investment has not been addressed in Nigeria.

Therefore, our objective in this paper is to: (i) determine the extent of the impact of investment on economic growth, (ii) ascertain whether the relationship be-

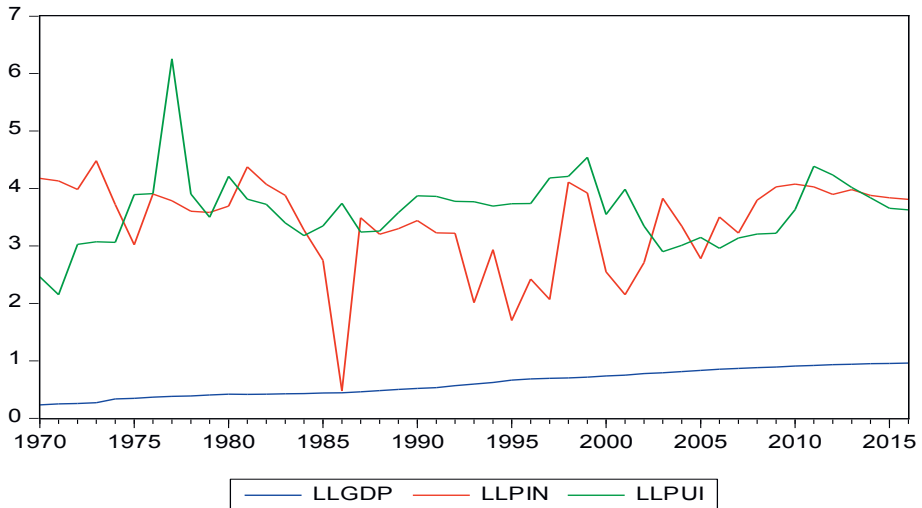
tween investment (public and private) and economic growth linear or nonlinear, and (iii) verify if the impact of investment on economic growth changes depending on public and private investment. To achieve the objective stated above, the study adopts the Markov Regime-Switching approach. The outcome of this study will shed light the relative contribution of private and public investment on economic growth in the periods of expansion and contraction. This information will assist the government in designing innovative investment policy to enhance promote growth in the phases of contraction and expansion.

The rest of the paper is structured as follows: Section 2 gives an overview of public, private and economic growth between 1970 and 2016. A review of the theoretical and empirical literature is provided in section 3. Section 4 describes the data, model and methods adopted. Section 5 contains empirical results. The last section provides the conclusion.

2. DYNAMICS OF PUBLIC, PRIVATE AND ECONOMIC GROWTH IN NIGERIA: 1970-2016

At independence in 1960, Nigeria adopted the State-led growth under the import substitution industrialisation strategy (ISI). The government encouraged massive private sector investment in enterprises in the domestic economy. However, private investment dropped drastically following the commencement of the civil war in 1967. At the end of the Nigerian civil war in January 1970, the government started the reconstruction and rehabilitation of infrastructure and social services in the affected areas. The sharp increase in oil revenue buoyed this ambitious public investment programme. Government investment during this period was so massive that the structure of relative prices and wages changed fundamentally. The increase in wages, coupled with an appreciating currency squeezed the profitability of the non-oil exports and undermined their competitive position internationally. This development led to a steady drop in private investment and the dominance of public investment till early 1977 (Fig. 1). Private investment increased and led public investment in early 1980, but the dominance was short-lived as it dropped sharply from 1981 to 1986 (Fig.1). The decline in public investment in the early 1980s was as a result of the sharp drop in international oil price in early 1980, which adversely affected government revenue. To sustain the economy, Government accumulated large fixed and external debts. Government attempt to finance these deficits through borrowing from the banking system and, or money creation and by drawing from international reserves had a significant adverse effect on the private sector. In particular, the private sector incurred huge trade arrears with suppliers abroad. This development explains the sharp decline in private investment from 1981 to 1986.

Figure 1.: Plots public investment, public investment and growth of GDP



Source: Author's

The introduction of the structural adjustment programme in mid-1986 led to a sharp increase in private investment in late 1986 but later declined steadily in the subsequent years. Public investment exercised dominance over private investment from 1987 till 2003. As shown in Fig 1, private investment started responding well to the various economic measures introduced in the economy from 2004 and indeed, led public investment over the period 2006 to 2011.

In general, looking at the trends of public and private investment especially from 2004, country's policy of encouraging more private investment seemed to have yielded some fruits although public investment still dominated for most of the years.

3. LITERATURE REVIEW

In this sub-section, we provide a capsule summary of the literature on investment and economic growth. Available theoretical literature including various growth theories (classical, neoclassical and its recent extensions as well as endogenous growth theory) clearly showed the role of investment in economic growth (Romer, 1986; Markiv, Romer & Weil, 1992; Fischer 1993; Barro & Sala-i-Martins, 1999; Ocolisanu et al., 2022). These theories identified channels through which investment impact economic growth. Several empirical studies have confirmed the positive impact of aggregate investment on economic growth (Barro & Lee 1994). However, the controversy on the relative contribution of public and private investment to economic growth is not yet resolved in the literature. The debate is on the complex and controversial question of whether public and private investments are substi-

tutes, or compliments or independent (Nazmi & Ramirez 1997; Greene & Villanueva, 1991; Blejer & Khan, 1984; Cavallo & Daude, 2011; Bom & Ligthart, 2014; Bahal, Raissi & Tulin 2018; Ari & Koc, 2020). The complementary hypothesis argues that public investment may 'crowd in' private investment and thus enhances economic growth. The 'crowding in' is particularly important where public investment is on infrastructural facilities such as road, electricity, education and health. The argument centres on the fact that public investment on such lumpy projects that are naturally not appealing to the private investor often generates positive externalities that enhance private investment. In this wise, public investment possibly assists in raising the productivity of private investment (Gjini & Kukeli, 2012; Crowder & Himarios 1997; Alfonso & Aubyn, 2019; Masten & Grdovic, 2019).

The 'crowding out' hypothesis simply suggests that public and private investments are substitutes. It argues that public investment may "crowd out" private investment on capital goods, irrespective of the financing approach adopted (Bahal et al., 2018; Devarajan et al., 1996). The 'crowding out' is particularly possible when public investment is executed by inefficient state enterprises that receive high state subsidies. It is equally possible when public investment is on enterprises which produce goods and services that directly compete with the private sector even when the latter is more efficient in the provision of such goods and services. Moreover, public investment may 'crowd-out' private investment when the former is debt-financed either from internal or external sources (Cavallo & Daude, 2011; Dash, 2016; Fujii et al., 2013). Lastly, public investment may crowd out private investment as a result of a decrease in the availability of savings to the private sector, coupled with an increase in the cost of finance.

Given that the relationship between public and private investment is ambiguous, several studies have been carried out empirically on the subject matter. However, empirical studies have found mixed results. Some empirical studies have reported 'crowd in' effect of public investment on private investment in the development process (Erden & Holcombe, 2005; Ramirez, 1996; Munnell, 1990; Cullison, 1993; Odedokun, 1997). Specifically, the study by Blejer & Khan (1984) found that public infrastructural investment was complementary to private investment in 24 developing countries over the period 1971-1979. Eden & Holcombe (2005) showed that public investment 'crowded in' private investment in 19 developing countries. The same result was obtained by Hatano (2010) for Japan. Other studies that affirmed 'crowds in' effect of public investment on private investment include Sahoo et al., (2010); Aschauer (1989a, 1989b); Cullison (1993); Foye (2014); and Ramirez (1996).

In contrast, some other studies have shown that public investment 'crowds out' private investment with an adverse effect on growth. For example, Everhart and Sumlinski (2001) found that public investment crowded out private investment in 63 developing countries for the period 1970-2000. Gjini & Kukeli (2012) also found a negative correlation between public and private investment in Western countries, but not in the Eastern European countries. Cavallo & Daude (2011) equally found

that public investment crowded out private investment in 116 developing countries over the period 1980-2006. Other studies in this group include Serven (1996); Ghali (1998) and Aremo (2013).

3.1. Contribution of Public and Private Investment to Growth

Theoretical and empirical studies seem to agree that both public and private investment have a positive impact on economic growth (Nazmi & Ramirez, 1997; Auby & Alfonso, 2008; Aschauer, 1989a, 1989b; Yang, 2006; Khan & Kumar, 1997). However, it remains unresolved the debate on whether the public investment or private investment is more beneficial to economic growth. One school of thought argues that the marginal productivity of public investment is lower than that of private investment thereby making the contributions of public investment to economic growth much lower than that of private investment (Khan & Kumar 1997; Khan & Reinhart, 1990). It is argued further that the allocation of private investment to various industry and locations is a function of the market rate of return, which makes it highly efficient. This private investment allocation method is in contrast to that of public investment, which is often based on social and discretionary criteria (Mallick, 2014). The other school of thought argues that public investment is more important than the private investment in the growth process as it is usually on lumpy projects which are often shunned by the private sector (Nazmi & Ramirez, 1997).

Empirically, evidence on the relative contributions of public and private investment to economic growth has been mixed and somewhat inconclusive. For example, some empirical studies including Kahn & Kumar 1997; Ghura 1997; Beddies, 1999; Coutinho & Gallo 1991; Hague 2013; Khan & Reinhart, 1990; and Serven & Solimano, 1989, 1990) found that private investment contributed more to economic growth than public investment. In contrast, some other studies have reported public investment exerted a higher impact on economic growth than private investment. These studies include Bedia (2007); Belloc & Vertola (2004); and Mallick (2014). The final group of studies has reported a complementary role of both public and private investments in the growth process. Consequently, one cannot be said to be more important than the other (Ramirez, 1996; Ramirez & Nazmi, 2003; Sahoo et al. 2010; Erden & Holcombe, 2005).

Since the studies above relied mainly on linear methods in analyzing the linkage between investment and economic growth, the ambiguity of the findings of these studies may be due to adoption of different models and the methods may be sensitive to the sample selected and non-linearity may be important. Hence, to control for non-linearity on the relationship between investment and economic growth, we employ Markov switching specification. To the best of our knowledge, this study will be the first empirical study of the non-linear relationship between investment (public and private) and economic growth with particular reference to Nigeria.

4. METHODOLOGY

4.1. Data

The data used to estimate the model are annual observations for Nigeria over the period 1970-2016. The data are obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and the variables are in logarithmic form except the variables in rate form such as exchange rate, inflation and interest rate. RGDP is the real GDP. The real GDP is defined as nominal GDP deflated by the consumer price index (1990=100). Real GDP measures the actual economic growth if production without any distortion effects from inflation. Exchange rate is the real exchange rate defined as domestic currency per unit of U. S. dollar, discount rate is the Central Bank of Nigeria minimum rediscount rate and inflation rate is the consumer price index (1990=100). Human capital is measured as share of university, polytechnic and colleges of education students in the total population. Private investment is the percentage of gross fixed capital formation in GDP. Public investment is measured as the sum of government capital expenditures on economic and social community services as percentage of GDP. External debt is total external debt of Nigeria. The use of these variables is extant in the literature (Amassoma & Ogbuagu 2015; Akinlo 2004; Egbe-tunde & Fabiyi, 2015)

4.2. Model

In this study, a modified neoclassical production function, which accounts for public and private investment, labour and other control variables, is adopted. This is stated as:

$$Y_t = Af(L, K_p, K_g, Z) \quad (1)$$

where Y, the dependent variable is the real output level measured as the annual growth rate of real gross domestic product (a proxy for economic growth); K_p is the gross capital formation by the private sector (a proxy for private investment); K_g is the public sector gross investment measured as the gross fixed capital formation by the government and Z represents other variables that may explain the output growth including exchange rate, inflation, interest rate and external debt.

Equation 1 is a variant of the Solow's (1956) growth model. This model has been used extensively by several researchers including Feder (1983, 1986); Khan & Reinhart, (1990); Bedia (2007); Ponce & Novaro (2016); Yovo (2017); and Makuyana & Odhiambo (2018, 2019).

Explicitly specifying equation 1, we obtain:

$$\ln Y_t = \alpha_0 + \alpha_1 \ln L_t + \alpha_2 \ln K_p + \alpha_3 \ln K_g + \alpha_4 \ln Z_t + \varepsilon_t \quad (2)$$

where ε_t measures productivity growth, is the error term with normal distribution, α_1 is the elasticity of output with respect to labour, and α_2 and α_3 capture the marginal productivity of private and public capital respectively, and α_4 is the elasticity of output with respect to other factors.

4.3. The Markov Regime-Switching Approach

In examining the non-linear impact of investment on economic growth in Nigeria, the study utilizes the Markov Regime-Switching approach (MSM). This model developed by Hamilton (1989, 1990 and 1996) is particularly suitable to examine the economic growth in different regimes. One, economic growth is allowed to be shifted in the mean and variance, that is, for example of expansion and contraction and high volatility and low volatility. Two, Markov-Switching model is capable of taking care of asymmetry, dependency, weight and persistence in extreme observations in data (for details of other advantages, see Arin & Spagnolo 2011, Saltoglu et al., 2003; Akinlo 2017; Anas et al., 2004; and Fiaz, et al., 2022).

The general form of Markov-Switching model takes the form:

$$\Delta y_t - \mu(s_t) = A_1(\Delta y_{t-1} - \mu(s_{t-1})) + \dots + A_p(\Delta y_{t-p} - \mu(s_{t-p})) + u_t \quad (3)$$

where u_t is normally and independently distributed.

The low (recession) phase (0) and high (expansion) phase regimes are related with different conditional distributions of y_t , however, depends on regimes (Bilgili et al 2012; Krolzig, 2000, 2001). The multivariate Markov Regime-Switching model, which is adopted in this paper to analyze the relationship between economic growth and investment in Nigeria, is formally stated as:

$$RGDP_t = \beta_0(s_t) + \beta_1 t(s_t) + \sum_{i=2}^n B_i X_{it}(s_t) + u_t \quad (4)$$

where $RGDP_t$ is economic growth, s_t is the state (regime), t is trend, X_{it} is investment (public and private) and other variables (labour, capital, exchange rate among others) and u_t is the residual time and t is time subscript. The state term in the equation (8) is a vector of states; state (regime 0) and state (regime 1) or equivalently corresponds to vector of regimes. Hence, the parameters of B_0, B_1, \dots, B_n denotes time varying parameters.

Maximum likelihood estimation of this model is performed with annual data 1970-2016. This is with a view to investigating the possible structural changes (regime shifts) in level, and/or trends as well as possible changes in parameters of vector \mathbf{b} in economic growth-MSM equations through the transition probabilities (Hamilton (1989, 1990) by conducting analytical derivatives of Feasible Sequential Quadratic Programming explicitly detailed in the work of Lawrence and Tits (2001).

5. EMPIRICAL RESULTS

The results of three alternatives Markov-Switching models 1-3 denoted by MSM₁, MSM₂ and MSM₃ respectively are shown in Table 1. In the three alternative models, the growth rate of gross domestic product is the dependent variable. In model 1 (MSM₁), the independent variables are human capital, exchange rate and investment broken into public and private investment. The second alternative model (MSM₂) has external debt as an additional independent variable to those of MSM₁, while the third alternative model (MSM₃) has inflation and inflation rate as two additional variables to MSM₁ while excluding exchange rate. In the third alternative model (MSM₃), the coefficient of interest rate is negative and statistically significant at one percent level in both periods of contraction and expansion. The negative value for interest rate confirms the theoretical relationship between interest rate and economic growth. It is contended in the literature that interest rate is inversely related to investment and thus output. Generally, high interest rate is argued would increase the cost of production with adverse effect on output. Inflation is found to be negative and significant at the level of 5 percent in the period of expansion. It is, however, positive but insignificant in the contraction phase. The consensus in the literature is that beyond a threshold, inflation hurts the economy. Several studies have documented the negative effect of inflation in economic growth. It is argued that an increase in the rate of inflation often leads to increase in the prices of raw materials, machinery and equipment as well as the wage bill which tend to discourage private investment with adverse effect on economic growth (Bint-E-Ajaz and Ellahi, 2012).

In MSM₂, the effect of external debts is found to be negative and significant at the level of one percent in the periods of economic contraction and expansion. The result is similar to the results of the studies by Dogan & Bilgili (2014); Chudik, et al., (2017), and Elbarhardt & Presbitero (2015). This result confirms the existence of 'debt-overhang' hypothesis in Nigeria. Asides, other channels through which debt could possibly have negative impact on economic growth are liquidity constraint channel (Moss & Chiang 2003), the 'crowding-out' effect (Hansen, 2004), the uncertainty channels (Codogno, et al., 2003; Cochrane, 2011).

In MSM₁, exchange rate variable has negative effect on economic growth in the periods of contraction and expansion but significant only in the latter. Though in MSM₂, the variable has positive effect in both contraction and expansion periods;

the coefficient is not significant. The negative and significant value of exchange rate should not come as a surprise. In a high import-dependent economy, depreciation of domestic currency definitely will increase the cost of imported goods with adverse effect on investment and output. The domestic currency Naira depreciated massively for most period of study following the deregulation policy adopted by the government in mid 1986.

Table 1.: Markov Regime switching models for Investment -Growth Nexus

Variable/Regimes	MSM ₁	MSM ₂	MSM ₃
Constant			
Regime 0	2.658(0.000)	1.528(0.000)	1.999(0.000)
Regime 1	2.944(0.000)	2.628(0.000)	2.743(0.000)
Trend			
Regime 0	0.222(0.000)	0.191(0.000)	0.220(0.000)
Regime 1	0.208(0.000)	0.182(0.000)	0.196(0.000)
Human Capital			
Regime 0	-0.181(0.191)	-0.240(0.003)	-0.409(0.000)
Regime 1	-0.156(0.000)	0.113(0.375)	0.127(0.118)
Private Investment			
Regime 0	0.016(0.837)	0.092(0.000)	0.153(0.000)
Regime 1	0.052(0.000)	-0.106(0.086)	-0.050(0.233)
Public Investment			
Regime 0	-0.044(0.748)	0.296(0.000)	0.309(0.008)
Regime 1	0.021(0.000)	0.039(0.527)	0.016(0.691)
Exchange rate			
Regime 0	-0.0006(0.804)	0.001(0.075)	
Regime 1	-0.002(0.008)	0.002(0.131)	
External Debt			
Regime 0		-0.112(0.000)	
Regime 1		-0.062(0.002)	
Inflation			
Regime 0			0.0005(0.803)
Regime 1			-0.003(0.048)
Interest Rate			
Regime 0			-0.038(0.000)
Regime 1			-0.020(0.000)

Source: Author's Computation

In the three alternative models, human capital is found to be negative in contraction period and significant in MSM₂ and MSM₃. In the expansion period, the variable is equally negative and significant in MSM₁. Though, the variable is positive in the period of expansion in MSM₂ and MSM₃, the coefficient is not significant. This result is contrary to Pattilo, et al., (2002, 2004); Presbitero (2010); and Schclarek & Ramon-Ballester (2005) findings of positive relationship between human capital and economic growth. However, the negative relationship between human capital and economic growth is consistent with the result by Makuyana & Odhiambo (2019).

In Table 1, the effect of private investment on economic growth is positive in the contraction phase for all the three alternative models - MSM₁ - MSM₃ and significant in MSM₂ and MSM₃. In the expansion phase, the coefficient is only positive and significant in MSM₁. In MSM₂ and MSM₃, it is negative but statistically insignificant. These findings confirm earlier results by Bint-E-Ajaz & Ellahi (2012); Makuyana & Odiambo (2019); Ponce & Navarro (2016) and Yovo (2017) that private investment is positively related to economic growth.

In the same way, public investment variable is found to have positive effect on economic growth in both regimes as exemplified in the works of Bedia (2007); Belloc & Vertova (2004); and Fournier (2016). However, the coefficient is significant in period of contraction for MSM₂ and MSM₃ as well as in the period of expansion in MSM₁. The coefficient of private investment (0.052) in MSM₁ in the expansion period is higher than the coefficient of public investment (0.021) in MSM₁. This suggests that positive impact of private investment on growth is higher than that of public investment during the expansion period. In contrast, the coefficient of public investment (0.296) in MSM₂ and (0.309) in MSM₃ during the contraction period are higher than the coefficient of private investment (0.092) in MSM₂ and (0.153) in MSM₃ for the same period.

This means that public investment contributes more to economic growth than private investment during the period of contraction. This finding is quite consistent with a priori expectation. Private investment is expected to be higher during the period of expansion and economic stability since private agents can make more profit during boom in economic activity. In contrast, public investment is expected to increase during the period of contraction to bail the economy out of contraction and provide the enabling environment for private agents to operate. This actually formed the policy thrust of some developed countries including United States, United Kingdom and China during the economic recession of 2007-2008.

What this suggests is that Government in Nigeria must be innovative in terms of investment spending in the contraction and expansion phases. In the period of contraction, public investment must be increased to pump prime the economy and thereby boosts private investment. In contrast, during the period of expansion government should encourage increase private investment based on the finding that private investment contributes more to economic growth than public investment in this phase.

As shown in Table 2, all the models seem to perform well. However, MSM₂ model seems to fit the data best due to the fact that it gives the lowest AIC value of 0.830218 and the highest log likelihood value of 37.63060. Using the variance as a measure of goodness of fit, the variance of regime 1 is 4.835546 and Regime 0 (-1.381889) choose MSM₁ as best model among the alternative in this work. The linearity test in Table 2 rejects the null hypothesis in one percent level of significance. This simply means that the relationship between economic growth and investment is not linear. Each of the alternative models indicate that when the current state of the relationship of economic growth and investment in time (t) is regime 1, the probability of the jump of the growth and investment relationship from regime 1 at time t+1 to regime zero is 0.152348 on average.

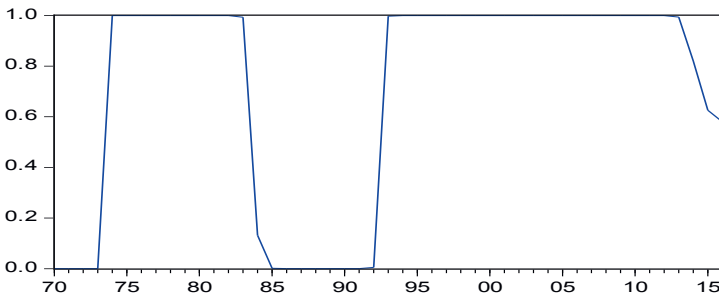
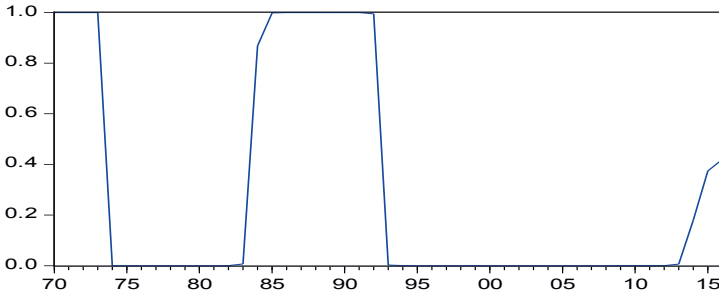
Table 2.: Switching variances, transition probabilities and test statistics of Markov Regime-Switching Models: 1970-2016

	MSM ₁	MSM ₂	MSM ₃
Sigma 0	-1.381889	-3.281906	-2.501423
Sigma 1	-4.835546	-1.948930	-2.331764
P[0/1]	0.021767	0.092938	0.142338
P[1/1]	0.978233	0.907062	0.857662
P[1/0]	0.152594	0.060389	0.090930
P[0/0]	0.847406	0.939611	0.909070
Log likelihood	18.87885	37.51013	31.54488
AIC	-0.122504	-0.830218	-0.576378
Linearity Test (²)	30.95168 (0.0000)	37.63060 (0.0000)	16.82045 (0.0000)

Note: Below the linearity test values are the *p*-values
Source: Author's Computation

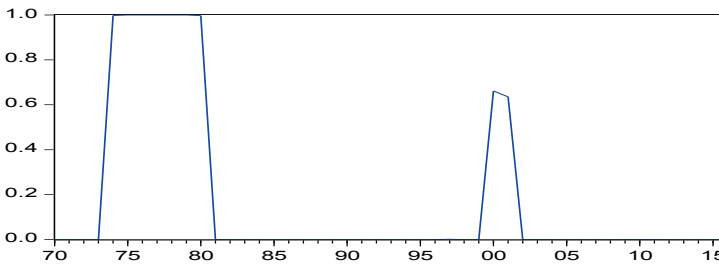
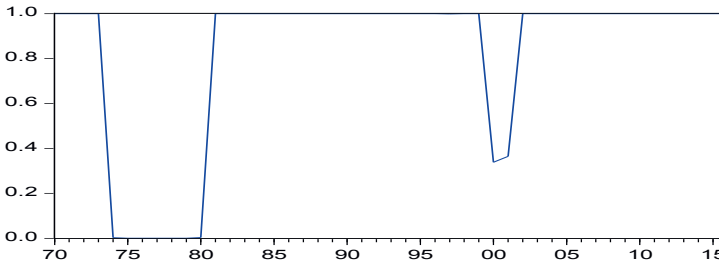
It is possible to observe the time duration (Regime classification) of the smoothed probabilities. Figures 2a-b to Figures 4a-b (where upper Figure is (a) and lower Figure (b) respectively) provide the smoothed probabilities of Regime 0 and Regime 1 of MSM₁ to MSM₃ respectively. Regime 0 time points as revealed in Figure 2a are: 1979-1974, 1980-1998 and 2001-2016. Regime 1 points cover the periods of 1974-1979 and 2000-2001. In Figures 3a and 3b, the regime 0 points for MSM₂ which is considered the best model in this paper covers the periods of 1974, 1982-1991 and 2011-2016 and the regime 1 points cover the periods 1970-1973, 1975-1999 and 1991-2010. In MSM₃, the regime 0 points cover the periods: 1974-1976, 1981-1990 and 2012-2016 (Figure 4a). However, the regime 1 points for MSM₃ cover the periods of 1970-1973, 1977-1980 and 1991-2010.

Figures 2a & 2b.: Probabilities of Regimes 0 and 1 smoothed MDMSM₁



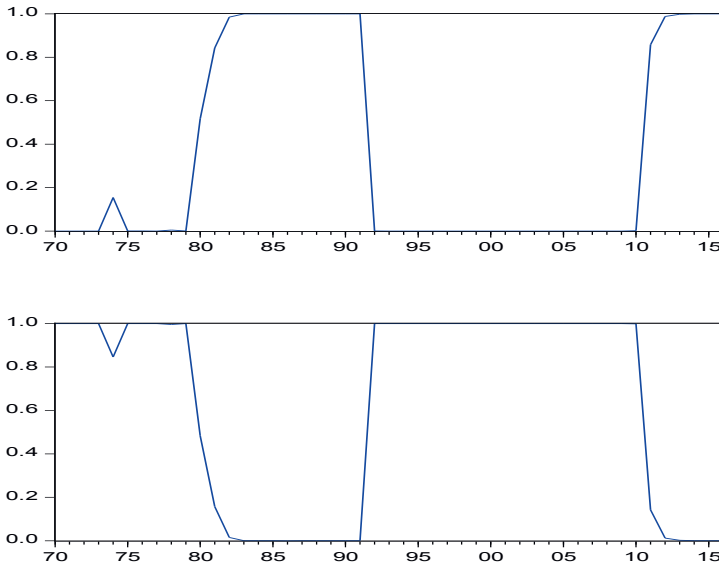
Source: Author's

Figures 3a & b.: Probabilities of Regime 0 and 1 SmoothedMDMSM₂



Source: Author's

Figure 4a & 4b.: Probabilities of Regime 0 and 1 smoothed MDMSM₂



Source: Author's

6. CONCLUSION

The paper has re-examined the investment-led growth hypothesis in the case of Nigeria using a set of annual data spanning from 1970-2016. Unlike previous works done on this very issue by Makuyana & Odhiambo (2019); Bucci & Del-Bo (2012); and Bahal, et al., (2018) among others; we use Markov-Switching model based on the argument that investment-growth relationship is non-linear. Besides, these models allow us to examine the impact of investment (public and private) on growth in two states of growth by allowing the data themselves to identify these states.

The results from the analysis show that the relationship between economic growth and investment is not linear. Also, both public and private investment has significant effect on economic growth. However, private investment tends to contribute more to economic growth than public investment during the period of expansion. The reverse is the case during the period of contraction. In general, both components of investment are germane to economic growth. The results support the basic neoclassical framework, with emphasis on savings and investment for analyzing long-term growth performance. It further suggests the importance of making distinction between respective roles played by public and private investment. More importantly, the results suggest that it is important to make a distinction between the impact of investment (public and private) on growth in two stages of growth. The results suggest that in the period of expansion, policies should be designed to enhance

private investment. Finally, government would need to spend more during period of contraction thus supporting the expansionary policy of the government during the recession in 2016.

Moreover, the results show that interest rate needs to be moderated so that investment will not be adversely affected in both periods of expansion and contraction. In the same way, the rate of inflation must be kept low because high domestic will adversely affect investment and thus economic growth. Government needs to address the high and rising debt level in the country. Reduction in the debt level will help to free resources for domestic production. Moreover, policymaker must work to enhance the value of the domestic currency by promoting increased national productivity. This is particularly important in a raw materials import dependent nation like Nigeria. Massive depreciation of domestic currency will lead to increase cost of production with adverse effect on investment and economic growth.

As area of future research, extending the work to more countries in sub-Saharan Africa (SSA) would help to generalize the results. Moreover, future research could experiment with alternative measures of GDP that take into consideration externalities, such as quality of life and environmental sustainability.

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