Internal Security Outlay and Agricultural Output Nexus: An ARDL Bound Test Approach

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Abstract

Nigeria is currently witnessing an erratic level of insecurity and this has prompted the large allocation of the national budget to security as a security threat has become a serious issue for the government. The study examined the relationship between internal security expenditure and the agricultural output in Nigeria from 1990 to 2018 and employed the Autoregressive distribution lag model (ARDL) bound test and Granger causality test. However, co-integration or long-run relationship between internal security expenditure and the agricultural was established and the empirical result revealed that internal security expenditure has a short-run (0.1751) and long-run (0.1698) positive and statistically significant effects on the agricultural output in Nigeria within the period of study. In addition, Granger causality showed a one-way relationship, running from internal security spending to the agricultural output. As a stop-gap measure, Good governance should be strengthened at all levels of government because good governance is linked to a successful weapon against insecurity and the government should be development-oriented by accelerating social, economic, and infrastructural development to ease economic activities and industrial growth, to provide a market for agricultural output, thus enhance food security and employment generation to reduce unhealthy uprising youth unemployment.

Contribution/Originality: The study is amongst the few that attempts to measure the effectiveness of internal security expenses on agricultural productivity in Nigeria using the ARDL model.

Keywords: ARDL, agricultural output, internal security expenditure
JEL Code: Classification: C32, Q11, H56

1.0 Introduction

One of the most fundamental economic problems that have been debated for centuries, from the individual who constitutes the smallest unit of society to the largest organization is economic growth, and one of the biggest threats to the economic growth of every Nation is insecurity, while peace and stability is the opposite. The Nigerian agricultural sector is considered as the largest employer of labor and plays an important role in economic growth and development, accounting for over 40% of the budgetary revenue, more than 60% of foreign exchange, contributes 47% of the Gross Domestic Product (GDP), and 10% of export earnings (Nigeria investment promotion commission [NIPC], 2016). The sector is a catalyst of growth which trickles down to other sectors and thus brings about growth.

Furthermore, the agricultural sector has undergone and currently undergoing some challenges. These challenges range from insecurity, poor management, poor policies implementation and lack of basic modern infrastructure necessary for better performance which has led to falling in its productivity over the years. The contributions of the sector started waning owing to the above problems and discovery of oil. According to Sanusi (2010), the decline of Nigeria's economic fortune is associated with inadequate funding and the inability of the government to invest the huge revenue generated from oil and gas in the agricultural sector. The abundance of oil resources instead of bringing prosperity into the Nation,

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rather fueled corruption, agitation among elites and political class, and denied the real sector the needed attention (Shittu, 2017).

However, the rising insecurity in Nigeria has been traced to the denial of a large portion of the population the basic needs for meaningful and sustainable living standard. Also, government failure, rising inequalities and unfairness, corruption, weak security, desperate politicians, rising poverty, unemployment, illiteracy, loss of sociocultural and communal values, lack of tolerance and fear of God, porous border and exploitation which ignite insecurity in Nigeria (Igbuzor, 2011; Onuoh, 2011; Nwagbosa, 2012). These compounded to the emergence of militancy such as militants in the oil region, a dreaded group of Boko Haram, Shiites Movement, Independent People of Biafra (IPOB), kidnapping, robbery, farmers herdsmen clashes, banditry, communal crises which fueled ethno-religion crises in Jos, Kaduna, Taraba, Zamfara, and Benue (Chumu-okoro, 2010; Shittu, 2017). This rising trend in insecurity notably, farmer-herders clashes, kidnapping, and communal crisis have affected agricultural output through destruction of planted crops, farmland, displacement of farmers into an internally displaced person (IDPs), and fear of been killed. Consequently, direct bearing on the psychology of the surviving farmers in the affected areas (Shittu, 2017). World bank (2017), posited that about 20.9 million Nigerians were displaced in 2015 but reduced to 1.7 million in 2017. Additionally, as a result of this feminine, malnutrition, poverty rate, crime, unemployment rate, etc have become the order of the day.

In a bit to caution, the effect of the above on agricultural output the government increased its internal security budgetary outlay from 5.03% in 2010 to 7.08% in 2016, subsequently 6.26% and 6.36% in 2017 and 2018 with the corresponding percentages of agricultural contribution to GDP in 2010 and 2017 stood at 23.89% and 20.85% respectively (World Bank, 2018). This is a clear indication of a diminishing effect of internal security threat on National output thereby posing a serious threat on food security in the midst of the growing population. Correspondingly, in 2008 Nigeria internal security expenditure was 444.6 billion Naira with an agricultural output of 11645.37 billion Naira, in 2009 the internal security spending falls to 233 billion Naira with an increased agricultural output of 12330.33 billion Naira because of the stability achieved in insecurity challenges between 2008 and 2009. In 2015 insecurity rise, thus increase in the disbursement of internal security from 233 billion Naira to 348 billion Naira but the agricultural output stood at 13429.8 billion Naira with a high number of IDPs 65,000. In 2016 internal security spending and agricultural output continues to witness uprising at 388 and 15952.22 billion Naira with the ever highest record of IDPs in Nigeria 737,000. Lastly, in 2017 internal security expend increased by 77.87 billion Naira representing a 16.62% increment in its budget allocation which increased agricultural output by 1227.28 billion Naira and reduces IDPs by 458,000 (Central bank of Nigeria, 2017). Hence, increasing budget allocation to the security sector increase the agricultural sector, reduce insecurities and number of IDPs. This poses a great signal to investors who want to come into the economy to invest.

There are several studies on government expenditure, security and agriculture (Fajonyomi et al, 2018; Idoko & Jato, 2018; Onime, 2018; Ndubusi, 2018; Oriavwote & Eshenake, 2013; Obayori, Osai, Ahmodu, & Maeba, 2018). However, most of the studies only tried to link agriculture and economic growth, agriculture and finance, agriculture and poverty, insecurity and economic growth, and National security and economic development. The only available study that have attempted to measures the same relationship with this study was (Eneji, Babagario & Agri, 2019). However, the study inherited serious paucity. The study was conducted in a Local Government Area in Gombe state, however, secondary data were used while federal recurrent expenditures on security were used for the state. secondly, the ADF unit result for the federal government recurrent expenditure on security was integrated of order I(2), implying the variable is inappropriate for the analysis but used. Lastly, the other variables show mixed order of integration which called for co-integration text and was not done, hence ran OLS method

which is only applicable for use when all the variables were integrated of level I(0). Therefore, the following gaps were identified: Reviewed studies laid no attention to internal security spending and agricultural output. Thus, this study is a step away from previous studies because it narrows the scope to internal security expenditure and agricultural output in Nigeria from 1990 to 2018, and to the best of the researcher knowledge, there is no existing study on the subject matter that have used this advance methodology. Furthermore, this research expands the current body of knowledge by providing the empirical relationship between the two variables and conducting basic statistical tests such as the pre-test, diagnostics tests, and the Granger causality test.

Based on the above, this study seeks to provide an answer to these principal questions. What is the relationship between internal security spending and agricultural output in Nigeria? Does internal security spending Granger cause agricultural output in Nigeria? The main objective of the study is to examine the relationship between internal security outlay and agricultural output in Nigeria from 1990 to 2018.

The study is paramount to policymakers and farmers because it provides information on the determinants of agricultural output in Nigeria and how to increase its output in mixed of security challenges to improve living standards of the teeming population, especially, the rural farmers. Secondly, the study plays an important role in shaping, designing and implementing new and better ways of doing things and provides new understanding and discovery that benefit society. Lastly, it creates public awareness of the implications of increased security spending in the midst of a rising threatening in the National economy.

2.0 Literature Review

2.1 Conceptual Issues

Government expenditures are the expenses which the government incurs for maintenance of its own society and economy (Babalola Aninkan & Salako, 2015). It represents total expenditure to attain a predetermined macroeconomic objective(s) such as stable environment, provision of social infrastructure, peace and stability, defense, justice, and law and order. Similarly, are the costs incurred by the government for the provision and maintenance of itself as an institution, the economy, and society (Gukat & Ogboru, 2017).

The waken responsibility incurred by the government in process of providing the basic social needs through different means of intervention and programmes to improve the wellbeing of her citizenship is referred to as government expenditure.

Internal security is the protection of the domestic territory and citizens by security agencies in the country to achieve relative peace and stability for smooth growth and development of the economy (Oriavwote & Eshenake, 2013). In other words, is the necessary provision put in place by the government to overcome the internal threat when needs arises such as reinforcement of arm, police, civil defense, custom and immigration. Internal security spending or expenditure is the total cost incurred in maintaining the above security agencies to achieve smooth and uninterrupted economic growth.

Agricultural output is the value of agricultural products which, free of intra- branch consumption, are produced during the accounting period and before processing, is available for export and consumption (Olabanji, Adebisi, Ese & Emmanuel, 2017). It is the total value of the agricultural product produced in a year both for domestic consumption and exportation.

Internal security outlay and agricultural output could be related in monetary terms because an increase in internal security spending theoretically means secure farmers and their farmland which invariably improve the productivity output of the agricultural sector. As it is currently, the agricultural output is low in Nigeria because of rising insecurity in the rural areas resulting in the abandonment of their farmland and run for the safety of life which has led to rising inflation, poverty, crimes, reuniting of another deadly terrorist group and diversion of the huge revenue generated, to security in order to curtail the situation. This has generated a lot of controversies among academic, economists, policymakers, and stakeholders in recent time.

2.2 Theoretical Framework

There have been contributions from various schools of thought such as the Classical, Neoclassical, Keynesian, etc on whether the government should intervene to short-run fluctuations in economic activity. The classical school believes that market forces bring the economy to long-run equilibrium through adjustment in the labour market. The classical and neoclassical economists deem fiscal policies as ineffective due to the well-known crowding-out effect. While the Keynesians say that government expenditure does not obstruct economic growth instead it accelerates it through full-employment, increased aggregate demand and so forth. Thus, this study adopted Keynesian theory as a theoretical framework**.** The theory suggested that government spending can contribute positively to sectorial growth (like the agricultural sector) in the economy. Hence, an increase in government consumption is likely to lead to an increase in employment, profitability, and investment through multiplier effects on aggregate demand. Consequently, government expenditure increases the aggregate demand which brings about an increased output depending on expenditure multipliers. Keynes regards public expenditures as an exogenous factor which can be utilized as a policy instruments to promote growth. Although, in recent time most of the empirical argument on security spending dominated on its effect on economic growth, however, a study available discussed below:

2.3 Empirical Review

Eneji, Babagario & Agri (2019) ascertains the effects of insecurity on agricultural productivity in Nigeria (Balanga LGA, Gombe State). The study adopted the Ordinary Least Squares method and found that federal government recurrent expenditure has a positive effect on agricultural production.

Fajonymoni et al, (2018) examined the effects of herdsmen conflict on food production in North Central of Nigeria, employed survey method and found that there is a significant relationship between the availability of food and security. The study does not reveal the nature of the relationship, therefore, it pauses doubt on the policy implications of the findings. Oriavwote and shenake (2013) examined the impact of security expenditure on the level of economic growth in Nigeria for the period 1980 to 2010, employed an error correction mechanism (ECM) and found that security expenditure has a negative impact on the level of economic growth in Nigeria. Likewise, Onime (2018) studied the effect of insecurity on economic growth in Nigeria used descriptive method and found that insecurity affects economic growth by driving out investment. Obayori et al (2018) investigated security in the face of increasing terrorism in Nigeria, adopted a library science method and found that unemployment, poverty, religious intolerance, and partisan politics causes terrorism and security challenges. Igbinedion (2016) explored the relationship between defense expenditure and education expenditure in Nigeria for the period 1980-2014, utilized ECM, and found that defense expenditure complements education spending. The study lack merit because it failed to establish the kind of relationship between the variable studies, therefore the implication of the findings is questionable. Ndubuisi (2018) ascertained the role of government sectoral expenditure on productivity in Nigeria, employed vector error correction model (VECM) and found that sectorial expenditure exerted a positive and significant influence on productivity in the long run. Jeliluv et al. (2018) carried out a study on the effect of insecurity and

investment on the Nigerian economy for a period 2007-2017 employed correlation anal and found that insecurity has a significant impact on economic growth. Adeyeye (2016) studied the nexus between foreign direct investment and security expenditure in Nigeria, employed ECM and found that internal security expenditure has a negative relationship with foreign direct investment whereas, defense expenditure exhibit a positive effect on foreign direct investment.

3.0 Methodology

The study employed time-series data from 1990 to 2018. Internal security expenditure sourced from the Central bank of Nigeria statistical bulletin (2017), the agricultural output sourced from the World Bank indicator (2018) and corruption measured by corruption perception index obtained from Transparency international database (2019). The study used the ARDL analytical technique to estimate the effect of internal security expenditure on the agricultural output in Nigeria. The reason for this choice is that the variables are integration of different orders (level and first difference) and have a long-run relationship which validates the use of the model.

$$AGOU = f(INSC, CPI) \quad (3.1)$$

Where AGOU denotes agricultural output, INSC denotes Internal security expenditure, CPI denotes the Corruption perception index.

$$AGOUt = \alpha + \beta_1 INSC_t - \beta_2 CPI_t + \mu_t \quad (3.2)$$

Where α = constant, b = coefficient, and u_t = Error term

The coefficient ($b_1 > 0$ and $b_2 < 0$). The expected sign of the first coefficient is greater than zero while the second coefficient is less than zero, I.e. a positive relationship between the agricultural output and internal security expenditure and a negative between corruption in Nigeria.

To analyze objective two which is the causal relationship between the agricultural output and independent variables, the Granger causality model is specified below.

$$AGOUt = \sum_{k=I}^{n} \beta 1 INSCt + \sum_{k=I}^{n} \beta 2 CPIt + \mu_t \quad (3.3)$$

4.0 Results and Discussion

The test of unit root result represented in table 1. The diagnostic tests are conducted in table 5 to know whether the model is normally distributed, homoscedasticity, absent of autocorrelation, correct specification, and stable. The Bound test is carried out in table 2 to determine if there is a long-run relationship between internal security disbursement and the agricultural output. The Autoregressive Distributive Lag model is presented and discussed in tables 3 and 4. And Granger causality test in table 6 to evaluate the direction of causality between the internal security expenditure and the agricultural output.

Stationary of the variables are conducted using ADF unit root test. Null hypothesis, the variable has a unit root, against alternative.

Table 1: Unit root test for stationary

Variables	ADF-Statistic	Order of integration
AGOU	-5.030125 (0.0004)	Level

INSC	-4.859522 (0.0009)	Level	
CPI	-4.725753 (0.008)		First difference

Source: Authors computation (2019)

The above table 1 shows ADF- statistics test of unit root. AGOU and INSC are stationary at level while CPI is stationary at first different, suggesting that the series is integrated of order I(0) and I(1). Hence, the justification for using the ARDL Bound test or co-integration approach in the study.

After obtained the stationary status of the variables, the next task is the ARDL bounds test for long-run relationship and estimation of short-run and long-run regression follows, presented in table 2, 3 and 4

Table 2: Bound test or co-integration test

Level of significance	Bound I(0)	Bound I(1)	F-statistics
10%	2.26	3.35	
5%	2.62	3.79	7.744768

Source: Authors computation (2019)

Table 2 shows the co-integration result. The bound F-statistics is 7.744768 which is greater than both 10% and 5% upper critical bound (3.35) and (3.79), therefore, we concluded that in the study period in Nigeria, a long run equilibrium relationship exists between the agricultural output, internal security expenditure and corruption perception index. I.e the dimension taken on agricultural output in Nigeria is co-integrated with the identified determinants. This means that even though their relationship may be distorted in the short run, but equilibrium is attained in the long run. Thus, a justification for ARDL model.

Table 3: Short-run Estimates

Variables	Coefficient	T-statistics	Prob.
C	55.93957	2.188880	0.0386
AGOV(-1)	-1.076242	-5.522708	0.0000
INSC	0.175163	3.972220	0.0012
CPI	-1.327154	-1.922299	0.0665

Source: Authors computation (2019)

The above result is the short run estimation in Table 3. The result revealed that the agricultural output has a positive and statistically significant relationship with internal security expenditure within the study period in Nigeria at 1% level of significance. Specifically, one percent change in internal security expenditure leads to an average of 0.18% increase in the agricultural output. Additionally, the lagged value of the agricultural output and corruption have an inverse statistically significant effect on the agricultural output in Nigeria at a 5% and 1% level of significance respectively. A percent increase in the lagged value of the agricultural output and level of corruption in Nigeria results in an average of 1.33% reduction in the value of agricultural output.

Table 4: Long-run Estimates

Variables	Coefficient	T-statistics	Prob.
C	51.97673	2.259939	0.0332

INSC	0.169838	4.200168	0.0030
CPI	-1.233137	-1.922299	0.0665

Source: Authors computation (2019)

Table 4 shows the long-run estimation result. The result revealed that internal security expenditure has a positive and statistical significance relationship with the agricultural output at 5% level of significance in the long-run. That is, a percentage increase in INSC will result to 0.17% increase in AGOU within the period of study in Nigeria. Furthermore, CPI has a diminishing and statistically significant effect on AGOU in Nigeria at a 1% level of significance. A percent increase in the level of CPI in Nigeria will lead to an average of 1.23% reduction in the value of AGOU.

Thereupon, ascertained the ARDL results, a diagnostic test was conducted to evaluate the method of analysis assumptions and model correct specification and stability to determine either to proceed with the analysis or modify the variables in case classical assumptions of Ordinary least square is violated.

Table 5: Diagnostic Tests

Test Statistics	**Result**
Autocorrelation	0.565090(0.7539)
Heteroscedasticity	3.285893(0.3496)
Normality	3.560577(0.168589)
Ramsey RESET Test	Correct specification
CUSUM and CUSUMQ	

Source: Authors computation (2019)

Table 5 shows diagnostic tests results of Autocorrelation, Normality, Heteroscedasticity, Durbin Watson, Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Recursive Residual squares (CUSUMQ) test. The model passed the above tested assumptions of the model. This means that the residual of the model is serially independent, Homoscedastic and normally distributed. By satisfying these underlines classical assumptions of regression analysis, it is concluded that the estimated parameters are best, linear and unbiased as well as efficient. This means implications can be drawn from the results of this study. The Ramsey RESET test shows that the model is the correct specification because both t-statistics and f-statistics are statistically insignificant and the probability is less than 5%. On the stability of the parameters of the model over the sample period, CUSUM and CUSUMQ tests were conducted. The results are contained in appendix. It revealed that the estimated parameters of the models are stable over the study or sample period as both the recursive residuals and its squares is contained within the 5% critical bounds. This result has reinforced the results of the diagnostic tests obtain earlier. Overall the model is well fitted, stable and good for policy recommendation.

Hence, the justification for Bound test or co-integration approach in the study to determine whether a long-run relationship exists between the agricultural output and its potential determinants. Null hypothesis (X does not Granger cause Y and Y does not Granger cause X) was test against alternative

Table 6: Granger Causality test

Null Hypothesis	**F-statistics**	**Prob.**	**Decision**
CPI does not Granger Cause INSC	2.16841	0.1382	Accept Null
INSC does not Granger Cause CPI	3.38033	0.0525	Reject Null
AGOU does not Granger Cause INSC	0.10609	0.8998	Accept Null

INSC does not Granger Cause AGOU	4.22612	0.0015	Reject Null
AGOU does not Granger Cause CPI	4.19511	0.0286	Reject Null
CPI does not Granger Cause AGOU	6.47566	0.0041	Reject Null

Source: Authors computation (2019)

Table 6 shows the Granger causality test. The result revealed that CPI does not granger cause INSC, decision accepts the null hypothesis, however, INSC Granger causes CPI, we reject null and accept alternative hypothesis and conclude that at 5% level of significance INSC can predict CPI. Secondly, AGOU does not Granger cause INSC, null hypothesis was accepted while INSC Granger cause AGOU, null hypothesis was rejected and alternative hypothesis accepted and conclude that at 5% level of significance INSC can cause changes in AGOU. Lastly, AGOU and CPI have a bi-directional relationship in Nigeria within the study period at 5% level of significance, hence, null hypothesis rejected and accepted the alternative hypothesis, that AGOU Granger causes CPI and CPI Granger causes AGOU. The overall test portrayed that the internal security expenditure could be an essential optional policy in the face of growing security threat to uplifting agricultural output in Nigeria.

5.0 Conclusion and Policy Recommendations

Security like other elements in the business environment enhances and optimizes output and business activities but insecurity hinders these activities and so it constitutes a threat to development. There is a strong skepticism that if the level of insecurity in a country is not scaled down, its ability to provide the needs of her citizen will be aborted. Since the uproar of insecurity challenges in Nigeria, there have being concerned effort by the government to cushier out the bad element through allocation of a huge percentage of budget to security and establishment of anti-terrorism act 2011, computer-based closed-circuit television camera (CCTV), enhancement of surveillance heightening of physical security, anti-corruption, and other security development policy and programme to address the problem of insecurity challenges to save life, property and improve productivity to enhance food security, rural income, reduce inflation, unemployment and poverty, yet the agricultural output is on decline state. This study employed ARDL bound test and Granger Causality test to examine the effect of internal security expenditure on the agricultural output in Nigeria within the period of 1990-2018. However, co-integration or long-run relationship between internal security expenditure and the agricultural output was established and the empirical result revealed that changes in the internal security outlay have an appreciating effect on the agricultural output in the short run and long run in Nigeria. This is a demonstration that transparent internal security disbursement is a panacea for increasing agricultural output in Nigeria.

As a recommendation from the study findings, internal security spending is one of the drivers of the agricultural output and vice versa during the period of the study. Good governance should be strengthened at all levels of government because good governance is a successful weapon to win the war against insecurity. The government should be development-oriented by accelerating social, economic and infrastructural development to ease business operations and industrial growth, to provide a market for agricultural output, thus enhance food security and employment generation to reduce unhealthy uprising youth unemployment.

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Appendix one

Null Hypothesis: AGOU has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.030125	0.0004
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CPI) has a unit root

Exogenous: Constant

Lag Length: 6 (Automatic - based on AIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.725753	0.0008
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INSC has a unit root

Exogenous: Constant

Lag Length: 6 (Automatic - based on AIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.859522	0.0009
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Appendix two

ARDL Long Run Form and Bounds Test

Dependent Variable: D(AGOU)

Selected Model: ARDL(1, 0, 0)

Case 2: Restricted Constant and No Trend

Date: 06/25/19 Time: 11:11

Sample: 1990 2018

Included observations: 28

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	55.93957	25.55625	2.188880	0.0386
AGOU(-1)*	-1.076242	0.194876	-5.522708	0.0000
CPI**	-1.327154	0.690399	-1.922299	0.0665
INSC*	0.175163	0.044097	3.972220	0.0012

* p-value incompatible with t-Bounds distribution.

** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-1.233137	0.629620	-1.958540	0.0619
INSC	0.169838	0.040436	4.200168	0.0030
C	51.97673	22.99918	2.259939	0.0332

EC = AGOU - (-1.2331*CPI - 0.0698*INSC + 51.9767)

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.744768	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
			Finite Sample: n=35	
Actual Sample Size	28			
		10%	2.845	3.623
		5%	3.478	4.335
		1%	4.948	6.028

	Finite Sample: n=30	
10%	2.915	3.695
5%	3.538	4.428
1%	5.155	6.265

Appendix Three

Pairwise Granger Causality Tests

Date: 06/25/19 Time: 09:40

Sample: 1990 2018

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CPI does not Granger Cause INSC	27	2.16841	0.1382
INSC does not Granger Cause CPI		3.38033	0.0525
AGOU does not Granger Cause INSC	27	0.10609	0.8998
INSC does not Granger Cause AGOU		4.22612	0.0015
AGOU does not Granger Cause CPI	27	4.19511	0.0286
CPI does not Granger Cause AGOU		6.47566	0.0041

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.226572	Prob. F(2,22)	0.7991
Obs*R-squared	0.565090	Prob. Chi-Square(2)	0.7539

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.063649	Prob. F(3,24)	0.3830
Obs*R-squared	3.285893	Prob. Chi-Square(3)	0.3496
Scaled explained SS	21.76613	Prob. Chi-Square(3)	0.0001

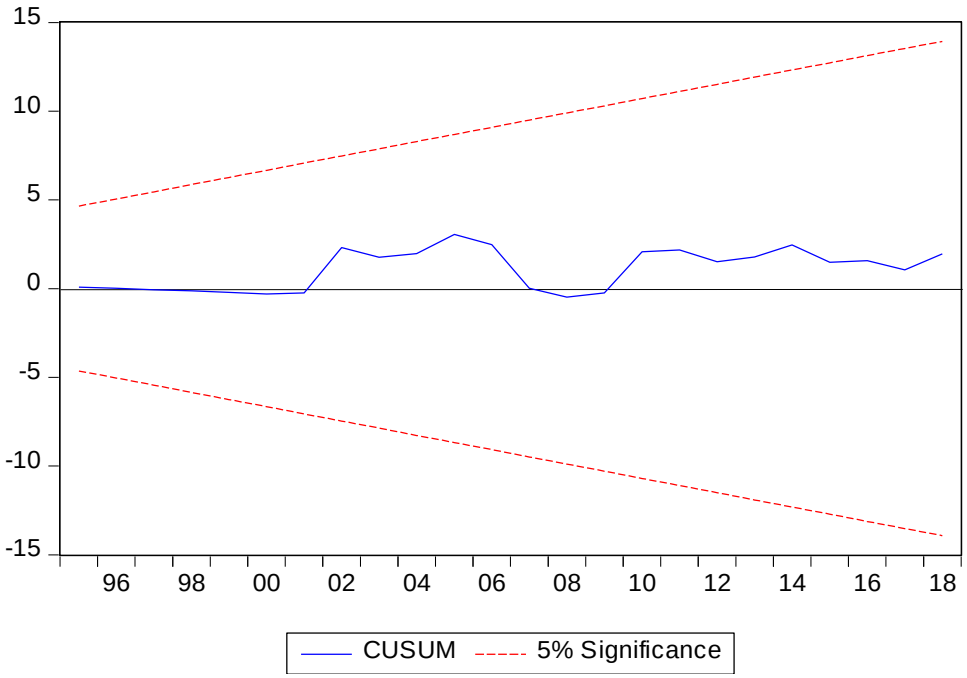
Ramsey RESET Test

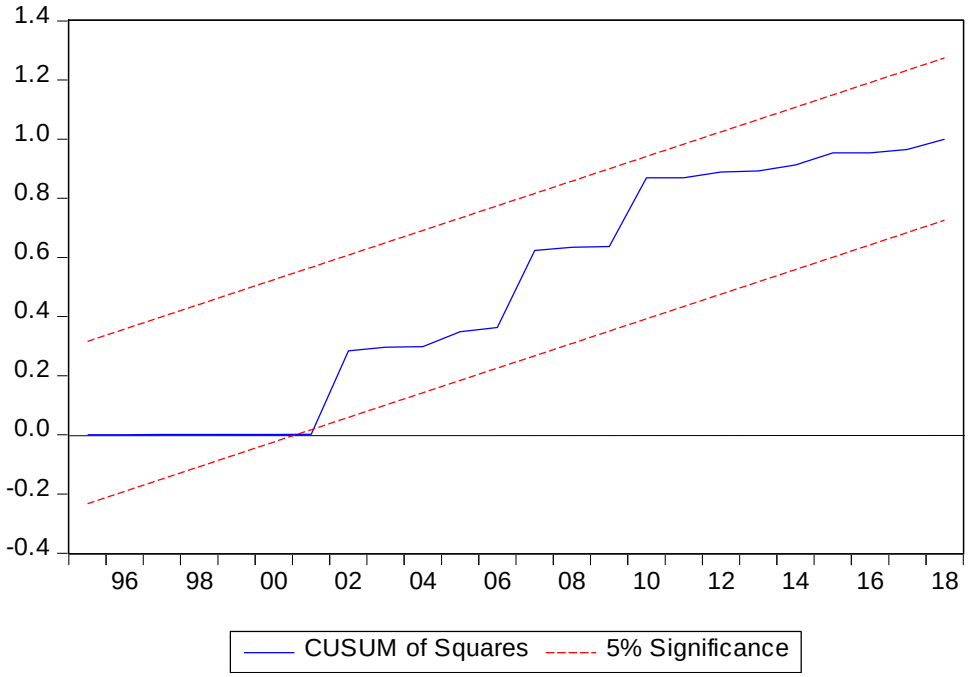
Equation: UNTITLED

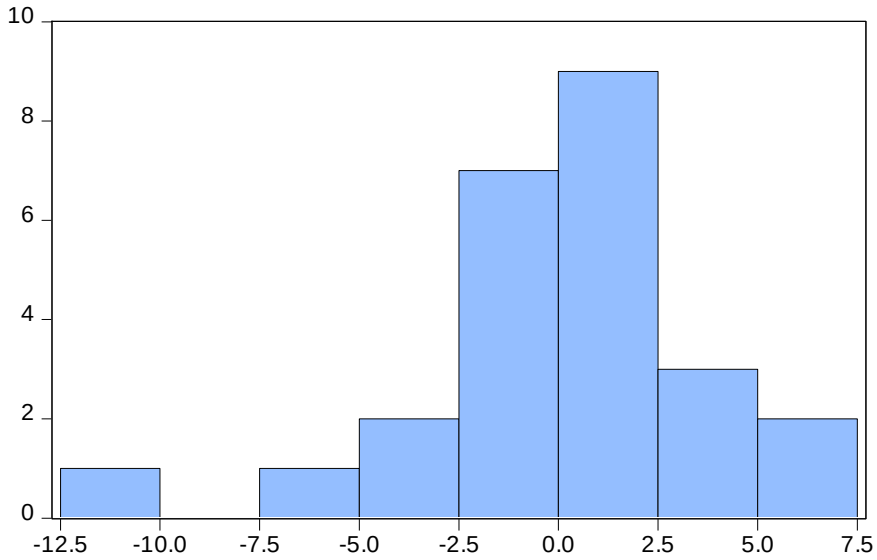
Specification: AGOU AGOU(-1) CPI INSC C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.764979	23	0.4510
F-statistic	0.117506	(1, 23)	0.4010







Series: Residuals	
Sample 1994 2018	
Observations 25	
Mean	-3.64e-14
Median	0.399413
Maximum	7.331202
Minimum	-10.83480
Std. Dev.	3.909608
Skewness	-0.613151
Kurtosis	4.383595
Jarque-Bera	3.560577
Probability	0.168589