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Empirical Investigation of the Validation of Peacock-Wiseman Hypothesis; Implication for Fiscal Discipline in Nigeria

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Abstract
This study attempted to examine the direction of causality between government expenditure and revenue in Nigeria. This was with a view to examining the validity of Peacock-Wiseman hypothesis and its implications on Nigerian economy. Times series data on variables (government expenditure, government revenue and inflation) covering the period (1961-2010) were used after a thorough investigation of the statistical properties of these variables. The data were sourced from CBN Statistical Bulletin 2010 edition, CBN Annual Reports (various years) and World Development Indicators of the World Bank CD-ROM. The study employed Johansen multivariate cointegration technique, Vector Error Correction Mechanism (VECM) and standard Granger causality tests. The result showed that variables converge to a long-run equilibrium. Also, the VECM results indicate that unidirectional causality running from expenditure to revenue was found supporting Peacock-Wiseman spend-revenue hypothesis. Standard Granger causality test was also carried out on the first difference of the two fiscal variables; the result showed that there existed a short-run unidirectional causality running from expenditure to revenue validating Peacock-Wiseman spend-revenue hypothesis. Hence, this hypothesis holds in Nigeria both in the short-run as well as in the long-run.
This implies that government spending induced government revenue growth in Nigeria. Also, the result of the impulse response revealed that the evolution of government expenditure and revenue followed a different trend.
The study concluded that government spending decision occurred prior the decision to raise revenue during the period under investigation.
Keywords: causality, multivariate, converge, uni-directional, short-run, long-run.

1. Introduction

The debate on the direction of causality between government revenue and expenditure has received great attention among scholars and public finance analysts in the recent time. This growing debate on the causal direction between revenue and expenditure has produced two popular hypotheses in the public finance literature. The first of this hypothesis is revenue-spend hypothesis while the second is called spend-revenue hypothesis. The first hypothesis states that causality runs from government revenue to expenditure while the second hypothesis states that causality is in the opposite direction, that is, from government expenditure to revenue. The *revenue-spend* hypothesis postulates a causal relation running from revenue to spending which implies that spending adjust in response to changes in revenues. This hypothesis was initially formulated by Friedman (1978) and Buchanan and Wagner (1978), but these authors differed in their perspectives. While Friedman (1978) argues that the causal relationship works in a positive direction, Buchanan and Wagner (1978) postulate that the causal relationship is negative. According to Friedman raising revenue would lead to more government spending and hence to fiscal imbalances. Cutting revenue is, therefore, the appropriate remedy to budget deficits.
On the contrary, Buchanan and Wagner (1978) propose an increase in taxes as remedy for deficit budgets. Their point of view is that with a cut in revenue earnings of government, the public will perceive that the cost of government programmes has fallen and hence raise demand for more programmes from the government which if undertaken will result in an increase in government spending. Higher budget deficits will then be realized since revenue earnings will decline and government spending will increase.
The *spend-revenue hypothesis* otherwise known as Peacock-Wiseman hypothesis is valid when spending hikes created by some special events such as natural, economic or political crises compel government to increase revenue by raising taxes or by borrowing or through seigniorage. As higher spending now tends to lead to higher tax later, this hypothesis suggests that spending cuts are the desired solution to reducing budget deficits. This hypothesis is also consistent with Barro's (1979) view that today's deficit-financed spending means increased tax liabilities in the future in the context of the Ricardian equivalence proposition. An understanding of this causal link might contribute to the formulation of specific policies with regard to deficits management for countries running large fiscal imbalances.
Budget deficits reduction could be achieved through either spending cuts or raising revenue.
However, it is very uncertain which of these options will lower deficits for long time. To know which is likely to

be the more efficient strategy to achieve permanent reductions in budget deficits, the analysis of the direction of causality between public revenues and expenditures can offer a relevant guideline.

Empirical evidence against Peacock-Wiseman hypothesis has been found by Manage and Marlow (1986), Marlow and Manage (1987) and Bohn (1991) for the USA; Owoye (1995); Ewing and Payne (1998); Park (1998); Chang et al. (2002); Chang and Ho(2002a); Fuess et al. (2003); Baghestani and AbuAl-Foul (2004); Sobhee (2004) and Yaya Keho (2009) for Cote D'ivoire.

Studies providing evidence in support of Peacock-Wiseman hypothesis include Anderson et al. (1986); Von Furstenberg et al. (1986) and Ram (1988a) for the USA; Hondroyiannis and Papapetrou (1996) and Vamvoukas(1997) for Greece; and Dhanasekaran (2001) for India. A critical observation of most of these studies revealed that studies concentrating on the validation of Peacock-Wiseman hypothesis are scarce for Nigeria. This study therefore becomes necessary in order to shed light on whether Peacock-Wiseman hypothesis holds in Nigeria. The finding of this study will have important policy implication; it is an indication that fiscal authority takes spending decision first and then decides on how to raise revenue.

The rest of this paper is organized as follows: The next section produces the theoretical and empirical literature review. Section 3 describes the data and methods used in the analysis. Section 4 reports the empirical findings while section 5 draws the conclusion.

2. Theoretical and Empirical Literature Review

Theoretically, causality between government expenditure and revenue are associated with different schools of Thought. There is divergence of opinions as regard the direction of causality between the two fiscal variables.

To Keynes and the Keynesians, government should spend first and then raise revenue in order to balance what could be referred to as fiscal equation. This view is based on the theory of compensatory finance, where fiscal deficits are created to boost economic growth. Subsequently, through an in-built mechanism, the multiplier effect of budget would eliminate any output gap and ensure a higher tax base, from which the extra tax revenue would be generated to pay off for the initially created fiscal deficit.

To the Classical economics, budget must always balance. Government expenditure must not exceed its revenue. This school of thought believes in what is known as fiscal neutrality. They are of the view that any mismatch between government expenditure and revenue could harm the workings of the economy. It could have distortionary effects on the smooth operation of the price system. Hence, fiscal neutrality in this context dictates revenue and then spend paradigm. It is clearly understood that this view stands an opposing end to that of the Keynesian. What stands in-between both of these extremes is the fiscal syncronisation hypothesis, a situation in which the motivation to raise revenue and to spend is determined simultaneously (see Brown and Jackson, 1991), Lindahl (1958) and Musgrave (1966).

Empirical studies exploring the direction of causality between government expenditure and revenue include Peacock and Wiseman (1979), Gounder et al., (2007), Bohn (1991), Mount and Sowell (1997), Garcia and Henin (1999), Hoover and Sheffrin (1992), Eita and Mbazima (2008), Sobhee (2004), Okeho (2009). According to the empirical literature, while there is no consensus in the findings of most studies, studies differ in the use of control variables, some studies also did not include control variable in their analysis, having noted this, the present study introduced inflation as a control variable.

3. Data and Methodology

This paper uses government expenditure (GOVEXP), government revenue (GOVREV) and CPI. These time series data were sourced from CBN statistical bulletin 2010 edition, CBN Annual Reports (various years) and World Development Indicators (WDI) 2011 published by the World Bank covering the period (1961-2010). The study employed Johansen multivariate cointegration techniques, vector error correction mechanism and standard Granger causality tests to examine the direction of causality between government expenditure and revenue. To avoid spurious regression, the study attempted to test the stationarity of the variables by employing the Augmented Dickey–Fuller (ADF) and Philips-Perron unit root tests. If variables are non-stationary, there is a possibility that one or more cointegration relationships among the variables exist (Engle & Granger, 1987). The study therefore applied the Johansen and Juselius maximum likelihood test (Johansen and Juselius,1990) to test for cointegration between the variables based on a VAR model specified as follows:

$$Y_t = \mu + \sum_{i=1}^{p} \Pi_i Y_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (1)$$

where Y is a vector of variables, μ is a vector of constant terms, Π are coefficient matrices, p is the number of lags, and ε is a vector of the disturbance term with a mean of zero and constant variance. By reparameterizing Eqn. (1), the corresponding VECM is obtained:

$$\Delta Y_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \Pi Y_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where Δ is the first difference operator,

$$\Pi = \sum_{i=1}^{p} \Pi_i - I, \text{ and } \Gamma_i = -\sum_{j=i+1}^{p} \Pi_j$$

By checking the rank of Π, the existence of a long-run relationship between the variables can be detected. Finally, a causality test is conducted based on VECM, following Granger (1988).

Most studies on causality between government expenditure and revenue have used bivariate models while a few recent studies have adopted a multivariate analysis by including a control variable in the VECM specification. This study adopted a multivariate approach by including inflation as a control variable in the causality tests.

The study also adopted a bivariate Granger causality tests to find out if the result will be consistent with that obtained from the VECM. This is thus specified as follows:

$$\Delta GOVEXP_t = \sum_{i=1}^{m_1} \eta_i \Delta GOVREV_{t-i} + \sum_{j=1}^{m_1} \phi_j \Delta GOVEXP_{t-j} + \varepsilon_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$\Delta GOVREV_t = \sum_{j=1}^{m_2} \varphi_i \Delta GOVEXP_{t-i} + \sum_{j=1}^{m_2} \psi_j \Delta GOVREV_{t-j} + \varepsilon_{3t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where Δ is first difference operator, ε_{2t} and ε_{3t} are white noise error terms. GOVEXP is government expenditure, GOVREV is government revenue, η, ϕ, φ, ψ, are parameters to be estimated, m_1, m_2, are the number of lags in the VAR.

4. Empirical results

The result of the ADF unit root test shown in Table 1(a) revealed that variables in their level form follow a I(1) process. They become stationary after first differencing. The study also employed Phillips-Perron unit root test. Phillips-Perron unit root test is adjudged in the literature to be more robust and can increase the power of a test especially when Time series data are involved. Hence when ADF and PP tests do not produce the same result, the result obtained from the PP test is adopted. However, both tests in this study produced the same result. The result of PP unit root test shown in Table 1b revealed that all variables are nonstationary at level. They all become stationary after first differencing.

Table 1a: Result of Augmented Dickey Fuller (ADF) Unit Root Test

Variable	ADF Test-statistic at level	MacKinnon 5% Critical value	ADF Test-statistic at First Difference	MacKinnon 5% Critical value	Order of Integration
GOVEXP	-1.2149	-3.5298	-9.8260	-3.5298	I(1)
GOVREV	-0.3490	-3.5298	5.1680	-3.5298	I(1)
LOG(CPI)	-1.5575	-3.5298	-4.4155	-3.5298	I(1)

Source: computed by the author

Table 1b: Result of Phillips-Perron Unit Root Test

Variable	PP Test-statistic At Level	MacKinnon 5% Critical Value	PP Test-statistic At First Difference	MacKinnon 5% Critical Value	Order of Integration
GOVEXP	-1.6219	-3.5266	-9.8236	-3.5298	I(1)
GOVREV	-0.0456	-3.5266	-4.6387	-3.5298	I(1)
LOG(CPI)	-1.5325	-3.5266	-4.3766	-3.5298	I(1)

Source: computed by the author

After the issue of stationarity of the variables has been settled, next was to determine the number of cointegrating relationships, the maximum likelihood method of estimation proposed by Johansen and Juselius (1990) was employed. The results are presented in Table 2a and 2b. Both the trace statistics and maximum eigenvalue suggest the existence of one cointegrating vector indicating that variables converge to a long-run equilibrium. Also, as suggested by Engle and Granger (1987), if cointegration exists between two variables, there must be at least causality in one direction, the idea of no causality therefore becomes a myth.

Table 2a: Result of Johansen Cointegration Test (Trace test)

Date: 02/15/13 Time: 11:15
Sample (adjusted): 1973 2010
Included observations: 38 after adjustments
Trend assumption: Linear deterministic trend
Series: GOVEXP GOVREV
Exogenous series: LOG(CPI)
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.661641	47.64756	15.49471	0.0000
At most 1 *	0.156535	6.468982	3.841466	0.0110

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 2b: Result of Johansen Cointegration Test (Maximum Eigenvalue test)
Date: 02/15/13 Time: 11:15
Sample (adjusted): 1973 2010
Included observations: 38 after adjustments
Trend assumption: Linear deterministic trend
Series: GOVEXP GOVREV
Exogenous series: LOG(CPI)
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.661641	41.17858	14.26460	0.0000
At most 1 *	0.156535	6.468982	3.841466	0.0110

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

After we have confirmed that a long-run equilibrium relationship exists between government expenditure and government revenue via consumer prices in the economy, the study proceeds by providing the estimates of the dynamics that characterized this unique relationship. The result of the VECM is reported in Table 3. It is important to note that CPI plays the role of a control variable, and tend to track any additional feedback effect which the exogenous variable may have on the dependent variable. The optimal lag length chosen in the two equations based on SIC is set at 2.
It was found that, it is only in the DGOVREV equation that the lagged value of the residual is significant. In general, the coefficients in the DGOVEXP equation are insignificant and it appears that neither GOVREV nor CPI turn out to explain changes in GOVEXP. Hence, there is unidirectional causality running from expenditure to revenue. This finding is inconsistent with the findings of Sobhee (2003) and Sobhee (2004) who found unidirectional causality in the opposite direction.

Table 3: Result of VECM

	D(GOVEXP)	D(GOVREV)
CONSTANT	654083.7[2.004]	303613.0[6.599]
D(GOVEXP(-1))	-0.879[-2.53]	-0.248[-5.061]*
D(GOVEXP(-2))	-0.020[-0.043]	-0.352[-5.405]*
D(GOVREV(-1))	-1.405[-1.642]	-0.528[-4.374]
D(GOVREV(-2))	-1.412[-1.550]	-0.248[-1.928]
D(LOG(CPI(-1)))	-745365.9[-0.801]	-175059.4[-1.334]
D(LOG(CPI(-2)))	-89808.9[-0.100]	-130570.3[-1.028]
ECM_{t-1}	0.494[1.684]	0.367[8.894]*
R-Squared	0.359	0.785
Adj. R-Squared	0.210	0.734
Akaike AIC	30.15934	26.24086
Schwarz SC	30.50410	26.58561
F-statistic	2.402167	15.61907
VECM DIAGNOSTIC TEST: LM-Stat 6.941[0.643] JB-Stat 6.282[0.392] Cross Terms Heteroscedasticity Test-Stat 220.681[0.293]		

Note: [] = t-statistic, * = sig at 1%, ** = sig at 5%

The study further applied bivariate standard Granger causality test using the first difference of the two fiscal variables, the result as presented in Table 4 showed that unidirectional causality running from expenditure to revenue existed between the two variables. This indicates that a short-run one-way causality running from expenditure to revenue existed in Nigeria during the period under study.

Table 4: Short run Causality using the bivariate standard Granger causality test

Null Hypothesis	**Obs**	**F-Stat**	**Prob.**	**Decision Rule**
D(GOVREV) does not Granger cause D(GOVEXP)	37	0.391	0.679	Do no reject Ho
D(GOVEXP) does not Granger cause D(GOVREV)	37	5.227	0.011*	Reject Ho

|* *indicates rejection of hypothesis of no causality at 5% level of significance*

Impulse response analysis

The study also embarked on the impulse response analysis of the two fiscal variables central to this study. The result which confirms our findings is reported in the appendix. It showed how each endogenous variable responds to one standard deviation shock in the VECM equation. Over a horizon of 10 periods, it can be clearly seen that the evolution of government expenditure and revenue follows a different trend. At the initial time, government expenditure exhibits a positive trend while revenue exhibits a negative trend which later changes to positive. Also, how each variable responds to one standard deviation shock each period seems not to follow the same pattern. This buttress the fact that expenditure and revenue decisions are not made simultaneously and that expenditure decision was taking prior to revenue decision. It looks as if the periodic response is not the same. Expenditure changes do not necessarily respond to a lag or lags of changes in government revenue. What is more alluring is that expenditure changes rather precede revenue changes. In either direction therefore, it is observed that it is expenditure changes that stimulate revenue changes and not in the other way round. Similarly, in either case, the shocks do not die out; it persists over at least the 10 periods shown.

5. Conclusion

This study was carried out to find out the direction of causality between government expenditure and revenue, this was with a view to determining the validity of Peacock-Wiseman revenue-spend hypothesis and its implications on Nigeria economic growth. Time series data covering the periods 1961 to 2010 were used for this study. The statistical properties of the data were properly investigated using appropriate econometric techniques. The study employed a multivariate analysis by introducing a control variable in the VECM specification. The findings showed that unidirectional causality running from expenditure to revenue was found to exist between government expenditure and government revenue. The study found short-run and long-run causal evidence running from expenditure to revenue supporting Peacock-Wiseman revenue-spend hypothesis. Taking spending decision prior decision to raise revenue might be responsible for the growth of fiscal deficits in Nigeria during the study period. This has a serious implication on fiscal discipline especially in an economy characterized with high level of corruption and ineptitude like Nigeria. The basic rule of cutting your coat according to your size is vehemently violated. The nation lives so extravagantly when the resources available are not actually in support of such a living.

The study concluded that government spending decision occurred prior the decision to raise revenue in Nigeria during the period under investigation.

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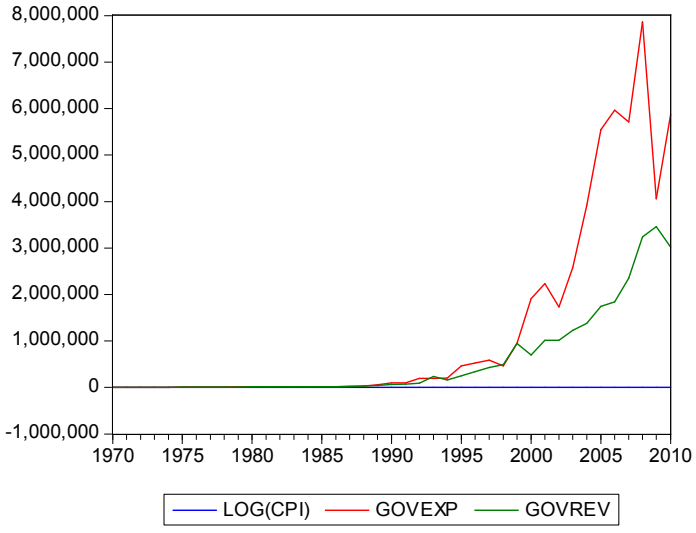
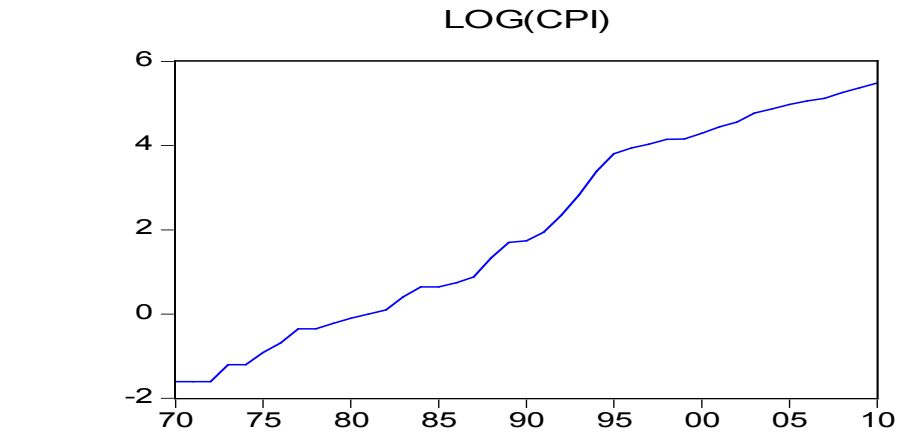
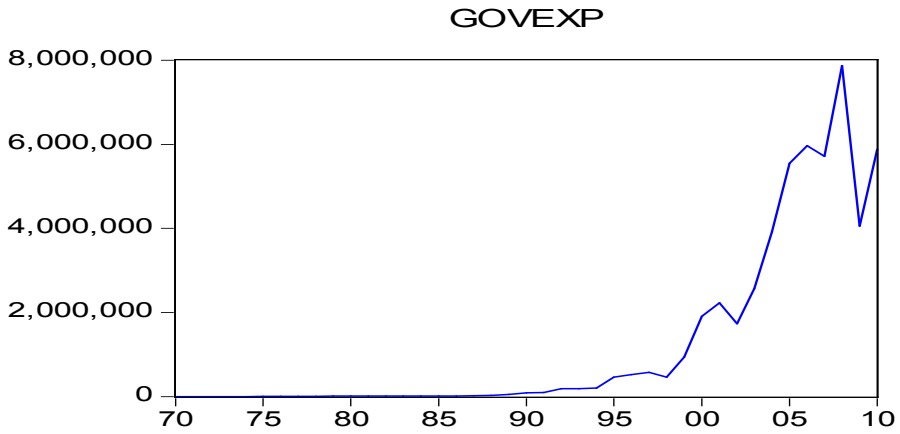
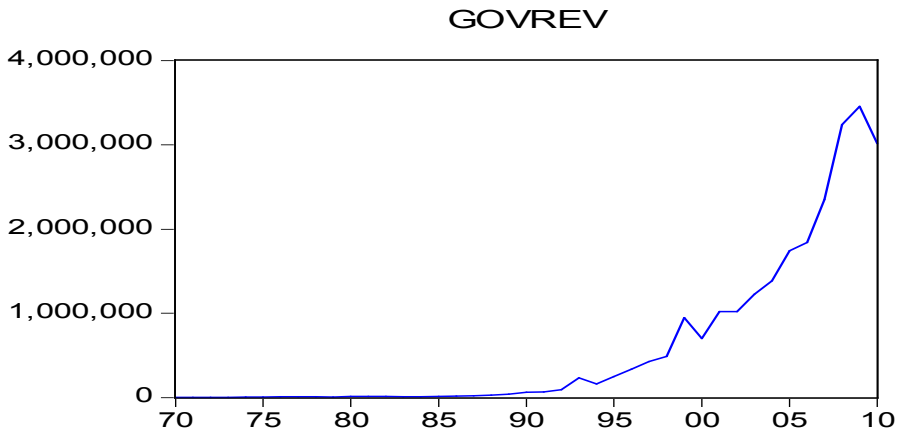
Appendix
Graph of variables (single)



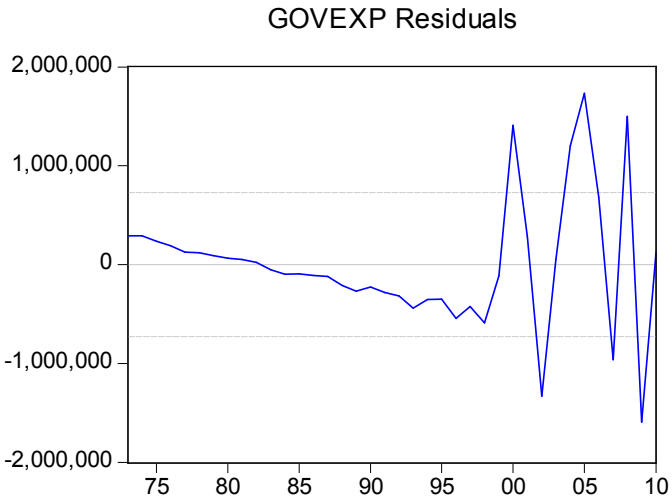
Graph of variables (multiple)

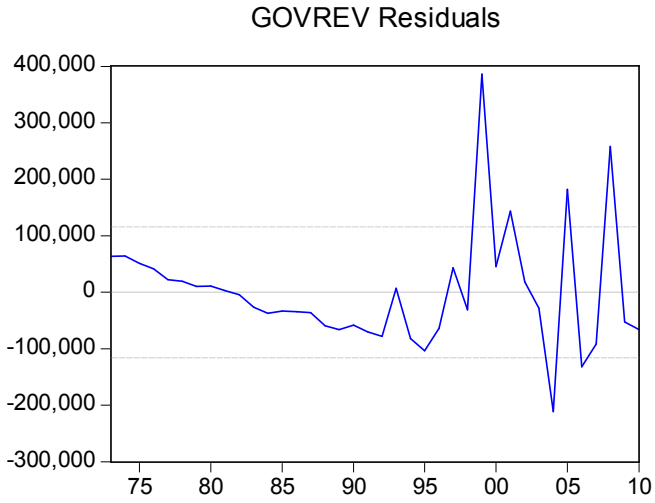


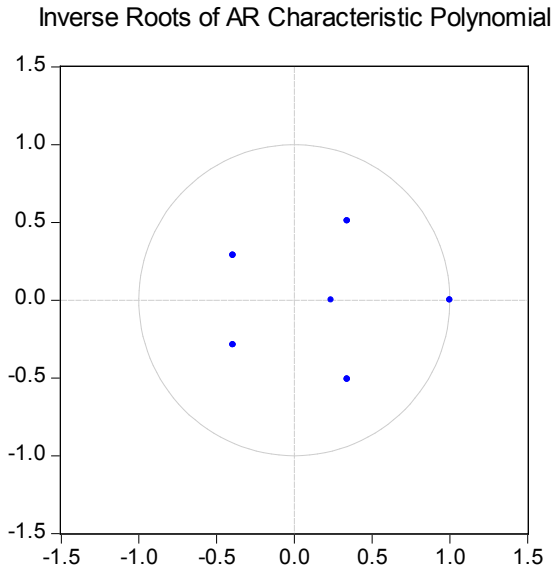




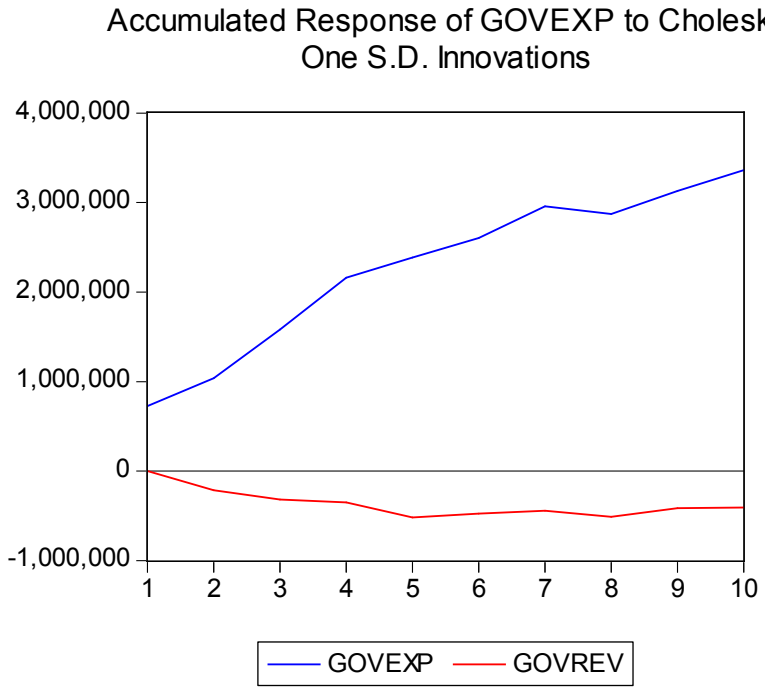
GRAPHS OF RESIDUALS

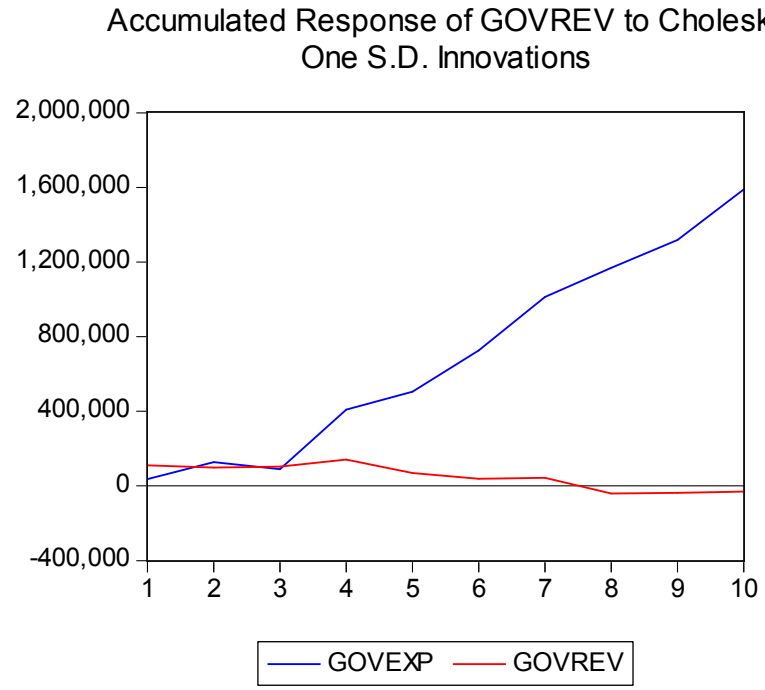


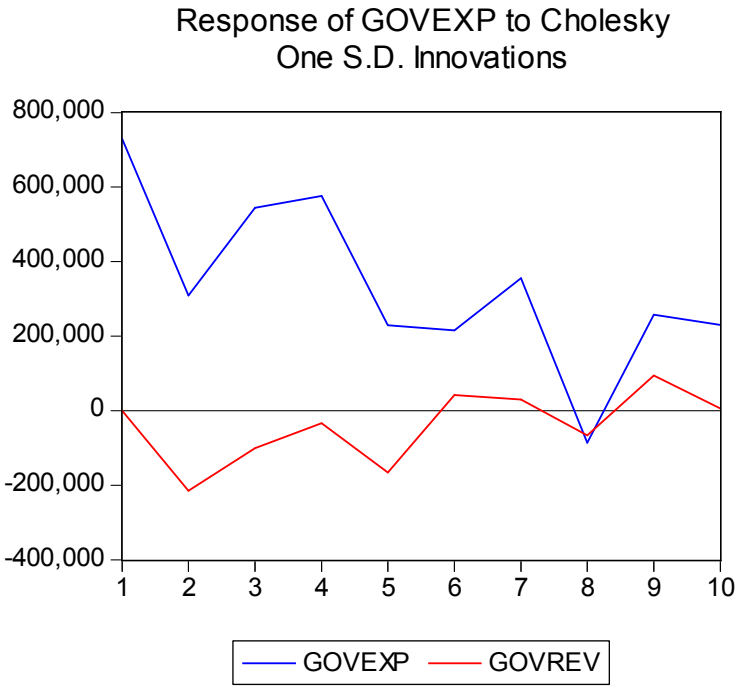




Result of the impulse response analysis






Response of GOVEXP to Cholesky
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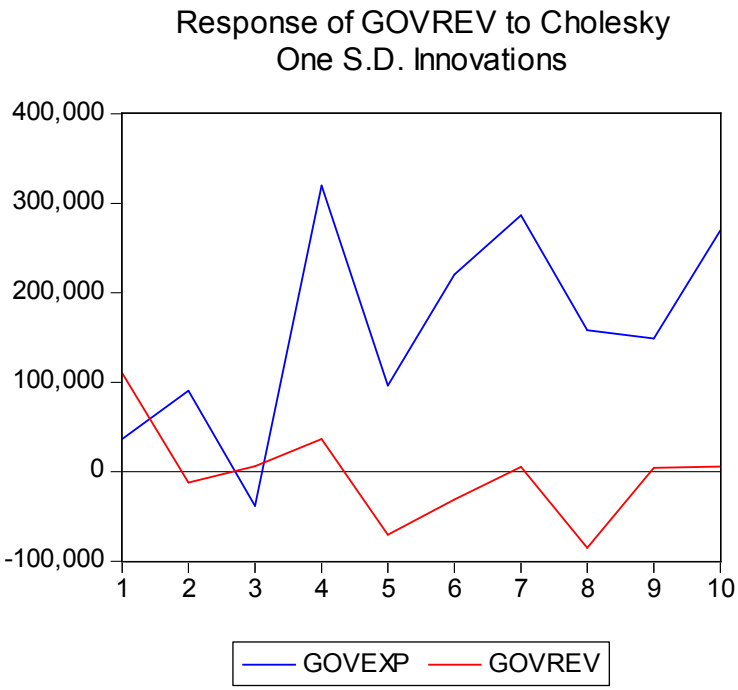
10
GOVEXP
GOVREV


Response of GOVREV to Cholesky
One S.D. Innovations
400,000
300,000
200,000
100,000
0
-100,000
1
2
3
4
5
6
7
8
9
10
GOVEXP
GOVREV