International Business Management 10 (19): 4653-4658, 2016
ISSN: 1993-5250

Test of Causality Between Two Macro Variables: A Case of India

Bipasha Maity
Thiagarajar School of Management, Pamban Swamy Nagar,
Thirupparakundram, 625005 Madurai, India

Abstract: There are a plenty of research attempted to capture the causal relationship between GDP and Government Expenditures (GE). Since, the direction of causal relationship between these two macro variables is still inconclusive, I have taken a modest attempt to test a few hypotheses with respect to the relationship in question through this research. I gathered data on GDP and GE over a period 1960-2014 and fit the Vector Autoregressive (VAR) and Vector Error-Correction (VEC) models to data. Out of three hypotheses, one is confirmed that is GE Granger causes GDP of India. Policy makers/managers would get insight from the findings of this research to formulate better public policy/business strategy.

Key words: Causality, VAR, VECM, GDP, GE

INTRODUCTION

The ultimate goal of any government is to push its own country toward economically sound. This goal does not happen to be achieved automatically. Government needs to frame and implement sound economic policy to ensure a healthy economic growth rates to give its population a good quality life. Only government's proper fiscal policy will ensure higher and stable economic growth rates. On the other hand, government expenditures measure the degree of economic development of any country.

Economic progress of a nation is measured through two indices these are Government Expenditures (GE) and GDP (Homles and Hutton, 1990; Levine and Renelt, 1992; Ghali and Al-Shamsi, 1997; Ghali, 1999; Loizides and Vamvoukas, 2005; Tang, 2009). Hence, anyone can suspect that there might be a hidden relationship between government expenditures and GDP. The relationship between the GDP and the Government Expenditure (GE) has been a lively controversy among the studies in the world. In this context, a few strategic propositions could be framed whether GDP drives GE, GE drives GDP and GDP and GE are causing one another simultaneously (Gurgul *et al*., 2012; Loto, 2011).

These propositions need to be tested empirically for policy makers/managers whose policy/strategy is influenced by these two variables (Akinlo, 2013; Arghyrou, 2000; Liu and Hsu, 2008; Chimobi, 2009; Mudaki and Masaviru, 2012; Oteng-Abayie and Frimpong, 2009; Zamanian *et al*., 2012). However, this issue has been studied extensively in past for general purposes only without clearly defined its stakeholders. It is to be noted that this study differs from others since I attempt to capture the hidden relationship between Government Expenditures (GE) and GDP of India to assist policy makers/managers to formulate a sound public policy/business strategy.

Literature review: To get substantial insight into the tentative propositions, I do an extensive literature survey in the field of economics. I pooled a substantial number of empirical works reported a causal relationship between GDP and GE. It is to be noted that I gathered the most relevant studies related to phenomenon under study since my work is not a literature review. I assigned these relevant studies into two groups on the basis of their findings: bidirectional causality observed studies and unidirectional (positive or negative as the case may be) causality observed studies. I discuss both in turn.

Bidirectional: Singh and Sahni (1984) used data on public expenditure and national income of India to see the direction of causality between GDP and GE. The authors found that the GDP and GE cause one another. In another study, Wu *et al*. (2010) analyzed data on government expenditures and GDP for 182 OECD and non-OECD countries and observed bidirectional causality between them in both cases. Payne and Ewing (1996) reported mixed findings using data on GDP and government expenditure of a sample of 22 countries. In a recent study, using data on GDP and government

expenditures of Saudi Arabia, Al-Haqbani (2004) found bidirectional causality between these two macroeconomic variables.

In a relatively bigger study, Fasano and Wang (2001) observed bidirectional causality between government expenditure and GDP. In a similar vein, Aregbeyen (2006) also found bidirectional causality between GDP and government expenditure using data of Nigeria over a period 1970-2005. Anwar *et al.* (1996) attempted to pursue an ambitious research covering 88 countries data on GDP and government expenditure over a period 1960-1992 and found bidirectional causality between them for eight countries. Cheng and Lai (1997) also observed that the GDP and GE influence one another in a case of South Korea. In sum, there is a substantial number of studies reported bidirectional causality between GDP and GE (Devlin and Hansen, 2001; Biswal *et al*., 1999).

Unidirectional (positive): A sizeable number of studies reported a positive relationship between GDP and government expenditure (Alexiou, 2007; Aschauer, 1990; Abdullah, 2000; Al-Yousif, 2000; Barro, 1990; Kolluri *et al*., 2000). In a slightly different study, Wahab (2011) examined the effect of government expenditures on economic growth using both cross-sectional and panel data. The author found a positive relationship between economic growth and government expenditures. In another research, Donald and Shuanglin studied the differential effects of various forms of expenditures on economic growth of 58 countries. Their results reveal that the government expenditures (on education and defense) influence economic growth positively.

Using both the cross-sectional and time series data on GDP and GE over a period 1950-1980 of 115 countries, the author has observed a positive influence of GE on GDP (Ram, 1986). Cooray (2009) used data on GDP, government expenditures and quality of governance of 71 countries and seen that the GE has a positive effect on GDP. Using data on GDP and GE of US, Liu *et al*. (2008) found that the government expenditures drive GDP in case of US. A similar relationship has been reported in a study of 51 developing countries by Akitoby *et al*. (2006).

Unidirectional (negative): There are a substantial number of studies reported that the government expenditures and GDP are negatively related (Al-Faris, 2002; Barro, 1991; Engen and Skinner, 1992; Folster and Henrekson, 2001; Husnain *et al*., 2011; Landau, 1986). Particularly, in a cross-sectional research, Landau (1983) found an inverse relationship between GDP and GE using data of 96 countries. In a similar study, Devarajan *et al.* (1996) observed a negative relationship between GDP and GE for a group of developing countries. Loto (2011) used data on GDP and government expenditure over a period 1980-2008 of Nigeria and found a negative relationship between GDP and government expenditures as observed by Nurudeen and Usman (2010). In a systematic study of 113 countries, Grier and Tullock (1989) found that the GDP has a negative effect on the government expenditures.

In summary, I could say that GDP and GE are causing one another. However, the direction and extent of influence on each other differ by countries. Policy makers/managers wouldn't be so confident to use the findings of the above studies to formulate public policy/strategy in case of Indian scenario. They needed solid evidence on the relationship between GDP and GE in respect to their own country. To assist the Indian policy makers/ managers, I think more research need to be done on the issue in hand.

In the above backdrop, we set our research direction concerning "how GDP affects GE and vice-versa (how GE affects GDP)" in this research while this aspect has received considerable attention in past, the interplay between the two remains fuzzy. I do this research that goes beyond just fill the gap in the literature to add value in the decision making process of policy makers/managers directly or indirectly related to Indian economic scenario.

MATERIALS AND METHODS

Research design

Model and hypotheses: A simple plot indicates that both the variables GDP and GE are evolving overtime together. Further, I found a constant ratio between the values of GDP and GE overtime which indicates these two are co-integrated. These two criteria (not reported due to space constraint) ensure (not statistically) that GDP and GE might be co-integrated (Granger, 1986; Hanssens *et al*., 2003). That is these two show a joint dynamic behavior in reality which can't be seen through bare eyes. To understand the joint dynamic behavior of a collection of macro variables, vector autoregressive was introduced by Sims (1980). With two variables GDP and GE and order-p VAR of two equations:

$$y_t = \beta_{y0} + \sum_{p=1}^{p} \beta_{yyp} y_{t-p} + \sum_{p=1}^{p} \beta_{yxp} x_{t-p} + v_t^{y_t} \qquad (1)$$

$$x_t = \beta_{x0} + \sum_{p=1}^{p} \beta_{xyp} y_{t-p} + \sum_{p=1}^{p} \beta_{xxp} x_{t-p} + v_t^{x_t}$$

Where:

y_t	=	GDP at period t
y_{t-p}	=	p period lagged GDP
x_t	=	GE at period t
x_{t-p}	=	p period lagged GE
$((\beta))y_0$, β_{yyp}, β_{yxp}, β_{x0}, β_{xyp}, β_{xxp})	=	Parameters to be estimated
v_t^{yt}, v_t^{xt}	=	Error terms

The parameters in Eq. 1 help me to test the tentative hypotheses as mentioned above. I represent all three hypotheses mathematically with respect to Eq. 1:

- $H_{1.1}$: GE Granger causes GDP of India

That is mathematically, H_0: $\beta_{yx1} = \beta_{yx2} = ... = \beta_{yxp} = 0$ against H_a: $\beta_{yx1} = \beta_{yx2} = ... = \beta_{yxp} \neq 0$.

- $H_{1.2}$: GDP Granger causes GE of India

That is mathematically, H_0: $\beta_{yx1} = \beta_{yx2} = ... = \beta_{yxp} = 0$ against H_a: $\beta_{yx1} = \beta_{yx2} = ... = \beta_{yxp} \neq 0$.

- $H_{1.3}$: GDP and GE of India Granger cause one another simultaneously

That is mathematically, H_0: $\beta_{yx1} = \beta_{yx2} = ... = \beta_{yxp} = 0$ and $\beta_{xy1} = \beta_{xy2} = ... = \beta_{xyp} = 0$ against H_a: $\beta_{yx1} = \beta_{yx2} = ... = \beta_{yxp} \neq 0$ and $\beta_{xy1} = \beta_{xy2} = ... = \beta_{xyp} \neq 0$.

I would like to mention that only testing Granger causality between GDP and GE is not sufficient to help managers/policy maker to make informed decisions. They also need to know how GDP and GE react to deviation from the long term equilibrium. To solve this, I consider a Vector Error-Correction (VEC) Model (Davidson and Hendry, 1981; Davidson *et al*., 1978; Engle and Granger, 1987; Granger, 1986; Hendry, 1986; Hendry and Richard, 1983; Phillips, 1954; Sargan, 1964). With two variables and p lagged length the bi-variate VEC model can be written mathematically as:

$$\Delta y_t = \beta_{y0} + \sum_{p=1}^{p} \beta_{yyp} \Delta y_{t-p} + \sum_{p=1}^{p} \beta_{yxp} \Delta x_{t-p} + \lambda_y (y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v_t^{y_t}$$

$$\Delta x_t = \beta_{x0} + \sum_{p=1}^{p} \beta_{xyp} \Delta y_{t-p} + \sum_{p=1}^{p} \beta_{xxp} \Delta x_{t-p} + \lambda_x (y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v_t^{x_t}$$

Where:

Δy_t	=	First differenced GDP at period t
Δy_{t-p}	=	p period lagged first differenced GDP
Δx_t	=	First differenced GE at period t
Δx_{t-p}	=	p period lagged first differenced GE
$((\beta))y_0$, β_{yyp}, β_{yxp}, β_{x0}, β_{xyp}, β_{xxp})	=	Parameters to be estimated
$((\lambda)_x$, $\lambda_y)$	=	Parameters to be estimated
v_t^{yt}, v_t^{xt}	=	As mentioned above

Data base: To test the hypotheses and estimate parameters, I collect inflation adjusted year-wise data on GDP and GE from the World Bank reports over a period 1960-2014. I prepared a data file consists of 55×2 data points on per capita GDP and GE of India. It is to be noted that I have tested source reliability of data by comparing to that reported in Reserve Bank of India (RBI) reports.

RESULTS AND DISCUSSION

As a preliminary check, I verify that both the data series (GDP and GE) are stationary. In this context, I use an Augmented Dickey-Fuller (ADF) regression to test whether both the series have unit root. In this case, I included four lagged differences to eliminate serial correlation in the error term of Dickey-Fuller regression. Results are posted in Table 1.

Test statistic values (in Table 1) are more negative than the critical value even at 1% level of significance. Hence, I reject the hypothesis of presence of unit root that is both the series are stationary. On the other hand, to assess the optimal lag length (p in the above equation), I use AIC and SBIC criteria. At various lag length, the estimated values are shown in Table 2.

The values of AIC and SBIC of all 4 lags are available for data beginning 1960, even though the fewer than 4 lags could be used for such a long period. In this case, both the criteria support a lag of one, so that is what we choose in this work. In a nut shell, I could fit a VAR model of one lag to data without confusion.

Table 1: Augmented dickey-fuller test for unit root

		Interpolated Dickey-Fuller (CV) (%)		
Variables	Test statistic	1	5	10
GDP	-5.211	-3.496	-2.887	-2.577
GE	-4.77			

Mackinnon approximate p-value for z (t) = 0.0001, CV: Critical Value

Table 2: Results of AIC and SBIC

Lag	AIC	SBIC
0	14.25	14.55
1	12.15	13.22
2	12.45	13.72
3	13.21	13.85
4	13.95	14.11

AIC: Akaike Information Criterion; SBIC: Schwartz-Bayesian Information Criterion

Table 3: Validation statistics for VAR model

					LM			
Variables	R^2	χ^2	p-values	EV	1	2	3	4
GDP	0.37	97.45	<0.01	0.87	5.6	4.7	5.9	8.2
GE	0.17	36.17	<0.01	0.51				

Table 4: Estimates of VAR model

Variables	Coefficient	SE	t-values	p-values	R^2	χ^2	p-values
GDP							
GDP L1	0.35	0.09	2.77	0.005	0.37	97.45	<0.001
GEL1	0.23	0.09	2.40	0.016			
Constant	1.60	0.25	6.40	<0.001			
GE							
GDPL1	0.15	0.80	0.18	0.200	0.17	36.17	<0.001
GEL1	0.29	0.08	3.63	<0.001			
Constant	1.22	0.37	3.29	<0.001			

I run VAR regressions starting the data from1960 with one lag which is 1961. Results are the coefficients from OLS estimation of the two regressions plus some system and individual equations goodness-of-fit statistics. Results are presented in Table 3 and 4. Table 3 represent validation statistics and coefficients of lagged GDP and GE are posted in Table 4. I interpreted validation statistics first and the estimates next. It is to be noted that I present and interpret the statistically significant results (VAR or VEC model as the case may be) only in this work.

To assess the Validity of VAR, I test for stability and autocorrelation of the residuals. Results are shown in Table 3. The Eigen values are less than one which indicates the system is stable. I use a Lagrange multiplier test for the joint null hypothesis of no autocorrelation of the residuals of the two equations. I cannot reject the null of no serial correlation at orders 1 through 4 at any conventional significance level. Furthermore, I observe moderate R^2 for GDP and GE which means the VAR model, gives a good fit to the data. In a nut shell, I don't have sufficient evidence to contradict the validity of VAR model.

To determine whether GDP and GE of India influence one another, I use Granger causality tests. Test results (in Table 4) reveal that the effect of lagged GE on GDP is significant (the p-value is 0.016) and effect of lagged GDP on GDP is also significant (the $p<0.005$). That is there is a strong evidence to confirm the hypothesis ($H_{1.1}$) in this case. In other words, GE Granger causes GDP which means lagged GE affects GDP conditional on the effect of lagged GDP. Then it is confirmed that lagged GE helps to predict GDP of India.

On the other hand, the impact of lagged GDP on GE is insignificant at any conventional significance level. However, the impact of lagged GE on GE is significant at high significance level ($p<0.001$). This evidence is not enough to reject our second hypothesis ($H_{1.2}$). That is GDP does not Granger causes GE which means GDP will not help us to predict GE of India. Combining the evidence related to hypotheses ($H_{1.1}$ and $H_{1.2}$) I do not able to reject the hypothesis ($H_{1.2}$). This means there is no bidirectional causality has been observed between GDP and GE of India.

Table 5: Estimates of VECM

Variables/ predictor	Coefficient	SE	t-values	p-values	R^2	χ^2	p-values
ΔGDP							
β_{y0}	0.296	0.161	1.834	0.035	0.322	120.42	<0.001
β_{yy1}	0.034	0.123	2.753	0.004			
β_{yx1}	0.138	0.081	1.709	0.045			
λ_y	0.730	0.420	1.765	0.044			
ΔGE							
β_{x0}	0.121	0.071	1.704	0.045	0.431	194.55	<0.001
β_{xy1}	0.041	0.010	4.100	<0.001			
β_{xx1}	0.230	0.133	1.720	0.043			
λ_x	0.900	0.510	1.730	0.042			

y = GDP; x = GE

To understand 'correction' of previous period's disequilibrium that happens in current period for two variables (GDP and GE) and one co-integrating relationship, we fit our Vector Error Correction (VEC) model to data on GDP and GE. Results are shown in Table 5. Results consist of validation statistics and all the coefficients in question. Significant R^2 suggests that the model gives a good fit to data.

Coefficients of one period lag GDP, one period lag GE and λ (x or y as the case may be) are significant at $p<0.05$ or better. This significant evidence suggests that the variation in GDP/ GE is not only explained by GE/ GDP but also by the temporal gap between GDP and GE. Then, we could say that the temporal gap between GDP and GE is acting as catalyst in shaping the relationship between these two macro-economic variables. It means GDP and GE do not diverse from each other by a great extent at least in the long run. These two variables may drift apart in the short run and if it is continued in the long run underlying stochastic pattern bring GDP and GE back together. The significant coefficient of λ is nothing but the magnitude of the error correction parameters which indicates how GDP and GE react from the deviation of long term equilibrium. Since, the magnitude of the coefficients 0.73 and 0.90 for GDP and GE, respectively this means that the extent of react of GE to GDP is more prominent than that of GDP to GE in this case.

Managerial/policy implications: Finding of the econometric analysis on macro issue should generate sufficient insight for policymakers/managers to take better decisions. Sometimes simple analysis wouldn't be quite enough to capture the essence of the phenomenon under study that is why, I use the Granger's causality test to assess whether GE improves the prediction accuracy in GDP or vice-versa.

In this context, the findings of VAR should assist managers/economists of firms to predict GDP growth rates more precisely which needed is invaluable in formulization of sound business strategy to ensure sustainable growth. These findings also help them to keep their eyes on the movements of GDP and GE to adopt in the economic condition of India quickly.

On the other hand, policymakers follow predetermined specific rules to frame policy for social development which is influenced by the integration and co-integration of the components of a system. That is why, the findings of the system approach should assist Indian policymakers to maintain a healthy balance between GDP and GE formulating a solid tax policy to ensure that GDP and GE wouldn't be apart widely which indeed helps them to minimize fiscal deficit in future.

CONCLUSION

Using data on GDP and GE, I take a modest attempt in this research to see whether GDP and GE are having long-run equilibrium relationship in a case of India. I use VAR and VEC models to test 'who causes who' and what is the degree of adjustment needed if GDP and GE draft from one another, respectively. The findings of this work support the Keynesian proposition that GE drives GDP. What does it mean? It means the government expenditure influence GDP substantially. I don't find any evidence that advocates the Wagner's law in this work. Overall, the findings tentatively reflect that the public sector is still dominating Indian economy.

REFERENCES

Abdullah, H.A., 2000. The relationship between government expenditure and economic growth in Saudi Arabia. J. Admin. Sci., 12: 173-191.

Akinlo, A.E., 2013. Government spending and national income nexus for Nigeria. Global J. Bus. Res., 7: 33-41.

Akitoby, B., B. Clements, S. Gupta and G. Inchauste, 2006. Public spending, voracity and Wagner's law in developing countries. Eur. J. Political Econ., 22: 908-924.

Al-Faris, A.F., 2002. Public expenditure and economic growth in the Gulf cooperation council countries. Applied Econ., 34: 1187-1193.

Al-Haqbani, M.S., 2004. Government expenditure and economic growth in Saudi Arabia: An empirical investigation. Admin. Sci., 31: 180-188.

Al-Yousif, Y.K., 2000. Do government expenditures inhibit or promote economic growth: Some empirical evidence from Saudi Arabia. Indian Econ. J., 48: 92-96.

Alexiou, C., 2007. Unraveling the mystery between public expenditure and growth: Empirical evidence from Greece. Int. J. Econ., 1: 21-31.

Anwar, M.S., S. Davies and R.K. Sampath, 1996. Causality between government expenditures and economic growth: An examination using cointegration techniques. Public Finance, 51: 166-184.

Aregbeyen, O., 2006. Cointegration, causality and wagner's law: A test for Nigeria. Econ. Financial Rev., 44: 1-17.

Arghyrou, M.G., 2000. Public expenditure and national income: Time series evidence from Greece. Ekonomia, 4: 173-191.

Aschauer, D.A., 1990. Is government spending stimulative? Contemporary Econ. Policy, 8: 30-46.

Barro, R., 1991. Economic growth in cross-section of countries. Q. J. Econ., 10: 407-443.

Barro, R.J., 1990. Government spending in a simple model of endogenous growth. J. Political Econ., 98: 103-125.

Biswal, B., U. Dhawan and H.Y. Lee, 1999. Testing Wagner versus Keynes using disaggregated public expenditure data for Canada. Applied Econ., 31: 1283-1291.

Cheng, B.S. and T.W. Lai, 1997. Government expenditure and economic growth in South Korea: A VAR approach. J. Econ. Dev., 22: 11-24.

Chimobi, O.P., 2009. Government expenditure and national income: A causality test for Nigeria. Eur. J. Econ. Political Stud., 2: 1-11.

Cooray, A., 2009. Government expenditure, governance and economic growth. Comp. Econ. Stud., 51: 401-418.

Davidson, J.E.H. and D.F. Hendry, 1981. Interpreting econometric evidence: The behavior of consumer's expenditure in the UK. Eur. Econ. Rev., 16: 177-192.

Davidson, J.E.H., D.F. Hendry, F. Srba and S. Yeo, 1978. Econometric modelling of the aggregate time-series relationship between consumers' expenditure and income in the United Kingdom. Econ. J., 88: 661-692.

Devarajan, S., V. Swaroop and H.F. Zou, 1996. The composition of public expenditure and economic growth. J. Monetary Econ., 37: 313-344.

Devlin, N. and P. Hansen, 2001. Health care spending and economic output: Granger causality. Appl. Econ. Lett., 8: 561-564.

Engen, E.M. and J. Skinner, 1992. Fiscal policy and economic growth. NBER Working Paper No. 4223, Cambridge.

Engle, R.F. and C.W.J. Granger, 1987. Co-integration and error correction: Representation, estimation and testing. Econometrica, 55: 251-276.

Fasano, U. and Q. Wang, 2001. Fiscal expenditure policy and non-oil economic growth: Evidence from GCC countries. IMF Working Paper, WP/01/195, pp: 1-20.

Folster, S. and M. Henrekson, 2001. Growth effects of government expenditure and taxation in rich countries. Eur. Econ. Rev., 45: 1501-1520.

Ghali, K.H. and F. Al-Shamsi, 1997. Fiscal policy and economic growth: A study relating to the United Arab Emirates. Econ. Int., 50: 519-533.

Ghali, K.H., 1999. Government size and economic growth: Evidence from a multivariate cointegration analysis. Applied Econ., 31: 975-987.

Granger, C.W.J., 1986. Developments in the study of cointegrated economic variables. Oxford Bull. Econ. Stat., 48: 213-228.

Grier, K.B. and G. Tullock, 1989. An empirical analysis of cross-national economic growth: 1951-1980. J. Monetary Econ., 24: 259-276.

Gurgul, H., L. Lach and M. Roland, 2012. The relationship between budgetary expenditure and economic growth in Poland. Central Eur. J. Opera. Res., 20: 161-182.

Hanssens, D.M., L.J. Parsons and R.L. Schultz, 2003. Market Response Models: Econometric and Time Series Analysis. Kluwer Academic Publishers, Boston.

Hendry, D.F. and J.F. Richard, 1983. The econometric analysis of economic time series. Int. Stat. Rev., 51: 111-164.

Hendry, D.F., 1986. Econometric modeling with co integrated variables: An overview. Oxford Bull. Econ. Stat., 48: 201-212.

Homles, J.M. and P.A. Hutton, 1990. On the causal relationship between government expenditures and national income. Rev. Econ. Stat., 72: 87-95.

Husnain, M.I., M. Khan, I.H. Padda, N. Akram and A. Haider, 2011. Public spending, foreign direct investment and economic growth: a time series analysis for pakistan (1975-2008). Int. J. Finance Econ., 61: 20-28.

Kolluri, B.R., M.J. Panik and M.S. Wahab, 2000. Government expenditure and economic growth: Evidence from G7 countries. Applied Econ., 32: 1059-1068.

Landau, D., 1983. Government expenditure and economic growth: A cross-country study. Southern Econ. J., 49: 783-792.

Landau, D., 1986. Government and economic growth in the less developed countries: An empirical study for 1960-1980. Econ. Dev. Cult. Change, 35: 35-75.

Levine, R. and D. Renelt, 1992. A sensitivity analysis of cross-country growth regressions. Am. Econ. Rev., 82: 942-963.

Liu, C.H., C. Hsu and M.Z. Younis, 2008. The association between government expenditure and economic growth: The Granger causality test of the US data, 1974-2002. J. Public Budget. Account. Financial Manage., 20: 439-452.

Liu, C.H.L. and C.E. Hsu, 2008. The association between government expenditure and economic growth: Granger causality test of US data, 1947-2002. J. Public Budget. Account. Financial Manage., 20: 537-553.

Loizides, J. and G. Vamvoukas, 2005. Government expenditure and economic growth: Evidence from trivariate causality testing. J. Applied Econ., 8: 125-152.

Loto, M.A., 2011. Impact of government sectoral expenditure on economic growth. J. Econ. Int. Finance, 3: 646-652.

Mudaki, J. and W. Masaviru, 2012. Does the composition of public expenditure matter to economic growth for Keneya? J. Econ. Sustainable Dev., 3: 60-70.

Nurudeen, A. and A. Usman, 2010. Government expenditure and economic growth in Nigeria from 1970 to 2008: A disaggregated analysis. Bus. Econ. J., 4: 12-20.

Oteng-Abayie, E.F. and J.M. Frimpong, 2009. Size of government expenditure and economic growth in three WAMZ countries. Bus. Rev. Cambridge, 14: 172-175.

Payne, J.E. and B.T. Ewing, 1996. International evidence on Wagner's hypothesis: A cointegration analysis. Public Finance, 51: 258-274.

Phillips, A.W., 1954. Stabilisation policy in a closed economy. Econ. J., 64: 290-231.

Ram, R., 1986. Government size and economic growth: A new framework and some evidence from cross section and times series data. Am. Econ. Rev., 76: 191-203.

Sargan, J.D., 1964. Wages and Prices in the United Kingdom: A Study in Econometric Methodology. In: Econometric Analysis for National Economic Planning, Hart, P.E., G. Mills and J.N. Whittaker (Eds.). Butterworths, London, UK.

Sims, C.A., 1980. Macroeconomics and reality. Econometrica, 48: 1-48.

Singh, B. and B.S. Sahni, 1984. Causality between public expenditure and national income. Rev. Econ. Stat., 66: 630-644.

Tang, C.F., 2009. An examination of the government spending and economic growth nexus for Malaysia using the leveraged bootstrap simulation approach. Global Econ. Rev., 38: 215-227.

Wahab, M., 2011. Asymmetric output growth effects of government spending: Cross-sectional and panel data evidence. Int. Rev. Econ. Finance, 20: 574-590.

Wu, S.Y., J.H. Tang and E.S. Lin, 2010. The impact of government expenditure on economic growth: How sensitive to the level of development? J. Policy Mod., 32: 804-817.

Zamanian, G., M. Mahmoodi and E. Mahmoodi, 2012. Government expenditure and GDP: The case of 12 Asian developing countries. J. Am. Sci., 8: 66-69.