

A Study on Causality Testing between Public Expenditure and Economic Growth in Oman

Dr. M. Tamilselvan

Faculty of Accounting & Finance – Ibri College of Technology,
Sultanate of Oman

Dr. V. Manjula

Faculty of Accounting & Finance – Ibri College of Technology,
Sultanate of Oman

ABSTRACT

The incremental growth of GDP is very significant to all the nations in order to create adequate employment opportunities and implement various welfare and developmental schemes. Therefore, the priority of the government is to enhance the growth by enriching investment and allocating funds to various schemes. Among the various factors which determine the growth, public expenditure is one of the significant factors. In this direction, the current study has made an effort to identify the causal relationship between GDP and Public Expenditure in Oman using data for 42 years between 1974-2015. The data has been analyzed using Johansen Cointegration Test, Vector Error Correction Model and Wald test. The findings of the study revealed that there is unidirectional causality running from Public Expenditure towards GDP and supports the Keynesian (1936) approach which emphasize that the spend- revenue hypothesis.

Key Words: Johansen Cointegration Test – VECM – GDP – Public Expenditure

INTRODUCTION

The management of fiscal inequality is very crucial for any economy especially for developing economies like Oman. The government should be very vigilant in order to enhance the growth in productivity, employment and price stability through a well-designed fiscal policy. It can be well understood by testing the correlation and causal effect of spending and revenue of a country over a period to focus and formulate a well-balanced fiscal policy. The previous research works have contributed several hypotheses in the causation of these variables such as "the fiscal synchronization hypothesis," "the revenue-spend hypothesis," and "the spend-revenue hypothesis"¹ There are two different school of thoughts demonstrating the relationship between expenditure and growth like Wagner's theory (1883) and Keynesian theory (1936). The first is emphasizing revenue-spend hypothesis and the later is focusing on spend- revenue hypothesis².

REVIEW OF LITERATURE

Seema Narayan and Badri NarayanRath(2012) untangle the consumption driven evidence for sustaining the Wagner's law. **CosimoMagazzino(2012)** resulted the consistency of

¹ Ugo Fasano and Qing Wang(2002)Testing the Relationship Between Government Spending and Revenue: Evidence from GCC Countries, IMF Working Paper- WP/02/201-PP-3

² Muhlis Bağdigen and Hakan Çetintaş()Causality between Public Expenditure and Economic Growth: The Turkish Case - JEL Classification Codes: O40, H54.PP-3

Wagner's theory on long run spending and short run spending on dependent labor in Italy. **Michael Chletsos and Christos Kollias(2010)** evidenced that only the defense expenditure supported the Wagner's assumption in Greece. **Nurudeen and Abdullahi Usman(2010)** found that the government expenditure is not correlated to growth of Nigeria. **Oluwole Owoye(2010)** demonstrated that there is bidirectional underlying connection between government expenditure and tax revenue in G7 countries except Japan and Italy. **Shih-Ying Wu and Jenn-Hong Tang(2010)** originated that the government spending sustain Wagner's law and the hypothesis in 182 countries. **Paresh Kumar and Ingrid Nielsen(2008)** found the combined support for Wagner's law in Chinese provinces. **Hassan Mohammadi(2008)** confirmed a robust dependence on Wagner's model. **Louis Chih -hung Liu and Mustafa Z. Younis(2008)** found the reliability of the US federal expenditure with Keynesian's theory. **Ugo Fasano and Qing Wang(2006)** substantiated that government spending tracked hydrocarbon returns and , advocated a pro-cyclical disbursement strategy to deviation in oil proceeds. **Cesar Calderon and Linliu(2003)** confirmed that there is strong causative relationship between financial development and economic growth for 109 developing and industrial countries. **Michael Bleaney and Richard Kneller(2003)** validated that the fiscal policies are not making any consequences in the growth of OECD countries. **Ansari and Gordon(1997)** proved that the public expenditure is not determining the national income in Ghana, Kenya and South Africa. **Shantayanan Devarajan and Vinaya Swaroop(1996)** revealed that there is positive causation between current expenditure and growth where as the findings confirmed the negative correlation between capital expenditure on growth in forty three developing countries. **George Hondroyannis and Evangelia(1996)** showed that there is extensive correlation between outlay and growth. **Abu Chowdary(1991)** established that the defense expenditure and growth are not associated in fifty-five developing countries. **Ram and Rati(1986)** found that the growth of Greece is depending on the anticipated monetary growth. **Balvir Singh and Balbir S. Sahni (1984)** showed the joint dependence of the variables public expenditure and national income in India.

Statement of Problem

The review of literature suggests that the appropriate fiscal policy in different economic situation is significant to stabilize the inflation and enhance the productivity and employment. In this line, enormous researches have been conducted in various nations covering different time and adopting several stochastic econometric models. The research findings of the previous studies have revealed a combined results, as mentioned in the introduction, such as "the fiscal synchronization hypothesis," "the revenue-spend hypothesis," and "the spend-revenue hypothesis" The extensive understanding from the above mentioned reviews is revealing that the similar type of the study has not been exclusively conducted in Oman though a study was initiated by International Monetary Fund professionals considering the entire GCC in 2002. So, it is observed that the causality between spending and growth has not been tested since 2002. Therefore, it is felt that it is the apt time to undergo a research to test whether the relationship of public spending and growth of Oman is supporting Wagner's approach or Keynesian's approach by addressing recent changes in fiscal policy due to the oil price volatility.

Objectives of the Study

To review and understand the previous studies and its contribution to find the research gap for the current study.

To analyze the data using appropriate statistical models and interpret the results for hypothesis testing.

To draw a valid conclusion to recommend the policy makers to manage the fiscal imbalances by administering various types of spending in different economic situations.

RESEARCH METHODOLOGY

The data analysis in the present study uses secondary data Gross Domestic Production and Public Expenditure for 42 years from 1974 to 2015 in Oman that was sourced from <https://tradingeconomics.com/oman> website. The presence of spurious regression ensures the absence of the linear relationship between the time series variables Gross Domestic Production and Public Expenditure. Therefore this paper motivates to investigate the existence of long run association between the sample time series variables adopting Johansen cointegration and short run causality of Public Expenditure on GDP and GDP on Public Expenditure employing Vector Error Correction Model (VECM) and appropriate coefficient diagnostic test called wald statistics. The entire data analysis has been performed E-view -10 econometrics software in this study.

Johansen – Juselius Cointegration

$$X_t = \sum_{i=1}^{p-1} \alpha_i X_{t-i} + \beta \Delta X_{t-1} + \epsilon_t \quad (1.1)$$

Where X_t is the 2x1 vector (PE, GDP) respectively, Δ is a symbol of difference operator, ϵ_t is a 2x1 vector of residuals. The VECM model has information about the short and long run adjustment to changes in X_t via the estimated parameters α_i and β respectively. Here, the expression ΔX_{t-1} is the error correction term and can be factored in to two separate matrices α and β , such as $\beta \Delta X_{t-1} = \alpha \Delta X_{t-1}$, where α denotes the vector of cointegrating parameters while β is the vector of error correction coefficients measuring the speed of convergence to the long run steady state.

Vector Error Correction Model (VECM)

$$GDP_t = \sum_{i=1}^{p-1} \alpha_i GDP_{t-i} + \sum_{i=1}^{p-1} \beta_i PE_{t-i} + Z1 * EC1_{t-1} + \epsilon_{1t} \quad (1.2)$$

$$PE_t = \sum_{i=1}^{p-1} M_i GDP_{t-i} + \sum_{i=1}^{p-1} N_i PE_{t-i} + Z2 * EC2_{t-1} + \epsilon_{2t} \quad (1.3)$$

Where α_i , β_i , M_i and N_i are the short run coefficients, EC1 and EC2 are error correction terms, ϵ_{1t} and ϵ_{2t} are the residuals in the equation 1.2 and 1.3 respectively. The $EC1_{t-1}$ is the lagged value of the residuals derived from the cointegrating regression of GDP on PE (Equation 1.2) while $EC2_{t-1}$ is the lagged value of the residuals derived from the cointegrating regression of PE on GDP (Equation 1.3)

RESULTS AND DISCUSSION

Table:1 Estimates of Johansen Co - integration – Trace Statistics

Hypothesized No of CE(s)	Eigen Value	Trace Statistics	0.05 Critical Value	Prob**
None*	0.416669	21.90039	15.49471	0.0047
At Most 1	0.051527	1.957384	3.841466	0.1618
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
*MacKinnon-Haug-Michelis (1999) p-values				

Source: Data Analysis

Table:2 Estimates of Johansen Co - integration – Maximum Eigen Value

Hypothesized No of CE(s)	Eigen Value	Max Eigen Statistics	0.05 Critical Value	Prob**
None*	0.416669	19.94300	14.26460	0.0057
At Most 1	0.051527	1.957384	3.841466	0.1618
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
*MacKinnon-Haug-Michelis (1999) p-values				

Source: Data Analysis

Table:3 Least Square Estimates of Vector Error Correction Equations

$D(GDP) = C(1)*(GDP(-1) - 4.28573062315*PE(-1) - 1.47396788068) + C(2)*D(GDP(-1)) + C(3)*D(GDP(-2)) + C(4)*D(GDP(-3)) + C(5)*D(GDP(-4)) + C(6)*D(PE(-1)) + C(7)*D(PE(-2)) + C(8)*D(PE(-3)) + C(9)*D(PE(-4)) + C(10)$			$D(PE)=C(11)*(GDP(-1)-4.28573062315*PE(-1)-1.47396788068) + C(12)*D(GDP(-1)) + C(13)*D(GDP(-2)) + C(14)*D(GDP(-3)) + C(15)*D(GDP(-4))+C(16)*D(PE(-1))+C(17)*D(PE(-2))+C(18)*D(PE(-3)) + C(19)*D(PE(-4)) + C(20)$		
C(1)	GDP(-1) & PE(-1)	0.0022	C(11)	GDP(-1) & PE(-1)	0.0022
C(2)	D(GDP(-1))	0.2343	C(12)	D(GDP(-1))	0.0893
C(3)	D(GDP(-2))	0.0036	C(13)	D(GDP(-2))	0.0514
C(4)	D(GDP(-3))	0.2557	C(14)	D(GDP(-3))	0.2556
C(5)	D(GDP(-4))	0.3061	C(15)	D(GDP(-4))	0.3769
C(6)	D(PE(-1))	0.8793	C(16)	D(PE(-1))	0.3564
C(7)	D(PE(-2))	0.0077	C(17)	D(PE(-2))	0.0017
C(8)	D(PE(-3))	0.0479	C(18)	D(PE(-3))	0.2171
C(9)	D(PE(-4))	0.3388	C(19)	D(PE(-4))	0.9064

Source: Data Analysis

Table:4 Estimates of Wald Statistics – Equation (1)

Null Hypothesis: C(6) = C(7) = C(8) = C(9) = 0

Test Statistics	Value	df	Probability
F- Statistics	3.785107	(3.27)	0.0218
Chi-square	11.35532	3	0.0100

Source: Data Analysis

Table:5 Estimates of Wald Statistics – Equation (2)

Null Hypothesis: C(12) = C(13) = C(14) = C(15) = 0

Test Statistics	Value	df	Probability
F- Statistics	1.415784	(3.27)	0.2598
Chi-square	4.247352	3	0.2360

Source: Data Analysis

The Table:1 and 2 indicate the estimates of Johansen cointegration test. The calculated p-values 0.1618 and 0.1618 are more than 5% at at most 1 hypothesized no of cointegration equation. Hence the null hypothesis in both trace statistics and max-eigen statistics are not

rejected and it ensures the long run association between GDP and Public Expenditure in the study period. Table:3 portrays the vector error correction estimates. The VECM has been performed to test the causality of Public Expenditure and the lagged variables of Public Expenditure and GDP towards GDP and vice versa. The p-values C(1) and C(11) are the measure of causality in the long run. The estimated value is 0.002 which is lower than 5%, hence it is proved that there is long run causality between GDP and Public Expenditure. The p-values lagged GDP and Public Expenditure between C(2) to C(9) are the measure of causality towards GDP. The p-values lagged GDP and Public Expenditure between C(12) to C(19) are the measure of causality towards Public Expenditure. The results show that the short run causality towards GDP is ensured by only three lagged variables such as D(GDP(-2) p-value 0.0036, D(PE(-2) p-value 0.007 and D(PE(-3) p-value 0.0479 out of eight lagged variables since the p-values are less than 5%. On the other hand only one lagged variable D(PE(-2) p-value 0.0017 is having short run causal relationship towards Public Expenditure. The short run joint relationship between the lagged variables towards the dependent variables is measured using Wald test. The probability of chi-square are 0.0100 and 0.2360. It proves that all the lagged variables of Public Expenditure are having short run joint causal relationship towards GDP. In contrast, the lagged GDP variables are not having short run causal relationship towards Public Expenditure.

CONCLUSION

The study has investigated the long run and short run independent and joint causal relationship between GDP and Public Expenditure having adopted cointegration and Vector Error Correction Models. The Johansen cointegration result has proved that there is a long run association between GDP and Public Expenditure. The results of Vector Error Correction estimates found that there is a long run independent unidirectional causality runs from Public Expenditure towards GDP. Besides, the Wald test results also specify the unidirectional joint causality from Public Expenditure toward GDP in Oman. The study supports the Keynesian (1936) approach that Public Expenditure causes GDP in both long run and short run.

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