Causation Between Consumption, Export, Import, and Economic Growth of Oman

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Abstract
To examine the causation between consumption, export, import, and economic growth for the Sultanate of Oman using yearly time series data collected from the World Bank for 2000-2018. Further, it was tested by basic statistics, the Bound test with the ARDL model, and the Granger-causality tests. The findings of the Bound test analysis indicate the presence of both long-run and short-run associations among competing variables. The ARDL Model result reflects that imports have both short-run and long-run effects, supported by the Granger Causality tests by indicating the presence of unidirectional causality import to economic growth and import to consumption. The outcome of the study revealed that import is essential for economic growth as imports can absorb foreign technology in the domestic economy that can boost the export and further act as an engine of growth.

Keywords:
Consumption, export, import, economic growth, ARDL model

INTRODUCTION

In the 80s and 90s, the theory of economic growth found a new landmark known as "new growth theories" or "endogenous growth theories." These theories advocated human capital and technological progress as the primary factor for economic growth; they also took technological progress as an endogenous factor, i.e., generated by the internal causes of the economy (Romer, 1989; 1990). Paul Romer, Robert Lucas, J. Grossman, E. Helpman, P. Aghion, and P. Howitt are the main contributors to these theories.

In the light of the above background, economic growth is regarded as one of the primary long-term apprehensions of policymakers and macroeconomists (Chokri & Bouchrika 2018). The nexus between consumption, export, import, and economic growth measured in the gross domestic product (GDP) takes a central place in the literature on economic development and becomes a question of significant concern for policymakers, government planners, and some extent, academicians and economist. Gross domestic product is a chief aspect that regulates the import for a country, and GDP growth is solidly linked with import growth, mainly machinery, fuel, oil, and food items (Islam et al., 2012). Similarly, vigorous economic growth is a vital goal for developing nations to enhance happiness and well-being. Attaining firm and continued economic growth is a significant challenge in developing nations (Pradhan et al., 2015). The relevance of economic growth arises from the fact that the nation's populace is snowballing, and consequently, a convinced GDP growth must attain to guarantee an acceptable way of life. The theoretical and empirical investigation provides conflict views like the relationship between these entire variables or, particularly, export and GDP or between Import and GDP Ample literature suggests that the relationship between export, import, and economic growth as GDP can be categorized into two broad types of approaches viz. 1) Cross-country studies explore the nexus between export, Import, and GDP on a single country 2) Cross-sectional studies investigate the nexus among export, Import, and GDP on various countries simultaneously (Alaoui 2015).

A plethora of studies conducted on macroeconomic factors that determine economic growth prove to be viable (Fischer, 1993; Barro, 1997; Alper, 2018; Antwi et al., 2013; Mbulawa, 2015; Altaee et al., 2016; Kryeziu, 2016; Okunnu et al., 2017; Oshodi, 2018; Sharma et al., 2018; Chowdhury et al. 2019; Abalon, & Fredrick, 2020). Based on up-to-date works, three favorable factors have been chosen for further research in Oman to discover the connections between the dependent variable GDP and independent variables, i.e., final consumption expenditure, export, and import. Although many research works explore the relationships among these variables and economic growth individually, this study has taken three essential variables to evaluate its impact on Oman's economy. Moreover, even with the large share of literature, a tiny amount or no specific study is available exclusively for Oman (Al-Mawali et al., 2016). The present research will be an initial step to look into Oman's economy.

Hence, enormous theoretical and empirical literature shows the relationship between Export, Import, and Economic growth. Ramos (2001) examined the Granger-causality

and could not identify any causation among Portugal's export, import, and economic development. Din, M. (2004) examined the export-led-growth hypothesis for the five most prominent South Asian economies using a multivariate time-series framework. They indicated dual causation among export and output growth in Bangladesh, India, and Sri Lanka for the short-run, and the existence of a long-run association between export, import, and output for Bangladesh and Pakistan, further depicts no long-run association among the variables for India, Nepal, and Sri Lanka. Afzal (2006) investigated the causation among economic growth, export, and its various categories, import, and world income. He found a stable and robust connection between GDP and export and dual causation running from manufactured export and GDP. Awokuse (2007) studied the impact of export and import on economic growth in three transition economies. They discovered dual causation among export and growth in Bulgaria and from import and export to economic growth in the Czech Republic and one-way causation among import and growth in Poland.

Elbeydi et al. (2010) indicated that income, exports, relative prices are co-integrated, and the long-run dual causation exists among export and income growth. Zambe & Constant (2010) examined the connection between export, import, exchange rate, and economic growth for Cote d'Ivoire and suggested a dual connection between export and economic growth. Hye and Siddiqui (2011) used the ARDL and rolling regression method to investigate the association between export, trade terms, and economic growth. They suggested that export enhance economic growth and, on the other hand, trade impede economic growth. It is necessary to promote export to improve the terms of trade. Sato and Fukushige (2011) constructed a short-run vector auto-regression model to investigate the causation among variables like economic growth, export, and import and disclosed that export-led growth is not viable for the economy of North Korea. Hye and Boubaker (2011) examined export-led growth, import-led growth, and foreign deficit sustainability assumptions and disclosed the one-way causality running from export to economic growth and the dual affiliation between import and economic growth. Hence, their findings validate export-led growths, import-led growth, and the foreign deficit are weakly sustainable for Tunisia.

Jirankul (2012) used bound test co-integration to investigate the link between manufacturing export and importing capital goods in Thailand. His result showed a robust long-run association between importing capital goods and the growth rate of manufacturing export. Thus, a decline in the import of capital goods will reduce manufacturing exports and impede economic growth. Hye (2012) used the ARDL approach to investigate the export-led growth, growth-led export, import-led growth, growth-led import, and foreign deficit sustainability assumption for China. His outcomes confirmed the dual long-run affiliation between economic growth and export, economic growth and Import, and export and Import. He concluded that the export-led growth, growth-led export, import-led growth, and growth-led import hypothesis are valid and foreign deficit is sustainable for China.

Abugamea (2015) discovered both long-run and short-run connections between economic growth, export, and import. His findings confirmed the presence of long-run

connections between imports and economic growth. Also, disclose that both export and import are the main determinants of economic growth for Palestine. Causality tests confirm VECM outcomes that import granger causes economic growth in the long run, but not in the short run. Alaoui (2015) performed the co-integration test on Export, Import, and economic growth developed a long-run and short-run bond among the variables. The Granger causality test confirmed the existence of the long-run bond among these variables. The short-run causality indicates dual causation among economic growth and import, one-way causation running from export to import, and no causality among economic growth and export. Saaed and Hussain (2015) disclosed one-way causation among export and import, similarly among export and economic growth. Kalaitzi and Cleeve (2017) revealed a long-run relationship between exports and economic growth. He also discovered the dual causation between export and economic growth in the short-run and long-run. Further, he disclosed that economic growth causes export. Bakari and Krit (2017) discovered one-way causation among imports and economic growth and could not have any causal relation between export and GDP.

Fannoun and Islam (2019) exposed the long-run dual causality among export, import, and economic growth in Palestine. The short-run outcomes supported export-led import and import-led export hypotheses. Impulse response functions suggested that a positive shock to one variable in the system generates responses in the other variables in the same direction. Rani and Kumar (2019) investigated the long-run association and direction of causation among economic growth, trade openness, and gross capital formation in BRICS nations. The ARDL bound test outcomes indicated the presence of a long-run association among variables. Granger causality results revealed a one-way causal effect flowing from trade openness to economic growth in India, and that for Brazil supports the trade-led growth hypothesis. At the same time, dual causation was found between trade openness and economic growth in China, supporting the feedback hypothesis. They found a unidirectional causality in South Africa moving from economic growth to trade openness, thus validating the growth-led trade hypothesis.

This study aims to produce reliable outcomes that enrich our understanding of the causal affiliation among variables and its impression on the economic growth of the Sultanate of Oman through an econometric analysis based on a general macroeconomic model outline with both long-term and short-term influence. Specifically, we adopt the ARDL Bound Test to scrutinize our foremost objective: to dynamically interact for the short-run and long-run associations among the competing variables. The second objective is to examine the direction of causation among the competing variables.

METHODS

This study applied the autoregressive distributed lag (ARDL) model and vector error correction model (VECM) to investigate long-run and short-run causal associations among competing variables like consumption, export, import, and economic growth Sultanate of Oman using yearly data from 2000-2018. The data set consists of samples

for GDP (constant 2010 US$) as a proxy to economic growth indicator, consumption (constant 2010 US$), exports of goods and services (BOP, current US$), and imports of goods and services (BOP, current US$). All data set are taken from World Development Indicators 2019.

Figure 1. Depicts the Data Set *Source; Authors own calculation*
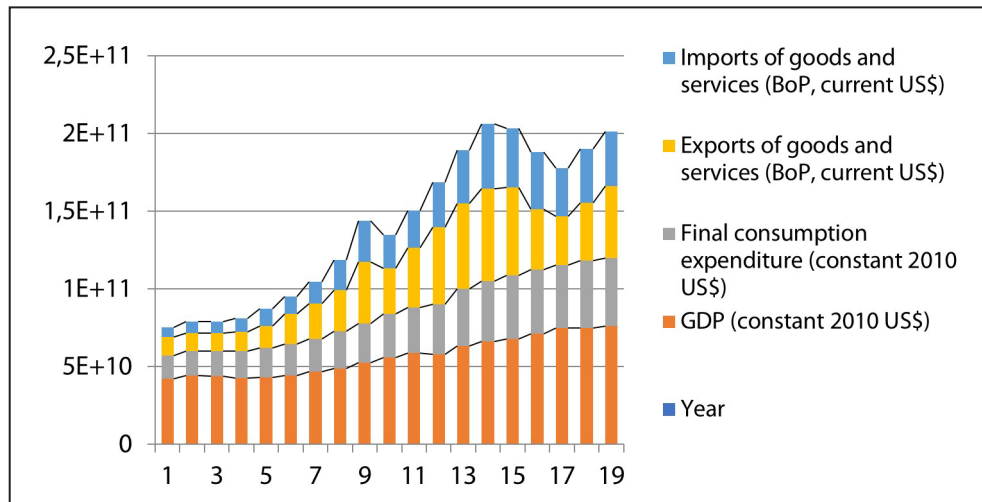
Early empirical formulations tried to capture the causal link between economic growths, export, and import (Balassa 1988, Din 2004, Afzal 2006, Saad 2012, Güngör and Bernard 2014 and Bakari and Krit 2017. However, our model will go beyond these approaches by adding variable consumption along with export and import, and the model can be expressed along with an assumption of ceteris paribus:

$GDP_t = f\ (Consumption,\ Export,\ Import)$ (1)

All the variables are used in a real term and transformed into a logarithmic function:

$$LY_t = \log\ (Y_t).$$

The log-linear econometric format can be express as:

$\log\ (GDP)_t = \beta_0 + \beta_1 \log\ (Consumption)_t + \beta_2 \log\ (Export)_t + \beta_3 \log\ (Import)_t + \varepsilon_t$ (2)

Where, β_0: constant term, β_1: coefficient of a variable (consumption), β_2: coefficient of variables (export), β_3: coefficient of a variable (Import), t: The time trend and ε_t: The random error term assumed to be normal, identically and independently distributed.

The ARDL model with (p, q) can be express as:

$LNM_t = \gamma_{0i} + \sum_{i=1}^{p} \delta\ LNM_{t-1} + \sum_{i=0}^{q} a_1 LNC_{t-1} + \sum_{i=0}^{q} a_2 LNE_{t-1} + \sum_{i=0}^{q} a_3 LNG_{t-1} + \varepsilon_{it}$ (3)

Where LNM_t is a vector, and the independent variables are allowed to be purely I (0) or I(1) or co-integrated; a and γ are coefficients; γ is constant; i =1,...k; p, q are optimal lag orders; ε_{it} is a vector of the error terms- unobservable zero-mean white noise vector process. P lags used for the dependent variable, and q lags used for independent variables.

RESULT AND DISCUSSION

Table 1 depicts the descriptive statistic of the data where economic growth has the mean value of 24.74 and the maximum and minimum are 25.06 and 24.47; similarly, the value for the consumption is 24.5 as maximum and 23.42 as a minimum value having a mean value of 24.02. Likewise, the export had a maximum value of 24.81 and 23.18 as the minimum value having a mean value of 24.05. Moreover, the import had a maximum of 24.46 and 22.57 as minimum value having a mean value of 23.69. Most importantly, the data is normally distributed as Jarque-bera, and its Probability is above the significance level.

Table 1. Descriptive statistic & Correlation

	Mean	Median	Maximum	Minimum	Std. Dev.	Jarque-Bera	Probability
LNG	24.74	24.75	25.06	24.47	0.22	1.85	0.4
LNC	24.02	24.05	24.5	23.42	0.38	1.74	0.42
LNE	24.05	24.16	24.81	23.18	0.58	1.73	0.42
LNM	23.69	23.91	24.46	22.57	0.65	2.08	0.35
Pairwise Correlation							
LNG	1						
LNC	0.98	1					
LNE	0.83	0.91	1				
LNM	0.91	0.97	0.97	1			

The correlation test predicts the association among the two variables, and correlation outcomes show that the entire variable is positive and strongly correlated. As our dependent variable gross domestic product and the independent variable consumption have a correlation coefficient equal to (0.98), we can predict that if 1% increases in consumption increase the 0.98% of Oman's gross domestic product. Likewise, export is also an independent variable to a gross domestic product whose correlation coefficient is (0.83) suggest that if 1% increases in export will increase by 0.83% of Oman's gross domestic product. Another independent variable is Import; whose correlation coefficient is (0.91) suggest that if 1% increases in import will increase 0.91% of Oman's gross domestic product.

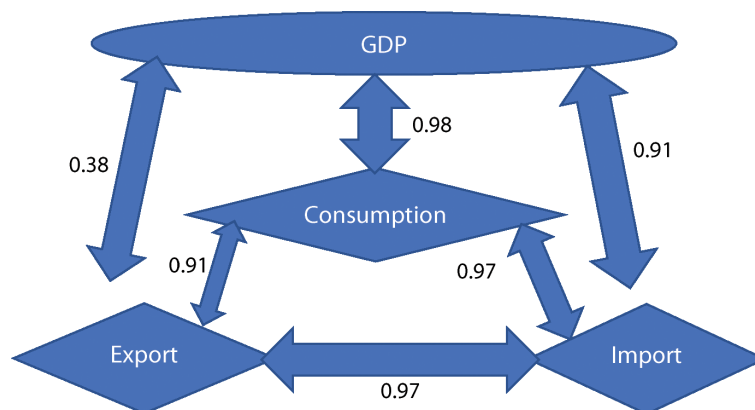**Figure 2. Calculation of Correlation**

Figure 2 depicts the relations between consumption, export, and import of Oman. The 1% increase in consumption will increase by 0.97% of imports and 0.91% of export, suggesting that Oman people prefer the imported product compared to the domestic product. However, export and imports are strongly correlated with a coefficient of 0.97.

Table 2. Unit Root Test

Dependent		ADF.		Phillips-Perron	
Variable		t-statistic	Prob.	Adj. t-stat.	Prob.
LNG.	Level	0.301	0.971	0.228	0.967
	1st difference	-3.163	0.0406**	-3.163	0.0406**
LNC.	Level	-1.378	0.569	-1.285	0.613
	1st difference	-3.100	0.0458**	-3.165	0.0405**
LNE	Level	-1.268	0.621	-1.277	0.616
	1st difference	-3.405	0.0257**	-3.405	0.0257**
LNI.	Level	-1.730	0.400	-1.888	0.330
	1st difference	-3.497	0.0215**	-3.250	0.021

** represents 5% significance level source; Authors computation on E-views

The unit root test was conducted to check the presence of stationarity using the Augmentin Dicky Fuller test (ADF) and Phillips Perron (PP) test. The aim is to depict that the series becomes stationary at what difference. As shown in table 2, all the variables became stationary at first order, i.e. I (1), and the lag length criterion is 1 for the entire ARDL (p, q_1, q_2) model.

Table 3. ARDL (p, q_1, q_2) F- Bounds Test

Dependent Variable	Test Statistic	Value	Significance	Lower Bound I(0)	Upper Bound I(1)	Decision
	F-Statistics	9.40588	10%	2.72	3.77	
	K	3	5%	3.23	4.35	
			2.50%	3.69	4.89	
			1%	4.29	5.61	
LNI			10%	-2.57	-3.46	ECM
	t-Statistics	-4.4874	5%	-2.86	-3.78	
			2.50%	-3.13	-4.05	
			1%	-3.43	-4.37	

Table 3 represents the ARDL bound test based on F-statistics and t-statistics. This table represents the bound test used on an individual variable to check its significance. The bound test indicates both long-run and short-run for the variable in log form of import for the study.

Table 4a. short run ARDL model equations derived from analysis

Dependent	Equations
LNM	-3.025142 - 0.507414*LNG + 1.124*LNC + 0.5395*LNE

**depicts significance at 10% level

Table 4a depicts the short-run model equation derived from the econometric model, where the import is the dependent variable. It has the long-run equilibrium adjustment at a speed of 3.03 per cent and also harmed the economic growth meaning that a percentage increase of imports leads to a decrease of economic growth by 0.5 percentile of Oman economic growth. As well as, the consumption will increase by 1.124 per cent not only the consumption; it will also boost the export by increasing its percentile by 0.54.

Table 4b. Long-run ECM equations retrieved from analysis

Dependent	Equations
LNM	-3.025142 - 0.507414*LNG + 1.124*LNC + 0.5395*LNE - 0.817538

depicts significance at 10% level, Author's computation on E-views 10

Table 5a is the cumulative representation of the findings of Tables 3 and 4 based on the t-statistics and Wald F- test to check the significance of the tested variables. For the import and export, both t-statistics and Wald F-test are significant, export is significant, and consumption is significant at 10 per cent level.

Table 5a. Summary of Short Run ARDL Model

Dependent	t-Statistics	Wald F Test
LNM	*LNE Significant*	*LNE Significant*
	*LNC**Significant*	

Significant at 10% level Source; Author's compilation

Table 5b is the collective representation of the findings of the results based on the Regressors t-statistics, Error correction term t-statistic and Pairwise Granger Causality test to check the significance of the tested variables. For the import, export is significant to both t-statistics and consumption is only significant at 10 per cent to Regressors t-statistics, and import granger causes to both economic growth and consumption.

Table 5b. Summary of Long Run ECM Model

| Dependent	Regressors t-Statistics	ECT t-Statistics	Pairwise Granger Causality Test
LNM	LNE Significant, LNC** Significant	LNE Significant	LNM Granger Causes LNG, LNM Granger Causes LNC

** Significant at 10% level

Table 6 represents the diagnostic test results that revealed the Homoskedasticity model with no serial correlation based on the heteroskedasticity Test: Breusch-Pagan-Godfrey and Breusch-Godfrey Serial Correlation LM Test. Finally, in Figure 4, we can depict our model's robustness and suggest that our model is stable as CUSUM and CUSUM Square are significant at a 5% level.

Table 6. Summary of Diagnostic Test

Dependent variable	Heteroskedasticity Test: Breusch-Pagan-Godfrey				
	F-Statistic	1.05311	Prob. F (4,13)	0.4179	Conclusion
	Obs*R-squared	4.40518	Prob. Chi-Square(4)	0.3539	Homoskedasticity
	Scaled explained SS	2.25979	Prob. Chi-Square(4)	0.6881	
	Breusch-Godfrey Serial Correlation LM Test				
	F-Statistic	0.290705	Prob. F(1,12)	0.5996	Conclusion
	Obs*R-squared	0.425744	Prob. Chi-Square (1)	0.5141	No Serial Correlation

The analysis results indicate that there is a unidirectional causal effect from imports to consumption. Also, a unidirectional causal effect from import to economic growth as supported by the Rahman & Shahbaz (2013), Bakari S (2007), and Bakari & Krit (2017) findings, but not with export although it was well evident that import will lead to promoting the export as import can absorb foreign technology in the domestic economy; this increases the availability of intermediate goods and inputs. This condition includes machinery, human capital, skilled labor, and equipment, which, in general, can increase productivity in Oman's economy. Finally, we can conclude that our model proves to be statistically significant, and Oman's economy's main factor is import that will boost the export capacity of Oman, which in turn will lead to the growth of its economy.

Figure 3. Stability Test for LNM dependent variable
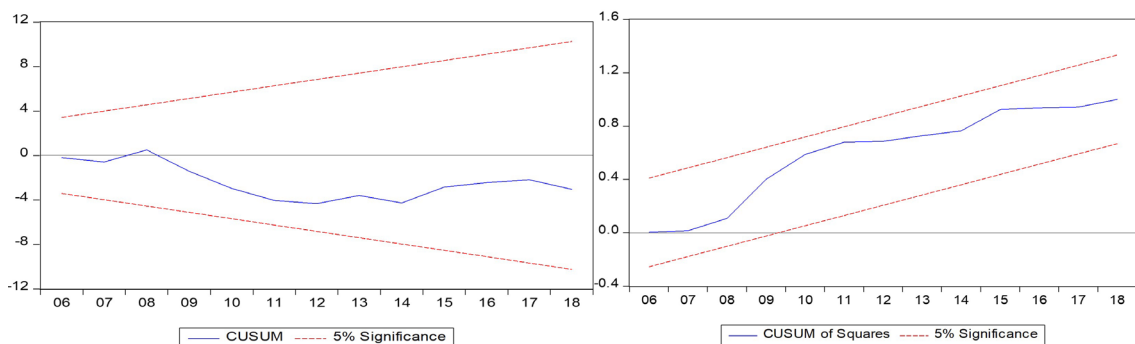
CONCLUSION

Our study relies on a two-fold investigation method. Firstly, it investigates the relationship between consumption, export, import, and economic growth for the Sultanate of Oman; secondly, if such a relationship exhibits tried to investigate the model's causality

direction. The correlation test showed that all the variables were positively correlated, and the variables became stationary at the first difference, having a one lag length criterion. The ARDL bound test indicates the presence of both long and short-run equilibrium for import as dependent and other variables as an independent. The short-run ARDL and ECM model indicates that export is significant at 5% and consumption at 10%. ECM also revealed that exports are significant. Hence, it provides an idea that it has a robust causal effect between imports and exports and imports and consumption. To further strengthen our finding, we used the pairwise Granger causality test that indicates the direction of their causal effect among variables.

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