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The Stimulus of Export and Import Performance on Economic Growth in Oman

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ABSTRACT

Purpose: To investigate the stimulus of export, import, on economic growth in Oman. *Methodology:* Yearly data for the periods 1974-2018 were used for testing basic statistics, ADF stationary test, co-integration analysis followed by VAR Model, the Granger causality tests, IRF, variance decomposition test followed with basic diagnostic test. *Approach:* Outcome of ADF analysis shows that economic growth, export, and import become stationary at first difference level. *Johansen co-integration analysis indicates short-run affiliation among the three parameters. Findings:* Vector auto regressive Model reflects that export has a negative stimulus on economic growth. Though, an import has a positive stimulus on economic growth. Granger causality tests indicate unidirectional causality with both export and import to economic growth. Also, the outcome of the Granger Causality tests indicates that there is unidirectional causality between export and import. Impulse response function revealed a positive shock by both export and import on economic growth in the future. The study emphasizes policymakers' and its reformist role in promoting the stimulus of import, export that influences the level of economic progress of the Sultanate of Oman.

INTRODUCTION

The connection among export and import and its impression on the country's economic progress is the topic of keen interest for economists, policymakers and to some extent for academicians. Economic growth is considered to be the best degree of a country's well-being or economic welfare. Export and import can show a significant role in economic development for both advanced countries and underdeveloped nations. The association among import, export and economic progress is the most occurring theme of the debate, where the economist tries to illuminate the different levels of economic advance-

ment among nations. The economic well-being of any nation can be appraised through its goods and services produced within its territory and this can be termed as Gross Domestic Product (GDP). Hence, the GDP of any nations can be revealed as:

$$GDP = C + I + G + (NX)$$

Where, {C} can be denotes consumption, {I} can be denotes investment, {G} as expenditure, {NX} as net exports (i.e. export minus imports). The present study tried to investigate the causation together on export and import and its stimulus on economic progress (i.e. GDP) on the Sultanate of Oman and while, keeping the Consumption, Investment, and Government spending presumed to be constant i.e. *ceteris paribus*.

Economists incline to study the fluctuations in economic development by interpreting the connexion amongst exports and imports on economic growth. Henceforth, the connection among them plays a crucial role in the expansion of economic development. Thus, it's a question of key concern for economists, government planners, and policymakers. The reason behind this is that the foremost aim of virtually every country's economist is to escalate its country's GDP, which ultimately leads to better well-being for its natives. The objective of this study is to create an econometrical model that investigates the link among export, import and economic growth on the Sultanate of Oman. Specifically, we aim to empirically explore a response to the following postulates:

- i. To examine export influence on economic growth.
- ii. To evaluate the impact of import on economic growth.
- iii. To identify that economic growth leads to both export and import.
- iv. To assess the causal link among export and import.

1. REVIEW OF THE LITERATURE

Economists, academics, and policymakers have done a deep study on tracking the association among these parameters. There are dual views on the outcome of the relation amid import, export and economic growth as per empirical literature. These thoughts can be categorized as: Firstly, the prevailing pragmatic research tried to individually inspect the significance of export or import on economic growth; next in line, the pragmatic research studies the connection among export and import collectively on economic growth. Concerning approaches familiar with establishing the importance of export or import on economic growth, had duet key methodologies; Basic is simple or multiple regressions, whereas secondary employs the cause and effect method.

Many scholars have tried to scrutinize whether exports and economic development are interconnected and determined the directions of their actions. The pragmatic study, centered on the export-led economic growth hypothesis, has delivered varied results in dual causation by Granger causality. With the help of VAR models, the long and short-run comparisons were also assessed. Ullah et al. (2009) reveal that export extension leads to economic growth. Abu al-Foul (2006) found unidirectional causation from export to output. Demirhan and Akcay (2005) export lead to economic progress in Morocco and Jordan. Awokuse (2005) observed a realistic sign of causation based on duet attitudes which designates that the causative relation amid real exports and real GDP growth is two-way. Further, causes of growth are also established to be noteworthy. Mah (2005) found long-run two-way causality amid real GDP and export growth in China. Vohra (2001) indicate export have a notable and strong influence on economic progress.

Kim and Lin (2009) investigated the influence of export composition on economic progress which displayed that some exports contribute equitably to economic progress. Specifically, underdeveloped nations rely on their primary product exports, tentative to unnecessary price variations. Therefore, this class of exports had an insignificant impression on economic progress, whereas industrial exports had a noteworthy and strong influence on economic progress. Kalaitzi (2013) studied the affiliation between exports and economic growth and firmly embedded the presence of a long-run bond among industrial export, prime export, and economic progress. Also, the Granger causality test exhibited one-way causation among industrial export and economic progress. Therefore, diversification of export from oil to manu-

facturing could quicken economic expansion in the UAE. Hussain (2014) found one-way causation among export and import. Though, the connection amongst both export and import on economic progress were not remarkable. Sachin (2015) probed the affiliation among export, import and economic growth in India. He found a long run co-integrating link among GDP, Export, and Import. Granger causality tests revealed a one-way cause and effect from GDP to export, and no causality relation with GDP and import. Finally, export leads to import but import does not lead to export, hence one-way causation from export leads to import.

Numerous analyses also used causatives for multiple parameters between exports, economic progress, and a third important macroeconomic parameter such as import, external debt, external debt servicing, income, etc. Amoateng and Amoako-adu (1996) inspected the causation among export, external debt and economic progress in African nations, he revealed dual causatives among external debt, economic progress, and export. Baharumshah and Rashid (1999) explored the long-run causality among export, GDP, and imports of the Malaysian economy. Shirazi and Manap (2004) established a strong long-run connection among the three parameters. Eita and Jordaan (2007) evaluated the Granger causality between export, GDP and per capita income in Namibia, and suggested export-led growth hypothesis. Ahmed et al. (2000) scrutinized the cause and effect among export, external debt, and economic growth. They concluded that there is no united response out of them. Awokuse (2007) examined the impression of export and import on economic progress in trio conversion economies and established a dual causative bond among export and economic progress in Bulgaria while causation flows from import and export to economic progress in the Czech Republic and lastly, Poland had one-way causation among import and economic progress.

Al-Sawaee (2008) instituted a positive outcome on productivity of export on economic growth in oil-producing nations and had an adverse effect in the non-oil producing nations. He recommended the embracing strategy of export-oriented in order to take the help of comparative advantage. Elbeydi (2010) showed that the income, export and relative expenses are interconnected and had long run two-way causes and effects amongst the exports and income progression. He also specified that the export elevation strategy pays to the economic development in Libya. Tang et al. (2015) re-investigated the export-led growth postulate for four Asian Tigers. They tested MWALD causation for bivariate model and advocated dual causation among exports and GDP for Hong Kong and Singapore, whereas, one-way causation from GDP to exports for South Korea and Taiwan. However, the trivariate model revealed dual causation occurs for all economies. Additionally, they found that all the four economies are unstable for the export-led growth hypothesis. Afaf (2015) explained that export, import and GDP are found to be integrated of I (1) level, the co-integration test confirmed that GDP, export, and import are co-integrated and the presence of a long-run association among all the parameters. Abugamea (2015) revealed that the co-integration test indicated vector error correction models (VECM) and the presence of a long-run link among imports and economic progress and also found that export and import are the key components of economic progress in the Palestinian. Further, causation tests confirm VECM results that import granger causes economic growth in the long run but not in the short run. El-Alaoui (2015) found both long-run, short-run causes and effects among export, import, and economic growth. Hussain and Saaed (2015) suggested one-way causes and effects among export and import and between export and economic growth. Kalaitzi and Cleeve (2017) explored the causation amid export and economic growth in the UAE. The co-integration test exposed the presence of a long-run bond among parameters. Also, evidence in support shows a dual causal association between export and economic growth in the short-run however, economic growth causes export in the long- run. Bakari (2017) found the co-integration among the parameters in Mauritania. Vector Error Correction Model (VECM) reflected that export had an optimistic outcome on economic growth. Nevertheless, import had an undesirable consequence on economic development. Granger causality test indicated one-way causes and effects among import and economic growth and established no causativeness among export and GDP. Guntukula (2018) revealed that dual causation was running among export and economic progress as well as import and economic progress. And, confirmed that export-led growth and growth-led export hypothesis. Lastly, he suggested that both growth and export promotion strategy are to be followed regularly with pressure on sustainable and inclusive economic growth.

Islam and Zahra (2019) Co-integration test indicated a long-run equilibrium link among export, import, and economic growth. They estimated error correction approach which suggested long-run dual causation between export, import and economic progress in Palestine. They indicated a solid bond among export and economic growth and thus policymakers should motivate Palestinian companies to enter the international markets for economic progress. Contrarily, short-run outcomes provided a sign to support export-led import and import-led export hypotheses. Impulse response function suggested that, an optimistic shock to one variable in the system generated responses in another variable in the same direction.

In conclusive, many of the scholars have addressed co-integration, VAR and VEC model approaches to investigate the stimulus among these parameters. Our review of literature is limited to such studies that focus on causality having a stimulus impact of export, import on the economic growth of the Sultanate of Oman.

2. DATA, METHODOLOGY & MODEL SPECIFICATION

Yearly data from 1974-2018 collected from World Bank, having 45 samples which should be adequate to capture both run (short and long) causation among the parameters in the model. The data file contains monitored for GDP (constant 2010 US\$) as economic growth indicator, export (in terms of goods and services i.e. BOP, current US\$), and import (in terms of goods and services i.e. BOP, current US\$). Initial pragmatic interpretations tried to record the causative link among export, import and economic growth (Balassa, 1988; Din, 2004; Afzal, 2006; Saad, 2012; Abbas, 2012; G ng r, 2014; and Bakari, 2017); our model can be expressed as having ceteris paribus:

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

All the parameters are used in a real term and converted into a logarithmic function:

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

This can also be constituted in a log-linear econometric structure as:

$$\log(GDP)_t = \beta_0 + \beta_1 \log(Exports)_t + \beta_2 \log(Imports)_t + \varepsilon_t \quad (2)$$

where, β_0 : constant term, β_1 : coefficient of a variable (exports), β_2 : coefficient of variables (imports), t : The time trend and ε_t : Presumed that the random error term to be normally, uniformly and autonomously distributed.

The Long-run model can be expressed as:

$$LNG_t = a_0 + a_1 LNE_t + a_2 LNI_t + \varepsilon_t$$

In short run our model can be expressed as:

$$\begin{aligned} \ln g_t &= a + \sum_{i=1}^k \beta_i \ln g_{t-i} + \sum_{j=1}^k \phi_j \ln e_{t-j} + \sum_{m=1}^k \delta_m \ln im_{t-m} + u_{1t} \\ \ln e_t &= \sigma + \sum_{i=1}^k \beta_i \ln g_{t-i} + \sum_{j=1}^k \phi_j \ln e_{t-j} + \sum_{m=1}^k \delta_m \ln im_{t-m} + u_{2t} \\ \ln im_t &= \vartheta + \sum_{i=1}^k \beta_i \ln g_{t-i} + \sum_{j=1}^k \phi_j \ln e_{t-j} + \sum_{m=1}^k \delta_m \ln im_{t-m} + u_{3t} \end{aligned}$$

3. EMPIRICAL ANALYSIS

The test of correlation shows a strong association among parameters. It is found that the dependent variable gross domestic product (LNG) and the autonomous variable export (LNE) are strongly corre-

lated with a correlation coefficient equal to (0.91791). Therefore, an increase in export by 1%, gross domestic product (GDP) increases by 0.92%. Another independent variable which is import (LNIM) is also strongly correlated with a correlation coefficient equal to (0.9392). On the other hand, an increase in import by 1% raises the gross domestic product (GDP) by 0.94%.

Table 1. Descriptive and correlation matrix

	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob	LNG	LNE	LNI
LNG	24.16	24.33	25.06	22.68	0.66	-0.61	2.33	3.6	0.17	1		
LNE	22.9	22.53	24.81	20.92	1.14	0.17	1.93	2.35	0.31	0.92	1	
LNI	22.59	22.44	24.46	20.3	1.14	0.12	2.04	1.83	0.4	0.94	0.99	1

Source Author's Computation

Table 2. Unit Root Test

		ADF		Phillips-Perron	
		t-statistic	Prob.	Adj. t-stat.	Prob.
LNG	Level	-3.636	0.0088*	-3.4197	0.0155**
	1st Difference	-4.5996	0.0006*	-4.5851	0.0000*
LNE	Level	-1.0218	0.7373	-0.9994	0.7454
	1st Difference	-6.474	0.0000*	6.5132	0.0000*
LNI	Level	-1.5147	0.517	-1.4687	0.5399
	1st Difference	-5.7993	0.0000*	-5.8018	0.0000*

*,** represents 1% and 5% significance level

Source; Authors computation on E-views

Table 2 indicates that some time series become stationary at level and first-order difference means that by accepting the alternate hypothesis i.e. the series has no unit root, so now we can proceed further for the other relevant tests. Before estimating our model, we have to estimate the VAR lag order selection criteria by using symmetric lags; the same lag length is used for all parameters in the model. This lag length is frequently selected using a clear statistical criterion such as the AIC, SC, HQ, LR, and FPE.

Table 3. VAR Lag order selection criterion

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-43.7995	NA	0.00177	2.1767	2.299	2.222
1	121.6098	300.0447*	1.23e-06*	-5.098*	-4.607*	-4.917*
2	127.3244	9.569	1.44E-06	-4.945	-4.085	-4.628
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final predicted error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source; Authors computation on E-views 10

Table 3 reveals that the VAR lag 1 criterion must be chosen as LR, FPE, AIC, SC, HQ and HQ statistics. Therefore, the lag of 1 is used further for estimation purposes.

Table 4a. Johansen Co-integration Test for GDP as a dependent variable

Eigenvalue		Trace Statistics	0.05 Critical Value	Prob.*	Max-Eigen Statistics	0.05 Critical Value	Prob.*	Inference
None	0.313693	23.15116	29.79707	0.2387	16.1865	21.13162	0.2142	VAR Model
At most 1	0.123381	6.964663	15.49471	0.5818	5.662341	14.2646	0.6568	
At most 2	0.029833	1.302322	3.841466	0.2538	1.302322	3.841466	2538	
LNGDP		LNEX			LNIM			
1		11.2516			-11.826			
		(2.687)			(2.74682)			

Source; Authors Own Calculations, Eviews 10

Co-integration test result indicates no co-integrating equation at the 0.05 level, and provides the presence of short-run equality between GDP, export and import, which can be expressed as:

$$lngdp = -11.25157(lnex) + 11.8262(lnim)$$



Source; Author's calculations, Eviews 10

According to the above short-run equation, an increase of 1% in exports leads to a decrease of 11.25157% of GDP ceteris paribus. On the other hand, a 1% increase in imports leads to an increase of 11.8262% of GDP in the short-run ceteris paribus.

Table 4b. Johansen Co-integration Test for LNEX as a dependent variable

Eigenvalue		Trace Statistics	0.05 Critical Value	Prob.*	Max-Eigen Statistics	0.05 Critical Value	Prob.*	Inference
None	0.313693	23.15116	29.79707	0.2387	16.1865	21.13162	0.2142	VAR Model
At most 1	0.123381	6.964663	15.49471	0.5818	5.662341	14.2646	0.6568	
At most 2	0.029833	1.302322	3.841466	0.2538	1.302322	3.841466	2538	
LNEX		LNIM			LNGDP			
1		-1.051071			0.088877			
		(0.07757)			(0.14284)			

Source; Authors Own Calculations, Eviews 10

Co-integration test result indicates no co-integrating equation at the 0.05 level, and provides the existence of short-run equation between import, export and GDP, which can be expressed as:

$$lnex = -1.051071(lnim) + 0.088877(lngdp)$$



Source: Authors own calculations, Eviews 10

According to the above short-run equation, a 1% increase in imports leads to a decrease of 1.051071% of export ceteris paribus. On the other hand, a 1% increases in GDP leads to an increase of 0.088877% of GDP in the short-run ceteris paribus.

Table 4c. Johansen Co-integration Test for LNIM as a dependent variable

	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.*	Max-Eigen Statistics	0.05 Critical Value	Prob.*	Inference
None	0.313693	23.15116	29.79707	0.2387	16.1865	21.13162	0.2142	VAR Model
At most 1	0.123381	6.964663	15.49471	0.5818	5.662341	14.2646	0.6568	
At most 2	0.029833	1.302322	3.841466	0.2538	1.302322	3.841466	2538	
LNIM		LNGDP		LNEX				
1		-0.084558		-0.951410				
		(0.12596)		(0.06692)				

Source; Authors Own Calculations, Eviews 10

Co-integration test result indicates no co-integrating equation at the 0.05 level, and provides the existence of short-run equation between import, GDP and export, which can be expressed as:

$$Inim = -0.084558(lngdp) - 0.951410(lnex)$$



According to the above short-run equation, a 1% increase in GDP leads to a decrease of 0.084558% of Import ceteris paribus. On the other hand, a 1% increases in export leads to a decrease of .95141% of GDP in short-run ceteris paribus. Based on the Johansen co-integration test reveals that the three variables are not co-integrated, which indulges us to use the VAR model for a further test of significance.

Table 5. Vector Auto Regression Estimates

standard errors in () & T-statistics in[]			
	LNGDP	LNEX	LNIM
LNGDP(-1)	0.89079	-0.0054	0.01378
	(0.03184)	(0.14891)	(0.08849)
	[27.9813]	[-0.036]	[0.15575]
LNEX (-1)	0.06313	0.79391	0.51008
	(0.04098)	(0.19167)	(0.1139)
	[1.5407]	[4.14205]	[4.47841]

LNIM (-1)	-0.0208	0.18134	0.45654
	(0.04737)	(0.22159)	(0.13168)
	[-0.4385]	[0.81835]	[3.4671]
	1.71535	0.83542	0.34958
	(0.4106)	(1.92063)	(1.1413)
	[4.17764]	[0.43497]	[0.3063]
R-squared	0.99478	0.96391	0.98696
Adj. R-squared	0.99439	0.96121	0.98598
Sum sq.rsids	0.08726	1.90925	0.67418
S.E equation	0.04671	0.21848	0.12983
F-statistic	2540.31	356.158	1009.33
Log-likelihood	74.4737	6.59126	29.4926
Akaike AIC	-3.2033	-0.1178	-1.1588
Schwarz SC	-3.0411	0.04441	-0.9966
Mean dependent	24.1958	22.9477	22.6397
S.D. dependent	0.62343	1.10925	1.0966
Determinant reside covariance (dof adj.)			1.02E-06
Determinant reside covariance (dof adj.)			7.67E-07
Log-likelihood			122.473
Akaike Information Criterion			-5.0215
Schwarz Criterion			-4.5349
Number of coefficients			12

Source: Authors Own calculations: Eviews10

Table 6a. VAR Granger Causality/Block Exogeneity Wald Test for GDP as dependent

Exclude	Chi-sq	Df	Prob.	Decision
Export	2.373803	1	0.1234	Insignificant
Import	0.192291	1	0.661	Insignificant

Source: Authors Own calculations: Eviews10

Table 6b. VAR Granger Causality/Block Exogeneity Wald Test for Export as dependent

Exclude	Chi-sq	Df	Prob.	Decision
GDP	0.001297	1	0.9713	Insignificant
Import	0.6697	1	0.4132	Insignificant

Source: Authors Own calculations: Eviews10

Table 6c. VAR Granger Causality/Block Exogeneity Wald Test for Import as dependent

Exclude	Chi-sq	Df	Prob.	Decision
GDP	0.02426	1	0.8762	Insignificant
Export	20.05619	1	0.000	Significant

Source: Authors Own calculations: Eviews10

$$\begin{aligned} \text{LNGDP} &= C(1) * \text{LNGDP}(-1) + C(2) * \text{LNEX}(-1) + C(3) * \text{LNIM}(-1) + C(4) \\ \text{Ingdpt} &= 0.890793 * \text{Ingdpt}_{-1} + 0.063133 * \text{Inext}_{-1} - 0.020773 * \text{Inimt}_{-1} + 1.715349 \\ \text{LNEX} &= C(5) * \text{LNGDP}(-1) + C(6) * \text{LNEX}(-1) + C(7) * \text{LNIM}(-1) + C(8) \\ \text{Inext} &= -0.005363 * \text{Ingdpt}_{-1} + 0.793910 * \text{Inext}_{-1} + 0.181339 * \text{Inimt}_{-1} + 0.835424 \\ \text{LNIM} &= C(9) * \text{LNGDP}(-1) + C(10) * \text{LNEX}(-1) + C(11) * \text{LNIM}(-1) + C(12) \\ \text{Inim} &= 0.013783 * \text{Ingdpt}_{-1} + 0.510078 * \text{Inext}_{-1} + 0.456535 * \text{Inimt}_{-1} + 0.346535 \end{aligned}$$

Since we know that some coefficients (C) are not statistically significant for that we have to apply the Wald Coefficient Test. After applying Wald Coefficient test we have to delete C (2), C (3), C (5), C (7), C (8), C (9), and C (12) from our model, hence our new estimated equation can be expressed as:

$$\begin{aligned} \text{LNGDP} &= C(1) * \text{LNGDP}(-1) + C(4) \\ \text{Ingdpt} &= 0.890793 * \text{Ingdpt}_{-1} + 1.715349 \end{aligned}$$

It means that GDP in the short run depends 89 % upon its previous value ceteris paribus, hence, GDP does not have any casualty with export and import.

$$\begin{aligned} \text{LNEX} &= C(6) * \text{LNEX}(-1) \\ \text{Inext} &= 0.793910 * \text{Inext}_{-1} \end{aligned}$$

Impression can be drawn for export that it depends on 79.39 % on its previous value ceteris paribus.

$$\begin{aligned} \text{LNIM} &= C(10) * \text{LNEX}(-1) + C(11) * \text{LNIM}(-1) \\ \text{Inim} &= 0.510078 * \text{Inext}_{-1} + 0.456535 * \text{Inimt}_{-1} \end{aligned}$$

Impression can be drawn from import in the short run that it depends 51% on previous year export as well as 45.65 % on its previous year ceteris paribus.

Table 7. Pairwise Granger Causality Test

Null Hypothesis	Observations	F-Statistic	Prob.*	Decision
LNG does nor Granger Cause LNE	44	0.21912	0.6422	Rejected
LNE does not Granger Cause LNG		9.01907	0.0045	Accepted
LNI does not Granger Cause LNE	44	0.90787	0.3463	Rejected
LNE does not Granger Cause LNI		21.0436	0.00004	Accepted
LNI does not Granger Cause LNG	44	6.44396	0.015	Accepted
LNG does nor Granger Cause LNI		0.34878	0.558	Rejected

Source: Own tions: Authors calcula- Eviews10

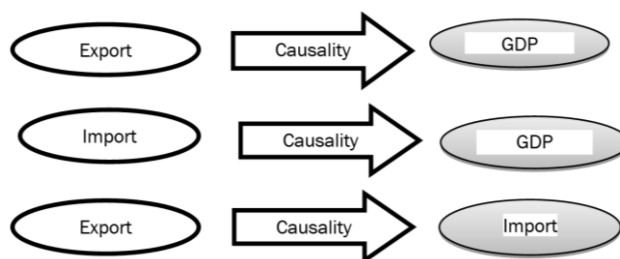


Figure 1. Causal directional flow diagram, Authors own calculations

Table 8. Summary of VAR Outcomes

Dependent	VAR Granger Causality Test	Wald Coefficient Test	Pairwise Granger Causality Test
GDP	Insignificant	Insignificant	Insignificant
Export	Insignificant	Insignificant	Export Granger Cause GDP, Export Granger Cause Import
Import	Export significant	Export Significant	Import Granger Cause GDP

Source: Authors own calculations, Eviews 10

Table 9. Diagnostic tests for VAR Model for LNG as Dependent

VAR Residual Serial Correlation LM Tests				
Lag	LRE*stat	Df	Prob.	Decision
1	12.4711	9	0.188	No Serial Correlation
	Rao F-stat	Df	Prob	
	1.42904	9,85.3	0.1886	
VAR Residual Normality Tests				
Jarque-Bera	Df	Prob.		Significant
7.38819	6	0.2864		
VAR Residual Heteroskedasticity Tests				
Chi-sq	Df	Prob.		Homoskedasticity
43.422	36	0.1845		

Source; Authors own calculations, Eviews 10

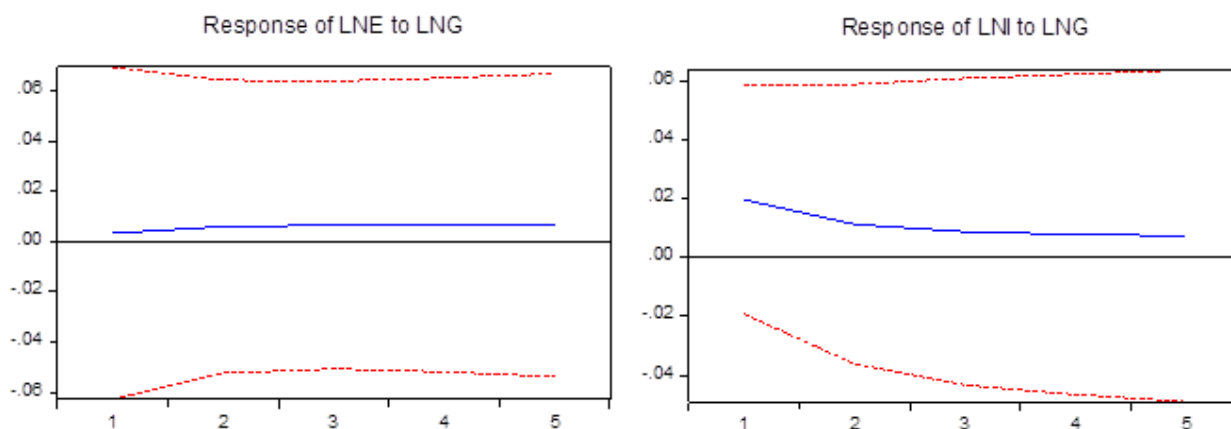


Figure 2. Depicts the Impulse Response Function

Figure 2 indicates the response of LNE to one standard deviation shock to LNG the blue line in the figure represents the Impulse Response Function (IRF) which rested under a 95% confidence interval. IRF graph revealed that for the short-run i.e. for periods 1 and 2 the graph is increasing whereas, for the long-run, the graph revealed stability in the curve. Hence, the shock in the LNE will have a positive stimulus on LNG for both periods.

IRF graph for the response of LNI to one standard deviation shock to LNG revealed that for the short-run i.e. for periods 1 and 2 the graph is decreasing whereas, for the long-run, the graph revealed stability in the curve. Hence, the shock in the LNI will have a positive stimulus on LNG for both periods.

Table 10. Variance Decomposition of LNG

Period	S.E.	LNG	LNE	LNI
1	0.04671	100	0	0
2	0.06361	96.28	3.62	0.11
3	0.07618	90.76	9.12	0.12
4	0.08683	84.49	14.41	0.097
5	0.0965	77.98	21.95	0.08

Source: Authors Computation on E-views 10

The results of Variance Decomposition (VDC) are presented in the above table 10. The results were reported for a 5-years horizon. The ordering of the variables is based on the Cholesky decomposition method which suggests the following order of the variables: Log of GDP as (LNG), Log of export as (LNE) and Log of import as (LNI).

In the short-run, 100% of the forecast error variance in GDP is explained by itself in a period of 1. The contribution of LNE and LNI is having a very weak influence or zero in predicting the GDP i.e. (LNG) in the future. Whereas in long-run 78% of the forecast error variance in GDP is explained by itself for the period of 5, the contribution of LNE is 22% of the forecast error variance in GDP and less than 1% is the contribution of the forecast error variance in GDP for the period of 5. Hence, period 1 denotes the short-run where GDP is 100% forecasted, and period 5 is denoted as long-run where GDP is 78% forecasted by itself.

Table 11. Diagnostic tests for VAR Model for LNE as Dependent

VAR Residual Serial Correlation LM Tests				
Lag	LRE*stat	Df	Prob.	Decision
1	12.4711	9	0.188	No Serial Correlation
	Rao F-stat	Df	Prob	
	1.42904	9,85.3	0.1886	
VAR Residual Normality Tests				
Jarque-Bera	Df	Prob.		Significant
8.55985	6	0.1999		
VAR Residual Heteroskedasticity Tests				
Chi-sq	Df	Prob.		Homoskedasticity
43.422	36	0.1845		

Source; Authors own calculations, Eviews 10

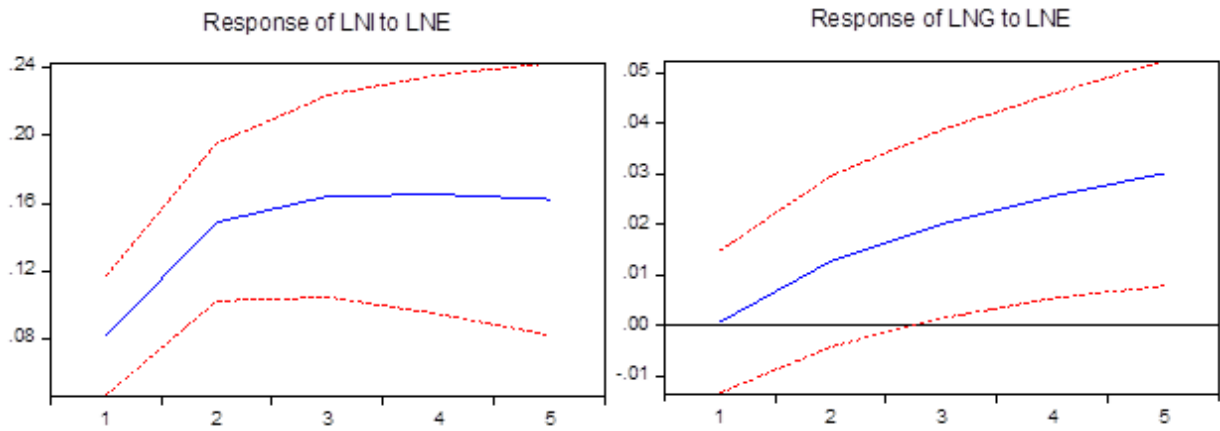


Figure 3. Depicts the Impulse Response Function

Figure 3 indicates the response of LNI to one standard deviation shock to LNE the blue line in the figure represents the Impulse Response Function (IRF) which rested under a 95% confidence interval. IRF graph revealed that for the short-run i.e. for periods 1 and 2 the graph is sharply increasing and for the period 3 it buildup whereas, for the long-run, the graph revealed stability in the curve. Hence, the shock in the LNI will have a positive stimulus on LNE for both periods.

IRF graph for the response of LNG to one standard deviation shock to LNE revealed that for the short-run i.e. for periods 1 and 2 the graph is sharply increasing whereas, for the long-run, the graph revealed increasing but not at that pace as in short-run. Hence, the shock in the LNG will have a positive stimulus on LNE for both periods.

Table 12. Variance Decomposition of LNE

Period	S.E.	LNE	LNI	LNG
1	0.2185	100	0	0
2	0.289	99.6	0.397	7.26E-05
3	0.339	99.26	0.74	0.0001
4	0.38	99.03	0.97	0.0002
5	0.415	98.87	1.13	0.0002

Source: Authors Computation on E-views 10

The results of Variance Decomposition (VDC) are presented in the above table 12. The results were reported for a 5-years horizon. The ordering of the variables is based on the Cholesky decomposition method which suggests the following order of the variables: Log of GDP as (LNG), Log of export as (LNE) and Log of import as (LNI).

In the short-run, 100% of the forecast error variance in LNE is explained by itself in a period of 1. The contribution of LNI and LNG is having a very weak influence or zero in predicting the export i.e. (LNE) in the future. Whereas in long-run approximate 99% of the forecast error variance in export is explained by itself for the period of 5, the contribution of LNI is approximate 1% of the forecast error variance in LNE and about 0.0002% is the contribution of LNG in the forecast error variance in LNE for the period of 5. Hence, period 1 denotes the short-run where LNE is 100% forecasted, and period 5 is denoted as long-run where LNE is 99% forecasted by itself.

Table 13. Diagnostic tests for VAR Model for LNI as Dependent

VAR Residual Serial Correlation LM Tests				
Lag	LRE*stat	Df	Prob.	Decision
1	12.4711	9	0.188	No Serial Correlation
	Rao F-stat	Df	Prob	
	1.42904	9,85.3	0.1886	
VAR Residual Normality Tests				
Jarque-Bera	Df	Prob.		Significant
5.774218	6	0.449		
VAR Residual Heteroskedasticity Tests				
Chi-sq	Df	Prob.		Homoskedasticity
43.422	36	0.1845		
Source; Authors own calculations, Eviews 10				

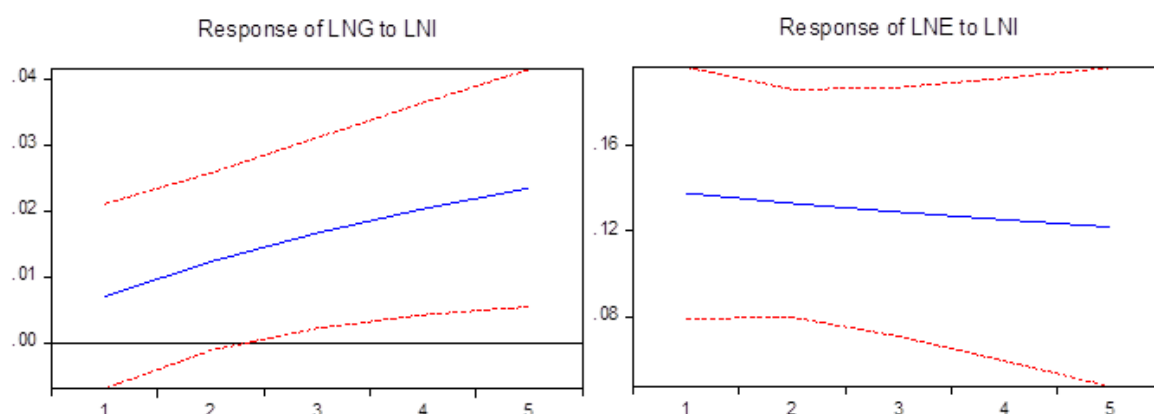


Figure 4. Depicts the Impulse Response Function

Figure 4 indicates the response of LNG to one standard deviation shock to LNI the blue line in the figure represents the Impulse Response Function (IRF) which rested under a 95% confidence interval. IRF graph revealed that for the short-run i.e. for periods 1 and 2 the graph is sharply increasing whereas, for the long-run, the graph upsurges. Hence, the shock in the LNI will have a positive stimulus on LNI for both periods.

IRF graph for the response of LNE to one standard deviation shock to LNI revealed progressive decline for both run. Hence, the shock in the LNG will have a positive stimulus on LNI for both periods.

Table 14. Variance Decomposition of LNI

Period	S.E.	LNI	LNG	LNE
1	0.129	100	0	0
2	0.203	81.85	0.172	17.976
3	0.263	72.22	0.265	27.51
4	0.311	67.28	0.314	32.4
5	0.352	64.45	0.344	35.2

Source: Authors Computation on E-views 10

The results of Variance Decomposition (VDC) are presented in the above table 12. The results were reported for a 5-years horizon. The ordering of the variables is based on the Cholesky decomposition method which suggests the following order of the variables: Log of GDP as (LNG), Log of export as (LNE) and Log of import as (LNI).

In the short-run, 100% of the forecast error variance in LNI is explained by itself in a period of 1. The contribution of LNE and LNG is having a very weak influence or zero in predicting the import i.e. (LNI) in the future. Whereas in long-run approximate 65% of the forecast error variance in import is explained by itself for the period of 5, the contribution of LNG is less than 1% of the forecast error variance in LNI and about 35% is the contribution of LNE in the forecast error variance in LNI for the period of 5. Hence, period 1 denotes the short-run where LNI is 100% forecasted, and period 5 is denoted as long-run where LNI is approximately 65% forecasted by itself.

CONCLUSION

The present study is based on a twofold inspection technique. Initially, it scrutinizes the connection among export, import, and GDP for the Sultanate of Oman. Last but not least, if such a connection arises, it tries to scrutinize the causativeness amongst the models. To achieve our purpose, time-series yearly data were taken from the World Bank for the periods 1974 to 2018. Then correlation test is used to develop a relationship, followed by Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root test to check whether the series is stationary at what degree, further Johansen co-integration analysis was done, which leads to predict the nature of Vector Auto-Regressive (VAR) model and its causal effects. As per our investigation, the test of correlation shows the connexion among the parameters to be strongly correlated. While the ADF and PP unit root test signifies that when the zero level and first difference is considered the parameters become stationary, also, it was determined by Johansen co-integration analysis that there is no co-integration among the parameters which means in the short run there is a connection among the three parameters in Oman. Although, export has an adverse influence on economic growth in the short run while import has a positive influence on economic growth for the short-run with the assumption of *ceteris paribus*.

Vector Auto-Regressive Model is used to identify the connection among the parameters and Granger Causality Test to indicate the direction of their causal effect among variables. The results of our analysis indicate that there is a one-way causal effect from import to GDP, as well as unidirectional causative stimulus flowing from export to GDP. Hence, GDP does not have any causal influence on both of these variables in the short run *ceteris paribus*. Fascinating fact is that it was export who promotes the import and unidirectional causation flows from export to import hence export leads to import. The IRF firstly indicates that response in the form of one deviation shock provided by both LNE, LNI will have a positive stimulus on LNG followed by the response in the form of one deviation shock provided by both LNG; LNI will have a positive stimulus on LNE. Lastly, the IRF also directs that response in the form of one deviation shock provided by both LNE, LNG will have a positive stimulus on LNI.

Variance decomposition for economic growth reveals that in short-run GDP is forecasted to 100% by itself whereas, in the long-run, its share is reduced to about 78% by itself, 22% by LNE and less than 1% by LNI. The variance decomposition of export also discloses that in short-run export is forecasted to 100% by itself whereas, in the long-run, its share reduces marginally i.e. 99% by itself, 1% by LNI and 0% by LNG. Eventually, variance decomposition of import tells that in short-run import is forecasted to 100% by itself whereas, in the long-run, its share reduces to about 65% by itself, 35% by LNE and less than 0.4% by LNG.

To end with, we can clinch that our model proves the postulate (i) as supported by Al-Sawae (2008), Güngör and Bernard 2014, Hussain and Saaed (2015), postulate (ii) as supported by Abugamea (2015), Bakari (2017) and last but not least postulate (iv) supported by Hussain and Saaed (2015), Masoud and Suleiman (2016), El-Alaoui (2015) to be true as well as statistically significant for the short run. In a nut shell this study emphasizes policymakers' and its reformist role in promoting the stimulus of import, export that influences the level of economic progress of the Sultanate of Oman.

IMPLICATION AND LIMITATION

Future research is to expand this research work by adding other factors that can influence economic growth as a covariate in research. By adding covariate into the research model, robust and unbiased results can be achieved. Factors that can be included in the macro-economic model include consumption, Investment, Government spending, export, import etc. Finally, the scope of this research is to evaluate the controlled macro-economic parameters and their impact on economic growth. Therefore, future researchers who want to conduct similar research can include more macro-economic factors and explore their impact.

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