

# Exports, Imports and Economic Growth in Sri Lanka: Evidence from Causality and Co-Integration Analysis

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## Abstract

This study aims to find long run causal relationship between the export and import on economic growth in Sri Lanka over the period from 1962 to 2015 using annual data. Johansen co-integration technique and vector error correction model (VECM) are used to investigate the relationships. The empirical results do not confirm a bidirectional causality between any of the variables considered but there is a unidirectional causality between export and economic growth in the short run. Further, it finds that there is a long-run equilibrium relationship between export and economic growth. Major implication of our findings is that export is matter for the economic growth of Sri Lanka than import.

**Keywords:** Economic growth, Export, Import, Granger causality, VECM,

## Introduction

An important policy strategy for assessing growth and development in developing economies is to ascertain economic relationships between economic growth and the trade sector for a particular economy (Andrews, 2015). The relationship between Export, Import and Economic growth is an important issue among economists, and many researchers tried to investigate this relationship. It is widely argued that there is a two-way causal relationship between export and economic growth. Consequently, an extensive empirical literature exists on the relationship between exports and growth (Uğur, 2008). Jahfer and Inoue (2014) find that the trade openness affects economic growth significantly in Sri Lanka. Hussain and Saaed (2014) state that there are four possible propositions on a relationship between export and economic growth: export-led growth (ELG), growth-driven export (GDE), feedback relationship between export and economic growth and finally there is no relationship. Some of the researchers found unidirectional causality and some of them found bidirectional causality and of course some of them could not found any evidence for causality between export and GDP (Hussain & Saaed, 2014).

Export-led growth (ELG) hypothesis suggest that Export growth is often considered to be a main determinant of the production and employment growth of an economy. It encourages that the overall progress of countries can be achieved not only by mounting the quantity of

manpower and investment within the economy, but also by increasing exports(Hussain & Saeed, 2014). Balassa (1978), Edwards (1998) and Ramos (2001) explain how export contribute for economic growth of economy in four sequence of steps.

In contrast to the export-led growth hypothesis, The growth-driven export (GDE) hypothesis suggest that export expansion could be stimulated by productivity gains caused by increase in domestic levels of skilled-labor and technology (Krugman, 1984). Further it suggests that there is unidirectional causality from economic growth to exports but not vise-versa. Neoclassical trade theory typically stresses the causality that runs from home-factor endowments and productivity to the supply of exports (Findlay, 1984). The product life cycle hypothesis of Vernon (1966) has also attracted significant consideration among international trade theorists in recent years (Ramos 2001).

Lawrence and Weinstein (1999) suggest import-lead growth (ILG) hypothesis which suggests that economic growth could be driven primarily by growth in imports. Endogenous growth models show that imports can be a channel for long-ran economic growth because it provides domestic firms with access to needed intermediate and foreign technology. Growth in imports can serve as a medium for the transfer of growth-enhancing foreign R&D knowledge from developed to developing countries (Mazumdar, 2001).

### **Research Problem**

Studies are find that there are relationship exist between Export, Import and Economic growth in Sri Lankan context. Velnampy and Achchuthan (2013) find that the export and import have the significant positive relationship, and also, both export and import have the significant impact on the economic growth. Jahfer and Inoue (2014) find that the Export and Import affects economic growth significantly in Sri Lanka. The strong correlation of export, import and economic growth rates has nothing to say about a relationship between the export import and the economic development, as it may arise from a purely short-run relationship (Ramos, 2001). However, It has become meaningful when understand the casual interrelationships among export, import and economic growth in long run. Any research on the long-run causal relationship among export, import and economic growth is hard to find in Sri Lankan context. Therefore, the test for existence of a long-run causal relationship among export, import and economic growth is to be performed to fill the gap in literature in Sri Lankan context.

### **Research Question**

What type of casual relationship exist in the long run among the export, import and economic growth in Sri Lanka.

### **Research Objective**

The objective of this research is to see the relationship among the export, import and economic growth in Sri Lanka during the period 1960-2015.

## Methods

In this study, we use annual data for the Sri Lanka economy for the period 1962 to 2015 and collected mainly from World Development Indicators published by the World Data Bank and the reports of Central Bank of Sri Lanka. The economic growth is measured in terms of GDP is the sum of gross value added by all resident producers in the economy. Exports represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income. Imports represent the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income and transfer payments. The GDP, Export and Import data are measured in constant local currency. All the data are transferred to natural logarithms for conventional statistical reasons.

In order to investigate the effect of export (LgX) and import (LgM) on Economic Growth (LgY), co-integration test and vector error correction model (VECM) are applied. Since macroeconomic time series data contain unit root, variables used in the study are tested for stationary before running causality tests. For this purpose, unit roots are tested using augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1979) test. Furthermore, The Phillips-Perron unit root (PP) (Phillips & Perron, 1988) test and Dickey-Fuller (DF) are also performed due to the possibility of the existence of structural breaks which result in the ADF test wrongly indicating non- stationary in what is actually a stationary series (Hussain, 2014).

After confirming that the variables are integrated of order one, then it is tested the existence of co-integration relationship between the variables. The co-integration tests are done among the variables using the Johansen (1988) co-integration tests. Since Johansen co-integration is sensitive to the lag length, the Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) are used to determine the appropriate number of lag.

## Results and discussion

### Unit root test

As a first step, to check the stationary of the variables, the augmented Dickey-Fuller (ADF) test, Phillips-Perron unit root (PP) and Dickey-Fuller (DF) test were employed at level and first difference are shown in table 1.

The lag length for the unit root tests was selected to ensure that the residuals were white noise. It is obvious from the unit root tests show that at level, none of the variables represents a stationary process. The unit root tests computed using the first difference of GDP (LgY), exports (LgX) and imports (LgM) indicate that all variables become stationary at the 1% level of significance. As differencing once produces stationary, it suggests that each of the series GDP (LgY), the exports (LgX) and the imports (LgM) is integrated in order 1, I(1).

Table 1. Unit root test

Series	Levels			1st difference			integrated of order
	DF	ADF	PP	DF	ADF	PP	
LgY	0.388083	1.92251	1.866236	-5.4475	-	-	I(1)
Lag	2	0	0	0	0	0	
LgX	2.035975	0.821937	1.022145	-	-	-	I(1)
Lag	0	0	0	0	0	0	
LgM	1.976386	0.846284	0.818265	-	-	-	I(1)
Lag	0	0	0	0	0	0	

**Test for co-integration**

Since all series are integrated processes of order one. This is a necessary step in order to test the co-integration of the variables. The co-integration tests are done among the variables using the Johansen's co-integration tests to investigate long-term equilibrium relationship among the variables. Number of lags is selected using an optimal lag structure in the unrestricted VAR (Table 2).

Table 2. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	12.87059	NA	0.000135	-0.394824	-0.280102	-0.351137
1	261.0139	456.5836*	9.49e-09*	-9.960555*	-9.501669*	-9.785809*
2	268.8405	13.46180	9.99e-09	-9.913620	-9.110570	-9.607814
3	276.5584	12.34869	1.06e-08	-9.862337	-8.715123	-9.425472
4	286.5274	14.75405	1.04e-08	-9.901095	-8.409717	-9.333170

\* indicates lag order selected by the criterion  
 LR: sequential modified LR test statistic (each test at 5% level)  
 FPE: Final prediction error  
 AIC: Akaike information criterion  
 SC: Schwarz information criterion  
 HQ: Hannan-Quinn information criterion

Johansen's approach derives two likelihood estimators for the co-integration rank: a trace test and a maximum Eigen value test. Table 3 presents summarized co-integration results

between the variables. Co-integration results indicate the existence of long-run association between GDP, Export and import in Sri Lanka. Therefore, VECM can be used to investigate the relationships among the selected variables.

Table 3. Co-integration Test

Hypothesized No. of CE(s)	Trace Test				Maximum Eigenvalue Test		
	Eigenvalue	Trace Statistic	Critical value at 5%	Prob.**	Trace Statistic	Critical value at 5%	Prob. **
None *	0.479482	45.2289	24.2759	0.0000	33.95237	17.7973	0.0001
At most 1	0.155796	11.2765	12.3209	0.0743	8.806796	11.2248	0.1291
At most 2	0.046385	2.46974	4.12990	0.1371	2.469744	4.129906	0.1371

Trace test and Max-eigenvalue 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

### Granger-causality in the Vector error correction model

The number of co-integrating relationships found in Table 3 will result in a corresponding number of residual series, and hence error correction terms (ECT) to be used in the subsequent vector error correction model VECM.

To test whether export and import Granger-causes GDP, the following VECM is estimated.

$$\Delta LgY_t = \lambda_{10} + \sum_{i=1}^n \lambda_{11i} \Delta LgY_{t-i} + \sum_{i=1}^n \lambda_{12i} \Delta LgX_{t-i} + \sum_{i=1}^n \lambda_{13i} \Delta LgM_{t-i} + \lambda_{14} ECT_{t-1} + \mu_t$$

To test whether GDP and import Granger-causes Export, the following VECM is estimated.

$$\Delta LgX_t = \lambda_{20} + \sum_{i=1}^n \lambda_{21i} \Delta LgX_{t-i} + \sum_{i=1}^n \lambda_{22i} \Delta LgY_{t-i} + \sum_{i=1}^n \lambda_{23i} \Delta LgM_{t-i} + \lambda_{24} ECT_{t-1} + \mu_t$$

To test whether GDP and export Granger-causes Import, the following VECM is estimated.

$$\Delta LgM_t = \lambda_{30} + \sum_{i=1}^n \lambda_{31i} \Delta LgM_{t-i} + \sum_{i=1}^n \lambda_{32i} \Delta LgY_{t-i} + \sum_{i=1}^n \lambda_{33i} \Delta LgX_{t-i} + \lambda_{34} ECT_{t-1} + \mu_t$$

Since the variables are co-integrated, there are long-term relationships among the variables under consideration. Table 4 presents summary results of VECM with respect to Economic

growth, export and import under the three models. The estimated ECT is negative and highly significant in model 1. The result is supporting the co-integration among the variables represented by model. The result suggest there is a long run causality from export and import on economic growth. Furthermore, the export coefficient is positive and significant in the model 1. It suggests that the export causes GDP in the short run. However, the import is not causes GDP in the short run in Sri Lankan Economy. According to VECM test result of the model 2 and 3, the error correction terms are insignificant. Therefore, there is no causality from economic growth and import on export in the long run. In addition, there is no causality from economic growth and export on import in the long run.

Dependent Variable		D(LGY)		
	Coefficient	Std. Error	t-Statistic	Prob.
D(LGY)				
ECT	-0.01408	0.002516	-5.59382	0.0000
D(LGY(-1))	0.186353	0.152814	1.21948	0.2286
D(LGX(-1))	-0.10969	0.044285	-2.47695	0.0168
D(LGM(-1))	0.067499	0.035634	1.894194	0.0642

  

Dependent Variable		D(LGX)		
	Coefficient	Std. Error	t-Statistic	Prob.
D(LGX)				
ECT	-0.01245	0.009276	-1.34162	0.1860
D(LGY(-1))	0.10193	0.56329	0.180954	0.8572
D(LGX(-1))	-0.21311	0.163242	-1.30549	0.1979
D(LGM(-1))	0.096829	0.131353	0.737166	0.4646

  

Dependent Variable		D(LGM)		
	Coefficient	Std. Error	t-Statistic	Prob.
D(LGM)				
ECT	-0.0034	0.012458	-0.27265	0.7863
D(LGY(-1))	0.709439	0.756542	0.937738	0.3531
D(LGX(-1))	0.040643	0.219246	0.185377	0.8537
D(LGM(-1))	-0.02456	0.176417	-0.13919	0.8899

The results support the one-way causal relationship between economic growth and export and there is no significant causality between import and export in Sri Lankan Economy. The result support Export led hypothesis rather than Growth-driven exports.

## Summary and Conclusions

This study investigates the long run causal relationship among export, import and economic growth in Sri Lanka using annual data over the period 1962 to 2015. The stationarity of the data is tested using ADF, DF and PP test. Johansen co-integration technique and the VECM are used to estimate the effect of export and import on economic growth. Johansen co-integration test finds that export, import and economic growth are co-integrated. VECM results demonstrate that there is a long-run equilibrium relationship among the variables and

a unidirectional causality between the export and economic growth in the short run. Further, no strong evidence that import causes economic growth of Sri Lanka. Moreover, major implication of our findings is that export is matter for the economic growth of Sri Lanka than import.

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