Linkages between Export, Import and Capital Formation in India

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Abstract

Linkages between export, import and capital formation investigated by time series econometric techniques like Unit root test, Co-integration and Granger causality during the period of 1991 to 2010 for India. This study checked that whether there is uni-directional or bidirectional causality between export, import and capital formation in India. In this paper, the results reveal that there is bidirectional causality between gross domestic capital formation and export growth. The traditional Granger causality test also suggests that there is uni-directional causality between capital formation and import and export.

Keywords: Linkages, Econometric, Unit root, Co-integration, Granger causality, Unidirectional, bidirectional.

Introduction

Investment is outmost importance to an economy as it helps expand productive capacity and increase potential output, thus stimulating future economic growth, employment creation and a rise in living standards. Gross capital formation is one of the expenditure components of Gross Domestic Product (GDP), together with final consumption and net exports, and serves as an indicator of the level of investment in an economy. Investment is made possible through saved income, which implies the sacrifice of consumption today in the expectation that the saved and invested income will yield an increased flow of income and consumption tomorrow. Poorer countries and territories typically face a dilemma whereby little income may be available for saving and investment if a large proportion of income is spent only to meet the essentials of life, thus limiting the expectations of growth in the future. Another way Capital Formation refers to "capital stock", capital stock is one of the basic determinants of an economy's ability to produce income."Capital formation" is simply the enlargement of the capital stock. Through capital formation output, income and employment are increased in Underdeveloped countries. If this increased income is properly and equitably distributed among people, it will promote economic welfare and will help to eradicate poverty. Capital formation promotes production in the country and as such imports can be reduced and exports can be increased. Rising exports imply large foreign earning. It lessens dependence on foreign countries. In this way Economist have considered capital formation as the instrumental factor of Economic development. In the opinion of Planning Commission, "The key to higher productivity and expanding income and employment lies in stepping up the rate of capital formation". Gross capital formation consists of expenditures by the private and public sectors on additions to the fixed assets of the economy, such as equipment, machinery and buildings, plus net changes in the level of inventories, and acquisitions less disposals of valuables, such as precious metals and works of art.

Review of literature: A lot of studies have been done on the different aspects of export, imports and capital formation at national and international level. A few studies have been taken for review:

Ibrahim[1] analyzes the productivity of public and private capital formation in a developing economy, Malaysia, using annual data from 1961 to 1995. The analysis is based on neo-classical growth regression, where the transition to the steady-state level of income per capita is modeled using an error correction framework. The results suggest that the public investment has been unproductive over the periods under consideration. Consistent with existing empirical studies, the private investment rate and the export performance of the country are positively related to economic growth. Tsoukis and Alyousha[2] focused on the long-run Granger causality between the gross saving/GDP ratio and the gross investment/GDP ratio in seven industrialized economies: Australia, Canada, Germany, Japan, Netherlands, the United Kingdom, and the United States since 1945. For the whole sample period, they found saving and investment to be cointegrated only in Australia and the UK, and the test for Granger causality indicated causality running from saving to investment in both countries. For the post-1980 period, they found cointegration between the two variables only for Germany, and with evidence of causality running from investment to saving. Thurayia[3] studied the relationship between exports and economic growth experience in Saudi Arabia and Sudan. Results showed that the growth rate in total exports in Saudi Arabia had an active role in achieving economic growth while it had a weak influence in Sudan. The results of cointegration and error correction models showed a positive effect of exports on GDP in the short- and long- run, which confirms the validity of the hypothesis of export-led growth in

Saudi Arabia, and Sudan. Awokuse[4] examined the impact of export and import expansion on growth in three transition economies by specifying causal models based on vector error correction models, the empirical results indicate a bi-directional causal relationship between exports and growth in Bulgaria and causality from import and export to economic growth in the Czech Republic and only the import-led growth (ILG) hypothesis is supported by the Polish data. Donwa and Odia[5] examined the impact of globalization on the gross fixed capital formation in Nigeria from 1980 to 2006. Using the ordinary least square, it was found that globalization proxy by openness was negatively and insignificantly related to gross fixed capital formation. In other words, globalization has not helped in assisting fixed capital formation. Foreign Direct Investment and Gross Domestic Product were positive and significant while exchange rate had a negative impact on GFCF. Interest rate had positive and insignificant relationship with GFCF. Adhikary[6] examined the linkage between FDI, trade openness, capital formation, and economic growth rates in Bangladesh over a period 1986 to 2008 using time series analysis. All variables are found stationary at first differencing both at constant and constant plus trend level under the ADF and PP stationary tests. The Johansen-Juselius procedure is applied to test the cointegrating relation between variables followed by a vector error correction model. The empirical results trace a strong long-run equilibrium relationship between GDP growth rates and the explanatory variables with unidirectional casual flows. The volume of FDI and level of capital formation are found to have significant positive effect on changes in real GDP. The degree of trade openness unleashes negative but diminishing influence on GDP growth rate. Bakare[7] examined the relationship between capital formation and growth in Nigeria. The study applied Harrod - Domar model to Nigerian growth model. The ordinary least square multiple regression analytical method was used to examine the relationship between capital formation and economic growth. The study tested the stationarity and co integration of Nigeria's time series data and used an error correction mechanism to determine the long-run relationship among the variables examined. The paper reviewed the literature and found that Harrod-Domar model has scarcely been used to test the relationship between capital formation and economic growth. The empirical study found that the data were stationary and co integrated and showed that there is a significant relationship between capital formation and economic growth in Nigeria. The results supported the Harrod-Domar model which proved that the growth rate of national income will directly or positively be related to saving ratio and capital formation (i.e. the more an economy is able to save-and invest-out of given GNP, the greater will be the growth of that GDP). The econometric results suggested the need for the government to continue to encourage savings, create conducive investment climate and improve the infrastructural base of the economy to boost capital formation and promote sustainable growth. A large numbers of studies established on relationship between exports and economic growth, saving and capital formation, export and import relation, but no desirable literature found on the linkages between exports,

imports and capital formation at national level during 1991-2010. There is enough scope of research in this area.

Objective of the paper: The main objective of this paper is to investigate linkages between capital formation, exports and imports in India. I want to empirically investigate the relationship between capital formation, exports and Imports in India during 1991 to 2010.

Hypothesis
I have proposed the following hypothesis for this study:
H0: There is no significant Linkage between Capital Formation, export and Imports in India during the study period 1991 to 2010.

Data Sources: In this paper, I seek to trace the relationship between capital formation, exports and imports in the context of India over a period 1991 to 2010. For this purpose, data has been gleaned from Economic survey 2010-11 and Handbook of India Statistics Publish by RBI.

Estimate Technique: The modern econometric approach is employed for analyzing the relationship. In order to determine the order of integration of the time series variables we first conduct the unit root test, we employ the augmented Dickey-Fuller test to test for the Stationarity of data. The general form of ADF test is estimated by the following regression:

$$\Delta Y_t = \alpha_0 + \alpha\, Y_{t-1} + \sum_{t=1}^{n} \alpha\, \Delta Yi + €t \qquad (1)$$
$$\Delta Y_t = \alpha_0 + \alpha\, Y_{t-1} + \sum_{t=1}^{n} \alpha\, \Delta Yi + {}^{\delta}t + €t \qquad (2)$$

Where, Y is a time series, t is a linear time trend, Δ is first difference operator, α_0 is a constant, n is the optimum number of lags in the dependent variable and € is a random error term. After that we proceed to test the co-integration among the different variables with the help of Johansen co-integration test. Based on the results of co-integration test we perform traditional Granger Causality test.

Results and Discussion

Econometric Results: All the variables in this study are tested for stationarity using the Augmented Ducky Fuller test Statistics.

The critical value provided at 1% and 5% level of significant is – 3.8304 and -3.0294 and the computed t- value is 5.434, 4.10 and 3.94 in case of DGCF, EXPRT and MPRT. The ADF test states if the computed t- value is more negative than the critical value or the absolute of computed t-value is more positive than the absolute of the critical value, so we reject the null hypothesis of unit root. The ADF statistics is calculated by dividing the estimate β by its standard error. The cumulative distribution of the ADF statistics is provided by 'Fuller'. From this test, the computed t-absolute value is more positive than the absolute 1% and 5% critical value, so we reject the null hypothesis of unit root. This is meant that the data of Gross Domestic Capital Formation, export and import are stationary at level.

Table-1
Augmented Dickey Fuller (ADF) Unit Root Tests

Variable	ADF Test Statistic	Order of Integration	Lag Order	Durbin-Watson Statistic	Critical Value
GDCF	5.434384 (0.0002)	Stationary at level	1	2.20	1% = -3.8304
					5%= -3.0294
					10%=-2.6552
EXPRT	4.106534 (0.0007)	Stationary at level	1	2.97	1% = -3.8304
					5%= --3.0294
					10%=-2.6552
MPRT	3.942749 (0.0020)	Stationary at level	1	2.81	1% = -3.8304
					5%= --3.0294
					10%=-2.6552

Source: _Researcher's own calculation based on GDCF, EXPORT AND IMPORT data 1991-2010._
GDCF= Gross Domestic capital Formation, EXPRT= Exports, MPRT= Imports

Table-2
Results of the Johansen Based Co- Integration Test of GDCF and MPRT

Lag Interval	Test assumption	Eigen value	Likelihood ratio/ trace Value	5%Critical Value	1% Critical Value	Hypothesized No. of CE(s)
1 to 1	Linear deterministic trend in the data	0.808424	25.17398	15.41	20.04	None**
		0.025467	7.386947	3.76	6.65	At most 1**

Source: Researcher's own calculation based on GDCF, EXPORT and IMPORT data 1991-2010.

Table-3
Results of the Johansen Based Co- Integration Test of GDCF and XPRT

Lag Interval	Test assumption	Eigen value	Likelihood ratio/ trace Value	5%Critical Value	1% Critical Value	Hypothesized No. of CE(s)
1 to 1	Linear deterministic trend in the data	0.787760	39.19532	15.41	20.04	None**
		0.466066	11.29468	3.76	6.65	At most 1**

Source: Researcher's own calculation based on GDCF, EXPORT and IMPORT data 1991-2010.

Table-4
Results of the Johansen Based Co -Integration Test of MPRT and XPRT

Lag Interval	Test assumption	Eigen value	Likelihood ratio/ trace Value	5%Critical Value	1% Critical Value	Hypothesized No. of CE(s)
1 to 1	Linear deterministic trend in the data	0.919635	52.85042	15.41	20.04	None**
		0.339631	7.469208	3.76	6.65	At most 1**

Source: Researcher's own calculation based on GDCF, EXPORT and IMPORT data 1991-2010.

Table-5
Granger-Causality Test

CASE	Null Hypothesis	M (Lag)	F-Statistic	Probability	F- table value	Decision
CASE I	MPRT does not Granger Cause XPRT	2	2.29475	0.14012	3.59	Ho:Accepted
CASE II	XPRT does not Granger Cause MPRT	2	5.14842	0.02255	3.59	H_0: Rejected
CASE III	GDCF does not Granger Cause XPRT	2	14.8211	0.00044	3.59	H_0: Rejected
CASE IV	XPRT does not Granger Cause GDCF	2	5.06820	0.02359	3.59	H_0: Rejected
CASE V	GDCF does not Granger Cause MPRT	2	6.0453	0.04951	3.59	H_0: Rejected
CASE VI	MPRT does not Granger Cause GDCF	2	0.08003	0.92354	3.59	H_0:Accepted

Source: Researcher's own calculation based on GDCF, EXPORT and IMPORT data 1991-2010.

The results presented in table 1 shows that all variables are stationary in their original levels of series at1%, 5% and 10% level of significance. So all the variables are stationary and the next step is to test whether the stationary variables are co-integrated or not. Co-integration analysis is carried out to determine the existence of long-run relationship that exists between the dependent variable and its regressor. Different approaches and test techniques have been developed for

cointegration tests. The second stage is to perform the cointegration test using the popular method developed by Johansen S., and Juselius K., Two criterion, Trace statistics and Eigen value are used for cointegration test at1% and 5% level of significance which are presented in table 2, 3 and 4. The Trace-Statistic value is shown to be greater than the critical values at both 1% and 5% levels, thus indicating 2 co-integrating equations at both 1% and 5% levels. The Trace test indicates the existence of two co-integrating equations at 1%and 5 % level of significance.

As discussed above, there is co-integration between the variables, so the next step is to test the direction of causality using the granger causality test. I have presented the traditional Granger causality results in table 5, which shows that export Granger cause imports but there is no reverse causation from import to export, as the F value is statistically insignificant in this case. It also shows that capital formation Granger cause exports and also export granger cause gross domestic capital formation, means there is bi-directional causality between export and gross domestic capital formation. These results suggest that the direction of causality is from Gross Domestic Capital Formation to Import since the estimated F-statistic is significant at the 5 % level of significant; Reject the null hypothesis that GDCF does not Granger Cause Import. On the other hand, there is no reverse causation from Import to Gross domestic capital formation, because the F-value is statistically insignificant in this case, means there is unidirectional causality between gross domestic capital formation and imports. It means India's imports increase with the increase in gross domestic capital formation.

Conclusion

In this paper, the relationship between exports, imports and gross domestic capital formation in a developing country like India has been investigated using popular time series methodologies. The data properties are analyzed to determine the stationarity of time series using the Augmented Dickey-Fuller unit root test which indicates that all variables are stationary at their level. The results of the cointegration test based on Johansen's procedure indicate the existence of the cointegration between exports and imports, export and gross domestic capital formation and import and gross domestic capital formation. Therefore, the variables of the study have a long run equilibrium relationship between them, although they may be in disequilibrium in the short-run. The results of the empirical analysis lead to the conclusion that both exports and gross capital formation is significantly influencing each other. The results strongly support the unidirectional causation from capital formation to total imports, as well as in case of exports to imports, means causality runs from Gross domestic capital formation to imports and exports to imports.

Suggestions and Limitation of the study: On the basis of above findings, it is suggested that more thrust should be given for export and capital formation in the economy. The policy implication of the positive relationship between exports and gross capital formation is that an expansion of exports will lead to an increase in capital formation. In addition, the increase in capital formation may also lead to an increase in exports. In this regard, the study recommends the diversification of export commodities, infrastructure development and maintenance of stable exchange rate and operationalization of Export Processing Zones. The limited database, short time period and selected variables are some of the major limitations of this study. Prospective researchers can investigate the effect of macroeconomic variables on capital formation, export and import using alternative methodologies and daily or weekly data to empirically assess whether the results are sensitive to the frequency of data. Other aspects on which future researchers can pay attention are the longer time horizon, larger sample sizes with greater numbers of sectors using other macroeconomic and non-macroeconomic variables.

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