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Globalization and Economic Growth in India: A Granger Causality Approach

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Abstract:

Today, the term 'globalization' has become a 'buzzword' in any economy all over the world. The growing integration of economies and societies all over the universe has been one of the most burning topics in international economics over the past few years. Globalization has many dimensions and has a variety of social, political and economic implications.This paper attempts to enquire into the fact econometrically whether globalization is a cause of India's economic growth in the long run. More precisely, the article tries to find the causal relationship between globalization and economic growth in India. The regression results show that private investment, openness and human resource development have significant positive impact on economic growth via GDP growth. Financial integration variable (capital inflow+capital outflow) has negative impact, although not significant, on economic growth and public investment is also having insignificant positive impact on economic growth. Johansen's cointegration procedure showed that all the above-mentioned variables are cointegrated implying these macro economic variables have long-run equilibrium relationship with economic growth via GDPgrowth. Error-correction model results also supported the cointegration results. We observe that the direction of causality between globalization and economic growth in India is generally bidirectional (causality runs in both directions) excepting a few where it is unidirectional.

Keywords: Globalization, economic growth,causality,opneness,financial integration,GDP.

1.Introduction:

Today, the term 'globalization' has become a 'buzzword' in any economy all over the world. The growing integration of economies and societies all over the universe has been one of the most burning topics in international economics over the past few years. Globalization has many dimensions and has a variety of social, political and economic implications. This term introduced in early 1980, which never precisely defined, is a frequently used word in the political economy. Though there is no appropriate definition of globalization, the term globalization refers to the integration of economies of the world through unrestrained trade and financial flows as well as through mutual exchange of technology and knowledge. Preferably, it also contains free inter-country movement of labour. The process of globalization not only includes opening up of world trade but also development of advanced means of communication, internationalization of financial markets, growing importance of MNC's, population migrations and more generally increased mobility of persons, goods, capital, data and ideas but also infections, diseases and pollution. Therefore, it simply means growing integration of the national economies, openness to trade, financial flows, foreign direct investment and the increasing interaction of people in all facets of their lives. Globalization also implies internationalization of production, distribution and marketing of goods and services. International integration implies the adoption of common policies by the individual countries.

India opened up the economy in the early nineties following a major crisis that led by a foreign exchange crunch that dragged the economy close to defaulting on loans. The response was a slew of Domestic and external sector policy measures partly prompted by the immediate needs and partly by the demand of the multilateral organizations. The new policy regime radically pushed forward in favour of a more open and market oriented economy. As a participant in the globalization wave, India went through several structural and policy changes only in early 1990s, even if the awareness of need for opening up country's borders was started in late 1980s. The first step towards globalization was taken with the announcement of the devaluation of Indian currency by 18-19 percent against major currencies in the international foreign

exchange market. In fact, this measure was taken in order to resolve the BOP crisis. In order to make the process of globalization smooth, privatization and liberalization policies are moving along as well. By virtue of this programme, intensive charges have been made in industrial policy of India Government. Relaxing of licensing rule, reduction of tariff rates, removal of restrictions on import etc. are among those which have been initiated at early stage. Under the privatization scheme, most of the public sector undertakings are being sold to private sector. Licensing policy has been relaxed drastically excepting a few industrial undertaking in India. Some of the recent initiatives taken to further liberalize the FDI regime, inter alias, include opening up of sectors such as Insurance, development of integrated townships (upto 100%); defence industry,tea plantation (upto 100% subject to divestment of 26% within five years to FDI); enhancement of FDI limits in private sector banking, allowing FDI up to 100% under the automatic route for most manufacturing activities in SEZs; opening up B2B e-commerce; Internet Service Providers (ISPs) without Gateways; electronic mail and voice mail to 100% foreign investment subject to 26% divestment condition; etc. Therefore, wide-ranging financial sector reforms in the banking, capital markets, and insurance sectors, including the deregulation of interest rates, strong regulation and supervisory systems, and the introduction of foreign/private sector competition have already been executed.

The policy reforms undertaken since 1991had the objectives to make the entire economy more efficient, technologically up-to-date and competitive. This was done with the expectation that efficiency improvement, technological up-gradation and competitiveness would ensure Indian economy to achieve rapid growth. In view of greater openness of Indian economy due to trade liberalization, private sector can build and expand capacity without any regulation. There had been an investment boom in manufacturing sector in the first half of 1990s, (Uchikawa). The advocates of globalization believe that this policy reforms will improve economic growth and performance significantly while critics argue that total withdrawal of restrictions on several matters will have a negative effect on future growth and performance of the economy. There are also negative aspects of globalization. The opponents are of the view that globalization may worsen inequalities both across and within countries, environmental degradation and vulnerability of the poor nations might increase and developed countries establish dominance over these countries culminating in revival of colonialism.

The effects of globalization on growth have also been frequently analyzed with various measures. Until most recently, however, most studies examined them employing cross sections only. For example, Chanda (2001) uses an index of capital account openness to show that more developing countries have suffered from globalization than not, while Rodrik (1998) as well as Alesina et al. (1994) found no effect of capital account openness on economic growth. With respect to foreign direct investment (FDI), there is evidence of a positive growth-effect in countries which are sufficiently rich (Blomström et al. 1992) and a negative one in low income countries (Garrett 2001). Among others, Dollar (1992) analyzed the relationship between economic performance and openness to trade, Frankel and Romer (1996) those between growth and actual flows. Their results show that both openness to trade and actual trade flows are robustly related to growth. All of these studies present, however, only cross sectional estimates. Moreover, they do not adequately control for endogeneity. Their results might therefore reflect unobserved characteristics which do not vary over time instead of being the consequences of globalization or might reflect reverse causality. Streeten (1999) observes that economic liberalization, technological changes, competition in both labour and product markets have contributed to economic failure, weakening of institutions and social support systems, and erosion of established identities and values.

Some recent studies use panel data to examine the relationship between some dimensions of globalization and growth. Among them, Dollar and Kraay (2001) found that an increase in trade flows and foreign direct investment resulted in higher growth rates. Greenaway et al. (1999) also report a strong relationship between trade and growth. With respect to FDI, Borensztein et al. (1998) provide evidence of a positive growth-effect – given a minimum threshold stock of human capital. Carkovic and Levine (2002), to the contrary, do not find a robust influence of foreign direct investment on growth. A detailed analysis of the impact of several indicators of financial integration and growth is provided by Edison et al. (2002a). Their results show that no robust relationship exists. Todaro and Smith (2003) have stated that globalization presents new possibilities for eliminating global poverty and globalization can benefit poor countries directly and indirectly through cultural, social, scientific and technological exchanges as well as trade and

finance. Some very important low-income countries like India and China have used globalization to their advantage and have succeeded in achieving enviable economic growth rate and thus reducing some international inequalities. Dollar and Kraay ((2004) have studied the effects of globalization on the poor in the developing countries. They note that over half of the developing countries experiencing globalization have gained large increases in trade and considerable reduction in tariffs. These countries are catching- up with the developed countries while the remaining is losing. They have reported that the increase in economic growth leads to a proportionate increases in incomes of the poor.

This paper attempts to enquire into the fact econometrically whether globalization is a cause of India's economic growth in the long run. More precisely, the article tries to find the causal relationship between globalization and economic growth in India.

2. Methodology &Database:

2.1. Data and Variables

The objective of this paper is to investigate the impact of various factors of globalization on India's economic growth as well as the dynamics of the relationship between globalization and economic growth in India using the annual data for the period, 1990-91 to 2010-11 which includes the 21 annual observations. All necessary data for the sample period are obtained from the Handbook of Statistics on Indian Economy and Handbook of statistics on Securities Market of India, 2010-11 published by Reserve Bank of India. All the variables are taken in their natural logarithms to avoid the problems of heteroscedasticity.

The real Gross Domestic Product (GDP) is used as the proxy for economic growth in India and we represent the economic growth rate by using the constant value of Gross Domestic Product (GDP) measured in Indian rupee. Economic growth, proxied by real GDP or real per capita GDP, is influenced by a variety of factors. The importance and relevance of these factors may differ from country to country and may also change overtime. Difficulty in obtaining capital stock series for a developing country like India has led us to use gross investment for capital which is again divided into public sector and private sector investments in order to appreciate their relative significance for economic growth. Two measures of openness are used to measure the degree of integration of Indian economy. Openness is the ratio of the sum of imports (M) and exports (X) to GDP and the financial integration is the ratio of sum of capital inflow and capital outflow to the GDP. The latter measure represents financial integration and the international interdependence is represented by the first measure. For capital inflow, we use the sum of official aid, foreign direct investment and portfolio investment in India. Since consistent and regular time series data is not available for capital outflow, we use debt servicing as a proxy for capital outflow. We use the expenditure on education including medical expenses and health expenditure as a proxy for HRD (human resource development). It is the human resources of a nation that ultimately determine the character and pace of its economic and social development because education makes not only efficient workers but also good citizens.

2.2.Econometric specification:

Step –I: Ordinary least square method:

Primarily, we have studied the effect of globalization on economic growth by a simple regression equation:

$$\ln GDP = \beta 0 + \beta 1 \ln PrInv + \beta 2 \ln PubInv + \beta 3 \ln Openness + \beta 4 \ln FinInt + \beta 5 \ln HRD + \varepsilon \text{ --------(1)}$$

The expected sign of all the coefficients is positive.

Where

ln = natural logarithm

GDP = nominal gross domestic product

PubInv = public sector investment

PrInv = private sector investment

Openness = trade openness

FinInt= financial Integration (capital inflow +capital outflow)

HRD = Human resource development

ε = White noise error term

Step II: The Stationarity Test (Unit Root Test):

It is suggested that when dealing with time series data, a number of econometric issues can influence the estimation of parameters using OLS. Regressing a time series variable on another time series variable using the Ordinary Least Squares (OLS) estimation can obtain a very high R^2, although there is no meaningful relationship between the variables. This situation reflects the problem of spurious regression between totally unrelated variables generated by a non-stationary process. Therefore, prior to testing Cointegration and implementing the Granger Causality test, econometric methodology needs to examine the stationarity ;for each individual time series, most macro economic data are non stationary, i.e. they tend to exhibit a deterministic and/or stochastic trend. Therefore, it is recommended that a stationarity (unit root) test be carried out to test for the order of integration. A series is said to be stationary if the mean and variance are time – invariant. A nonstationary time series will have a time dependent mean or make sure that the variables are stationary, because if they are not, the standard assumptions for asymptotic analysis in the Granger test will not be valid. Therefore, a stochastic process that is said to be stationary simply implies that the mean [(E(Yt)] and the variance [Var(Yt)] of Y remain constant over time for all t, and the covariance [covar(Yt, Ys)] and hence the correlation between any two values of Y taken from different time periods depends on the difference apart in time between the two values for all t≠s. Since standard regression analysis requires that data series be stationary, it is obviously important that we first test for this requirement to determine whether the series used in the regression process is a difference stationary or a trend stationary.

Several tests of non-stationarity called unit root tests have been developed in the time series econometrics literature. In most of these tests the null hypothesis is that there is a unit root, and it is rejected only when there is strong evidence against it. Most tests of the Dickey-Fuller (DF) type have low power (see Dejong et al. 1992). Because of this Maddala and Kim (1998) argue that DF, ADF (augmented Dickey-Fuller) and PP (Phillips and Perron) tests should be discarded. We, therefore, use the KPSS (Kwiatkowski, Phillips, Schmidt and Shin 1992) test which is considered relatively more powerful (Bahmani-Oskooee 1999). The KPSS Lagrange Multiplier tests the null of stationarity (H0: ρ< 1) against the alternative of a unit root (H1: ρ =1).

In econometrics, Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests are used for testing a null hypothesis that an observable time series is stationary around a deterministic trend. The series is expressed as the sum of deterministic trend, random walk, and stationary error, and the test is the Lagrange multiplier test of the hypothesis that the random walk has zero variance. KPSS type tests are intended to complement unit root tests, such as the Dickey–Fuller tests. By testing both the unit root hypothesis and the stationarity hypothesis, one can distinguish series that appear to be stationary, series that appear to have a unit root, and series for which the data (or the tests) are not sufficiently informative to be sure whether they are stationary or integrated.

Step-III: Testing for Cointegration Test(Johansen Approach)

Cointegration, an econometric property of time series variable, is a precondition for the existence of a long run or equilibrium economic relationship between two or more variables having unit roots (i.e. Integrated of order one). The Johansen approach can determine the number of co-integrated vectors for any given number of non-stationary variables of the same order. Two or more random variables are said to be cointegrated if each of the series are themselves non – stationary. This test may be regarded as a long run equilibrium relationship among the variables. The purpose of the Cointegration tests is to determine whether a group of non – stationary series is cointegrated or not.

Engle and Granger (1987) introduced the concept of cointegration, where economic variables might reach a long-run equilibrium that reflects a stable relationship among them. For the variables to be co-integrated, they must be integrated of order one (non-stationary) and the linear combination of them is stationary I(0).

The crucial approach which is used in this study to test cointegration is called the Johansen cointegration approach. The Johansen approach can determine the number of cointegrated vectors for any given number

of non-stationary variables of the same order.

If the hypothesis of nonstationarity is established for the underlying variables, it is desirable and important that the time series data are examined for cointegration. Toda and Philips (1993) have shown that ignoring cointegration when it exists, can lead to serious model misspecification. We use the maximum likelihood procedure of Johansen (1991, 1995) because it is based on well-established maximum Likelihood procedure.

Step-IV: The Granger Causality test :

Causality is a kind of statistical feedback concept which is widely used in the building of forecasting models. Historically, Granger (1969) and Sim (1972) were the ones who formalized the application of causality in economics. Granger causality test is a technique for determining whether one time series is significant in forecasting another (Granger. 1969). The standard Granger causality test (Granger, 1988) seeks to determine whether past values of a variable helps to predict changes in another variable. The definition states that in the conditional distribution, lagged values of Yt add no information to explanation of movements of Xt beyond that provided by lagged values of Xt itself (Green, 2003). We should take note of the fact that the Granger causality technique measures the information given by one variable in explaining the latest value of another variable. In addition, it also says that variable Y is Granger caused by variable X if variable X assists in predicting the value of variable Y. If this is the case, it means that the lagged values of variable X are statistically significant in explaining variable Y. The null hypothesis (H0) that we test in this case is that the X variable does not Granger cause variable Y and variable Y does not Granger cause variable X.In summary, one variable (Xt) is said to granger cause another variable (Yt) if the lagged values of Xt can predict Yt and vice-versa.

The spirit of Engle and Granger (1987) lies in the idea that if the two variables are integrated as order one, I(1), and both residuals are I(0), this indicates that the two variables are cointegrated.

Step V: Error Correcting Model (ECM) and Short Term Causality Test :

Error correction mechanism was first used by Sargan (1984), later adopted, modified and popularized by Engle and Granger (1987). By definition, error correction mechanism is a means of reconciling the short-run behaviour (or value) of an economic variable with its long-run behaviour (or value). An important theorem in this regard is the Granger Representation Theorem which demonstrates that any set of cointegrated time series has an error correction representation, which reflects the short-run adjustment mechanism.

Co- integration relationships just reflect the long term balanced relations between relevant variables. In order to cover the shortage, correcting mechanism of short term deviation from long term balance could be cited. At the same time, as the limited number of years, the above test result may cause disputes (Christpoulos and Tsionas, 2004). Therefore, under the circumstance of long term causalities, short term causalities should be further tested as well. Empirical works based on time series data assume that the underlying time series is stationary. However, many studies have shown that majority of time series variables are nonstationary or integrated of order 1 (Engle and Granger, 1987). The time series properties of the data at hand are therefore studied in the outset. Formal tests will be carried out to find the time series properties of the variables. If the variables are *I* (1), Engle and Granger (1987) assert that causality must exist in, at least, one direction. The Granger causality test is then augmented with an error correction term (ECT)

The acceptance of cointegration between two series implies that there exists a long run relationship between them and this means that an error-correction model (ECM) exists which combines the long-run relationship with the short-run dynamics of the model. The existence of cointegration implies that unidirectional or bidirectional Granger causality must exist. Therefore, it is necessary that the simple Granger causality test is improved with error-correction mechanism, derived from the residuals of the cointegrating relationship. Based on Engle and Granger (1987, 255) representation theorem, the error correction model of equation (1) is formulated as follows and the results have been provided in Table 5 below.

$$\Delta lnGDPt = \alpha + \lambda ECM_{t-1} + \Sigma\beta_i\ \Delta lnGDP_{t-i} + \Sigma\ \psi i\ \Delta InPrInv_{t-i} + \Sigma\varphi i \Delta lnPubInv_{t-i} + \Sigma\ \eta i\ \Delta lnOpenness_{t-i} + \Sigma\delta i\ \Delta lnFinInt_{t-i} + \Sigma\theta i\ \Delta lnHRD_{t-i} + \mu_t$$

ECM_{t-1} is the error correction term generated from the Johansen multivariate procedure and the parameter λ is the error correction coefficient that measures the response of the regressor in each period to departures from equilibrium. The presence of ECM_{t-1} reflects the presumption that dependent variable does not adjust instantaneously to its long-run determinants. Therefore, in the short-run an adjustment is made to correct any disequilibrium in the long-run. Therefore, error-correction model shows how system converges to long-run equilibrium. Lagged explanatory variables represent short- run impact and the long-run impact is given by the error correction term.

3. Empirical analysis and interpretation of the result:

The discussion will be divided into two sub-sections. In the first section, we will generally look into the descriptive analysis of the variables. The main target is to understand the behaviour of the variables itself, by looking at the distribution of mean, median, maximum, minimum, standard deviation, skewness and kurtosis of each variable. The next subsection will be focusing on the estimation results of regression, unit root, Johansen cointegration, granger causality analysis etc .

Table 1 presents descriptive statistics for the variables used in our estimate. Summary statistics in table 1 include the mean and the standard deviation, minimum and maximum value for Period 1991-92 to 2007-08.The mean, median, maximum, minimum and standard deviation can determine the statistical behaviour of the variables. The relatively smaller figure of standard deviation indicates that the data dispersion in the series is quite small. This finding suggests that almost all independent variables included in the sample were having smaller dispersion level of different independent variables under our study across time series. The descriptive statistics shows negative skewness for private investment, openness and human resource development variables which indicate flatter tails than the normal distribution. Out of five independent variables under our consideration, only financial integration variable (lnFinInt.) shows leptokurtic distribution (kurtosis>3).

[Insert Table-1 here]

In Ordinary Least Squares (OLS) regression, time series residuals are often found to be serially correlated with their own lagged values. Serial correlation means (a) OLS is no longer an efficient linear estimator, (b) standard errors are incorrect and generally overstated, and (c) OLS estimates are biased and inconsistent .This test is an alternative to the Q-Statistic for testing for serial correlation. It is available for residuals from OLS, and the original regression may include autoregressive (AR) terms. Unlike the Durbin-Watson Test, the Breusch-Godfrey test may be used to test for serial correlation beyond the first order, and is valid in the presence of lagged dependent variables. The null hypothesis of the Breusch-Godfrey test is that there is no serial correlation up to the specified number of lags. The Breusch-Godfrey test regresses the residuals on the original regressors and lagged residuals up to the specified lag order. The number of observations multiplied by R^2 is the Breusch-Godfrey test statistic.

[Insert Table-2 here]

Therefore, the result from diagnostic checking shows that model does not suffer form autocorrelation.

The OLS results in Table 3 show that the primary variables have the expected sign. The regression results show that private investment ,openness and human resource development have significant positive impact on economic growth via GDP growth. Financial integration variable(capital inflow+capital outflow) has negative impact, although not significant, on economic growth and public investment is also having insignificant positive impact on economic growth.

[Insert Table-3 here]

The KPSS results (Table 4) show that all the variables are non-stationary in level form.Table (4) presents the results of the unit root test for the variables for their levels and first differences. The results indicate that the null hypothesis of a unit root can not be rejected for the given variable at levels with both trend and

without trend and, hence, one can conclude that the variables are not stationary at their levels. We get mixed results in level form with trend.

To determine the stationarity property of the variable, the same test above was applied to the first differences. Results from table (4) revealed that all the KPSS values both without trend and with trend are smaller than the critical t-value at 1% ,5% and 10%level of significance for all variables. Based on these results, the null hypothesis that the series have unit roots in their differences can be rejected.Therefore,all the variables are first difference stationary I (0) thus integrated of order 1.

[Insert Table-4 here]

Since the principal variables are stationary and integrated of order1, we apply now the Johansen cointegration test to see whether the variables are cointegrated or not suggesting long-run relationship. The test for presence of long-run relationship between the variables using the Johansen and Juselius (1992) LR statistic for cointegration was conducted. It can be seen from the Likelihood Ratio (L.R.) that we have two co-integration equations. In other words, there exist two linear combinations of the variables. Therefore, Economic growth and all right hand side variables are cointegrated thus having long-run relationship.

[Insert Table-5 here]

The acceptance of cointegration between two series implies that there exists a long run relationship between them and this means that an error-correction model (ECM) exists which combines the long-run relationship with the short-run dynamics of the model. The existence of cointegration implies that unidirectional or bidirectional Granger causality must exist.

[Insert Table-6 here]

The above results generally show that causality is bidirectional for the majority of the pairs of variables except eight where it is unidirectional. The following pairs of variables are the ones that exhibited unidirectional causality: lnGDP and lnFinInt, lnHRD and lnFinInt, lnFinInt and lnHRD, lnPubInv and lnFinInt, lnFinInt and lnPubInv, lnOpenness and lnGDP, lnOpenness and lnHRD.

If we consider all the other cases considered, we observe that the direction of causality between globalization and economic growth in India is generally bidirectional (causality runs in both directions).

Lagged explanatory variables represent short- run impact and the long-run impact is given by the error correction term. Error correction results show that the error correction term ECT t-1 has the correct negative sign and is significant for GDP, public sector investment, private sector investment and financial integration indicate the long-run equilibrium between the foresaid variables. An estimate of –0.037 for GDP indicates that 3.7% of the preceding year disequilibrium is eliminated in the current year.

[Insert Table-7 here]

4.Conclusions:

This paper explores the impact of globalization on economic growth of India for the period 1990-91 to 2010-11.In order to assess the impact of globalization empirically, we consider trade openness and financial integration, public and private investment, human resource development etc as macroeconomic independent variables expected to influence the economic growth in the regression framework. The regression results show that private investment, openness and human resource development have significant positive impact on economic growth via GDP growth. Financial integration variable (capital inflow+capital outflow) has negative impact, although not significant, on economic growth and public investment is also having insignificant positive impact on economic growth. Johansen's cointegration procedure showed that all the above-mentioned variables are cointegrated implying these macro economic variables have long-run equilibrium relationship with economic growth via GDPgrowth. Error-correction model results also supported the cointegration results. We observe that the direction of causality between

globalization and economic growth in India is generally bidirectional (causality runs in both directions) excepting a few where it is unidirectional. Main finding of this paper is that India's economic growth has received a strong impetus in post 1991 era. This increased economic growth is mainly and directly is a result of free trade movement that started in1991. The government is committed to accelerate economic reforms and developing basic infrastructure further to improve lives of the rural poor and boost economic performance.

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Table-1: Descriptive Statistics

	lnPrInv.	lnPubInv.	lnOpenness.	lnFinInt.	lnHRD.
Mean	9.521809	12.09481	-1.491968	-1.329050	11.20252
Median	9.750453	12.13208	-1.513043	-1.377870	11.43130
Maximum	11.11708	13.74224	-0.568462	-1.072210	12.38344
Minimum	7.548029	10.97454	-2.660567	-1.505240	9.920337
Std. Dev.	0.884445	0.733956	0.609094	0.111184	0.759835
Skewness	-0.439092	0.570509	-0.227997	1.014656	-0.181779
Kurtosis	2.535824	2.921038	2.111347	3.438598	1.859924
Jarque-Bera	0.863332	1.144639	0.872931	3.771664	1.252953
Probability	0.649426	0.564215	0.646317	0.151703	0.534472
Observations	21	21	21	21	21

Source: Own estimate

Table-2: Diagnostic Checking: Autocorrelation

Breusch-Godfrey Serial Correlation LM Test:			
F	0.378893	Probability	0.691936
Obs*R-squared	1.156691	Probability	0.560825

The statistic labeled 'Obs*R-squared' is the LM test statistic for the null hypothesis of no serial correlation. The high probability values indicate the absence of serial correlation in the residuals.

Source: Own estimate

Table -3: Regression Results by Ordinary Least Square Technique

Dependent Variable: lnGDP Method: Least Squares Sample: 1990-91 to 2010-11 Included observations: 21				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.668327	2.369770	3.235895	0.0055
lnPrInv	0.115559	0.027700	4.171817	0.0008
lnPubInv	0.133156	0.102699	1.296561	0.2144
lnOpenness	0.139912	0.024474	5.716692	0.000
lnFinInt	-0.076663	0.245016	-0.312890	0.7587
lnHRD	0.380466	0.190820	1.993850	0.0647
R-squared 0.977243		Mean dependent var 14.53448		
Adjusted R-squared 0.969657		S.D. dependent var 0.490226		
S.E. of regression 0.085394		Akaike info criterion -1.848129		
Sum squared resid 0.109382		Schwarz criterion -1.549694		
Log likelihood 25.40536		F-statistic 128.8254		
Durbin-Watson stat 1.409677		Prob(F-statistic) 0.000000		

Source: Own estimate

Table 4:Unit Root Test

Variable (log)	KPSS level		KPSS First Difference	
	Without Trend	With trend	Without Trend	With trend
lnGDP	2.0333	0.3935	0.2874	0.0557706
lnPrInv	0.4114	0.3680	0.12981	0.0525995
lnPubInv	1.8622	0.1567	0.152587	0.0747019
lnOpenness	2.0385	0.2015	0.186322	0.060313
lnFinInt	0.7095	0.2728	0.206787	0.0336542
lnHRD	2.0612	0.3137	0.15061	0.0955587

Ho: series has unit root; H_1: series is trend stationary

Note: 1%, 5% and 10% critical values for KPSS are 0.739, 0.463 and 0.347 for *without trend.*

1%, 5% and 10% critical values for KPSS *with trend* are 0.216, 0.146 and 0.1199.

Source: Own estimate.

Table 5: Johansen Cointegration Test:

Included observations: 20 Test assumption: Linear deterministic trend in the data Series: lnFinInt, lnGDP, lnHRD lnOpenness, lnPrInv, lnPubInv. Lags interval: No lags				
Hypothesized No. of CE(s)	Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value
None **	0.957328	136.9029	94.15	103.18
At most 1 *	0.877750	73.81849	68.52	76.07
At most 2	0.533268	31.78480	47.21	54.46
At most 3	0.447892	16.54480	29.68	35.65
At most 4	0.199756	4.664555	15.41	20.04
At most 5	0.010335	0.207784	3.76	6.65

Ho: has no co-integration; H1: has co-integration

*(**) denotes rejection of the hypothesis at 5%(1%) significance level .

L.R. test indicates 2 cointegrating equation(s) at 5% significance level.

Source: Own estimate

Table 6: Pair wise Granger Causality Tests

Sample: 1990-91 to 2010-11 Lags: 2			
Null Hypothesis:	Obs.	F-Statistic	Probability
lnGDP does not Granger Cause lnFinInt	19	4.48040	0.03133*
lnFinInt does not Granger Cause lnGDP		0.18269	0.83498
lnHRD does not Granger Cause lnFinInt	19	2.87988	0.08962**
lnFinInt does not Granger Cause lnHRD		3.86936	0.04595*
lnOpeness does not Granger Cause lnFinInt	19	2.46756	0.12079
lnFinInt does not Granger Cause lnOpenness		0.38558	0.68706
lnPrInv does not Granger Cause lnFinInt	19	0.72978	0.49948
lnFinInt does not Granger Cause lnPrInv		0.91377	0.42365
lnPubInv does not Granger Cause lnFinInt	19	3.00165	0.08226**
lnFinInt does not Granger Cause lnPubInv		9.86485	0.00212*
lnHRD does not Granger Cause lnGDP	19	0.29106	0.75188
lnGDP does not Granger Cause lnHRD		1.59103	0.23843
lnOpeness does not Granger Cause lnGDP	19	3.71120	0.05091**
lnGDP does not Granger Cause lnOpeness		1.50974	0.25484
lnPrInv does not Granger Cause lnGDP	19	1.50397	0.25605
lnGDP does not Granger Cause lnPrInv		1.43881	0.27022
lnPubInv does not Granger Cause lnGDP	19	0.91891	0.42172
lnGDP does not Granger Cause lnPubInv		6.06310	0.01269*
lnOpenness does not Granger Cause lnHRD	19	2.89771	0.08850**
lnHRD does not Granger Cause lnOpenness		1.37712	0.28446
lnPrInv does not Granger Cause lnHRD	19	0.37594	0.69337
lnHRD does not Granger Cause lnPrInv		0.25024	0.78202
lnPubInv does not Granger Cause lnHRD	19	0.75855	0.48666
lnHRD does not Granger Cause lnPubInv		1.19786	0.33097
lnPrInv does not Granger Cause lnOpenness	19	2.11038	0.15810
lnOpenness does not Granger Cause lnPrInv		0.47133	0.63372
lnPubInv does not Granger Cause lnOpenness	19	0.21961	0.80555
lnOpenness does not Granger Cause lnPubInv		8.28019	0.00423
lnPubInv does not Granger Cause lnPrInv	19	0.37392	0.69470
lnPrInv does not Granger Cause lnPubInv		1.91013	0.18471

a)The Schwartz criterion was used to determine the order of the lags on the bivariate (bVAR) relationships. The number of observations is the one that restricted us to two lags.

b)The estimates were achieved by using the integrated variables first differences. *(**) denotes significance at 5 (10) percent level.

Source: Own estimate

Table 7: Error-correction Results

	d_lnGDP	d_lnprinv	d_lnpubinv	d_lnopennes	d_lnFI	d_lnHRD
ECT	-0.037 (-2.31) *	-0.59 (-1.75) *	0.12 (2.64)*	-0.041 (-1.14)	-0.084 (-2.98)*	-0.0148 (-0.456)
d_lnGDP_1	0.659 (1.542)	-2.501 (-0.49)	2.13 (3.00)*	-0.865 (-1.57)	0.0623 (0.146)	0.0411 (0.084)
d_lnprinv_1	0.017 (0.605)	0.225 (0.67)	-0.157 (-3.35)*	0.071 (1.986)*	-0.0155 (-0.548)	0.0021 (0.068)
d_lnpubinv_1	-0.236 (-1.039)	3.90 (1.44)	-0.53 (-1.41)	0.391 (1.337)	0.465 (2.047)*	0.0667 (0.256)
d_lnopennes_1	-0.315 (-0.517)	12.59 (1.73)	-0.274 (-0.27)	0.517 (0.659)	1.276 (2.09)*	0.431 (0.616)
d_lnFI_1	-0.462 (-0.910)	7.66 (1.27)	0.255 (0.303)	0.308 (0.472)	1.62 (3.19)*	0.617 (1.062)
d_lnHRD_1	0.0119 (-0.046)	-2.41 (-0.78)	0.724 (1.67)	-0.498 (-1.48)	-0.0097 (-0.037)	0.418 (1.399)

Source: Own estimate