Remittances and Economic Growth in India: A Time Series Analysis

Tajinder Singh
Assistant Professor in Economics
Guru Nanak Dev University College,
Jalandhar

Dr. Anjali Mehra
Senior Assistant Professor in Economics
School of Social Sciences, Guru Nanak
Dev University, Amritsar

Abstract

International remittances to the developing regions are now the largest source of financial inflows in many developing countries. In most of the countries indulging in emigration, remittances have exceeded the merchandise export earnings. India is the top recipients of remittances among developing countries in 2012. The present study has been undertaken with the objective of analyzing the importance and impact of international remittances on the Indian Economy by using the time series data with the help of Johansen's cointegeration techniques and Granger's causality analysis. It is based on data taken from the World Development Indicators 2012, published by the World Bank. Remittances to India are highest among other foreign inflows i.e. foreign direct investment, portfolio investment and grant in aids. With the help of Johansen's cointegration techniques it was found that remittances have a positive and significant long run effect on the real gross domestic product per capita (LGDP) of India. It was observed through ECM and the causality analysis that remittances also have a short run impact on LGDP and real gross fixed capital formation per capita (LGFC) of country. Impulse Response analysis reveals that a positive shock to remittances causes significant variations in LGDP of India for all the period. A positive shock to remittances also causes significant variations in LGFC. The results of variance decomposition proved that shocks to LGDP explain the largest share of the fluctuations in LGDP. Thus it can be concluded that remittances play a significant role in the economic growth of the India and therefore the government should take steps for encouraging remittances by legalizing the different channels so that the transaction costs and time taken to remit is reduced which will further inspire NRIs and PIOs to remit money through legal channel and encourage them to make productive use of their funds.

JEL Classification: C01, C22, C87, F24

Keywords:

Remittances, Causality, VAR/VECM, Cointegration

Introduction

Prevailing regional inequalities and uneven development among nations encourage people to move from backward and poor economies to the developed world for better opportunities. The total number of worldwide international migrants in 2010 was estimated to be 215.8 million which was 3.2 percent of total world's population (*World Bank,* 2010). It is estimated that, if the migrant population continues to increase at the same pace as in the last 20 years, the stock of international migrants worldwide would be as high as 405

million by 2050 (*United Nations,* 2009). Migration has a significant role and implications for the development of developing countries. The most immediate and direct benefit of international migration is the remittances that the migrants send to their home countries. In general terms, remittances are international transfers of funds sent by migrant workers from the country where they are working, to people in the country from which they have come and it includes cash and gifts sent for household purpose as well as charity and other contributions by the migrants.

International remittances to the developing regions are now the largest source of financial inflows in many developing countries. In most of the countries indulging in emigration, remittances have exceeded the merchandise export earnings. It is claimed that remittances are nearly three times the value of the Official Development Assistance provided to low-income countries, and is the second largest source of external finance for developing countries after Foreign Direct Investment (*United Nations,* 2005). Remittances flow across the regions in the world increased rapidly from US$24.3 billion in 1980 to US$66 billion in 2000 and to $483 billion in 2011 and are expected to increase to $593 billion by 2014 (*World Bank,* 2012). Officially recorded flow of remittances to developing countries was estimated to have reached $401 billion in 2012. According to the Migration and Development Brief 20, the top recipients of remittances among developing countries in 2012, were India ($69 billion), followed by China ($60 billion), Philippines ($24 billion), and the Mexico ($23 billion).Other large recipients in US dollar terms include Nigeria, Egypt, Bangladesh, Pakistan, Vietnam and Lebanon. However, small and low-income countries such as Tajikistan, Liberia, Kyrgyz Republic, Lesotho, Moldova and Nepal tend to receive more remittances as a share of their gross domestic product (*World Bank,* 2013).

Global recession slowed down the growth of the worldwide flow of remittances but the deceleration is much less than the other foreign currency flows. This shows that the remittances are countercyclical and less volatile than other capital flows. The main reason behind this is the fact that new migration has slowed down, but number of permanent overseas migrants has not yet been much affected by the global economic crisis. Therefore remittances flows have currently slowed down, but there is no indication that they will slow down further. Hence remittances would be back on a higher growth in coming years (*Jha et al*, 2010).

The Indian Diaspora estimated around 27 million (*Government of India,* 2011), is world's second largest overseas community. The amount of remittances to India was US$ 63.8 billion in 2011(*World Bank,* 2012). Remittances to India have grown continuously and this trend became stronger after the adoption of economic reforms in 1991. As seen from Figure 1 remittances as compared to other foreign inflows like FDI, Portfolio Investment and ODA, have continuously shown an increasing trend. While portfolio investment and FDI showed negative impact of international financial crises of 2007-08, remittances continued to grow.

Figure 1

Perusal of Table 1 and 2 shows that India received worker's remittances to the tune of US$ 0.429 billion which were about 0.44 percent of GDP in 1975. The amount of remittances to India, including gifts was about US$ 2.7 billion in 1980. Throughout the eighties, it remained so. In the nineties, it increased rapidly from US$ 3.28 billion in 1991, to more than US$ 12 billion in 2000 and was estimated to be US$ 63.8 billion in 2011. Annual growth rate of remittances was positive after 2001 except for the year 2004 and 2009, and in 2010 and 2011 growth rate of remittances compared to previous years was estimated to be 7.79 percent and 17.67 percent respectively. The share of GDP at current prices remittances were 3.12 percent in 2010 (detail given in Table 2). Remittances constituted a significant share of important macroeconomic variables. According to Table 2, as a percentage of household final consumption expenditure, remittances were 0.53 percent in 1975 and rose to 7 percent in 2008, but again declined to 5.4 percent. This decline may be due to continuing crisis in Europe and U.S.A. where majority of Indian migrants reside. Remittances as share of gross domestic saving and gross capital formation were 11.48 percent and 9.84 percent respectively in 2009, but declined to 9.92 percent and 8.99 percent respectively in 2010. Compound annual growth rate of remittances as a share of Gross Domestic Product, Gross Domestic Saving, Household Consumption Expenditure and Gross Capital Formation is positive and found to be 6.773 percent, 7.993 percent, 5.036 percent and 4.888 percent respectively indicating a continuous increase.

Table 1

Table 2

Review of literature: The role of international remittances in the economic growth and development of the developing countries has recently received a great deal of attention. Whether remittances promote economic growth or not, is an important issue of debate amongst economists. As per Rubenstein (1992) migration causes only a shortage of labour in developing countries and remittances create the problem of lopsided development rather than sustainable development and also encourage the others to migrate illegally. Some part of remittances goes to religious activities rather than towards development. According to Nayyar (1994), the impact of remittances from emigrants on saving and investment in India is not significant but has a significant impact on Balance of Trade and Balance of Payments by reducing the current account deficit. These financial flows have a positive but small impact on exports and imports. But the critics are of the view that remittances do not contribute to economic growth, they only increase the expenditure on consumption, rather than capital formation which results in fueling inflation (*Chami et al,* 2003; *Rahman et al,* 2006). Others argue that remittances have positive impact on economic development through multiplier effect on consumption, which further generates income and investment and therefore remittances contribute significantly to the gross domestic product as well as foreign exchange earnings of developing countries (*Stahl et al* 1986; *Azeez et al,* 2009). Mallick (2008) on the other hand, observed that though remittances have positive influence on private consumption it has a neutral impact on growth rate of output while, having an adverse impact on private investment. As to the macroeconomic effects of remittances on the home countries, studies have shown that remittances help to alleviate credit constraints of the poor and have positively affected private investment (*Aggarwal et al,* 2006; *Giuliano et al,* 2006; *Pradhan et al,* 2008). Ratha (2003) and Kapur (2004), found that remittances are becoming an increasingly important and relatively stable source of external finance than

other capital flows such as Foreign Direct Investment, Portfolio Investment and Official Development Assistance. Clarke et al, (2004) and Gupta (2005), observed that though remittances were high when economic conditions abroad were benign, they were even higher during the periods of negative agriculture growth, natural disaster and economic crisis in the home country. Osili (2007) found that remittances have the potential to contribute to economic development by reducing poverty and providing savings for capital accumulation in the country of origin. Yang et al, (2006), found that the remittances have positive spillover effects on households without migrant members. Adams et al, (2005), used cross country analysis and showed significant poverty reduction impact of remittances, similarly Shafiq et al, (2012) and Kalim et al, (2009) observed by using cointegeration techniques that remittances have significant impact on poverty reduction in Pakistan. Portes (2009) found that remittances reduced poverty as well as inequality by increasing the income of poor people as well as reducing the income of rich people particularly in low income countries, Rao et al (2009) by using Solow model and taking impact of remittances on growth through total factor productivity, found that although remittances have no long run growth effects, but have short to medium term transitory growth effects. These growth effects do not raise the permanent growth rates but they have permanent level effects, while Jongwanich (2007) found that remittances have long run positive impact on human capital development and it seems to be used to finance education and health.

From the review of the above studies it is clear that most of these are mainly theoretical in nature and very few are substantiated with comprehensive quantitative analysis. To the best knowledge of the authors, a few studies have used cointegration technique to know the long run relationship between the remittances and economic growth of India. Therefore, the present study is an attempt to fill this void and the specific objective of the study is to analyse the importance and the relationship of remittances with the economic growth of India. The objectives of the study are

- To study the impact of remittances on Indian economy.
- To study the relationship of remittances with economic growth of India.

The study has been divided into five sections including the present one. Introduction was given in the section 1, while review of literature in the section 2. The data base and methodology has been discussed in Section 3. While Section 4 is an attempt to analyse the result obtained and tries to study the impact of remittances on economic growth of India. Section 5 concludes the findings.

Data Base and Methodology:

The present study is based on secondary data taken from the World Development Indicators 2012, published by the World Bank for the time period 1975 -2011. In order to verify the significant impact of remittances on economic growth, we have taken the growth equation used by Kohpaiboon (2003), Waheed, et al (2008), Jawaid et al (2011) Kumar (2011) and Rao et al(2010)), they assumed that the impact of remittances on economic growth is through the total factor productivity (TFP) and model formulated as:

$$LGDP_t = C + \alpha LREM_t + \beta LGFC_t + \mu \quad (i)$$

L denotes natural logarithms of respective variables, and the intercept term is the TFP referring to other likely factors (i.e. FDI, FII, foreign aid etc.) not included in the analysis and denoted in the model as C, μ_t is the Gaussians' error term. Data for Real Gross Domestic Product per capita (LGDP) (used as proxy for per capita income), Real Gross Fixed Capital Formation per capita (LGFC) (used as proxy for capital stock) and Real Remittances per capita (LREM) were taken from WDI for the year 1975-2011 in US$ at current prices and converted into per capita at constant prices (2005), by GDP deflator on PPP basis. Dummy variable, DM introduced for the values after the 1991 due to new economic reforms of 1991. So model becomes

$$LGDP_t = C + \alpha LREM_t + \beta LGFC_t + \theta DM + \mu_t \quad (ii)$$

α, β and θ are the elasticities for remittances, capital formation and dummy respectively. Time series properties of selected variables were checked with the help of unit-root tests. The presence of unit-root may lead to estimate a spurious regression and thus, disturb the accuracy of the parameters estimated (for a detailed discussion on 'stationarity of time series' see Asteriou and Hall, 2007, p.288). ADF and PP test are applied on the variables to check whether they were stationary at their levels or not. In case there is problem of non-stationarity in time series data then one option for achieving the stationarity is by successively differencing the series. But in this case if regression analysis is applied on this stationary series, the solution would not be ideal because the model has been correctly specified as a relationship between variables and when both variables are differenced, then implicitly the error process in the regression is also differenced and it produces a non-invertible moving average error process which creates serious estimation problems. Thus the model can no longer give a unique long-run solution. However the other option is that the linear combination of non stationary integerated variables is stationary and such variables are said to be cointegrated. The most desirable case in this option is when all the variables are integrated at the same order.

Three methods for testing for cointegration are popular in economic literature are:

1. Engle Granger (1987) Method

2. Johansen and Juselius (1990) Method

3. ARDL approach of cointegration in case of mixture of I(0) and I(1) variables.

The present study has used the Johanson's Methodology which is the maximum likelihood method for estimating cointegrating relation in multivariate systems as our variables are integrated at the same order I(1). The method involves estimating the following unrestricted vector autoregressive (VAR) model.

$$Z_t = A_o + A_1 Z_{t-1} + A_2 Z_{t-2} + \text{---} + A_k Z_{t-k} + u_t \quad (iii)$$

Where Z_t is an n×1 vector of non-stationary I(1) variable, A_o is a n×1 vector of constants, k

is the number of lags, A_k is a n× n matrix of estimable parameters, and u_t is n×1 vector of independent and identically distributed error terms. In a vector error correction model (VECM), it can be reformulated as follows:

$$\Delta Z_t = A_o + \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \text{---} + \Gamma_{k-1} \Delta Z_{t-k-1} + \Pi Z_{t-1} + u_t \quad (iv)$$

Where and $\Gamma_i=(I-A_1-A_2-...-A_k)$ and $\Pi=(I-A_1-A_2-...-A_k)$; *i=1,2...,k-1*

Here Δ is the difference operator, and I is an n× n identity matrix. The rank of matrix Π determines the number of cointegration vectors which is equal to the number of independent number of cointegrations. If the rank of Π equals r and r < n then there exists r cointegrating relationships. The rank of Π can be determined using Lambda-Max and Trace statistics. The lambda-max test is based on the log-likelihood ratio **ln[Lmax(r)/Lmax(r+1)]**, and is conducted sequentially for r = 0,1,..,k-1. This test tests the null hypothesis that the cointegration rank is equal to r against the alternative that the cointegration rank is equal to r+1. The trace test is based on the log-likelihood ratio **ln[Lmax(r)/Lmax(k)]**, and is conducted sequentially for r = k-1,...,1,0. This test tests the null hypothesis that the cointegration rank is equal to r against the alternative that the cointegration rank is k. We can decompose $\Pi=\alpha\beta'$ where α will include the speed of adjustment to the equilibrium coefficients while β' will be the long-run matrix of coefficients. Therefore the $Z\beta_{t-1}'$ term is equivalent to the error correction term and contains up to *n-1* vectors in a multivariate framework. In present analysis, models (iii) and (iv) have been estimated with a given set of variables.

To check the causal relationship between variables, Granger causality test, was used. A variable X_t is said to be Granger cause another variable Y_t, if the past and present values of X_t helps to predict Y_t.

Variance decomposition was carried out to determine the amount of the error variance of real gross domestic product per capita that can be explained by shocks to the other variables real remittances per capita and gross fixed capital formation per capita. It gives information about the relative importance of each innovation to the variables in the VECM. Specifically, it determines the portion of the forecast error variance of each variable that can be explained by exogenous shocks to the other variables.

Impulse responses measure the time profile of the effect of a shock, or impulse, on the (expected) future values of a variable. Impulse response function was used to know the response of LGDP due to the shock of LREM and LGFC, and response of LGFC to the shock LREM to know the impact of LREM on the both variables.

Results and Discussions:

Remittances and Economic Growth in India:

The broad objective of the study was to examine the relation of remittances and Indian economy for the period 1975-2011. Remittances, if utilized effectively play a vital role in enhancing saving, investment, human capital formation and also on the household consumption expenditure, thereby reducing poverty and improving national income. The developmental effects of remittances depend mainly on the magnitude and effective use by the receiving end. So remittances can overcome the saving and foreign exchange constraints, which enable an economy, to attain higher rate of growth (*Nayyar,* 2008, p. 296).

For identifying the relation of remittances and growth of Indian economy, the technique of cointegration and VECM were used on selected indicators. The presence of unit-root among the selected variables was analysed through Augmented Dickey Fuller (ADF) and Philips-Peron (PP) test. Table 3 summarises the results and according to this table, all the selected variables were found to be non stationary at level with drift (WD) and with drift and trend (WDT). Taking the first difference, it was observed that all the variables were stationary WD and WDT. So all selected variables are integrated at same order i.e. I(1).

Table 3

VAR model was used for determining the optimal lag length with LR, FPE, AIC, SC and HQ criterian and optimal lag length came out to be one (given in table 4). Diagnostic checking (see appendix Table A1 to Table A5) was applied for checking autocorrelation, heteroskedasticity and normality of the residual. Stability of VAR was also checked by AR root table.

Table 4

Table 5

As per Table 5, Pantula principle was applied to select the best suited model of Cointegration vector. Model 2(Indicates intercept (no trend) in cointegration equation (CE)-no intercept in VAR was selected out of five alternative models, as the best suited model for analysing short-run and long-run relationship(s)). An application of Johansen Cointegration test procedure confirms the existence of unique cointegration vector. Table 6 provides *Trace* and *Lambda Max* statistics with their respective *p-values*. It is evident from the analysis that the null hypothesis of at most of one cointegration vector cannot be rejected and Trace and Lamda Max statistics proved the existence of relationships between the variables under evaluation.

Table 6

Table 7 reports the effect of LREM and LGFC on LGDP. The results from this table thus comply with the notion of hypothesis that remittances have positive and significant effect on LGDP. Similarly LGFC have the significant positive effect on LGDP. As per significant elasticity of these variables confirm that one percent rise in LREM and LGFC increase the LGDP by 0.19 percent and 0.53 percent respectively. Effect of remittances on LGDP is significant. Constant term was also significant which showed that there were some variables which induced the total factor productivity and affected the LGDP.

Table 7

Table 8

As per short run adjustment ECM, values for all variables are given in Table 8. As per Table ECM coefficients of LGDP is negative and significant which as per expectation explains that adjustment in these variables is significant in short run. Coefficient is less than 1, which was required. It came out 0.54, which showed that there is quick adjustment in the log run and short run coefficient. 54 percent inequality is adjusted in each period. As per short run impacts of remittances on LGDP and LGFC have shown that lagged value of remittances have significant impact on gross domestic product and gross fixed capital formation. As per table $LREM_{t-1}$ has significant positive effect on D(LGDP) and D(LGFC)

As per result, observed in table 7 and table 8, remittances have positive and significant relation with gross domestic product and gross fixed capital formation of India in the short run and gross domestic product in the long run. Thus, remittances affect gross domestic product both directly as well as indirectly, through the gross fixed capital formation in the short run. Mutual causality has been checked through the VAR Granger Causality/Block Exogeneity Wald Tests and results are given in Table 9, which confirmes that LREM is a Granger cause for LGDP and LGFC. LGFC also Granger cause for LGDP but less significantly. LGDP and LGFC not a Granger cause for LREM. So there is one way by which causality existed from LREM to LGDP and LREM to LGFC.

Impulse Response analysis reveals that a positive shock to remittances causes significant variations in LGDP of India for all the period and become more increasing after 4 years and increasing for the whole period of 10 years. A positive shock to remittances also causes significant variations in LGFC, which is continuously positive for the through out period of 10 years in long run (given in the figure 2).

Figure 2

Table 10 shows the results of variance decomposition and proves that shocks to LGDP explain the largest share of the fluctuations in LGDP, which are reduced from 100 percent to 77 percent in 10 years period, while shock to remittances as an important driver of fluctuations in growth in medium to long run. LREM affected the LGDP variance in ten periods of about 21 percent which is significant.

Table 10

Conclusions and Policy Implications

The present analysis has been carried to pursue the objective of identifying impact of remittances in long run as well as in the short run. A time series data for 37 years spanning over the period 1975 to 2011 has been utilized for the study purpose.

Applying the Augmented Dickey Fuller and Philips-Perron test statistics, all the selected variables have been found stationary at the first difference and gave a signal for the existence of Cointegration relationship between them. An application of Johanson's Cointegration test confirmed the existence of unique Cointegration vector. The analysis of these elasticities described that LREM is a significant variable to promote gross domestic product of India in long run as well as short run. Further LREM also promotes LGFC in short run. Therefore, it can be said that remittances play a significant role in economic growth of India by promoting the growth and capital. These results confirm that, through remittances, income of people rises which results in the increase of their consumption, human development as well as increasing gross capital formation which through multiplier effect will result in expansion of gross domestic product in the long run. TFP can be affected by remittances through efficiency of financial institutions, domestic investment and through the size of domestic productive sectors. Therefore, it is essential that the Indian diaspora is encouraged to remit their earnings to India. For inspiring NRIs and PIOs to invest in India there is an urgent need to start innovative deposits schemes by Indian commercial banks as well as organising regular dialogue with representative of Indian diaspora so that the hurdles in their investment are removed. The government should also take suitable measures for legalising the different channels of remittances, so that transaction costs and time taken is reduced. The government of India should also take steps to encourage the productive uses of remittances rather than it being used for unproductive purpose. Thus, a sound socio-economic climate, development friendly migration policy and strengthening of infrastructure and extensive policy dialogue and coherence are critical components for making remittances work for development for the country.

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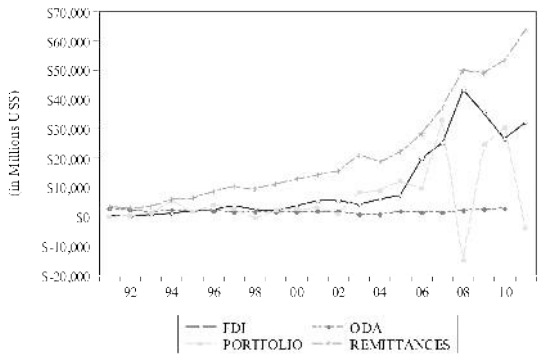
Figure 1

Remittances vis-a-vis other foreign flows to India



Data Source: World Development Indicators 2012

Table 1: Annual Growth of Remittances

Year	in US$ Millions	Annual Growth Rate	Year	in US$ Millions	Annual Growth Rate
1975	429.8837	--------	1994	5856.694	50.833
1976	642.3438	40.160	1995	6222.996	6.066
1977	934.4159	37.479	1996	8765.693	34.259
1978	1164.777	22.036	1997	10330.96	16.429
1979	1437.019	21.004	1998	9479.301	-8.603
1980	2756.976	65.156	1999	11124.28	16.001
1981	2301.416	-18.060	2000	12883.47	14.681
1982	2617.671	12.876	2001	14273.02	10.242
1983	2660.082	1.607	2002	15735.74	9.756
1984	2294.750	-14.773	2003	20999.15	28.854
1985	2469.209	7.327	2004	18750.38	-11.326
1986	2239.903	-9.746	2005	22125.09	16.549
1987	2665.414	17.392	2006	28333.64	24.733
1988	2315.296	-14.082	2007	37216.75	27.270
1989	2613.844	12.128	2008	49977.28	29.480
1990	2383.740	-9.215	2009	49468.37	-1.023
1991	3289.109	32.194	2010	53480.00	7.797
1992	2897.426	-12.679	2011	63818.00	17.672
1993	3522.788	19.543			

Authors calculations

Table 2: Remittances as a share of Macroeconomic Variables

Year	GDP	Household consumption Expenditure	Gross Domestic Saving	Gross Capital Formation
1975	0.44	0.53	2.49	2.35
1980	1.49	1.81	9.73	8.08
1985	1.07	1.42	5.10	4.57
1990	0.75	1.09	3.30	3.10
1995	1.74	2.70	6.87	6.56
2000	2.79	4.37	12.04	11.58
2001	2.98	4.62	12.82	12.35
2002	3.10	4.90	12.79	12.29
2003	3.50	5.66	13.74	13.08
2004	2.59	4.39	8.36	7.91
2005	2.65	4.55	8.31	7.65
2006	2.97	5.16	9.16	8.34
2007	2.99	5.25	8.77	7.85
2008	4.10	7.04	13.97	11.90
2009	3.59	6.22	11.48	9.84
2010	3.12	5.47	9.92	8.99
CAGR*	**6.77**	**7.99**	**5.03**	**4.88**

' Compound annual growth rate of remittances as a share of macroeconomic variables*
Authors calculations

Table 3 :ADF and Philips-Perron test for Unit root

	At Level (probability)				At first Difference (probability)			
	With drift		With drift and trend		With drift		With drift and trend	
Variables	ADF	PP	ADF	PP	ADF	PP	ADF	PP
LGDP	0.99	0.99	0.99	0.99	0.00***	0.00***	0.00**	0.00***
LGFC	0.99	0.99	0.96	0.96	0.00***	0.00***	0.00**	0.00***
LREM	0.83	0.80	0.69	0.51	0.00***	0.00***	0.00***	0.00***

*** represents that the value is significant at 1 percent level of significance.

Authors calculations

Table 4:VAR Lag Order Selection Criteria

Endogenous variables: LGDP LGFC LREM

Lag	LogL	LR	FPE	AIC	SC	HQ
0	34.56	NA	3.74e-05	-1.68	-1.41	-1.58
1	102.82	116.45**	1.15e-06**	-5.16**	-4.49**	-4.93**
2	108.36	8.46	1.44e-06	-4.96	-3.88	-4.59
3	118.77	14.09	1.39e-06	-5.04	-3.56	-4.54

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

Authors calculations

Table 5: Selection of Model for Cointegration Vector: An Application of Pantula Principal

No. of Vectors	Model 2	Model 3	Model 4
None	36.21	33.82	44.62
At most 1	8.97*	6.77	14.10
At most 2	2.58	0.86	0.90

*Notes: i) Model 2 indicates intercept (no trend) in cointegration equation (CE)-no intercept in VAR; ii) Model 3 indicates intercept (no trend) in CE and VAR; iii) Model 4 represents intercept and trend in CE-no trend in VAR; iv) * indicates the first time acceptance of null-hypothesis of number of cointegration vectors, when moving from most restrictive Model 2 to least restrictive model Model 4.*

Authors calculations

Table 6: Rank of Cointegration Matrix

No. of Vectors	Trace Statistics	*p-value*	Lambda Max	*p-value*
None	36.21**	0.03	27.24***	0.00
At most 1	8.97	0.73	6.39	0.74
At most 2	2.58	0.66	2.58	0.66

*** and ** represents that the value is significant at 1 percent and 5 percent level of significance respectively.

Authors calculations

Table 7: Two Cointegration Vectors (Relationships)

LGDP	Constant	LGFC	LREM
Panel A: Without Normalization			
1.000	-3.398***	-0.536***	-0.190***
	(0.248)	(0.064)	(0.043)
	[-13.65]	[-8.29]	[-4.36]

*i) Standard errors in ( ) & t-statistics in [ ]; ii) *** represent the value is significant at 1 percent levels of significance.*

Authors calculations

Table 8:Dynamic Short run relationship (VECM)

ECM	D(LGD)	D(LGFC)	D(LREM)
CointEq1	-0.540**	-0.659	0.700
	(0.180)	(0.276)	(0.444)
	[-2.992]	[-2.385.]	[1.577]
D(LREM(-1))	0.154*	0.276**	-0.116
	(0.081)	(0.124)	(0.200)
	[1.896]	[2.211]	[-0.581]
Dummy	-0.094**	-0.114	0.279**
	(0.046)	(0.071)	(0.114)
	[-2.040]	[-1.601]	[2.447]

*i) Standard errors in ( ) & t-statistics in [ ]; ii) ** and * represent the value is significant at 5 percent and 10 percent levels of significance, respectively.*

Authors calculations

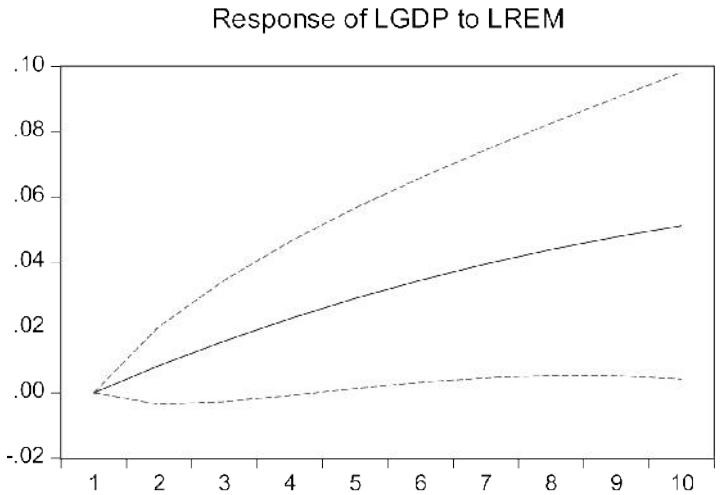
Table 9: VAR Granger Causality/Block Exogeneity Wald Tests

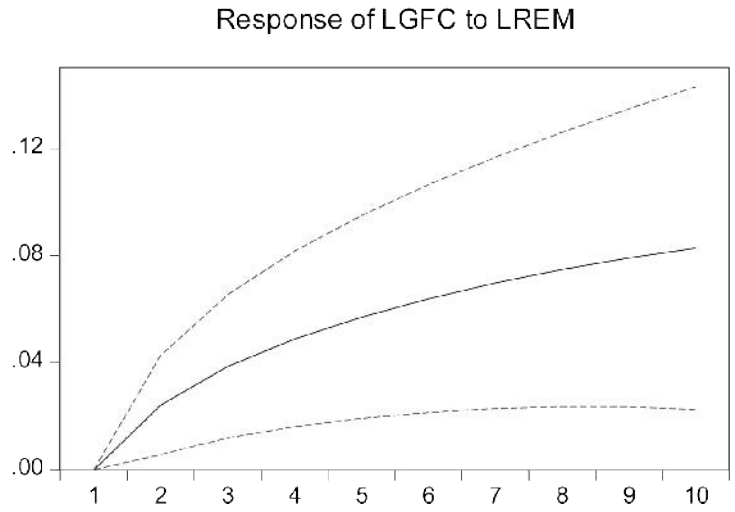
Direction	Chi-Square	df	Probability
[illegible]	2.715*	1	0.09
LREM→LGDP	6.16**	1	0.01
LGDP→LGFC	0.003	1	0.95
LREM→LGFC	8.38***	1	0.00
LGFC→LREM	0.125	1	0.72
LGDP→LREM	0.79	1	0.37
***, **, * represent the significant at 1 percent, 5 percent and 10 percent respectively			
Authors calculations			

Table 10: Variance Decomposition of LGDP

Period	S.E.	LGDP	LGFC	LREM
1	0.080776	100.0000	0.000000	0.000000
2	0.108766	96.47148	1.465087	2.063436
3	0.129944	92.42517	2.092963	5.481866
4	0.147947	88.78237	2.155008	9.062623
5	0.163876	85.71877	2.018868	12.26237
6	0.178196	83.21744	1.843073	14.93948
7	0.191171	81.19766	1.679135	17.12321
8	0.202994	79.56702	1.539085	18.89390
9	0.213819	78.24265	1.422504	20.33484
10	0.223773	77.15710	1.325831	21.51707
Cholesky Ordering: LGDP LGFC LREM				
Authors calculations				

Figure 2
Impulse response
Response to Cholesky One S.D. Innovations ± 2 S.E.





Appendix

Table A1 : VAR Residual Normality Tests

Null Hypothesis: residuals are multivariate normal			
Joint Normality Test	Doornic-Hansen	Cholesky (Lutkepohl)	df
Jarque-Bera (probability)	8.582(0.198)	5.457(0.486)	6
( ) represent probability values			
Authors calculations			

Table A2 : VAR Residual Portmanteau Tests for Autocorrelations

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	2.372	NA*	2.440	NA*	NA*
2	12.771	0.173	13.450	0.143	9
3	18.828	0.402	20.058	0.329	18
4	25.271	0.559	27.306	0.447	27
Authors calculations					

Table A3 : VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order "h"		
Lags	LM-Stat	Prob
1	5.821102	0.7577
2	9.531523	0.3897
3	6.177153	0.7221
4	8.989300	0.4383
Authors calculations		

Table A4 : VAR Residual Heteroskedasticity Tests

No Cross Terms Joint test: null hypothesis no heteroskedasticity		
Chi-sq	df	Prob.
43.43046	42	0.4102
Includes Cross Terms Joint test: null hypothesis no heteroskedasticity		
74.27034	78	0.5987
Authors calculations		

Table A5 : VAR Stability Condition Check

Root	Modulus
0.980314	0.980314
0.592064	0.592064
0.354867	0.354867
No root lies outside the unit circle. VAR satisfies the stability condition	
Authors calculations	